THIRD ANNUAL REPORT

OF THE

BOARD OF TRUSTEES

OF THE

ILLINOIS INDUSTRIAL UNIVERSITY,

FOR THE ACADEMIC YEAR

COMMENCING SEPT. 13, 1869, AND CLOSING JUNE 4, 1870.

WITH A REPORT OF THE

AGRICULTURAL LECTURES AND DISCUSSIONS,

AT

CHAMPAIGN, CENTRALIA AND ROCKFORD, Etc.

SPRINGFIELD:
STATE JOURNAL PRINTING OFFICE.
1870.

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"Our nineteenth century is the age of tools."—*Emerson*.

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ERRATA.

On page 269, last line before title "Highways," for "eminent," read "ermined."

On page 278, first line of second paragraph, for "stated periods," read "statute provides."

On page 278, in fourth line of second paragraph, for the words, "after the expiration of," supply "within."

INTRODUCTORY.

To His Excellency JOHN M. PALMER, *Governor of Illinois:*

In accordance with my duties as Corresponding Secretary of the Board of Trustees of the Illinois Industrial University, I submit herewith their Third Annual Report, including the Proceedings of the Board of Trustees and of their Executive Committee, and Reports of the Agricultural Lectures and Discussions held at the University, at Centralia and at Rockford, during the past year.

The Treasurer gives a full financial exhibit on pages 85, 86 and 87, covering the year of the report.

During the year covered by this report, as may be seen by reference to the circular and catalogue, 8 professors, 2 non-resident professors, 5 teachers and assistants of professors, and 4 assistants on the farm and in the garden and shop, have been employed; 180 students are enumerated on the catalogue, representing 46 of the 102 counties of Illinois, and 8 other States. Classified according to the studies pursued, 61 are in the Agricultural Course, 49 in the Elective, 43 in the Mechanical, 19 in the Military, and 8 in that of Civil Engineering.

The current academic year—no report of which is included in the following pages—has opened under very hopeful auspices. The number of students is increased to over 200, representing 50 counties of Illinois, and 7 other States; and the single building used for dormitories, recitation rooms and cabinets, is already crowded to overflowing. Students are occupying the basement rooms, in the want of better, at some risk of health. Thirteen teachers are obliged to make the best shift they can, with 8 recitation rooms, so limited in their capacity that some of the larger classes must recite in installments, and professors are compelled to teach the same lessons twice. The time has already arrived when a large extension of the capacity of the University seems necessary, to furnish proper means of culture to the young men and women of our State who desire the "new education," which it is the duty of the Industrial University to furnish.

A committee appointed by a convention held at Bloomington in March last, to visit the Illinois Industrial University, and report upon its management, state that on the 20th and 21st of September, 1870, they found 194 male students and 14 female students in attendance, and that the classes were composed about as follows, each student pursuing three or more studies:

History: taught by lectures to all the students.

Agriculture and Horticulture	50
Mechanics and Civil Engineering	54
Chemistry	65
Comparative Anatomy	15
Mathematics	138
Military Tactics	23
Commercial	50
English Literature, etc	92
German	63
French	27
Latin	20
Greek	0

These figures, made by gentlemen outside the University, are iven because the statement has been repeatedly made and believed that the Trustees of the University were perverting its funds to uses not intended by the Congressional grant, and were teaching the ordinary collegiate studies in the old way.

Only a visit to the institution is needed to dispel these fallacies. While it is not hoped, nor can reasonable be yet expected that all the proposed and desirable ends have yet been secured, it is apparent to the visitor that the institution is tending in the right direction. The Latin and Greek languages, which occupy a chief place in our ordinary colleges are perhaps studied less than they deserve. German and French, as of greater practical importance, not only as means of communication, but as containing a large mass of scientific and agricultural literature, are largely studied. The important relation which chemistry sustains to agriculture and the mechanic arts, is recognized in the interest that crowds the somewhat contracted limits of that department, with students. The advanced class in chemistry nearly fills the 24 tables of the working laboratory, and the new class of nearly 50 members overflows the recitation room, and will soon need a place for work. Agriculture and mechanics, besides being made the objects of direct study in the class-room, are being extensively illustrated and taught in the fields and shops. A large experimental orchard, comprising 1,200 varieties of apples, is already planted and growing thriftily; 400 varieties of pears, besides varieties of peaches and other fruits, are propagating for farther planting, and will be ready by the time the sites on which they are to be planted can be properly ameliorated by drainage and tillage. A green-house already been two years in use, and a larger glass structure has just been finished which is expected to receive some liberal donations of valuable exotic plants, especially those known in commerce—such as the Date, Sago and Fan Palms, Pine Apple, etc. A large collection of young forest trees of the more valuable species, for lumber, etc., has been made in the nurseries. These, as they attain sufficient size, are to be transplanted into permanent plantations, to test the values of the different species for this purpose. The experimental grounds are still under process of preparation by thorough tile-draining, which is being done by student labor. Two large and convenient barns have been erected on the experimental and stock farms, with due regard to economy and thoroughness of construction.

In the somewhat crowded space of the shops, the mechanical students are not only performing a limited amount of labor as a means of instruction, but are furnished with remunerative employment, which might be indefinitely extended by an enlargement of the shop, and furnish facilities for other work. At present these students are engaged in the making of patterns for founderies, stuff for picture frames, and the frames themselves, and have lately finished the work of fitting and putting up the steam heating apparatus in the University building, at a total cost of material, freights, etc., of $1,469 83, being more than $500 less than the amount appropriated by the Executive Committee for the purpose, and more than $3,500 less than the amount for which responsible parties were willing to contract to do the work. The zeal and interest shown in this department enforce the importance of giving it the aid which the Board of Trustees asked two years ago, but which the General Assembly did not consider it best to grant. It seems specially desirable that the State or private munificence should furnish the requisite presses, types, etc., for a printing office and bindery, which would furnish farther employment for students, and economise the expenses of the University. R. Hoe & Co., of New York, have presented the Cornell University with a steam cylinder press valued at $3,250. The example is worthy of imitation; and the fact of an University press at Cornell to-day, whose foreman, compositors, pressmen and engineer, are all matriculated students, and whose work is done well, proves that the idea is practicable.

Thus far, I have spoken of the work of the University, and its wants in the direction of teaching and furnishing the means of self-support to the young men and women who are thronging its lecture and recitation rooms. It may be proper, also, to say somewhat of a work not less important, but hitherto somewhat impracticable. I mean that of *originating knowledge*—especially in agriculture—by observation and experiment, and the ultimate elimination of a science of agriculture from the facts so collected. The charter of the University looks to this, and makes it the duty of the Corresponding Secretary of the Board of Trustees to issue circulars, directions for procuring needful materials for conducting experiments, and eliciting instructive information from persons in various counties, selected for that purpose, and skilled in any branch of Agricultural, Mechanical and Industrial Art; and to do all other acts needful to enable him to prepare an annual report regarding the progess of the University in each department thereof—recording any improvements and experiments made, with their costs and results, and such other matters, including State, industrial, and economical statistics, as may be supposed useful. The desirability of doing all this, is sufficiently manifest. There has been on the part of the State Agricultural Society, and of the State Board of Equalization, urgent and repeated requests made for statistics; and the importance of experimentation, if less urged, is still strongly felt. But if there be no power to *require* statistics, the duty of collecting them can avail little, and must be limited to recording and reprinting what has already appeared elsewhere.

Hence, it has not been deemed desirable to attempt the collection of statistics until increased powers were given for their collection, by placing the collection of State statistics in the hands of the Corresponding Secretary, or of the State Auditor, or of a Commissioner of Statistics, and requiring such statistics, so far as industrial, at least, to be made a part of this report.

In instituting experiments, we have to face some facts which we are assured by those of more experience, render experiment difficult. Those who heard the lecture of Dr. Manly Miles, Professor of Agriculture in the Michigan Agricultural College, given at our last State Fair, on Experimental Agriculture, will remember how, himself an experimenter of many years experience, he warned his listeners of the lack of any value in nearly all the experiments hitherto made, from the want of care in the experimenter. To make experiments of any value requires skill and intelligence, great care in avoiding fallacies, singleness of purpose in any given experiment, and great accuracy of detail. This brings us to the conclusion that the kind of experiments wanted require skilled persons to conduct them, and demand more time and expense than many can or will afford, gratuitously. We are brought, in short, to the conclusion, that we should have Agricultural Experiment Stations, at the University and in different parts of the State where chemical, physiological, agricultural, and other observations and experiments can be carried on with uniformity, continuity and exactness. Each of these stations should comprise a tract of ground and suitable buildings, donated to the State for the purpose; and the State should grant an annual appropriation of $2,000 or $3,000 to each, to pay the salary of a suitable superintendent and the wages of laborers. For further information as to the value of these Experiment Stations, I need only to refer to the testimony of such men as Liebig, Pugh and Johnson, who commend them as the best means yet discovered for forwarding agricultural investigation.

In view of difficulties such as these, and of the insufficient means for doing all that it was desirable to do, I have been expected to confine the expenditure for collecting material for my annual report to a limited amount, and have had to depend upon circulars and the Annual Agricultural Lectures and Discussions in different parts of the State for such facts of experience as are here presented. But it is earnestly to be hoped that, with more completeness of the improvements on the experimental farm, and less continuous and exacting demands of preliminary work, that proper experiments and observations may be commenced at the University, and farther means be spared to be spent in this direction. In saying this, however, I would by no means underrate the importance of the annual gatherings of the farmers of the State begun under the auspices of this University. They have a high value as a means of gathering facts and disseminating knowledge of the best practices in the art of agriculture, and are a great stimulus wherever they go.

Among the observations and experiments desirable to be instituted, and for which no sufficient provision has been yet made, are the following:

I. Meteorological Observations:

1. Scientific, after the method now pursued by the Smithsonian Institution, whose observations, so far as they go, may be also used.

2. Practical, after the plan adopted by the United States Signal Service, making it applicable, however, to agricultural as well as marine affairs. This can best be done, probably, by securing the services of the telegraph companies and a more general distribution of charts showing the current weather, like those of the Western Union Telegraph Company.

II. Mechanical Experiments:

1. With strength of materials.

2. With different motive powers.

3. Trials of agricultural implements used for pulverization, seed sowing, cultivation of the growing crop, harvesting, threshing, cutting and cooking of animal food, etc.

4. Trials of mechanical implements used in production and manufacture, such as mining, lumbering, reduction of ores, working in metals, woods and clays.

III. Experiments in physics; particularly the effects of different degrees of light, heat, electricity and moisture on seeds and plants.

IV. Chemical experiments; particularly the analysis of soils, of clays and other earths used in the arts; of coals, lime and building rocks, minerals, manures, plants and their products, and of animal products.

V. Experiments and observations in mining and metallurgy; especially in the mining of coal.

VI. Experiments with soils in their drainage; pulverization by implements; the application of different fertilizers; the variation of soils in the same field; their continuous cropping without the application of manures, and their irrigation.

VII. Experiments in special culture with different varieties of grasses, grains, roots, plants, trees, etc., with variations in the depth, distance and time of planting; in the cultivation, harvesting, manuring, drainage, irrigation and mode of propagation, etc.; with an examination into the special diseases and insects affecting each.

VIII. Experiments in the breeding and feeding of domestic animals of all kinds, including an economical comparison of different species and of varieties of the same species at different ages, under differing conditions of fatness and food, and examinations into their diseases.

It may seem to some, that in insisting upon so varied a course of experimentation, too much importance has been attached to this and perhaps the whole system of industrial education. But the facts show otherwise, as any one who will read the late speech of Judge Hoar upon National Education, may see. The facts there cited and borne out by the testimony of the Regent of this University, in his observations made in 1869, prove pretty conclusively that the polytechnic schools of the continental nations of Europe between the years 1851 and 1867, have almost entirely reversed the position of those countries as compared with their former condition. In 1851, England was far in advance of all the other nations in her exhibition of manufactures at the Crystal Palace. In 1867 she was far behind many other countries, and her former customers not only supplied themselves, but competed with her in the markets of the world. Her own statesmen trace her comparative inferiority to the lack of industrial education; and to-day, her operatives are by thousands thrown out of employment, and suffering for food. These facts prove, what is sufficiently reasonable, that educated intelligence, and not brute strength, is to win, even among the laborers of the future. Neither Illinois nor any other State *can afford* to neglect industrial education in any of its branches.

In conclusion, I would again call the attention of your Excellency to the resolution of the Board of Trustees (page 80), recommending a reduction of the number of the Board, which, already composed of 32 members, will be increased, at least by the addition of one for each congressional district, making the number 35 or more. The Board ask that the number be reduced to one member from each congressional district, with the present *ex-officio* members, which would make the total number about 20. For many institutions even this number might seem unnecessarily large; but experience has shown that in an *educational experiment* like the Industrial University, we require as wide a range of experience and observation in its legislative department as is practicable. To rightly ascertain the educational wants, tastes and capacities of the great industrial classes, and meet them, requires not only ability and faithfulness, but that kind of wisdom which is found in a multitude of counselors, coming from the ranks of the people in all parts of the State.

Respectfully, W. C. FLAGG,

Cor. Sec. of Board of Trustees.

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ERRATA.

On page 269, last line before title "Highways," for "eminent," read "ermined."

On page 278, first line of second paragraph, for "stated periods," read "statute provides."

On page 278, in fourth line of second paragraph, for the words, "after the expiration of," supply "within."

INTRODUCTORY.

To His Excellency John M. Palmer, *Governor of Illinois:*

In accordance with my duties as Corresponding Secretary of the Board of Trustees of the Illinois Industrial University, I submit herewith their Third Annual Report, including the Proceedings of the Board of Trustees and of their Executive Committee, and Reports of the Agricultural Lectures and Discussions held at the University, at Centralia and at Rockford, during the past year.

The Treasurer gives a full financial exhibit on pages 85, 86 and 87, covering the year of the report.

During the year covered by this report, as may be seen by reference to the circular and catalogue, 8 professors, 2 non-resident professors, 5 teachers and assistants of professors, and 4 assistants on the farm and in the garden and shop, have been employed; 180 students are enumerated on the catalogue, representing 46 of the 102 counties of Illinois, and 8 other States. Classified according to the studies pursued, 61 are in the Agricultural Course, 49 in the Elective, 43 in the Mechanical, 19 in the Military, and 8 in that of Civil Engineering.

The current academic year—no report of which is included in the following pages—has opened under very hopeful auspices. The number of students is increased to over 200, representing 50 counties of Illinois, and 7 other States; and the single building used for dormitories, recitation rooms and cabinets, is already crowded to overflowing. Students are occupying the basement rooms, in the want of better, at some risk of health. Thirteen teachers are obliged to make the best shift they can, with 8 recitation rooms, so limited in their capacity that some of the larger classes must recite in installments, and professors are compelled to teach the same lessons twice. The time has already arrived when a large extension of the capacity of the University seems necessary, to furnish proper means of culture to the young men and women of our State who desire the "new education," which it is the duty of the Industrial University to furnish.

A committee appointed by a convention held at Bloomington in March last, to visit the Illinois Industrial University, and report upon its management, state that on the 20th and 21st of September, 1870, they found 194 male students and 14 female students in attendance, and that the classes were composed about as follows, each student pursuing three or more studies:

History: taught by lectures to all the students.

Agriculture and Horticulture	50
Mechanics and Civil Engineering	54
Chemistry	65
Comparative Anatomy	15
Mathematics	138
Military Tactics	23
Commercial	50
English Literature, etc	92
German	63
French	27
Latin	20
Greek	0

These figures, made by gentlemen outside the University, are iven because the statement has been repeatedly made and believed that the Trustees of the University were perverting its funds to uses not intended by the Congressional grant, and were teaching the ordinary collegiate studies in the old way.

Only a visit to the institution is needed to dispel these fallacies. While it is not hoped, nor can reasonable be yet expected that all the proposed and desirable ends have yet been secured, it is apparent to the visitor that the institution is tending in the right direction. The Latin and Greek languages, which occupy a chief place in our ordinary colleges are perhaps studied less than they deserve. German and French, as of greater practical importance, not only as means of communication, but as containing a large mass of scientific and agricultural literature, are largely studied. The important relation which chemistry sustains to agriculture and the mechanic arts, is recognized in the interest that crowds the somewhat contracted limits of that department, with students. The advanced class in chemistry nearly fills the 24 tables of the working laboratory, and the new class of nearly 50 members overflows the recitation room, and will soon need a place for work. Agriculture and mechanics, besides being made the objects of direct study in the class-room, are being extensively illustrated and taught in the fields and shops. A large experimental orchard, comprising 1,200 varieties of apples, is already planted and growing thriftily; 400 varieties of pears, besides varieties of peaches and other fruits, are propagating for farther planting, and will be ready by the time the sites on which they are to be planted can be properly ameliorated by drainage and tillage. A green-house already been two years in use, and a larger glass structure has just been finished which is expected to receive some liberal donations of valuable exotic plants, especially those known in commerce—such as the Date, Sago and Fan Palms, Pine Apple, etc. A large collection of young forest trees of the more valuable species, for lumber, etc., has been made in the nurseries. These, as they attain sufficient size, are to be transplanted into permanent plantations, to test the values of the different species for this purpose. The experimental grounds are still under process of preparation by thorough tile-draining, which is being done by student labor. Two large and convenient barns have been erected on the experimental and stock farms, with due regard to economy and thoroughness of construction.

In the somewhat crowded space of the shops, the mechanical students are not only performing a limited amount of labor as a means of instruction, but are furnished with remunerative employment, which might be indefinitely extended by an enlargement of the shop, and furnish facilities for other work. At present these students are engaged in the making of patterns for founderies, stuff for picture frames, and the frames themselves, and have lately finished the work of fitting and putting up the steam heating apparatus in the University building, at a total cost of material, freights, etc., of $1,469 83, being more than $500 less than the amount appropriated by the Executive Committee for the purpose, and more than $3,500 less than the amount for which responsible parties were willing to contract to do the work. The zeal and interest shown in this department enforce the importance of giving it the aid which the Board of Trustees asked two years ago, but which the General Assembly did not consider it best to grant. It seems specially desirable that the State or private munificence should furnish the requisite presses, types, etc., for a printing office and bindery, which would furnish farther employment for students, and economise the expenses of the University. R. Hoe & Co., of New York, have presented the Cornell University with a steam cylinder press valued at $3,250. The example is worthy of imitation; and the fact of an University press at Cornell to-day, whose foreman, compositors, pressmen and engineer, are all matriculated students, and whose work is done well, proves that the idea is practicable.

Thus far, I have spoken of the work of the University, and its wants in the direction of teaching and furnishing the means of self-support to the young men and women who are thronging its lecture and recitation rooms. It may be proper, also, to say somewhat of a work not less important, but hitherto somewhat impracticable. I mean that of *originating knowledge*—especially in agriculture—by observation and experiment, and the ultimate elimination of a science of agriculture from the facts so collected. The charter of the University looks to this, and makes it the duty of the Corresponding Secretary of the Board of Trustees to issue circulars, directions for procuring needful materials for conducting experiments, and eliciting instructive information from persons in various counties, selected for that purpose, and skilled in any branch of Agricultural, Mechanical and Industrial Art; and to do all other acts needful to enable him to prepare an annual report regarding the progess of the University in each department thereof—recording any improvements and experiments made, with their costs and results, and such other matters, including State, industrial, and economical statistics, as may be supposed useful. The desirability of doing all this, is sufficiently manifest. There has been on the part of the State Agricultural Society, and of the State Board of Equalization, urgent and repeated requests made for statistics; and the importance of experimentation, if less urged, is still strongly felt. But if there be no power to *require* statistics, the duty of collecting them can avail little, and must be limited to recording and reprinting what has already appeared elsewhere.

Hence, it has not been deemed desirable to attempt the collection of statistics until increased powers were given for their collection, by placing the collection of State statistics in the hands of the Corresponding Secretary, or of the State Auditor, or of a Commissioner of Statistics, and requiring such statistics, so far as industrial, at least, to be made a part of this report.

In instituting experiments, we have to face some facts which we are assured by those of more experience, render experiment difficult. Those who heard the lecture of Dr. Manly Miles, Professor of Agriculture in the Michigan Agricultural College, given at our last State Fair, on Experimental Agriculture, will remember how, himself an experimenter of many years experience, he warned his listeners of the lack of any value in nearly all the experiments hitherto made, from the want of care in the experimenter. To make experiments of any value requires skill and intelligence, great care in avoiding fallacies, singleness of purpose in any given experiment, and great accuracy of detail. This brings us to the conclusion that the kind of experiments wanted require skilled persons to conduct them, and demand more time and expense than many can or will afford, gratuitously. We are brought, in short, to the conclusion, that we should have Agricultural Experiment Stations, at the University and in different parts of the State where chemical, physiological, agricultural, and other observations and experiments can be carried on with uniformity, continuity and exactness. Each of these stations should comprise a tract of ground and suitable buildings, donated to the State for the purpose; and the State should grant an annual appropriation of $2,000 or $3,000 to each, to pay the salary of a suitable superintendent and the wages of laborers. For further information as to the value of these Experiment Stations, I need only to refer to the testimony of such men as Liebig, Pugh and Johnson, who commend them as the best means yet discovered for forwarding agricultural investigation.

In view of difficulties such as these, and of the insufficient means for doing all that it was desirable to do, I have been expected to confine the expenditure for collecting material for my annual report to a limited amount, and have had to depend upon circulars and the Annual Agricultural Lectures and Discussions in different parts of the State for such facts of experience as are here presented. But it is earnestly to be hoped that, with more completeness of the improvements on the experimental farm, and less continuous and exacting demands of preliminary work, that proper experiments and observations may be commenced at the University, and farther means be spared to be spent in this direction. In saying this, however, I would by no means underrate the importance of the annual gatherings of the farmers of the State begun under the auspices of this University. They have a high value as a means of gathering facts and disseminating knowledge of the best practices in the art of agriculture, and are a great stimulus wherever they go.

Among the observations and experiments desirable to be instituted, and for which no sufficient provision has been yet made, are the following:

I. Meteorological Observations:

1. Scientific, after the method now pursued by the Smithsonian Institution, whose observations, so far as they go, may be also used.

2. Practical, after the plan adopted by the United States Signal Service, making it applicable, however, to agricultural as well as marine affairs. This can best be done, probably, by securing the services of the telegraph companies and a more general distribution of charts showing the current weather, like those of the Western Union Telegraph Company.

II. Mechanical Experiments:

1. With strength of materials.

2. With different motive powers.

3. Trials of agricultural implements used for pulverization, seed sowing, cultivation of the growing crop, harvesting, threshing, cutting and cooking of animal food, etc.

4. Trials of mechanical implements used in production and manufacture, such as mining, lumbering, reduction of ores, working in metals, woods and clays.

III. Experiments in physics; particularly the effects of different degrees of light, heat, electricity and moisture on seeds and plants.

IV. Chemical experiments; particularly the analysis of soils, of clays and other earths used in the arts; of coals, lime and building rocks, minerals, manures, plants and their products, and of animal products.

V. Experiments and observations in mining and metallurgy; especially in the mining of coal.

VI. Experiments with soils in their drainage; pulverization by implements; the application of different fertilizers; the variation of soils in the same field; their continuous cropping without the application of manures, and their irrigation.

VII. Experiments in special culture with different varieties of grasses, grains, roots, plants, trees, etc., with variations in the depth, distance and time of planting; in the cultivation, harvesting, manuring, drainage, irrigation and mode of propagation, etc.; with an examination into the special diseases and insects affecting each.

VIII. Experiments in the breeding and feeding of domestic animals of all kinds, including an economical comparison of different species and of varieties of the same species at different ages, under differing conditions of fatness and food, and examinations into their diseases.

It may seem to some, that in insisting upon so varied a course of experimentation, too much importance has been attached to this and perhaps the whole system of industrial education. But the facts show otherwise, as any one who will read the late speech of Judge Hoar upon National Education, may see. The facts there cited and borne out by the testimony of the Regent of this University, in his observations made in 1869, prove pretty conclusively that the polytechnic schools of the continental nations of Europe between the years 1851 and 1867, have almost entirely reversed the position of those countries as compared with their former condition. In 1851, England was far in advance of all the other nations in her exhibition of manufactures at the Crystal Palace. In 1867 she was far behind many other countries, and her former customers not only supplied themselves, but competed with her in the markets of the world. Her own statesmen trace her comparative inferiority to the lack of industrial education; and to-day, her operatives are by thousands thrown out of employment, and suffering for food. These facts prove, what is sufficiently reasonable, that educated intelligence, and not brute strength, is to win, even among the laborers of the future. Neither Illinois nor any other State *can afford* to neglect industrial education in any of its branches.

In conclusion, I would again call the attention of your Excellency to the resolution of the Board of Trustees (page 80), recommending a reduction of the number of the Board, which, already composed of 32 members, will be increased, at least by the addition of one for each congressional district, making the number 35 or more. The Board ask that the number be reduced to one member from each congressional district, with the present *ex-officio* members, which would make the total number about 20. For many institutions even this number might seem unnecessarily large; but experience has shown that in an *educational experiment* like the Industrial University, we require as wide a range of experience and observation in its legislative department as is practicable. To rightly ascertain the educational wants, tastes and capacities of the great industrial classes, and meet them, requires not only ability and faithfulness, but that kind of wisdom which is found in a multitude of counselors, coming from the ranks of the people in all parts of the State.

Respectfully, W. C. FLAGG,

Cor. Sec. of Board of Trustees.

DEPARTMENT OF ENGLISH LANGUAGE AND LITERATURE.

In the arrangement of the studies in this Department, the endeavor has been to present so thorough and extended a drill in grammatical and philological study, and in the authors and history of our language, as to afford the advantages, so far as may be, of the ordinary study of the Latin and Greek.

The course is arranged to extend through three years, but it may be shortened according to the ability or needs of the student.

Instruction will be given by text books and lectures; and constant practice in essay writing, forensics, presentation of plans and criticism, will be required. Public declamations, original or selected, and original essays, are required of every student at least twice a term, during his entire connection with the University.

FIRST YEAR.—*First Term.*—Punctuation, Use of Capitals, Sources of the English Language, Principles of Composition and Essay Writing.

Second Term.—Primary Rhetoric, Advanced Grammar, Philological and Grammatical Analysis of Modern Authors.

Third Term.—Advanced Grammar, Philological and Grammatical Analysis of Milton and other authors, History of their times and contemporaries.

SECOND YEAR.—*First Term.*—Grammatical and Philological Analysis of Shakspeare and early dramatists, History of the Times and Contemporaries of Shakspeare.

Second Term.—Grammatical and Philological Analysis of Chaucer, Gouee, Spenser, etc., and history of their times, etc.

Third Term.—History of English Literature, Essays and Criticisms.

THIRD YEAR.—*First Term.*—History of English and American Literature, Essays and Criticisms.

Second Term.—Rhetoric proper, Instruction, Plans, etc.

Third Term.—Elements of Criticism, Methods of Philological Study, etc.

DEPARTMENT OF GERMAN LANGUAGE AND LITERATURE.

This language being of quite practical value to the farmer and artisan in this country, it will be taught thoroughly in a two years' course. The first year aims to enable the student to read such German scientific works as his course demands. The second year completes the course, and makes the student thoroughly acquainted with the language.

FIRST YEAR.—*First Term.*—Worman's Complete German Etymology, to lesson 28. *Second Term.*—Etymology completed; Conversational Reader; German Echo commenced. *Third Term.*—Syntax; Reader completed.

SECOND YEAR.—*First Term.*—Review of Etymology; Classic Reader. *Second Term.*—Review of Syntax; Schiller's Wilhelm Tell; Gœthe's Iphigenia. *Third Term.*—Lectures on the German language, conversation and composition; Schiller's Jungfrau von Orleans; Reading of German papers through second and third terms.

Books for reference—Grimm's Deutsche Sprachlehre; Adler's Dictionary.

DEPARTMENT OF THE LATIN LANGUAGE AND LITERATURE.

Students will not be admitted to this Department who are not prepared to enter at once upon the reading of Cicero.

FIRST YEAR.—The orations of Cicero. Latin Prose Composition begun and continued through the course. Selections from Virgil. Latin Prosody.

SECOND YEAR.—Selections from Livy. Horace. Juvenal.

THIRD YEAR.—Cicero de Officiis. Cicero de Oratore. Lectures on the origin and structure of the Latin language. Frieze's Quintilian. Other authors will occasionally be substituted in place of some of the above.

DEPARTMENT OF GREEK LANGUAGE AND LITERATURE.

This course will resemble that in the Department of Latin.

FIRST YEAR.—First three books of Xenophon's Anabasis. Herodotus. Greek Prose begun.

SECOND YEAR.—Demosthenes, Thucydides, Homer's Iliad.

THIRD YEAR.—Xenophon's Memorabilia of Socrates. Selections from Plato and the Greek Poets.

Select portions of Smith's History of Greece will be read in course, and lectures given on the Grecian History, Literature and Philosophy.

DEPARTMENT OF HISTORY AND SOCIAL SCIENCE.

The instruction in this Department will be given partly with text books, but chiefly by lectures, with systematic readings of specified authors, and daily examinations on the same. The study of historical geography will keep even pace with the history studied, and the chronology will be rendered as clear and distinct as possible. Written exercises on chronology, and essays in historical criticism, will constitute prominent features of the course.

FIRST YEAR.—*First Term.*—Discovery, settlement and colonial history of the United States, with notices of other American States. American geography. Two lectures (or lessons) a week. *Second Term.*—History of the United States from the time of the Revolution. Two lectures (or lessons) a week.

SECOND YEAR.—*First Term.*—Ancient History of Greece and Rome, with notices of other ancient nations. Ancient geography. Five lessons (or lectures) a week. *Second Term.*—Mediæval history, with history of Christianity and ancient schools of philosophy. Scholasticism. Modern history—general European history. European geography. Five lessons (or lectures) a week. *Third Term.*—Political economy.

THIRD YEAR.—*First Term.*—Constitutional history of England, and of the United States. Two lectures a week. *Second Term.*—History of civilization. Analysis of historical forces and phenomena. Notices of the history of the arts and inductive sciences. *Third Term.*—Political philosophy. Constitutional and international law.

COMMERCIAL DEPARTMENT.

The course in this Department will occupy one year, the first term of which will be occupied in teaching the principles of book-keeping in general; the second, their application to special lines of business, general business forms and papers, and the third, to the higher operations of a counting house, commercial law and political economy. Students who wish to prepare for a commercial career, and also to acquire a general education, may extend this course through two or more years, by taking such collateral studies as their contemplated vocation may render desirable.

Studies recommended for this purpose, would be: the English and German Languages, Mathematics, one or two terms of Chemistry (for druggists, etc.), and History.

First Term.—Book-keeping by single and double entry. Theory of Mercantile Accounts, and the several principal and auxiliary books. Penmanship. Commercial calculations.

Second Term.—Partnership Accounts, Commission and Shipping. Farm books. Business forms and papers. Notes. Drafts. Exchange. Endorsements. Bills of lading. Account current. Account sales. Inventories, invoices, etc. Commercial correspondence.

Third Term.—Banking and Bank-book Keeping. Railroad Accounts. Political Economy, Twelve Lectures on Commercial Law.

DEPARTMENT OF MILITARY SCIENCE AND TACTICS.

This Department is organized under the provision of the Acts of the National and State Governments, requiring the instruction in Military Tactics.

The Board of Trustees of this University have adopted the rule, that all students take part in military exercise, unless excused for sufficient cause, as aggregation of numbers is a paramount necessity to render such instruction effective.

The instruction in this Department will be given in two sub-divisions, arranged as follows:

1. Practical Instructions in Military Tactics (for the present, confined to the infantry arm), to all able-bodied students of the University, comprising the following branches:

Manual of Arms; Squad and Company Drill; Bayonet Exercise; Skirmish Drill; Battalion Drill; Guard and Picket Duty; Evolutions of the Brigade; Target Practice.

The exercises are confined to three hours' drill and instruction per week.

2. Military Science. There will be taught a class in Military Science and Art, as far as it is necessary for duties as officers of the line. Students will be admitted into this class after having participated at least two terms in the general military exercises, and shown such proficiency and ability as may secure a utilization of the instruction thus received.

The instruction, theoretical and practical, is to occupy not to exceed five hours per week, and is so arranged as not to interfere with any other courses of study, and makes it possible for the member of any other course to engage in it as an optional study.

The members of this class will officer the companies, and act as drill sergeants and instructors for the lower classes.

As collateral studies for such as make this course a specialty, are recommended Mathematics and Surveying, English and Modern Languages, Drawing, one term of Chemistry, History and Political Economy.

FIRST YEAR.—*First Term.*—School of the company; bayonet fencing.

Second Term.—Battalion and skirmish drill; bayonet fencing.

Third Term.—Brigade and division evolutions; target practice and theoretical instruction on the rifle and fire arms.

SECOND YEAR.—*First Term.*—Military administration; reports and returns; army regulations and military laws; sword fencing.

Second Term.—Outpost and picket duty (Mahon's); sword fencing.

Third Term.—Military fortification, field and permanent; military bridges and roads; target practice.

THIRD YEAR.—*First Term.*—Artillery practice; field artillery; drill at the cannon.

Second Term.—Military engineering; cavalry tactics, theoretical.

Third Term.—Art of war (Jomini); military history and statistics; organization and administration of armies.

There is formed now a battalion of four companies, officered by the students of the military class, and battalion drill and skirmish were practiced last term.

APPARATUS.

The value of an institution of learning will depend largely upon the amount and character of its apparatus of instruction—its means of teaching to the eye. No other teaching is so rapid and effective as this. It has been the policy, from the outset, to provide the University the best and most complete means of illustration, and constant additions are being made to its apparatus in all departments.

CHEMISTRY.—This department is furnished with a working laboratory, in which tables are already provided for a class of 24 students, to work at once, with all the appliances needed for making chemical analyses, including the Bunsen Burner, the Spectroscope and the Hibbs' Assaying Furnace. In addition to the usual reagents and apparatus required for laboratory work, and already supplied, there is to be added this summer nearly $3,000 worth of new apparatus, including a Sacharometer, a Ruhmkorf's Coil, a Narrenberg's Polarizer, a Thermo Electric Pile, and other valuable pieces for illustrating the relations of light, heat and electricity to chemistry, so that the best facilities will be furnished for acquiring a thorough knowledge of this science. As soon as students shall have become acquainted with the general principles of the science, no pains will be spared to familiarize them with it in its applications to agriculture, and other industrial pursuits, and to awaken in them a love for scientific investigation. They will have access to minerals, ores, and geological specimens, and be taught how to analyze them. A library of standard works on general and analytical chemistry will soon be purchased; and English, French, and German periodicals will furnish information of the most recent views and discoveries in this department of science.

BOTANY AND HORTICULTURE.—*Papier mache* flowers, fruits, etc., have been procured from the celebrated Dr. Auzoux, of Paris. Among them are flowers of several classes which can be easily dissected, and which are so greatly enlarged as to exhibit to the eye the minute organs almost invisible in natural flowers. Also, fruits and grain magnified to show the organs, structure and parts, the coatings, starch, pulp, germs and various tissues. Nothing has ever exceeded the beauty and fidelity of these artificial fruits and flowers. Besides these, the University possesses extensive herbariums, collections of wood, seeds, grains, etc.; also large nurseries of forest and fruit trees, orchards, gardens, small fruit plantations and ornamental grounds—a propagating house and a large green-house just added. A botanical garden and an extensive aboretum are in preparation. The department has also two large and powerful microscopes.

ZOOLOGY, GEOLOGY, ETC.—Cabinets of insects, birds, reptiles, mammals, shells, skeletons, fossils, minerals, charts and plates are already collected and are rapidly increasing. A large double magic lantern, such as are manufactured for the English government army schools, has been procured from London, with a large number of slides to illustrate geology, natural history, astronomy, history, etc.

AGRICULTURE.—Besides the foregoing, nearly all of which serves to illustrate the sciences related to agriculture, the University farms, gardens, etc., embrace over a thousand acres of fine improved farming lands, on which large model barns are being erected, and for which several breeds of fine stock are to be purchased. To illustrate veterinary science, a veterinary stable is to be erected, and *papier mache* models, from Dr. Auzoux, of the horse's mouth and teeth, show the successive changes of age. A dissected foot and ankle, from the same manufactor, beautifully illustrates the complicated structure of this part of the horse.

PRACTICAL MECHANICS AND MECHANICAL ENGINEERING.—A mechanical shop, occupying a two-story building, is now established on the grounds of the University. In the upper story is the carpenter's shop. This shop is supplied with a circular saw, jig-saw, morticing machine, and a set of work benches and vises for students, with all the necessary carpenter's and cabinet maker's tools. The lower story is devoted to the machine-shop, which is furnished with a boiler and steam engine of eight-horse power; a machinist's "engine-lathe," and two hand-lathes, fitted up with chucks, drills, etc.; a wood-turning lathe; a pattern-maker's bench, with its complement of tools; a blacksmith shop; molding-sand, crucibles, etc., for making brass and other castings; several iron vises, and sundry other tools valuable in the machine shop. The engine is of special design, being adapted to receive different sets of valve-gears, for the purpose of illustrating to the classes, in a working model, the different varieties of the steam engine. In the mechanical shop, models and apparatus are constantly being made by the students, with the assistance of the director of the shops, and added to the present set of valuable illustrative apparatus of the class-room.

N. B.—Apparatus, of good quality, can be furnished for high schools and colleges. Orders are solicited.

Physics and Natural Philosophy.—This collection includes some of the latest and most important improvements in the apparatus of physics and natural philosophy. The air pump is of the best form in use. It was made by the celebrated firm of E. S. Ritchie & Sons, of Boston, and cost $275. It has a rotary movement, combined with "Ritchie's patent action" of the piston and valves. This final step in the perfection of the air pump furnishes the means for the nearest approach to an absolute vacuum that it is possible to make by mechanical means. The electrical machine is Ritchie's Patent Holtz Machine. This remarkable machine is of recent discovery, and for this reason is found in but few of the cabinets of older institutions of learning. It is distinguished for its wonderful power and great ease of action, rendering it suitable for performing many experiments, which, with the ordinary machine, were extremely difficult. The collection also includes a Grove's Battery of six cups, an induction coil, model telegraphic apparatus, Magdeburg hemispheres, vacuum tubes, receivers, magnets, and other accompanying apparatus.

Human Anatomy and Physiology are taught by the aid of a finely-mounted French skeleton, a French manikin, and large models of the eye, the trachea, lungs, etc., and numerous anatomical plates of life-size figures.

Geography and History are illustrated by some of the best maps, charts, engravings, plans of cities, etc.

Civil Engineering.—The apparatus for surveying and engineering embraces all the field instruments necessary for making Government land surveys, farm surveys, railroad and topographical surveying and leveling, as the Transit Theodolite, a Level from Newton & Co.'s, London, with two leveling-rods—the ordinary and the self-reading; a first-class Vernier compass; best brazed-link steel chains—Gunter's and Engineer's; also the necessary instruments for the new Stadiar surveying, as adopted in the Government surveys.

Military.—150 muskets and accoutrements complete; 12 cavalry swords; 1 bass drum; 1 tenor drum; 3 fifes; 2 bugles; 18 fencing muskets for bayonet practice; swords, gauntlets and masks, for sword practice; automaton regiment, for theoretical instruction; and a large drill hall to be erected this summer. The library also includes quite a selection of books on military science, military history and engineering.

LIBRARY AND READING ROOM.

The library contains over 4,000 volumes; and is especially rich in books relating to agriculture, mechanics, engineering and the arts; and in natural sciences, history, biography and literature.

The large Library Hall is fitted up as a reading room, and richly provided with American, English, French and German papers and periodicals, embracing the most important and celebrated scientific and art publications, monthlies, quarterlies, etc. The reading room, well warmed and lighted, is open every day and evening, and is constantly resorted to by the Faculty and students.

Besides the University library, there are also libraries belonging to the literary societies.

REQUIREMENTS FOR ADMISSION.

1. Each student is required by law to be at least *fifteen years* of age; but it is believed that few will be found mature enough at this age to enter with the highest profit upon the studies of the University, and it is recommended, as a general rule, that students be at least eighteen years old before entering.
2. The law also prescribes that "no student shall be admitted to instruction in any of the departments of the University, who shall not previously undergo a satisfactory examination in each of the branches ordinarily taught in the common schools of the State." In addition to these, candidates for advanced standing must pass an examination in each of the branches already pursued by the class, or an equivalent therefor. Those desiring ancient languages must pass in the ordinary preparatory studies in such languages.
3. There are certain elementary studies not yet reckoned among the "branches ordinarily taught in common schools," such as Elementary Algebra, Natural Philosophy and English Composition, which it is strongly recommended that students shall pursue before coming to the University. They necessarily precede the University courses. The advance of the classes compels the discontinuance of instruction in these studies, and students should, if practicable, come prepared to pass examination in them.
4. In order to indicate the extent and character of the examinations required, a set of the questions formerly used is appended at the close. The questions are varied, of course, each year.

CHOICE OF STUDIES.

The University is wholly elective in its courses. Entire liberty of choice is allowed each student in selecting the studies he will pursue. Each student is required to have fifteen lessons a week, unless specially excused for cause. Changes from one department to another can only be made at the opening of a term. Students should carefully seek the advice of the Faculty in the choice of a course of studies, or they will be liable to lose much time in attractive but irrelevant branches; and when a course has been determined on, it should be followed with steadiness and perseverance.

TERM EXAMINATIONS.

Frequent and searching examinations will be held, to test the progress in study, and to determine each student's fitness to remain in the classes. The University cannot be held responsible for the lack of thoroughness in the common school studies of its students; but it will insist upon thoroughness in its own proper studies.

A regular examination of all the classes is made at the middle and close of each term. A record is kept of the standing of each student at all the examinations, and from this his final certificate of graduation is made up.

THE UNIVERSITY UNIFORM.

Under the authority of the act of incorporation, the Trustees have prescribed that all the students, after their first term, shall wear the University uniform. The University cap is to be worn from the first. This uniform consists of a suit of cadet gray mixed cloth, of the same color and quality as that worn at West Point, and manufactured by the same establishment.

The coat is a single-breasted frock, buttoned to the chin, with standing collar, and a trimming of black mohair cord on the shoulders, in loops. The vest is also single-breasted, buttoned to the chin, with standing collar. Buttons for coat and vest are manufactured expressly for the University. They are gilt, of medallion style, the design being a sheaf of wheat surrounded with the words, "Illinois Industrial University." The pants have a welt of dark blue in the outside seams. The suit is a very tasteful dress, and is substantial and enduring. An arrangement has been made with responsible parties to furnish the suits to students at reasonable rates. Students can procure them ready made on their arrival here.

The University cap is of dark blue cloth, and ornamented with the initials I. I. U., surrounded by a silver wreath in front.

The arms and equipments used in the drill are furnished by the State.

Students will wear their uniform always on parade; but in their rooms and at recitation, may wear other clothing. An army blouse or fatigue dress can be purchased at low rates by those who want it.

HONORARY SCHOLARSHIPS.

The Legislature prescribed that one honorary scholar shall be admitted from each county in the State. These scholarships, which are designed "for the benefit of the descendants of soldiers and seamen who served in the armies and navies of the United States during the late rebellion," entitled the incumbents to free tuition. The trustees have also authorized the faculty of the University to remit the tuition of worthy young men whose circumstances are such as to require this aid.

Students desiring admission as honorary scholars, will apply to the county school superintendent for examination, and for a certificate of recommendation.

PRIZE SCHOLARSHIPS.

A movement has been started to secure in each county of the State the endowment of a prize scholarship, with a permanent fund of $1,000 for each. The plan contemplates that the income of this fund shall be annually awarded to the best scholar, from the public schools of the county, who shall present himself as a candidate for the University. The scholarship shall be determined by a competitive examination, to be held in each county, under the

Regent of the University, and the State Superintendent of Public Instruction The examination will be held the first Friday in September, or at such time and place as the County Superintendent of Schools may appoint. Honorary scholars will be examined at the same time. Only a few of the counties have as yet provided for the prize scholarship, but it is hoped that a prize of greater or less amount will be provided in each county in which a worthy candidate shall be selected.

STUDENTS' DORMITORIES AND BOARD.

There are in the University building about sixty private rooms for students, which are rented to the students who first apply. Each room is designed for the accommodation of two students. These rooms are fourteen feet long and ten feet wide. They are without furniture, it being deemed best that the students shall furnish their own rooms. It is earnestly recommended, for health's sake, that each student have a separate bed. A study table, chairs and a small coal stove, may be provided in common by the occupants of the room.

Good private boarding houses are already springing up around the University, where either day board or board and rooms can be obtained, with the advantages of the family circle. A boarding club is maintained by the students in the University building at a cost of from $2 to $2 50 per week. Several students have provided themselves with meals in their rooms, at an expense varying from $1 to $1 50 per week.

To avoid unnecessary litter about the grounds, coal is purchased by the University at wholesale, and furnished to students at cost.

HOW TO ENTER THE UNIVERSITY.

In answer to the questions often received, the following explicit directions are given to those wishing to enter the University:

1. You must be over 15 years of age and of good moral habits. If unknown to the faculty, you should bring a certificate of character.

2. You must possess a thorough knowledge of the common school branches, Arithmetic, Grammar, Geography and History of the United States. You should be able to pass an examination in Algebra to quotations of the second degree, and in Natural Philosophy. The further advanced in study, the better you will be prepared to secure the full advantages of a residence at the University. Some of the departments require more preparation than others.

3. You should enter at the beginning of a term; but you can enter at any other time if prepared to go forward with any of the classes.

4. If doubtful of your ability to enter the department you have selected, write to the Regent, J. M. Gregory, Champaign, and state what branches you have studied, the progress you have made in each, and your wishes as to course and term of study.

5. If prepared, come on at once. You will find friends in the faculty to advise, and if necessary, to assist you.

HOW CAN I PAY MY WAY?

In answer to this question, which often reaches us from earnest young men, eager for an education, but without means, we reply:

1. Your necessary expenses (except for books and clothing), will be as stated hereafter, under the head of "Expenses."

2. During the Spring and Fall terms, and to some extent during the Winter term, you can find work on the University farm and gardens, or in the shops, for which you will be paid 12½ cents per hour, if diligent and faithful. You can easily, without hindering your studies, work two or three hours a day, and if needful, the whole day on Saturdays. This will amount to $3 per week, and will, if you choose to board yourself, more than cover all your expenses. If you understand some common trade, you can do still better. You will easily be able to earn, during the vacation, enough to buy your clothes and books. Several secure labor, at good wages, on the farm or in the mechanic shops during the summer vacation. Some students pay their way, and have money to spare.

You should have, to start with, money enough to pay your entrance fee and bills, and to buy your half of the furniture of your room, which will cost, say $15. You will find numbers of fellow students who are taking care of themselves, and who will, with true brotherly feeling, advise and assist you. Come on without fear. What man has done, man can do. Remember, if *education* costs much, *ignorance* costs more. Education costs in youth; ignorance costs always.

TERMS.

The college year is divided into three terms, of fourteen, twelve and ten weeks. Students are expected, in all cases, to be present on the first day of the term. Those unavoidably delayed will be required to make up all lessons which their classes shall have passed over in their absence.

CALENDER FOR 1870–71.

Examination for admission	Tuesday, Sept. 13, 1870
Fall term opens	Wednesday, Sept. 14, 1870
Fall term closes	Wednesday, Dec. 21, 1870
Vacation of two weeks.	
Examination for admission	Jan. 3, 1871
Winter term opens	Jan. 4, 1871
Winter term closes	Mar. 27, 1871
Examination for admission	Mar. 28, 1871
Spring term opens	Mar. 29, 1871
Spring term closes	June 7, 1871
Commencement	June 7, 1871

EXPENSES.

Tuition in the Agricultural, Mechanical, Engineering, Chemistry and Military courses are free.

Tuition, in other courses, to students from Illinois, per annum	$15 00
Tuition, in other courses, to students from other States, per annum	20 00
Fee for incidentals, per term	2 50
Room rent for each student, per term	4 00

Room rent is only charged to students who room in the University building. Each student is required to pay a matriculation fee of $10 on first entering the institution. This entitles him to membership till he completes his studies. Honorary and prize scholars pay no tuition fee, but pay all other fees. All bills due the University must be paid, and the Treasurer's receipt be shown to the Regent before the student can enter the classes.

The annual expense of a residence at the University, exclusive of books and clothing, will be nearly as follows:

Tuition, room rent and incidentals, from	$19 00 to	$ 34 50
Board, from	54 00 to	180 00
Fuel and lights, from	10 00 to	15 00
Washing, 75 cents per dozen	10 00 to	15 00
Total	$93 50 to	$244 50

Many young men reduce the expense to within $90 per year, and pay this by their labor during the year. It ought to be known that *any young man can pay his way through college* who is willing, for the sake of an education, to practice steadily the virtues of industry and economy.

LADIES' DEPARTMENT.

The Trustees have voted to admit female students as soon as suitable accommodations can be provided. Ladies already attend the lecture course, and early preparations will be made to afford them the full benefits of the institution.

GOVERNMENT.

The University is designed for *men*, not *children*, and its government rests in an appeal to the manly feelings and sense of honor of its students. If any student shall show himself so weak or corrupt that he cannot, when thus treated, refrain from vicious conduct, he will receive permission to leave the institution, where his presence can only injure others, without being of any benefit to himself. But no pains will be spared to counsel the inexperienced, to admonish the careless, and save the tempted. Especially will it be an object to establish and maintain that high toned, refined, and honorable sentiment, which is at once the best safeguard against meanness and vice, and a constant inspiration to nobleness and virtue.

SCHEME OF RECITATIONS AND EXERCISES.

		7-8 A. M. *	8½-9½ A. M.	9½-10½ A. M.	10½-11½ A. M.	11½ A.M.-12½ P.M.	1-2 P. M.	2-3 P. M.	3-4 P. M.	4-5 P. M.
FIRST YEAR.	1st term.	Geometry....	Chemistry....	Latin............	Agriculture......	English........ .	Book-keeping....	Drawing.........	Drawing.....	Drill Mondays, Wednesdays and Fridays. Lectures Tuesdays and Thursdays .
	2nd term.	English 7:30	Geometry and Algebra, 9..	Chemistry 10.....	Botany 11........	....	Book-keeping, Latin, Descriptive Geom. and Drawing.......	Descriptive Geometry and Drawing.......	Agriculture..	As above.......
	3rd term.	Algebra.......	English......	Botany — Second Class..........	Analytical Chemistry...........	Analytical Chemistry....	Book-keeping....	Botany..........	Agriculture..	As above.......
SECOND YEAR.	1st term.	German Botany........	Chemistry....	Trigonometry....	Analytical Chemistry, English Literature......	Analytical Chemistry, Zoology, Latin..........	Surveying, Shop Practice, Drawing..	Surveying, Shop Practice, Drawing.............	Mil. Science, Agriculture	As above ......
	2nd term.	German 7:30	Physics 9.....	Analytical Chem. 10.— Rhetoric, Shades, Shadows and Perspective........	Shades and Shadows 11, and Perspective Analytical Chemistry............	....	Analytical Geometry...........	Agriculture, Latin...	Mil. Science.	As above.......
	3rd term.	German......	Physics......	Calculus..........	Analytical Chemistry, English Literature......	Analytical Chemistry, Lithology	Latin	Agriculture.......	Mil. Science.	As above.......

SCHEME OF RECITATIONS AND EXERCISES.—Continued.

		7-8 A. M. *	8½-9½ A. M.	9½-10½ A. M.	10½-11½ A. M.	11½ A.M. 12½ P.M.	1-2 P. M.	2-3 P. M.	3-4 P. M.	4-5 P. M.
THIRD YEAR.	1st term.	English......	Geology, Calculus......	French	Principles of Mechanics, Roads and R. Roads, Anal. Chem....	Prin. of Mech., Roads, & R. R. Anal. Chem....	Ancient History..	Anal. Chem., Agriculture.......	Anal. Chem., Mil. Science.	As above.......
	2nd term.	Agriculture, 7:30........	French 9.....	Phys. Geog. and Meteorology, Analyt. Mech., Geology, Eng. Lit............	Anal. Mech., Mahan's Engineering	....	Medæval History, Modern Hist'y.	Anal. Chem......	Anal. Chem., Mil. Science.	As above.......
	3rd term.	Elements of Criticism...	French	Pol. Economy....	Prac. Chem., Machine, Tools and Practice, Geology of Ill........	Prac. Chem., Machines, Tools and Practice...	Pol. Economy....	Mechanics and Astronomy	Mil. Science..	As above.......
FOURTH YEAR.	1st term.	Strength of Materials & Hydraulics.	Mental Philosophy....	Zoology, Applied Mech..........	Preparation of Chemicals......	Prep. of Chemicals, Prac. Astronomy, Geodesic Surveying.	....	Constitutional History........	....	....
	2nd term.	....	Animal Physiology, Moral Philos. 7, 9, & Logic, Drawing....	Rural Economy, Drawing 10, Assaying and Metallurgy.....	Stock Feeding, etc., Motors & Mill 11.—Work Assaying and Metallurgy.....	....	Stability of Structures...........	History of Civilization..........	Mining Engineering	....
	3rd term.	....	Entomology .	Rural Law, Mining, Engineering	Hist. of Phil., Assaying and Metallurgy	Assaying and Metallurgy, Stability of Structures	Drawing and Shop Practice........	Drawing and Shop Practice, Constitutional Law, Geology of Mines..........	....	....

QUESTIONS USED IN THE EXAMINATION OF CANDIDATES

FOR ADMISSION TO THE

ILLINOIS INDUSTRIAL UNIVERSITY, IN 1868.

No examination was deemed satisfactory in which the candidate did not answer correctly 70 per cent. of the questions in each study.

ORTHOGRAPHY.

1. What does Orthography include?
2. How many elementary sounds in the English language?
3. What letters might be spared from our alphabet as expressing no additional sound?
4. Write the plurals of lady, and day, and give the rule.
5. When a word receives a suffix which begins with a vowel, what is the rule in regard to doubling the final consonant?
6. How are derivative words formed?
7. Give words having the following prefixes and suffixes, and define each word: *ad*, *con*, *in*, *sub*, *ment*, *ship*.

READING.

1. What is Emphasis?
2. How many kinds are there?
3. What are the different classes of inflection?
4. Punctuate the following, and mark the emphatic words, the inflections, and the rhetorical pauses:

"There is a tide in the affairs of men which taken at the flood leads on to fortune."

"Let not your hearts be troubled Ye believe in God believe also in me In my Father's house are many mansions if it were not so I would have told you."

"New occasions bring new duties
Time makes ancient good uncouth
He must upward still and onward
Who would keep abreast with truth."

GRAMMAR.

1. Name the different classes of pronouns.

2. Give the rule for forming the possessive case of nouns, and write the possessive case singular *of lady*, *who*, *I*, and the possessive plural of *sheep*, *ox*, *mouse*.

3. What particular pronouns are varied in form to denote gender?

4. What sentences containing *that*, used as an adjective, a conjunction, and a relative.

5. Give the second person singular of the verb *be* in the several moods and tenses.

6. What are the principal parts of the following verbs: *Lay*, *lie*, *lead*, *make*, *see*, *sit*, *set?*

Answer each of the questions annexed to the following sentence:

"Of the committee who, in June, 1776, had been appointed to prepare the plan, Samuel Adams alone remained a member; and even he was absent when * * 'articles of confederation and perpetual union' were adopted, to be submitted for approbation to the several States."—*Bancroft's U. S. History, Vol. IX, page* 436.

7. Of how many *propositions*, (or *principal clauses*,) does the above sentence consist, and with what word does each proposition end?

8. Give the leading *subject* and *predicate* of each proposition.

9. Parse *who*, 1776, *member*, and *men*.

10. Also parse *had been appointed*, and *remained*.

11. Mention all the connectives, and the words, phrases, etc., which they severally unite.

12. Correct the following sentences:

"Both this dress and the other is becoming, but neither of them set well."

"You are not him who I expected to see."

"Either of the three will answer."

"The principle city of a State is not always its capitol."

ARITHMETIC.

1. If the divisor is 19, the quotient 37, and the remainder 11, what is the dividend?

2. What is the quotient of 65 bu. 1 pk. 3 qt., divided by 12?

3. In exchanging gold dust for cotton, by what weight would each be weighed?

4. Give the process for division of fractions by fractions, and the reasons for that process.

5. Divide two and three one-thousandths, by four one-hundredths; and give the reasons for the pointing of the answer.

6. Define ratio and proportion; and distinguish between them.

7. Find the unknown terms in the following proposition:

12 yds. 3 qrs. : 46 yds. 3 qrs. : : (   ) : 6 T. 1 cwt.

8. Required the proceeds of a ninety-days' note for $100.00 discounted at a bank at 10 per cent.

9. Sold 9 1-6 cwt. of sugar at $8¼ per cwt. and thereby lost 12 per cent. how much was the whole cost?

10. When it is 7 P. M. at Springfield, Ill., in 89 deg. 33 min. W., what is the time at Cambridge, England?

11. What is the square root of .0043046721?

12. Required the cube root of 212176173.

GEOGRAPHY.

1. Define Mathematical, Political and Physical Geography.

2. What motions has the earth, and to what phenomena does each motion give rise?

3. What is the order of the continents in extent of surface?

4. Describe the mountain systems of North and South America.

5. Name in their order the principal rivers of the Atlantic slope of the United States.

6. Name the countries of Europe, and their capitals.

7. Give the boundaries, and four largest towns of Illinois.

8. Describe the route of travel from Chicago to St. Petersburg, in Russia, and name the bodies of water, the rivers, countries, etc., which you would pass on your way.

9. Through what waters will a vessel pass, and in what directions sail, in going from Glasgow to Adrianople?

10. Name the peninsulas of Europe and Asia.

ALGEBRA.

1. How does the Algebra differ from Arithmetic?

2. Distinguish between a *coefficient* and an *exponent*, and define a *binomial*, a *radical quantity* and a *surd*.

3. What is an equation of the second degree?

4. Divide $x^4 - y^4$ by $x - y$.

5. Solve the equation, $(x + 1)^2 = 2x + 17$.

6. Find the sum of $\sqrt{50}$ and $\sqrt{72}$: of $\sqrt{\frac{2}{9}}$ and $\sqrt{\frac{3}{32}}$.

7. $\dfrac{\sqrt{a+x} + \sqrt{a-x}}{\sqrt{x}} = \dfrac{\sqrt{x}}{b}$ Find value of x.

8. State what books, and how far you have studied in algebra.

GEOMETRY.

1. Define a line; a plane; an angle; and a triangle.

2. Demonstrate the theorem—The sum of the angles of a triangle is equal to two right angles.

3. Demonstrate the theorem—The area of a circle is equal to the circumference into one half the radius.

4. State what books you have used, and how far you have studied Geometry.

NATURAL PHILOSOPHY.

1. Define Natural Philosophy.
2. Name the essential properties of matter.
3. What is specific gravity, and how found?
4. Define Pneumatics and Hydraulics.
5. Name and describe the mechanical powers.
6. Describe the Leyden Jar, and explain its theory.
7. State the extent of your study in Natural Philosophy.

LANGUAGES, ETC.

1. State the extent of your studies in Latin and other languages, ancient or modern, the books read and the time spent.

2. Also state the same in any other branches: as Chemistry, Botany, Physiology, Book-keeping, etc.

BY-LAWS.

GENERAL RULES.

1. Every student entering the University will be regarded as pledging himself to obey its officers, laws and regulations.

2. Each student, as a member of the University, is expected to show a proper interest in its prosperity, and is bound, in honor, to promote, in all suitable ways, its interests and success.

3. Every student will be expected to treat his instructors and fellow students with courtesy and due respect, and, by a faithful discharge of his own duties and by all gentlemanly and correct conduct, to contribute to the general well being.

4. Prompt and regular attendance at all general exercises and at all the exercises of his class, is a cardinal duty, which every student owes to the University and to his teachers and class mates.

5. Unusual and all unnecessary noise in the halls and other public rooms will be counted as a breach of proper decorum, and as a violation of the rights of the University.

6. Each student is expected to have a careful regard to the general neatness and good order of the buildings, and to avoid all markings or carvings on walls, floors or other parts of the buildings, or upon the furniture or fences of the University.

7. All property of the University is to be carefully preserved from injury, and every student carelessly or willfully injuring the same is expected to pay for the replacement or repairs.

8. All use of alcoholic drinks, and all visiting of drinking shops or saloons, and of billiard and gambling houses, are strictly forbidden as disgraceful, and destructive to the best interests of the student and of the University.

9. Students desiring to be absent from any University or class exercise shall secure permission beforehand for such absence, and when circumstances prevent application for such permission, they shall offer excuse for their absence, immediately on their return, to the University or to the class from which they have been absent.

10. Six absences during any one term from any University or class exercise which the student is required to attend, without a good and sufficient excuse for such absences, shall suspend the delinquent from all privileges of the University, till restored by the Faculty.

ADMISSION AND DISMISSION.

1. No student will be admitted but on the examinations required by law, and such additional examinations as may be required by candidates for advanced standing, or for any higher course of study.

2. Every student shall, when required, present testimonials of good moral character, or, if from another College or University, certificates of honorable dismission.

3. Students desiring to be absent from the University for one or more terms, or for any part of a term, must apply to the Regent for leave of absence, to be granted by the Faculty.

4. Students in good standing, and who have paid all their University dues, may at any time request and receive an honorable dismission.

Students who have attended the University for one year or more, shall, on leaving, be entitled to certificates stating the studies in which they have sustained their standing. And students who shall have completed satisfactorily the studies of any of the courses of the University shall be entitled to the full graduation certificate of that course, such certificates being granted in accordance with section 10 of the law for the organization of the University.

STUDENTS' ROOMS IN UNIVERSITY BUILDING.

1. The regular time for selection of rooms for the year shall be at the close of the Spring term. Students expecting to room in the building will draw lots for choice, in the order of seniority of classes: *Provided*, that any student who has, with the consent of the Professor in charge, fitted up his room with more than ordinary furniture or fixtures, may retain it if he chooses to decline drawing for a new choice. Students entering at other times may select any room which may be vacant.

2. In choice of rooms two room mates shall have preference over single students.

3. Any student occupying a room singly may be required to receive a room mate, unless he shall prefer to pay double room rent: *Provided*, there are vacant rooms for the applicants.

4. Occupants will be chargeable with any damage done to the room beyond the ordinary wear.

5. Students on renting a room will each deposit with the book-keeper $2, to be refunded at close of occupancy if the room is left in good condition: *Provided*, that the whole or part of the sum may be used to pay for repairs and cleansing.

6. All putting on of locks, or other alterations or repairs of room, involving any cutting or disfigurement, shall be done by the University carpenter, or under his direction, and no student shall be entitled to remove a lock, even though furnished by himself.

7. At the close of his occupancy, or whenever the student is leaving the University for a vacation or other protracted absence, he shall deposit the keys with the Professor in charge.

8. No more than two students shall occupy any room, except by permission of the Regent or Professor in charge, given in case of the larger rooms.

9. No room shall be used for any other purpose than as an ordinary dormitory and study room, except by special permission of the Faculty.

10. The occupants of any room shall keep the same at all times in neat and orderly condition, and shall not keep on hand any powder or other explosive material, nor shall any pail or bucket of hot ashes be at any time left standing in the room or halls.

FOURTH ANNUAL MEETING.

URBANA, ILLINOIS, *March* 8, 1870.

The Board of Trustees met at 4 o'clock P. M., in the chapel of the University, and was called to order by the Regent. After reading of the Scriptures, and prayer by the Rev. Mr. Riley of Urbana, the roll was called and the following members were found to be present: Messrs. Bateman, Blackburn, Brayman, E. L. Brown (of Chicago), A. M. Brown (of Pulaski), Burroughs, Cunningham, Dunlap, Edwards, Galusha, Goltra, Griggs, Kile, Johnson, Lawrence, Pearson, Pickard, Pickrell, Pullen, Scroggs, Slade, Van Osdel, Wright and the Regent—24.

The Regent stated that he had letters from Messrs. Emory Cobb and I. S. Mahan, expressing their regret that they could not be present; and a letter from Mrs. Edward Kitchell advising him of the death, in July last, of her husband, Mr. Edward Kitchell, a member of this Board.

On motion, the reading of the minutes of the last meeting was dispensed with.

Mr. Pickard was invited to come forward and take the oath, which was administered by Judge Cunningham.

Judge Lawrence took the chair by request of the Regent, who proceeded to read his report.

ANNUAL REPORT.

To the Trustees of the Illinois Industrial University:

GENTLEMEN—According to your requirement, I present the following report of the progress of the University, and of its desires and needs:

DOINGS OF THE EXECUTIVE COMMITTEE.

The Executive Committee, with one or two failures, has held regular monthly meetings, on the first Wednesday of each month. The proceedings of the April, May and June meetings are already published in the Second Annual Report. The minutes of the other meetings will be communicated herewith.

THE ATTENDANCE AND INSTRUCTION.

There have been in actual attendance during the year, since your last meeting, one hundred and ninety-six students. Of the students now here, fifty-one reported themselves as candidates for the Agricultural Course, forty-three for Mechanical and other Industrial Courses, and eighteen for Military Course. The others entered without fully deciding on their course. These are generally the younger students, who have not yet decided upon their aims or pursuit for life, but whose friends generally express the choice for some practical course.

There were present in the Spring Term one hundred and ten students, in the Fall Term one hundred and thirty-two, and in the current Winter Term one hundred and fifty-seven, showing a steady increase in the attendance.

The requirements for admission have been simply those prescribed by law—the ability to pass, satisfactorily, an examination in the branches ordinarily taught in the common schools. This low grade of qualifications compels many of the students to spend a year mostly in preparatory studies; and thus it happens that many who are truly in the industrial courses, do not appear at once in the special industrial classes. But much general instruction, by lectures and practical exercises, can be given to all, in the fields of industrial knowledge; and all have in this way been enabled, it is hoped, to gain much useful information.

It has been the constant aim of the Regent and Faculty, in obedience both to the laws and to the wishes of the Trustees, to give the University the bent and direction indicated in its name, and in the grant by which it was endowed. Without refusing instruction in other scientific and classical studies to such students as required it, all have taken some of the branches of learning related to Agriculture and the Mechanic Arts; and the record of our classes shows conclusively that the tide of sentiment in the University sets strongly towards the great Industrial pursuits. It is a significant fact that, while no instance is known of any student of the Industrial courses being diverted to the professions, several marked cases have occurred in which candidates for the law have been attracted, by the general influence prevalent here, to relinquish their plans and enter the Agricultural course. I mention these facts with great satisfaction, not in reply to the senseless charges so often made against us, and which I have learned to disregard as nearly harmless ebullitions of a toothless malice or pitiable delusion, but as evidence of the success of our plans and of the brightening future before us. If already, while only in our second year, and with our farms, gardens and shops only half developed, and our classes still mainly in the preparatory and elementary studies, so much attraction can be given to the Industrial courses, how surely will these courses hold their predominating position as "the chief object" of the University when all our forces shall be brought into full power and play?

It adds assurance to our hopes, that even our critics recognize the steady advance of the University to the position it is designed to occupy; and though they mistake the natural progress of our plans for a beneficial change in the plans themselves, we may still welcome their testimony, as a confirmation of our just expectations. Personally, I may say, "With charity towards all, with malice towards none," I am deeply grateful to Almighty God for the marked success which has attended our work, and for the fresh assurance that the grand hopes for learning and for mankind which induced my acceptance of this most difficult position, and which I expressed in the first words I had the honor to utter in the presence of this Board, are not to prove Utopian dreams, but blessed facts and bright realities. Industrial education is fast being proved a glorious possibility. We shall in due time exhibit it as a most benign and useful accomplishment.

The teachers who have been employed during the year are:

Wm. M. Baker, Professor of English Language and Literature;

W. F. Bliss, Professor of Agriculture and Superintendent of the Farms;

A. P. S. Stuart, Professor of Chemistry;

S. W. Robinson, Professor of Mechanical Science;

T. J. Burrill, Assistant Professor of Botany, etc.;

S. W. Shattuck, Assistant Professor of Mathematics and Civil Engineering;

Ed. Snyder, Assistant Professor of Book-Keeping, Military Tactics and German;

James Belanger, Teacher of Architectural and Mechanical Drawing;

H. M. Douglass, Assistant Teacher of Language, and Librarian; and

Robt. Warder, Assistant in Laboratory.

I should be unjust, alike to them and to my own feelings, if I did not express to you my profound sense of the ability and earnestness with which these gentlemen have performed their duties, and the zeal with which they have labored for the good of the students and the interests of the University. I must also mention my great satisfaction with the valuable course of twelve lectures given by Dr. J. A. Warder, your Lecturer on Pomology; and the course of thirty lectures now being delivered by Professor Sanborn Tenney, on Zoology and its relations to the pursuits of mankind. These lectures have been attended by large numbers of citizens, and have been highly appreciated.

There have also been employed as foreman and assistants, J. S. Searfoss, in the carpenter shop; Thos. Franks, on the gardens and ornamental grounds; H. K. Vickroy, in the nurseries and orchards; and Geo. S. Upstone, on the farm. I have reason to believe that all these gentlemen have performed their duties with fidelity, and with a praiseworthy regard to the best interests of the University. Mr. Searfoss and Mr. Franks were employed by the Board, and Mr. Vickroy and Mr. Upstone by Prof. Bliss, under authority given by the Board.

LECTURE COURSES.

Besides the ordinary University Lectures, there have been three courses of lectures given during the year to the farmers and fruit-growers of the State.

The first course was delivered at the University, during the week beginning January 10th, and embraced the following topics:

Introductory, by Dr. Warder;
Entomology, by Dr. H. Shimer;
Breeds of Cattle and Feeding of Cattle, by Prof. M. Miles, of Michigan Agricultural College;
Dairy Farming, by C. W. Murtfeldt;
Veterinary Science, and Pleuro-Pneumonia, by Dr. H. J. Detmers;
Rural Literature, by Hon. W. C. Flagg;
Drainage, by Prof. S. W. Shattuck;
Manures, by D. Gore, Esq.;
Ornamental Grounds, by the Regent;
Rural Economy, by Hon. W. C. Flagg and Prof. W. F. Bliss;
Laws of Highways and Inclosures, by J. O. Cunningham, Esq.;
Rural Architecture, by J. M. Van Osdel.

The second course was held at Centralia, January 24th, and the three days following. Lectures were given by the Regent and Professors Stuart, Shattuck and Snyder, of the University; by C. W. Murtfeldt and C. V. Riley, of St. Louis; H. C. Freeman, Assistant State Geologist; J. S. Taylor, of Centralia; A. M. Brown, of Villa Ridge; and Dr. E. S. Hull, State Horticulturist.

The third course was held at Rockford, the 21st, 22d, 23d and 24th of February. Lectures or addresses were delivered by Hon. Anson Miller, of Rockford; by the Regent and Professors Stuart and Shattuck, of the University; Hon. Elmer Baldwin, of Ottawa; Hon. J. G. Knapp, of Wisconsin; O. B. Galusha, of Morris.

These lectures were well received, and their general effect was to awaken fresh interest in the University and in the cause of Agricultural Education. I have no hesitation in recommending the repetition of the experiment at other points the next winter.

THE NATURAL HISTORY EXCURSION.

Provision was made at your last annual meeting for an excursion, to be conducted by Prof. Burrill, and to embrace such members of his classes as he might select. His report, which I append, will give you the history and results of the excursion. I think much good was done in collecting specimens, awakening an interest in the University, and in affording the most valuable instruction to the students engaged. I hope that in coming years similar excursions may be enjoyed by the successive classes. Much of the expense incurred was for outfit, which will be valuable for future service.

LIBRARY AND APPARATUS.

The University now embraces 3,480 bound volumes, classified as follows: Agriculture, 352; Mechanics, Engineering, etc., 158; Natural Science and Travels, 360; History—American 136, English 168, European 208, Asiatic 31, General 121; Biographical—American 81, English 61, General 121; Biographies and Works—American 49, English 149, French and German 182, General 98; Law and Political Science, 56; Military, 25; Philosophy and Education, 119; Cyclopedias, 72; General Periodicals, 351; Scientific Periodicals, 176; Public Documents, 457.

The Library Hall, which has been kept open daily to students, is also well supplied with the best Agricultural and other Scientific papers and periodicals.

The apparatus of instruction embraces, besides that in the Department of Natural Philosophy and Chemistry, a well mounted skeleton, a manikin, and preparations in *papier mache* exhibiting a horse's leg and foot (which can be dissected to show the parts), several sets of the jaws and teeth of the horse to exhibit the appearance of the mouth at different ages; also, greatly magnified preparations of flowers, fruits and grain, which can be taken to pieces to exhibit all parts of the flower and fruit, including envelopes, pulp and starch formations, and germs with pluma and radical. There is also a fine pair of magic lanterns, with apparatus to exhibit dissolving views; and sets of views in Geology, Natural History, Astronomy and History. Mechanical apparatus and models, and Agricultural implements of many varieties, are also accumulating to aid the practical instruction in these departments. Collections of seeds, soils, woods, minerals, insects, and other Zoological specimens are constantly gathering, and large additions are soon to be made from the collections made by the Powell Scientific Expedition.

THE FINANCES.

The Annual Report of the Treasurer and the list of warrants drawn, with their dates, objects and amounts, will give you full information concerning the receipts and expenditures for the year.* The statement of the Bookkeeper, which I append, shows the following items of income and expense:

INCOME.

Balance from last year	$1,324 59
Interest from bonds	24,390 00
Farm produce on hand, March, 1869	1,760 31
Fees, for tuition, etc	2,670 50
Receipts from farm for 1869	1,181 76
Rent of lands	246 45
Coal sold students	404 81
Garden—net proceeds	73 47
Carpentery, chairs, etc., sold	31 81
Total	$32,083 70

These do not embrace any part of the receipts from the State appropriations.

EXPENDITURES.

The appropriations made by the Board at the last annual meeting amounted to $36,044 00. The total expenditures, under these appropriations, have been $34,628 66. Some of the appropriations were found to overrun our needs, while others fell short. By the authority of the Executive Committee the deficiency of the latter was made up, as far as practicable, by the surplus of the former. The year's expenses, though less than the estimate, have never-

* See Appendix A and B.

theless exceeded the income, though when the amounts due for rent of the Griggs farm shall be collected and the sales of farm produce on hand shall be effected, the deficiency will be more than covered.

The Board provided for meeting any deficiency which might occur, by the sale of Champaign County Bonds. As these bonds constitute now a very important part of our permanent fund, I respectfully submit whether our expenditures ought not to be so regulated as to be met without any further sacrifice of these bonds. Our ultimate success will depend upon the sufficiency and certainty of our annual income. I am confident that the work of the University can be carried forward the coming year without at all exceeding the year's revenue, if due care be taken not to enter upon unnecessary expenditures, and not to load our funds with the payments of unnecessary salaries. Let every man be employed whose services are actually needed, but let no expensive supernumeraries be saddled upon us. The inevitable increase of the teaching force of the University which cannot be longer delayed will compel us to avoid, with the most careful attention, the diversion of our funds to mere outside work.

The items of the annual expenditure are given by the Bookkeeper's statement as follows:

Expense of Board and Committee Meetings	$1,011 28
Building account—for roofing, painting, alterations, repairs, cleaning, etc	2,575 00
Salaries—including Lecturers' fees	18,345 95
Fuel and lights, including coal sold students	1,180 56
University Grounds, labor, drainage, seeds, etc., including expense of propagating house	1,039 26
Mechanical Department—salary of carpenter and pay for labor, material and tools	1,358 97
Military Department—to be refunded from buttons sold	50 00
Agricultural Department—for labor, etc	4,212 50
Purchase of two lots	425 00
Salary of Treasurer	500 00
Salary of Corresponding Secretary	200 00
Geological excursion	200 00
Meteorological Instruments	81 50
Taxes on lands in Minnesota and Nebraska	988 48
Stationery and printing	179 33
Incidental expenses—insurance, postage, express, letters, advertising, etc	1,657 79

The details of the expenditure in the Agricultural Department will be found in the Bookkeeper's statement from Farm books.

STATE APPROPRIATIONS.

The appropriations voted by the State Legislature, amounting to the gross sum of $60,000, were made for the two years, '69 and '70, and it was found that only one-fourth of that designated for the Agricultural and Horticultural Department was available the first year. The expenditures under this appropriation are as follows:

On Farms	$1,778 02
In Horticultural Department	5,359 69
Chemical Laboratory	1,135 56
Library and Apparatus	6,247 26
Total	$14,520 53

This leaves a large balance of this appropriation to meet the projected improvements of the coming year. A statement will be found appended, of the several items of expenditure from these appropriations:

The total amount of warrants drawn for the year is.....	$48,036 59
Receipts of I. C. R. R. donation........................	1,162 60
Total expenditures for year*	$49,199 19

The report of Prof. Bliss and the Bookkeeper will present you, in detail, the work accomplished on the farm and experimental grounds. It is due to this important department of our work, and to those who have it in charge, to state that the chief stock farm came into possession of the University in a very dilapidated condition. The former owner says that his chief motive for selling, was that the land was no longer in a state to pay for the labor expended upon it. The buildings and fences were also in a ruinous condition, and a heavy expenditure was necessary before the farm could be brought into a state of proper tillage.

Almost every rod of fence on both farms has been either rebuilt or thoroughly repaired during the past year. Nearly five miles of hedges have been planted, completely inclosing the farms, except some short spaces, where the condition of the ground would not permit it. The farm house has been repaired and a well dug.

In pursuance of the plans adopted at the last annual meeting, the stock farm is being laid down to grass, as the easiest and most profitable mode of culture for our purposes.

Among the crops raised are the following:

Ten acres of common yellow corn. Five acres of mammoth corn. One-fourth acre of mammoth white corn. Fourteen acres of small, early white corn. Six acres of strawberry corn. Burr's mammoth sweet corn—one oz. seed. One-fourth acre extra early sweet corn. Brill's extra early sweet corn. Boston late sweet corn—one oz. seed. Pop corn—one-third acre.

POTATOES.

Early York, eight acres. Early Goodrich, one-half acre. Peach Blows. one-half acre. Shaker Blue, two quarts seed. Neshannock, three quarts seed. White Sprout, three quarts seed. Early Rose (garden), one pound seed, Garnet, Chili (garden). Rusty Coat Pink-eye. Harrison, one and one-half bushels seed. Sebee.

WHEAT.

Forty acres Fife spring wheat, sixty bushels of seed. Four acres of Mammoth spring wheat, six bushels of seed. Little May, White May, Alabama White and Genesee Red—two bushels of each.

Besides these, there were forty-five acres of Surprise oats, which yielded 1,204 bushels by measure, weighing thirty-eight pounds to the bushel.

One hundred and twenty acres of meadow were mowed, producing 175 tons of hay. One hundred and twenty-five acres were fallow plowed, and a large amount of labor was expended in the general improvement of the ground.

* See Appendix C.

A large and substantial advance was made in bringing the farm into such condition as it ought assume, to be worthy the University and to fit it for its peculiar uses in illustrating and advancing Agricultural science.

HORTICULTURAL DEPARTMENT.

This Department is now understood to embrace the Ornamental Grounds around the University buildings, the Vegetable Gardens, the Orchards, Small Fruit Plantations, Nurseries and Forest Tree Plantations. There were planted the last spring in the apple orchard 2,193 trees, of about 1,200 varieties, and about 600 trees were set in the nursery till the drainage of some wet places will permit them to be planted in the orchard. Not more than one-half of one per cent. of these trees died, and in most a very large growth has been made. The statement of Mr. Vickroy, the Orchardist, which I append,* will give you the particulars of this plantation, as also of the nurseries, shelter belts and hedges planted under his care. Shelter-belts of maples on the north and south, and of Norway spruce and Austrian pine on the west were set about the orchard, and every tenth row in the orchard was left vacant for planting an evergreen wind-break. In the nurseries were gathered, during the year, for the forest plantations and shelter-belts, 3,000 green ash, 1,000 white elms, 1,000 American arbor vitæ, 1,000 balsam fir, 1,000 red pine, 2 Austrian pine, 100 Scotch pine, 18 varieties of pears, several varieties of cherries, some tulip and sycamore trees, and also 1,300 small evergreens from forest. A large amount of nursery stuff was also propagated from seeds and from cuttings.

The work on the Vegetable Gardens and Ornamental Grounds were done chiefly by the Gardener, Mr. Franks, and the students. The lack of a team, and of sufficient help in the summer, together with the unfit condition of the ground, prevented any great success in the market garden, though a considerable quantity of vegetables was marketed both in Chicago and the cities of Urbana and Champaign.

The Ornamental Grounds were blooming with flowers in their season, and attracted universal admiration for their beauty and order.

A portion of the gardens is now under-drained, and the remainder will be under-drained during the current year. With proper facilities, this department may hereafter attain a success much more complete and useful.

It is proposed to occupy during the present season less breadth of ground with vegetables raised for market, and to try some experiments in seed-raising.

We have already growing several varieties of small fruits, and it is proposed to add largely to these in order to test, as accurately as possible, their relative value. Arrangements are also in progress to test a large number of culinary vegetables, of a wide range of varieties; careful reports of which will be made.

The gardens and nurseries will furnish us some of our best and most instructive illustrations of plant growth and fine culture, and will also afford us no small share of the labor for the students.

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* See Appendix D.

The new green-house, for which the materials are already on the ground, will add largely to our apparatus of illustration, and also to the attractions of the Horticultural Department.

A gardener's house was built last summer, and there should be erected immediately a barn for the garden teams, and also to afford seed-packing and tool rooms and root cellars. A building 24x30 feet will be sufficient for present use.

A good horse team, with wagon, plows, and a one-horse wagon or cart, seem indispensable. This team will serve also for the work on the University grounds, and, when not otherwise in use, can always be profitably employed in hauling manure from the town.

THE GREEN-HOUSE.

The material is already purchased, except the glass, and the carpenter's work nearly done, for a new green-house ordered by the Executive Committee, to cost $1,000. This building is much smaller than our need, and smaller than the green-houses provided for the Michigan and Massachusetts Agricultural Colleges; but the plan admits of extension hereafter, when our funds will permit. An additional appropriation will be needed to furnish a good heating boiler and pipes. A small appropriation will be also desirable to procure some seeds and house and bedding plants for propagation. The green-house will not only furnish some useful illustrations in an important branch of horticulture, but may be a source of some profit.

GENERAL VIEWS.

The management of the University farm and gardens will always be one of the most difficult parts of our enterprise. It will require constant vigilance from all who have the control of them to prevent their becoming a very onerous charge on the funds of the University. And yet, with skillful management, they may be made, all except the experimental grounds, to yield a revenue to the University. It is believed by some that in the end the two hundred acres of the experimental farm and gardens will be as much land as the University will need to retain for its immediate use. An arrangement might be made to place the large farm under the care of a competent overseer or lessee, who should employ his own assistants and receive a reasonable share of the proceeds for his pay. This would secure the same sort of personal and pecuniary interest in all the work which is so necessary to the success of every farmer, and would insure us a balance on the right side of our ledger. An arrangement might be made so that all the value of the farm for the purposes of experiment and instruction would remain unimpaired; it would still be a part of the University, and would lose none of its value as an illustration of scientific farming. The rotation of its crops and the general system of culture might still be prescribed so far as to secure it from degenerating in condition, and instead of an annual loss by its culture, it would return an annual profit to its manager and to the University.

This arrangement would greatly simplify our work, and would relieve the Professor of Agriculture from that endless detail of supervision which must necessarily detract from his strength and usefulness as an instructor. The two hundred acres which are nearer at hand are ample for all valuable experiments in scientific agriculture, as these owe their value to their scientific accuracy, not to their great extent.

Several of the Agricultural Colleges of Europe, after several years of costly trial, have found themselves compelled to adopt some plan similar to this to secure an efficient and economical management of their farms. It is not because scientific farming is unprofitable, but because the very nature and extent of a farm offers opportunities for so many leakages, which will only be properly guarded against by one whose personal interest renders him sharp-sighted to see and eager to stop all such leaks. I most earnestly commend this whole subject to your thoughtful consideration.

THE FOREST PLANTATIONS.

Many of the trees are already gathered into our nursery for the projected forest plantations, and the plantations themselves may soon be begun. Dr. Warder and some other experienced gentlemen have carefully looked over the plans, and have suggested some alterations, both in the varieties of trees to be planted, and in the grounds selected for the plantations. These suggestions are already in the hands of the Horticultural Committee, and will doubtless receive earnest attention at their hands. I only add that it has always seemed to me unadvisable to occupy with these plantations any part of the two hundred acres of our experimental grounds, as these are the only lands we have sufficiently near to be used in the practical illustration of agriculture to our students. The proper extent of these plantations has also engaged the attention of some experienced men, and it is questioned whether one acre of each species of tree is not as good as four to test the value of such plantations, especially when it is considered that the entire forest taken together will occupy many acres, and that the conditions of your single acre of oaks or maples, will be precisely the same as if the entire forest were composed of oaks or maples. The experiment is confessedly one of our most important ones, especially in our great prairie State, and no abatement in extent should be thought of, if it will at all impair the completeness or lessen the value of this experiment. What we want to determine is the actual cost and profit of artificial forests, and the relative values of timber trees which may be grown in Illinois. If necessary, let one hundred acres be given to this important problem; but let us not burden our too limited funds—already full small for our current expenses—with plantations not only larger than are necessary for our object, but whose very size will render them unwieldy, and so endanger their real success and utility. I would suggest also, for the wise consideration of the Board, whether these tree plantation may not best be made through successive years, so that the experience gained in planting the first may be used to improve the second plantations, and so on? Instead of planting at once, as proposed, four full acres each, with the leading sorts of timber trees, suppose that only one-half an acre each be planted this year, and after a year or two, another half acre be added—all the plantations of one year making a compact body, and thus giving all the conditions of a continuous forest. The experiment thus made under the varying conditions of successive seasons, will throw a more conclusive light upon the whole question, and will lead to results much safer and more satisfactory. I commend the whole subject to the wisdom of the Board.

THE MECHANICAL DEPARTMENT.

We have had considerable numbers of mechanical students here from the outset, and from the very outset instruction has been given in Mathematics and Mechanical Philosophy, the two main branches of learning relating to the mechanic arts. A shop was opened the first year, in which more or less of the students sought and found employment. A Professor of Mechanical Science was also appointed, but, after a year, he finally declined the appointment. The Executive Committee soon after appointed to the vacant chair Prof. S. W. Robinson, late of the Michigan University, and at the opening of this term, Prof. Robinson entered upon service.

Of the legislative appropriation for books and apparatus, $2,000 had been set apart for apparatus for the Mechanical Department, and after a full discussion of the matter with the Professor in charge, the Executive Committee decided that it was expedient to allow this sum to be expended for a steam engine, lathes and other tools and materials for a machine shop. These machines themselves are among the most important illustrative apparatus—being working models—and with the shop thus provided, we shall be able to produce for ourselves other apparatus, not only for this, but also for other departments of the University, and at cheaper rates than we can purchase them elsewhere.

But still better, the shop helps us to carry out the great idea of practical instruction which we have sought so steadily to secure in the other departments. It is not to teach boys trades that we intend, but to exhibit to them the practical illustration in the shop of the scientific principles they study in the books or learn in the lecture room. Their science grows luminous under the light of such illustrations, and instead of mere learned theorists, our students will go forth as practical engineers, architects and mechanicians.

On consultation with Prof. Robinson, I consented that he should attempt the manufacture of his engine, rather than purchase it ready made, as he desired one of his own devising, with different sets of valve gears, which would enable him to exhibit several distinct forms of the steam engine, without adding materially to the expense. Prof. Robinson accordingly employed, to assist him, Mr. —— Thomson, a skilled and liberally educated mechanic. They, with the assistance of the mechanical students, have made their own patterns, and an engine of ten-horse power is now completed. By raising the roof of the carpenter's shop and adding a second story, a good shop has been secured at slight expense.

Much enthusiasm is exhibited by the students of this department, some of whom are already engaged in making original drawings for machinery, and in learning to make patterns for the moulders. All express great interest in the progress of the shop.

It is reasonably hoped that this department will be able to lend important aid to the agricultural and other departments, in altering, repairing and even inventing and manufacturing tools, machinery and teaching apparatus; and the hope will strike you as well founded, when I inform you that among our students we have several good mechanics who have left their journeymen's place and wages to come here and educate themselves for the higher and more important spheres of their callings. Carpenters, cabinet-makers, blacksmiths, carriage-makers, house-painters, coach-painters and machinists, and even one master mechanic has sold his shop and come to get the benefit of this school of mechanical science. And will not this movement increase, and hundreds of our young mechanics throughout the State, having learned their trades, come here to arm themselves with a knowledge of those great mechanical laws and forces which underlies and explains the magnificent and almost mysterious triumphs of mechanical inventions which have enriched and glorified our country and the century itself?

Prof. Robinson asks that Mr. Thomson be employed for the coming year to aid in the more complete fitting up and development of the department. Mr. T. is a skillful and rapid worker in both wood and iron, and able to save to us his wages. He is, moreover, a graduate from the Scientific Department of the Michigan University, and is an accomplished draughtsman and civil engineer. If it is found that our funds will allow, I should greatly desire that the experiment might be tried. His salary ($1,000) might be charged to the apparatus account; and Prof. Robinson seems confident that the apparatus and other articles manufactured for sale will cover very nearly, if not quite, the entire expense of the shop.

Machinery can be attached, with slight cost, to the engine for grinding feed for the stock; and if, ultimately, the shops and barns can be brought into nearer neighborhood, the steam can be used here, as at the Agricultural College in England, to thresh and winnow the grain, cut straw, pump water, run grindstones, and the surplus be made available to parboil food and heat drying rooms.

The Trustees will, I doubt not, give very earnest attention to the means necessary for the development of a department so vitally connected with the highest material needs and prospects of our State.

The confirmation of Prof. Robinson's appointment to the chair of Mechanical Science and Engineering is cordially recommended; and I recommend, also, that the Department of Mining Engineering be temporarily intrusted to him.

THE MILITARY DEPARTMENT.

A military class has been taught during the year, and the entire body of students, except a few excused for cause, have been drilled in the manual of arms and in the evolutions of the company. I need not make any new argument in proof of the importance of this department. It is sufficient that it is the requirement of the laws of Congress and of the State, and must, therefore, receive our attention.

It is vital to the usefulness if not to the very existence of this department, that a drill hall be provided for it at an early day. I hope that, at no distant day, Congress may take this matter in hand, and pass a bill, now in the hands of the Military Committee, to give some efficient aid to the several State Institutions required by the law of Congress itself to give military instructions.

THE WORK OF THIS YEAR.

No subject connected with the administration of the University affairs has cost me so much solicitude as the improvements to be made this year, under the State appropriation. To secure a careful and economical expenditure of the fund, and to make it as productive as possible in good and valuable betterments, will demand the wisest forecast of the Board, and the most faithful and vigilant efforts of their agents and employees.

The expenditures in the Horticultural Department will embrace the completion of the green-house, the erection of the barn mentioned for the garden, the drainage of the gardens, the purchase of team, wagon, plows, cultivators, a lawn mower, roller, and other necessary tools for this department, together with the fencing of Green streets, the planting of the arboretum, fruit gardens, shelter belts, and forest plantations, and the building up and care of the nurseries and orchards already begun.

The balance of the library fund I recommend be expended under the charge of the Faculty, as they have already, with great care, made lists of books most needed in their several departments.

The Agricultural Committee have already given much and careful attention to the wants of that department. The appropriation for that department was was the largest of all, and scarcely a tenth part of it has yet been expended. Among the most pressing wants to be met by it are the following:

First. A house for farmer on experimental farm.

Second. An ample barn for same, with fruit rooms, root cellars, corn cribs, and with stables and stalls for the fine stock of all sorts, which the University should possess. This stock should be housed at this barn, at least during the winter, to bring it within reach of the students of animal husbandry; and if the main farm shall ever be disposed of, as proposed, the stock may then find a permanent home at this barn.

Third. A veterinary stable for the use of the Veterinarian in the illustration of his lectures. This must also be on the experimental grounds, to bring it within easy reach.

Fourth. The underdraining of so much of the grounds as may be thought necessary.

Fifth. A large barn on stock farm, with all the apartments and conveniences that any good farmer would need on a farm of the size of that.

Sixth. Some enlargements and repairs of the present farm house, and the repairing or building of one or two tenant houses.

Seventh. Such sheds, cribs, pens, yards and feeding-rooms as may be needed for a first-class stock farm.

Eighth. The purchase of neat cattle, sheep and swine, of such breeds as the Board may determine, shall be kept.

Ninth. The changes and improvements in the existing roads, and the opening of such new ones as may be necessary.

Tenth. A windmill, with tanks, pipes, etc., for watering stock.

Eleventh. The completion of fences, hedges and shelter-belts already begun.

Twelfth. Other purchases and improvements required.

After careful consultation, I am prepared to recommend that the green-house, the garden barn, and the farm house on experimental farm, be erected by the carpenter, with such aid as he can have from the students. That the material for the other buildings be purchased by the University, and that proposals be asked and separate contracts be made with responsible parties to lay the stone and brick work, and to do the wood work of the several buildings. That the Executive Committee be instructed to hold regular monthly meetings, or more frequent still, and, if necessary, to send one of their number weekly to aid the Regent to superintend the progress of the work, and to secure the utmost economy in the expenditure of the funds, and the utmost thoroughness in the work done.

I will place in the hands of the Committee on Finance some detailed estimates of the wants of the coming year. There will be needed to pay the salaries of teachers the sum of $21,000. The other current expenses will be $12,-450. In addition to these expenses there is an urgent demand for some new heating apparatus. Steam or hot water boilers and pipes, etc., can be put in for about $6,000.

DONATIONS.

It is a pleasant feature of our history, that, from the outset, generous friends of education have been found who have made valuable donations to the University. These donations are not yet so large as those received by older institutions, but they will increase as our Institution extends its fame and influence, and many will remember, in their prosperity, this home of learning and education.

The following donations are gratefully acknowledged for the past year:

J. D. Platt, Warren, Ill.—One Curtis' Patent Fanning Mill. A very excellent machine.

I. H. Halstead, Springfield, Ill.—One Patent Adjustable Harrow, which has worked very satisfactorily.

M. C. Goltra, Jacksonville, Ill.—Half bushel large yellow Seed Corn.

Northwestern Fertilizing Company.—320 pounds raw-bone Superphosphate, which was used upon the garden.

Samuel Edwards, La Moille.—10,000 White Pine Seedlings.

W. H. Mann & Co., Gilman, Ill.—20,000 Hedge Plants.

D. B. Weir, Lacon, Ill.—Specimens of the apple tree Borer; Seeds of the May Screw, an Arizona Hedge Plant.

Johnston & Huntly, Chicago, Ill.—Self-Raking Reaper--about $40 of the prize donated. Also, a Cycloid Mower. These implements have given much satisfaction in their use.

Hon. J. H. Moore, M. C., Decatur.—Congressional Globe and other valuable documents.

Henry McAffee, through Dr. Warder—A finely mounted collection of the Woods of Stephenson county, Ill.

D. W. RAMSDALE, Chicago.—One bushel of Norway Oats.
C. H. VAN OLINDA, Sandwich, Ill.—One bushel of Surprise Oats.
EDWARD LYNCH, student—Two well prepared Skeletons of Birds.
Prof. W. F. BLISS—Two bushels of White May Wheat.
J. M. GREGORY—An Organ for the Chapel, and a set of Engravings for the Library.
SAMUEL NEWBY, student—One bushel Seed Corn.
Mrs. — NUNN, Tennessee.—A fine Geode and other specimens, for Cabinet.
JOHN DEERE, Moline, Ill.—One Subsoil Plow, which does excellent service.
HOVEY & HEFFRON, Seedmen, Chicago—Fifteen varieties of Flower Seeds.
Dr. WARDER—400 Grape Cuttings, some Wilson's Blackberry and Everbearing Raspberry bushes
Messrs. PETTIGREW & REED, Chicago—100 Fuchsia Cuttings.
HENRY MICHAEL, St. Louis—24 Green-House and Bedding Plants.
— CONKLING, Esq., Champaign—One large Oleander and a collection of Summer Flowering Bulbs.
J. O. CUNNINGHAM, Urbana—A collection of Dahlias.
S. GRAVES & SONS, Jacksonville, Ill.—$25 off price of turning lathe, and circular and jig saws.

PUBLIC OPINION.

Knowing the scrupulous fidelity with which you have sought to obey the laws under which you act, and to conform the University to the declared ends of the statute, I the more cheerfully invite your attention to those expressions of public opinion which concern the University, and which are already known to you through the public press. However unworthy may have been the original source of any sentiment which gains a lodgment in the public mind, and however limited the extent to which such sentiment may prevail, any fairly stated objection to our course and management ought to have our candid and careful consideration. We are all liable to err. No human institution is perfect. Let us profit by all counsels, and thus attain our great end. Let us hear and weigh carefully and candidly every suggestion made for the improvement of the University. Let us correct, patiently, every public misapprehension of our plans and doings; and let us affirm afresh, and with stronger emphasis, our purpose to fulfill the laws under which we act, and to establish and maintain here a true University for the Industries, a school of sound, practical learning.

APPENDIX TO REGENT'S REPORT.

APPENDIX A.

To the Regent of the Illinois Industrial University:

SIR: At the annual meeting of the Board of Trustees, for 1869, $300 were appropriated for an expedition of survey and collection in the Department of Natural History. In accordance therewith, arrangements were early made. The Illinois Central and the Chicago, Burlington and Quincy Railroads granted free passes over their entire routes for myself and party. The necessary equipments for camping out were produced, and the following named students of the University selected, each having special charge of the department named: I. S. Raymond, Botany; W. A. Reiss, Entomology; S. A. Reynolds, Geology;

T. E. Rickard, Ornithology; and S. J. Westlake, Zoölogy, as restricted. Mr. A. L. Whitcomb, also a student, accompanied the party, paying his own ex. penses. A trial camp was made in the woods, near Urbana; after which we went south to Cairo, then north upon the main line of the I. C. R. R. to Galena, back to Mendota, thence to Chicago, and from Chicago to Champaign. Throughout the route, we stopped at every point deemed of special interest to us; but the most valuable collections were made in the vicinity of Villa Ridge, Cobden, DuQuoin, LaSalle and Galena. We were everywhere very kindly received and often greatly aided by persons interested in our labors; but at the risk of seeming invidious, I wish to record the names of Mr. Thomas Tizon of DuQuoin, Mr. J. M. Tracy of Cobden, Deacon Lothrop of LaSalle, and Mr. and Mrs. Danforth of Montgomery—from all whom we received special favors; and of Mr. John Bulmer of DuQuoin and Mrs. Graham of Galena, for specimens presented.

Among the many industrial establishments we visited, the Pottery at Anna, Illinois, and the Glass and Zinc works at LaSalle, Illinois, are particularly mentioned. The former is supplied with excellent potters' clay, a specimen of which was procured, from a bed thirty-three feet in depth and of unknown extent In the immediate vicinity, a good quality of fire clay is also found. Each of these natural deposits will doubtless prove a source of inexhaustable wealth, now scarcely imagined. Both the glass and zinc works at LaSalle are the result of comparatively recent enterprise. The former is supplied with sand from the St. Peter's sandstone, which here crops out, and with lime from the rocks adjacent; but the soda used is imported. About 500 pounds of sand, washed and sifted, 185 pounds of soda, and 120 pounds of lime are used per week. Their sales for the last year amounted to about $190,000. The glass is a very superior article. Zinc is made from what had been for years the refuse of the lead mines, and is now brought to LaSalle from Northern Illinois and Southern Wisconsin, instead of transporting the coal necessary for smelting. One firm alone use from ten to fifteen tons of ore per day, and give employment to two hundred and fifty men.

We gave special attention to the growing crops and the soils upon which they were grown. Frequent specimens of the latter were secured, but being in the middle of the summer very few seeds could be obtained.

The collections made and now in the University building may be summed up as follows:

Number of specimens of plants named	432
" " " " " not yet named	150
" " " " birds	42
" " " " reptiles	32
" " " " insects	150
" " " " mammals	5

Besides these, a large number of fossils, of fresh water shells and of minerals, together with some specimens of different kinds of wood, of soils, of materials of manufacture and of manufactured articles, were secured.

Two hundred dollars of the appropriation were drawn and expended as follows:

For camp and collecting equipments	$86 55
" provisions and board	83 99
" conveyance and express	20 00
" cabinet specimens	3 15
" unavoidable personal expenses	6 31
Total value	$200 00

There is on hand, counting the value at two-thirds of cost:

One tent	$19 87
Four rubber blankets	6 66
Other camp, collecting and taxidermists' equipments	12 33
Total	$38 86

All of which is respectfully submitted.

T. J. BURRILL.

APPENDIX B.

STATEMENT OF WARRANTS.

No.	Date.	To Whom.	For What.	Amount.
1	Mar. 11	Dodson & Hodges	Stove for chem. lab; hardware for rep.	$81 58
2	" 11	J. M. Pearson	Expenses to board meeting	27 45
3	" 11	M. C. Goltra	" " "	18 75
4	" 11	James P. Slade	" " "	26 90
5	" 11	L. W. Lawrence	" " "	26 80
6	" 11	S. Edwards	" " "	26 60
7	" 11	A. M. Brown	" " "	30 90
8	" 11	P. R. Wright	" " "	28 50
9	" 11	J. M. VanOsdel	" " "	25 75
10	" 11	Lemuel Allen	" " "	25 70
11	" 11	I. S. Mahan	" " "	22 15
12	" 11	B. Pullen	" " "	21 20
13	" 11	O. B. Galusha	" " "	21 35
14	" 11	Wm. Kile	" " "	9 50
15	" 11	M. L. Dunlap	" " "	9 75
16	" 11	J. C. Burroughs	" " "	25 70
17	" 11	Moulding & Harland	Flower pots	66 00
18	" 11	W. S. Maxwell	Half gal. alchohol	2 00
19	" 11	J. A. Hutchinson	Teaming	16 00
20	" 11	Walker Bros	Sash for hot-house	9 37
21	" 11	Walls Coal Mining Co	Two cars, 20 tons coal	40 00
22	" 11	William Price	Painting hot-house	27 30
23	" 11	O. L. Barber	Reporting lectures	25 00
24	" 11	Doty & Mitchell	Hotel bill	50 00
25	" 11	J. M. Gregory	Petty expenses	73 72
26	" 12	J. V. Peterson	Stationery	20 90
27	" 12	A. P. S. Stuart	Purchase of chemicals	23 90
28	" 12	C. G. Larned & Co	Stoves and repairs	71 90
29	" 12	Trevitt & Green	Hardware	15 67
30	" 12	Jonath. Periam	Salary to March	375 00
31	" 15	R. S. Walker	Fence posts	51 00
32	" 15	J. H. Pickrell	Expense to Board meeting	19 00
33	" 16	Patrick Lamb	Wages to March 15th	37 00
34	" 17	Robert Cole	Half month farm work	12 50
35	" 17	L. W. Smithey	" "	12 50
36	" 22	J. W. Bunn	Treasurer's salary	500 00
37	" 22	A. Blackburn	Expense to Board meeting	28 00
38	" 23	J. M. Gregory	Purchase of two lots for Un	425 00
39	" 30	J. M. Gregory	Salary, March, 1869	333 33
40	" 30	W. A. Baker	" "	166 67
41	" 30	A. P. S. Stuart	" "	166 67
42	" 30	W. F. Bliss	" "	166 67

No.	Date.	To Whom.	For What.	Amount.
43	Mar. 30....	S. W. Shattuck............	Salary, March, 1869.................	$125 00
44	" 30....	T. J. Burrill	" "	125 00
45	" 30....	Ed Snyder	" "	100 00
46	" 30....	J. S. Searfoss............	" "	83 33
47	" 30....	Thomas Franks............	Salary from Jan. 15th to March 15th..	137 50
48	" 30....	Pat. Lamb	Wages from March 15th to 31st........	18 75
49	" 30....	W. C. Flagg...............	Salary for 1868–9....................	200 00
50	" 30....	Ed. Snyder	Purchase Un. Buttons	25 00
51	" 30....	E. T. Fisher	1 month's farm-work	25 00
52	" 30....	James Blakesley...........	" "	35 00
53	" 30....	S. D. Childs	University seal......................	20 00
54	April 8....	Lemuel Allen	Expense to Ex. Com. meeting........	22 00
55	" 8....	Emory Cobb	" several Ex. Com. meeting.	39 75
56	" 8....	M. C. Goltra..............	" Ex. Com. meeting........	9 50
57	" 8....	J. S. Johnson.............	" " "	33 00
58	" 8....	Fred. Finder..............	1 month's work on farm.............	25 00
59	" 8....	Aug. Shavelan.............	" " "	25 00
60	" 8....	R. P. Wright	Expense to Ex. Com. meeting........	22 00
61	" 9....	Prairie Farmer Co.........	Advertising seeds....................	19 20
62	" 9....	Walls Coal Co.............	1 car coal...........................	20 00
63	" 9....	Hurlbud, Herrick & Co....	Hardware............................	28 40
64	" 9....	J. M. Campbell............	Seed oats	37 87
65	" 9....	Chas. W. Rolfe............	Pump for cistern	12 55
66	" 9....	Miller & Toll	Muslin for sacks.....................	2 00
67	" 10....	Dodson & Hodges	Hardware	32 48
68	" 10....	Hovey & Heffron	Flower and garden seeds.............	77 37
69	" 10....	A. F. Childs..............	Draining tile........................	126 00
70	" 10....	Fuller, Finch & Fuller.....	Paints and oil	83 90
71	" 10....	Elisha Eldred.............	Lumber..............................	382 55
72	" 10....	W. F. Bliss	2 sugar hogsheads....................	2 00
73	" 14....	J. H. McElwee	Forest trees	27 00
74	" 16....	Trevitt & Green	Hardware	9 45
75	" 16....	Irvin Ray.................	Work on grounds......................	25 37
76	" 16....	W. G. Stevenson.	" farm	15 00
77	" 16....	E. Snyder.................	Petty expenses	30 87
78	" 21....	E. Snyder.................	Students' labor	117 60
79	" 21....	Geo. S. Upstone	Work on farm	15 00
80	" 30....	Patrick Lynch	" grounds.....................	17 50
81	" 30....	J. M. Gregory.............	Salary for April.....................	333 34
82	" 30....	W. A. Baker...............	" "	166 67
83	" 30....	W. F. Bliss	" "	166 67
84	" 30....	A. P. S. Stuart...........	" "	166 67
85	" 30....	T. J. Burrill..............	" "	125 00
86	" 30....	S. W. Shattuck............	" "	125 00
87	" 20....	E Snyder..................	" "	100 00
88	" 30....	J. S. Searfoss............	" "	83 33
89	" 30....	Thomas Franks.............	" "	75 00
90	" 30....	Pat. Lamb.................	" "	37 00
91	" 30....	Charles W. Beyer..........	Ins. on library and apparatus	21 50
92	" 30....	E. T. Fisher..............	Farm-work, April.....................	42 00
93	May. 4....	James Blakesley...........	" "	35 00
94	" 4....	Fritz Finder	" "	42 00
95	" 4....	Aug. Shavelan.............	" "	42 00
96	" 4....	J. M. Campbell............	" "	50 00
97	" 5....	J. H. Pickrell............	Board expenses.......................	12 55
98	" 5....	B. Pullen	" "	17 20
99	" 5....	M. C. Goltra	" "	10 70
100	" 5....	Adams, Blackmer & Lyon.	2 doz. pamphlet cases	21 60
101	" 5....	Geo. R. Hosford	Kerosene oil and lamp chimneys.. ...	7 72
102	" 5....	Trevitt & Green	Farm tools and hardware.......... ...	15 70
103	" 5....	Union Coal Co.............	1 car coal...........................	15 00
104	" 5....	A. P. S. Stuart...........	Purchase of chemicals for laboratory.	4 57
105	" 5....	G. E. Hessell	Harness and repairs	7 95
106	" 5....	E. T. Whitcomb	Recording deeds......................	3 75
107	" 5....	Hibbard & Finch	Seeds and 1 plow	33 90
108	" 5....	R. B. Musson..............	Whitewashing and plastering.........	25 15
109	" 5....	Johnson, Myers & Co......	Repairing farm tools.................	6 45
110	" 5....	C. G. Larned..............	Hardware	33 40
111	" 5....	Moulding & Harland	Flower-pots	15 75
112	" 5....	F. K. Phœnix	Flowers and seeds....................	22 60
113	" 5....	Fuller, Finch & Fuller....	2 boxes window-glass.................	8 88
114	" 5....	D. B. Wier................	Trees for nursery....................	58 00
115	" 5....	F. M. & A. Avey...........	Blacksmithing........................	12 50
116	" 10....	J. M. Gregory	Salary for May, June, July, August..	1,333 34
117	" 10....	E. Snyder.................	Pay-roll of students' labor..........	235 35
118	" 10....	David Weeks	1 cord wood for hot-house	7 00
119	" 14....	J. W. Bunn................	Payment of taxes on land	984 73
120	" 14....	Beidler & Kratz	Lumber for farm......................	81 50

No.	Date.	To Whom.	For What.	Amount.
121	May 21....	W. W. Cranston..........	10 hogs for farm	$74 00
122	" 21....	David Boggies............	Work on farm.........................	9 50
123	" 25....	T. J. Burrill...............	Ex. of geological excursion..........	200 00
124	" 25....	Webb, Carstins & Shafer ..	1 harrow................................	28 95
125	" 31....	Wm. M. Baker............	Salary for May, 1869.................	166 65
126	" 31....	W. F. Bliss	" " "	166 66
127	" 31....	A. P. S. Stuart...........	" " "	166 66
128	" 31....	Thomas J. Burrill..........	" " "	125 00
129	" 31....	S. W. Shattuck	" " "	125 00
130	" 31....	E. Snyder.	" " "	100 00
131	" 31....	J. S. Searfoss............	" " "	83 33
132	" 31....	Thomas Franks............	" " "	75 00
133	" 31....	Pat. Lamb.................	Wages as janitor.....................	37 00
134	June 1....	E. T. Fisher..............	1 month's farm-work	42 00
135	" 1....	James Blakesley..........	" "	35 00
136	" 2....	J. H. Pickrell..........	Expense to Board meeting...........	7 75
137	" 3....	Hubbard & Herrick........	Hardware and locks....................	Canceled.
138	" 3 ...	State Journal Co..........	500 memorials for Legislature.........	16 50
139	" 3....	E. V. Peterson............	Stationery and crayons................	16 33
140	" 3....	E. Snyder..................	Payment of farm hands...............	48 12
141	" 3....	C. W. Rolfe...............	1 pump for Un. well	15 25
142	" 3....	Trevitt & Green...........	Hardware	9 60
143	" 3....	Ill. Cen. R. R. Co..........	Charges for back freight.............	39 51
144	" 3....	Dodson & Hodges	Hardware	13 00
145	" 3....	Adams, Blackmer & Lyon.	Students' record book and blanks.....	21 75
146	" 3....	E. Snyder..................	Postage, express and petty ex........	35 72
147	" 3. ..	Hovey & Heffron	Garden lines and hoes	9 25
148	" 3....	B. C. Beach & Co..........	1 plow and half ton coal	23 10
149	" 3....	S. J. Teachner............	Plastering chem. laboratory...........	35 10
150	" 3....	S. J. Teachner	" cabinet room	9 60
151	" 3....	Angle, Sabin & Co.........	1 knife grinder and 2 tons coal........	20 00
152	" 3....	W. & L. E. Gurley.........	Engineering instruments	28 90
153	" 3....	E. Snyder..................	Uniform buttons and cap letters......	25 00
154	" 3....	August Shablon............	1 month's farm-work..................	42 00
155	" 3....	James Braddock............	" "	35 00
156	" 3....	Fritz Finder	" "	42 00
157	" 3....	Martin Clancey	20 days' work with team at $3 on farm	60 00
158	" 3....	H. K. Vickroy	Work in ex. farm orchard	60 00
159	" 3....	John Jefferson.............	" " "	14 00
160	" 3....	Wm. Waites................	" " " 16½ days...	28 87
161	" 3....	Geo. Upstone.....	Work on stock farm...................	45 00
162	" 3....	E. Snyder..................	Payment of Students labor............	312 08
163	" 3....	W. W. Cranstone	3 hogs, 345 lbs @ 7½ cents...........	18 38
164	" 3....	J. M. Campbell............	Boarding farm hands and work.......	209 96
165	" 3 ...	F. M. & A. Avey...........	Blacksmithing.........................	17 70
166	" 15....	N. Tanner..................	Plowing fallow.......................	12 25
167	" 15....	W. R. Hough..............	" "	19 15
168	" 16....	Miller & Toll..............	Canvass and grain sacks..............	17 70
169	" 16....	G. N. Richards............	Advertising proposals for roof........	4 00
170	" 16....	W. S. McWilliams.........	14 days carpenter work at $3.........	42 00
171	" 16....	Tiernan & Call.............	Repairs of agricultural implements...	21 50
172	" 16....	W. F. Bliss................	Salary for June, 1869................	166 66
173	" 16....	W. M. Baker...............	" "	166 66
174	" 16....	S. W. Shattuck............	" "	125 00
175	" 16....	T. J. Burrill...............	" "	125 00
176	" 16....	E. Snyder..................	" "	100 00
177	" 16....	Thos. Franks..............	Gardener's salary for June, 1869......	75 00
178	" 16....	J. S. Searfoss.............	Carpenter's " "	83 33
179	" 30....	Patrick Lamb.............	Janitor's wages for "	37 00
180	" 30....	J. H. Pickrell.............	Expense to board meeting.............	6 80
181	July 7....	Martin Clancy.............	Work on farm with team..............	73 93
182	" 7....	Jas. Blakesley............	" " 1 month..............	30 50
183	" 7....	August Shablon.	" " "	40 38
184	" 7....	Fritz Finder..............	" " "	36 23
185	" 7....	J. Davies Wilder..........	Slating blackboards..................	80 56
186	" 7....	D. S. Crandall............	Advertising proposals for roof........	6 00
187	" 7....	S. Edwards................	Bill of fruit and ornamental trees.....	294 80
188	" 7....	Dr. J. A. Warder........ ..	Lectures at Institute, Jan.............	100 00
189	" 7....	E. Snyder..................	Payment of farm work and expenses..	348 66
190	" 7....	J. M. Campbell............	Boarding farm hands.................	55 83
191	" 7....	Western Rural Co..........	Advertising Farmers' Institute........	92 70
192	" 7....	Prairie Farmer Co	" " "	87 00
193	" 7....	Norman Coleman...........	" " "	27 00
194	" 7....	Journal of Agriculture....	" " "	15 00
195	" 7...	Flynn & Scroggs...........	Printing and advertising..............	16 00
196	" 7....	F. M. & A. Avey	Blacksmithing and repairs............	15 00
197	" 7....	Park & Royer..............	Hard lumber..........................	17 58
198	" 7...	C. G. Larned & Co,...	Hardware............................	23 05

No.	Date.	To Whom.	For What.	Amount.
199	July 7....	C. G. Larned & Co.........	Roofing University building..........	$873 60
200	" 7....	W. F. Bliss..............	Salary for July and August...........	333 33
201	" 7....	W. M. Baker..............	" " "	333 33
202	" 7....	T. J. Burrill............	" " "	250 00
203	" 7....	S. W. Shattuck...........	" " "	250 00
204	" 7....	E. Snyder................	" " "	200 00
205	" 7....	T. J. Burrill............	Collection of Minerals and Fossils....	500 00
206	" 7....	A. M. Lawver.............	3100 fruit trees........................	820 00
207	" 7....	W. H. Mann...............	Hedge plants and seeds..............	56 00
208	" 7....	Jas. Williams............	1 month's work on University grounds	35 00
209	" 7....	C. S. Emerson............	" " market garden.....	35 00
210	" 7....	Jas. Braddock............	" " farm...............	19 00
211	" 7....	M. C. Goltra.............	Expense attending meeting...........	16 75
212	" 7....	P. R. Wright.............	" " "	22 75
213	" 7....	A. M. Brown..............	" " "	27 35
214	" 7....	Joseph Rolfe.............	Mason work on gardener's house......	132 75
215	" 7....	Trevitt & Green..........	Hardware............................	30 37
216	" 7....	J. A. Hutchinson.........	Teaming.............................	6 00
217	" 7....	H. Jefferson & Son.......	"	6 00
218	" 7....	E. Snyder................	Payment of hands and expenses......	300 00
219	" 7....	J. M. Campbell...........	1 month's farm work with team......	50 00
220	" 7....	Geo. S. Upstone..........	1 month's work on farm..............	37 00
221	" 7....	E. T. Fisher.............	" " "	43 87
222	" 7....	M. T. Burwash............	" " "	28 25
223	" 7....	Wm. Waites...............	" " "	33 15
224	" 7....	H. K. Vickroy............	Services on Ex. farm................	76 10
225	Aug. 4....	A. P. S. Stuart..........	Salary for June, July and Aug........	500 00
226	" 4....	J. S. Searfoss...........	" July, 1869.	83 33
227	" 4....	Thos. Franks.............	" "	75 00
228	" 4....	Patrick Lamb.............	Wages as janitor, July..............	37 00
229	" 5....	J M. Campbell............	Boarding farm hands.................	76 83
230	" 5....	Flynn & Scroggs..........	Printing letter heads and envelopes...	24 25
231	" 5....	Heath & Milligan.........	Paints and putty....................	17 29
232	" 5....	W. J. Foote..............	3498 bricks for well................	34 98
233	" 5....	J. A. Williams...........	1 month's work on University grounds	35 00
234	" 5....	Chas. S. Emerson.........	" " market garden....	35 00
235	" 5....	J. K. Engledow...........	Plastering gardener's house..........	173 10
236	" 5....	S. J. Teachner...........	Whitewashing, etc., Un. buildings ...	190 13
237	" 5....	E. Snyder................	Pay-roll of farm hands..............	755 68
238	" 5....	Henry Swannell...........	Paints, glass and putty.............	32 44
239	" 5....	Jos. McCorkle............	Hardware............................	12 20
240	" 5....	A. S. Barnes & Co........	Books for library...................	23 20
241	" 5....	F. M. & A. Avey..........	Blacksmithing, digging well at gardener's house.............................	15 15
242	" 17....	Ill. Central R. R........	Advanced charges....................	23 05
243	" 17....	G. S. Upstone............	Payment of harvest help.............	69 00
244	" 17....	John Bingham.............	Digging well at gardener's house......	18 62
245	" 17....	Flynn & Scroggs..........	Printing and advertising............	30 75
246	" 17....	August A. Rader..........	Work on farms.......................	37 50
247	" 17....	Johnston, Huntly & Co....	One reaper..........................	100 00
248	" 17....	Elisha Eldred............	Lumber..............................	326 28
249	" 17....	J. M. Gregory............	Purchases for library and cabinet......	1020 93
250	Sept. 1....	E. Snyder................	Payment of labor and expenses.......	199 15
251	" 1....	W. F. Bliss..............	Expense at board meeting............	55 90
252	" 1....	E. Snyder................	Contingent fund for expenses.........	300 00
253	" 14....	Thos. Franks.............	Salary, August......................	75 00
254	" 14....	J. S. Searfoss...........	" "	83 33
255	" 14....	Pat. Lamb................	Wages "	37 00
256	" 14....	Geo. S. Upstone..........	" "	30 00
257	" 14....	Hulburd, Herrick & Co....	Locks and keys......................	76 56
258	" 14....	J. M. Campbell...........	Board of farm hands.................	65 60
259	" 14....	Elisha Eldred............	Lumber..............................	174 70
260	" 14....	Heath & Mulligan.........	Glass and paint.....................	22 02
261	" 14....	Webb, Carston & Co.......	One sod harrow......................	29 00
262	" 14....	Webster & Dunbar.........	Fencing (Griggs' farm)..............	15 26
263	" 14....	F. M. & A. Avey..........	Blacksmithing.......................	11 65
264	" 14....	Trevitt & Green..........	Hardware............................	Canceled.
265	" 14....	C. S. Emerson............	1 month's work on grounds...........	35 00
266	" 14....	W. M. Olcott.............	30 tons of hard coal	345 00
267	" 14....	Wm. Waites...............	1 month, 7 days work on Ex. farm....	50 71
268	" 14....	J. M. Gregory............	Library and cab. purchased in England	1355 65
269	" 15....	J. M. Gregory............	" " " Europe..	1028 09
270	" 16....	W. F. Bliss..............	Salary for September................	166 66
271	" 16....	Fritz Finder.............	1 month's work on farm..............	42 00
272	" 16....	August Shablon...........	" " "	42 00
273	" 16....	Jas. Braddock............	" " "	24 00
274	" 16....	Jas. Blakesley...........	" " " less six days..	32 35
275	" 16....	Geo. Lamberger...........	23 days work to August 31...........	46 00
276	" 16....	Pat. Lynch...............	11 " " "	22 00

No.	Date.	To Whom.	For What.	Amount.
277	Sept. 16....	Martin Clancey............	23½ days work with team.............	$ 79 50
278	" 16....	Jas. Blakesly.............	Boarding farm hands..................	26 90
279	" 16....	H. K. Vickroy.............	Salary for August.....................	60 00
280	" 16....	Geo. Stipe................	1 month's work on Ex. farm..........	40 00
281	" 16....	M. B. Burwash.............	" " " "	33 66
282	" 21....	J. M. Gregory.............	Salary for September..........	333 34
283	" 21....	J. McElvie................	Threshing oats........................	14 85
284	" 24....	A. S. Barnes & Co.........	Expense on apparatus..............	22 00
285	" 24....	A. L Rader................	Work for University during vacation..	84 92
286	" 24....	G. S. Upstone.............	Salary, September, 1869..............	30 00
287	" 28 .	J. F. Lupton & Co.........	Chemical Apparatus...................	469 00
288	" 28....	A. P. S. Stuart...........	Purchase of Spectroscope.............	38 15
289	Oct. 2....	W. A. Baker...............	Salary for September.................	166 66
290	" 2....	A. P. S. Stuart...........	" " "	166 66
291	" 2....	T. J. Burrill.............	" " "	125 00
292	" 2....	S. W. Shattuck............	" " "	125 00
293	" 2....	E. Snyder.................	" " "	100 00
294	" 2....	J. S. Searfoss...........	" " "	83 35
295	" 2....	Thos. Franks..............	" " "	75 00
296	" 2....	Patrick Lamb..............	Wages for September, 1869............	37 00
297	" 4....	J. T. Feagans.............	Plastering chemical recitation room...	12 00
298	" 4....	J. M. Gregory.............	Salary for October..................	333 33
299	" 4....	Jas. Ballangee............	" September.................	83 33
300	" 4....	Hibbard & Finch...........	Repair on implements.................	10 00
301	" 4....	A. S. Barnes & Co.........	Expenses on books....................	93 84
302	" 11....	Jas. Green................	Meteorological instruments...........	81 50
303	" 11....	J. F. Smithey.............	Plowing 11 days at $3................	33 00
304	" 11....	R. B. Warder..............	Salary for September.................	33 33
305	" 13....	M. C. Goltra..............	Board expenses.......................	10 00
306	" 13....	A. G. Pickrell............	A pair of mules......................	475 00
307	" 13....	J. H. Pickrell............	Board expenses.......................	7 90
308	" 14....	Burt Hall.................	8 days work on farm..................	24 00
309	" 14....	W. A. Baker...............	Salary for October, 1869.............	166 66
310	" 14....	W. F. Bliss...............	" "	166 66
311	" 18....	J. Kelley.................	54 bushels rye and cultivator........	57 14
312	" 18....	E. Snyder.................	Contingent fund......................	300 00
313	" 18....	H. K. Vickroy.............	Work on Ex. farm.....................	60 00
314	" 18....	Wm. Waites................	" " "	15 37
315	" 18....	George Stipe..............	" " "	37 70
316	" 18....	C. G. Larned..............	Guttering and hardware...............	190 18
317	" 18....	August Shablon............	1 month's work on farm...............	42 00
318	" 18....	Fritz Finder..............	" " "	42 00
319	" 18....	Jas. Braddock.............	" " "	20 00
320	" 18....	Geo. Lamberger............	15½ days " "	19 60
321	" 18....	Martin Clancey............	1 month's " "	64 20
322	" 18....	J. H. Blakesley...........	Board of farm hands..................	59 05
323	" 18....	E. V. Peterson............	2 fifes and 1 drum cord..............	5 25
324	" 18....	Hovey & Heffron...........	Garden tools.........................	6 00
325	" 18....	Wm. Price.................	Painting.............................	160 89
326	" 18....	Hubbard & Herrick.........	Tools and hardware...................	101 56
327	" 18....	E. Snyder.................	Petty expense........................	29 08
328	" 19....	A. Avey...................	Blacksmithing, etc	20 85
329	" 19....	James Rolfe...............	Mason work...........................	23 25
330	" 19....	James Rolfe...............	Building cistern, gardener's house....	9 00
331	" 19 ...	E. Snyder.................	Students' labor......................	325 40
332	" 20....	Chas. W. Rolfe............	1 pump for gardener's house..........	15 40
333	" 20....	Ellimwood & Chafler.......	Draining tools.......................	5 70
334	" 21....	A. H. Andrews.............	Castings for settees.................	87 50
335	" 23....	J. F. Luhme...............	Chemicals and apparatus..............	102 45
336	" 27....	W. Waites.................	1 month's work on experimental farm.	40 00
337	" 29....	W. and L. E. Gurley.......	One engineer's chain.................	16 50
338	" 29....	T. J. Burrill.............	Salary for October...................	125 00
339	" 29....	E. V. Peterson............	Envelopes, crayons and blank books..	55 35
340	" 29....	A. P. S. Stuart...........	Salary for October...................	166 67
341	" 29....	S. W. Shattuck............	" "	125 00
342	" 29....	E. Snyder.................	" "	100 00
343	" 29....	Jas. Ballangee............	" "	83 33
344	" 29...	R. B. Warder..............	" "	33 33
345	" 29....	Henry Douglass............	" "	83 33
346	" 29....	Thos. Franks..............	" "	75 00
347	" 29 ...	J. S Searfoss.............	" "	83 33
348	" 29....	Pat. Lamb.................	Wages for October....................	37 00
349	Nov. 4....	A. Avey...................	Blacksmithing........................	13 52
350	" 4....	J. M. Gregory.............	Salary for November..................	333 33
351	" 4....	J. Braddock...............	1 month and 2 days work on farm.....	21 50
352	" 5....	G. Lamburger..............	Work on University farm..............	47 75
353	" 5....	Martin Clancey............	Boarding farm hands..................	36 23
354	" 5....	Martin Clancey............	1 month's work with team.............	50 00

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No	Date.	To Whom.	For What.	Amount.
355	Nov. 5....	Wm. Weissgerber..........	Threshing 1,203 bushels oats, at 3 c...	$ 36 09
356	" 5....	Brazelton & Carr	Painting building..............	211 60
357	" 6....	W. F. Bliss..............	Visit to nurseries..............	56 40
358	" 7....	H. K. Vickroy	Salary for October..............	60 00
359	" 8....	G. W. Stipe..............	Wages for October..............	38 47
360	" 8....	D. S. Heffron	Seeds and bulbs	10 73
361	" 8....	Union Coal Co............	2 cars of coal	37 00
362	" 8....	Elisha Eldred............	Lumber for cabinet cases	109 05
363	" 8....	Fuller, Finch & Fuller.....	Glass, putty and oil..............	91 23
364	" 8....	Hulbard & Herrick	Locks for cabinet cases..............	14 79
365	" 8....	C. G. Larned..............	Hardware..............	113 38
366	" 8....	S. W. Shattuck	Books for military department.......	18 80
367	" 8....	Henry Swannell...........	Paints and oils..............	10 70
368	" 15....	W. F. Bliss	Salary for November, 1869	166 66
369	" 20....	E. Snyder................	Pay-roll of students	309 40
370	" 24....	Luther Guinness..........	Plastering farm buildings..............	14 88
371	" 24....	Union Coal Co.	2 cars of coal	40 00
372	" 24....	Fuller, Finch & Fuller.....	Glass and corks for cabinet	17 87
373	" 24....	H. K. Hosford	Kerosene and lamp chimneys.........	16 10
374	" 30	A. P. S. Stuart	Salary for November	166 66
375	" 30....	Wm. M. Baker.............	" "	166 66
376	" 30....	T. J. Burrill	" "	125 00
377	" 30....	A. S. Barnes & Co.	Charges on books from France	65 17
378	" 30....	S. W. Shattuck	Salary for November	125 00
379	" 30....	E. Snyder................	" "	100 00
380	" 30....	J. Ballangee.	" "	83 33
381	" 30....	H. B. Douglas	" "	83 33
382	" 30....	R. B. Warder	" "	33 33
383	" 30....	J. B. Searfoss.............	" "	83 33
384	" 30....	Thos. Franks..............	" "	75 00
385	" 30....	Patrick Lamb..............	" "	37 00
386	" 30....	Dodson & Hodges	Hardware and tools....	96 61
387	Dec. 1....	W. F. Bliss	Salary for December..............	166 66
388	" 1....	W. C. Flagg..............	Expenses as Corresponding Secretary.	51 50
389	" 4 ..	H. K. Vickroy	Salary for November....	60 00
390	" 4....	G. W. Stipe..............	Wages for November	40 00
391	" 4....	W. Waites.	" "	37 70
392	" 6....	Union Coal Co.........	2 cars of coal..........	40 00
393	" 8....	G. S. Upstone....	Wages for Nov., and add'l wages at $8 for 8 months as foreman	94 00
394	" 8....	John Wilson..............	1 month's work on farm..............	19 23
395	" 8....	PatrickDunbar	" " "	17 70
396	" 8....	Martin Clancey...........	1 month's work with team...........	48 08
397	" 8....	Martin Clancey	Boarding farm hands	62 06
398	" 13....	A. M. Brown..............	Expense at Board meeting...........	26 90
399	" 13....	B. Pullen	" "	14 70
400	" 13....	P. R. Wright	" "	21 50
401	" 13....	M. C. Goltra..............	" "	15 50
402	" 13....	J. M. Gregory	Traveling expenses..............	23 20
403	" 14....	W. J. Foote	15,000 brick for green house	150 00
404	" 14....	Ill. Cent. R. R............	Back freight and charges	69 87
405	" 16....	Eli & Burt................	Implements and repairs	15 45
406	" 16....	A. P. S. Stuart............	Purchase for Laboratory..............	11 57
407	" 16....	Angle & Sabin............	Draining tile and seeds..............	78 60
408	" 16....	C. G. Larned & Co.........	Hardware	51 88
409	" 20....	W. M. Baker..............	Salary for December..............	166 66
410	" 20....	J. M. Gregory.............	" "	333 33
411	" 20....	A. P. S. Stuart	" "	166 66
412	" 20....	T. J. Burrill	" "	125 00
413	" 20....	S. W. Shattuck	" "	125 00
414	" 20....	E. Snyder................	" "	100 00
415	" 20....	J. Ballangee..............	" "	83 33
416	" 20....	H. Douglas	" "	83 33
417	" 20....	J. S. Searfoss	" "	83 33
418	" 20....	Thos. Franks	" "	75 00
419	" 20....	Pat. Lamb	" "	37 00
420	" 20....	J. Hessell................	Harness and repairs..............	24 70
421	" 20....	Angle & Sabin............	1 plow and seeds.	10 70
422	" 20....	George Eli................	Rails and spikes..............	45 85
423	" 20....	Walker Brothers...........	Sawing and ripping lumber..........	6 55
424	" 20....	G. S. Upstone.	Expense to Fairs, etc..............	19 20
425	" 20....	G. S. Upstone..	Petty expense for farm.	74 68
426	" 20....	A. Bryant.................	Tree seeds..............	18 00
427	" 20....	G. S. Upstone...	Salary for October..............	30 00
428	" 20....	R. B. Warder..............	Salary for December..............	33 33
429	" 22....	Sweet & Plank	Insurance on University building.....	180 00
430	" 22....	D. Van Nostrand	Books for Library..............	15 00
431	" 22....	J. C. Sheldon.............	Insurance on University building.....	135 00

No.	Date.	To Whom.	For What.	Amount.
432	Dec. 22....	W. J. Foote	500 bricks for farm well	$ 5 00
433	" 22....	Miller & Thomas	Insurance for books and apparatus	45 00
434	" 27....	R. Peacock	Lumber for cabinet cases	25 05
435	" 27....	E. Snyder	Students pay-roll	142 45
436	" 27....	J. M. Gregory	Papers and periodicals for library	125 00
437	Jan. 8....	A. S. Barnes	Duties and charges on apparatus	129 00
438	" 8....	Peabody & Ayres	Blacksmithing, etc	7 05
439	" 20....	Am. Ex. Co	Reports from Springfield	38 30
440	" 10...	S. M. Hesse	Guns for bayonet drill	12 00
441	" 7....	J. H. Pickrell	Board expenses	25 65
442	" 12....	Emory Cobb	" "	29 25
443	" 12....	P. R. Wright	" "	28 75
444	" 12....	M. C. Goltra	" "	9 00
445	" 12....	A. M. Brown	" "	32 10
446	" 12....	Dr. M. Miles	Expense to lectures	60 00
447	" 13....	I. Turnell	2 infantry bugles	17 00
448	" 13....	Wm. Waites	1 month's work on farm	35 00
449	" 13....	Dr. H. J. Detmers	Lectures and expenses	35 00
450	" 13....	D H. Shimer	" "	35 90
451	" 13....	John Wilson	1 month's work on farm	20 00
452	" 13....	P. Dunbar	" " "	18 46
453	" 13....	Jesse Leary	" " "	13 00
454	" 13....	M. Clancey	" " "	34 50
455	" 13....	S. Welch	5 days' work on farm	7 50
456	" 13....	H. K. Vickroy	1 month's wages	60 00
457	" 13....	G. S. Upstone	" "	60 00
458	" 13....	G. S. Upstone	Boarding farm hands	47 38
459	" 13....	W. F. Bliss	Petty expenses for farm	53 79
460	" 13....	W. F. Bliss	Expenses as Recording Secretary	10 80
461	" 13....	G. Ely	1 spring wagon and repairs	163 35
462	" 13....	Fuller, Finch & Fuller	Paint, varnish and glass	53 46
463	" 13...	Hulburd & Herrick	Draining tools	11 50
464	" 13....	Union Coal Co.	3 cars coal	60 00
465	" 13....	Park & Royer	Lumber	67 50
466	" 13....	F. M. & A. Avey	Blacksmithing	3 68
467	" 13....	W. F. Bliss	Salary for January	166 66
468	" 14....	W. C. Flagg	Expenses to Lectures	14 59
469	" 14....	E. Snyder	Service as book-keeper	100 00
470	" 14....	W. C. Flagg	Salary as Corresponding Secretary	30 00
471	" 14....	J. M. Van Osdel	Expense to Lectures	14 59
472	" 18....	J. M. Gregory	Salary for January	333 33
473	" 22....	A. P. S. Stuart	" "	166 66
474	" 24....	J. A. Warder	For lectures given	600 00
475	" 24....	S. W. Shattuck	Salary for January	125 00
476	" 30....	W. M. Baker	" "	166 66
477	" 30....	S. W. Robinson	" "	166 66
478	" 30....	T. J. Burrill	" "	125 00
479	" 30....	E. Snyder	" "	100 00
480	" 30....	Henry Douglas	" "	83 33
481	" 30....	Jas. Ballangee	" "	83 33
482	" 30....	J. S. Searfoss	" "	83 33
483	" 30....	Thos. Franks	" "	75 00
484	" 30....	Pat. Lamb	" "	37 00
485	" 30....	R. B. Warder	Salary for January	33 33
486	" 30....	C. W. Murtfeldt	Expense to lectures	18 00
487	Feb. 1....	W. H. Merritt	Work on farm, January	18 75
488	" 4....	Elisha Eldred	Lumber for shop	35 54
489	" 4....	E. P. Miller	Insurance on garden house	15 00
490	" 4....	J. M. Gregory	Purchase of seed	14 25
491	" 5. ..	G. S. Upstone	Board of farm hands	14 06
492	" 5....	H. K. Vickroy	Salary for January	60 00
493	" 5....	G. S. Upstone	" "	60 00
494	" 5....	J. Wilson	Wages "	20 00
495	" 5....	P. Dunbar	" "	18 45
496	" 9....	J. M. Gregory	Salary for February	333 33
497	" 9....	Champaign Gas Company	Gas bill for University	12 24
498	" 9....	Elisha Eldred	Lumber for green-house	245 93
499	" 12....	Palmer, Fuller & Co	Sash for green-house	5 04
500	" 12....	J. F. Luhme & Co	Chemicals	26 35
501	" 12....	G. S. Upstone	Payments for shelling corn	28 44
502	" 17....	Elmswood, Stafford & Co	Draining tools	11 00
503	" 17....	F. M. & A. Avey	Blacksmithing	3 06
504	" 20....	E. P. Miller	1 barrel salt	3 25
505	" 20....	E. Snyder	Students pay-roll	351 54
506	" 20....	W. F. Bliss	Salary for February	166 66
507	" 25....	W. M. Baker	" "	166 66
508	" 25....	A. P. S. Stuart	" "	166 66
509	" 25....	S. W. Robinson	" "	166 66

No.	Date.	To whom.	For what.	Amount.
510	Feb. 25....	T. J, Burrill...............	Salary for February	$125 00
511	" 25....	S. W. Shattack............	" "	125 00
512	" 25....	E. Snyder.............. ...	" "	100 00
513	" 25....	Jas. Ballangee.............	" "	83 33
514	" 25....	Henry Douglas	" "	83 33
515	" 25....	J. S. Searfoss.............	" "	83 33
516	" 25 ...	Thos. Franks	" "	75 00
517	" 25....	Pat. Lamb.................	" "	37 00
518	" 25....	R. B. Warder..............	" "	33 33
519	" 25....	Union Coal Company......	3 cars of coal...........................	57 00
520	" 25....	H. K. Vickroy.............	Salary for February..	83 33
521	" 26....	Jared Teeple	Funeral expenses, L. C. Warner......	11 80
522	" 26....	D. M. Ford	Machinery.......................... ...	31 58
523	March 1...	Champaign Gas Company..	Gas bill for University, February	11 20
524	" 4....	Jones & Laughlin..........	Shafting, etc..............................	19 70
525	" 4....	W. McGregor..............	Boiler, smoke pipe and pump..	360 00
526	" 4....	Hall, Kimbark & Co.......	Machinery and tools	75 95
527	" 4....	W. A. James & Co.........	Belting and lathe......................	271 17
528	" 4....	S. W. Robinson............	Purchase of machinery, etc...........	136 55
			Total	$48,036 59

APPENDIX C.

To the Regent and Board of Trustees of the Illinois Industrial University:

The first work of importance done on the farms, after the meeting of the Board, in March of last year, was the building and repairing of fences, the building of bridges and the making of farm roads. All the fences on the stock farm, between five and six miles in length, were overhauled, the east line set back two rods, to give room for a road newly opened from Urbana southward, the south line set over on to Mr. Percival's land, with his neighborly aid and permission, to make room to plant a hedge on that side, and the work of removing and re-arranging the interior fences, begun by Mr. Periam, carried still further. A much needed road was made from the barn-house to the tenant-house east of it, and two small bridges thrown across the intervening small streams. The materials of the interior fences removed were used in building temporary cribs and outside fences, some of which needed much additional material after removal. One rail fence removed and re-set, had stood, as I am informed, seventeen years. The Board of Trustees should understand, if they do not already, that when this farm came into the hands of the University it was very much run down, and that a great deal of labor and a great deal of money must be expended on it before it can be brought even into as good condition as a common, well-ordered farm. The former owner informs us that he determined to sell it only after a careful examination had convinced him that it had just reached that point of exhaustion where no further profits could be expected, without the expenditure of considerable money. It was considered a fair subject for the application of agricultural science. Still it is a beautiful farm, and, with the improvements contemplated by the Committee on Agriculture, will answer the purpose it was designed for admirably.

CROPS.

The crops on the stock farm were 45 acres of spring wheat, 45 acres of Surprise oats, 85 acres of corn, 8 acres of potatoes, and 120 acres of meadow, chiefly timothy and clover. Much of this meadow is badly run out; some of it has been badly injured by the white grub; in the wetter portions red-top is taking the place of the timothy and clover, and in other portions blue or June grass is coming in. If it were not that we already have too much land under plow, it would be advisable to break up the whole or nearly the whole of this meadow; but for the reasons and in pursuance of the plans laid before the Board, last year, we are laying the farm down to grass as rapidly as possible, and propose to defer breaking up this old meadow until the plow-land shall have been sufficiently reduced in quantity.

Owing to late sowing, in consequence of the wet spring, the spring wheat was a light crop of a very inferior quality. The varieties sown were Mammoth and Fife. The oats yielded some 1200 bushels by measure, weighing 38 pounds to the bushel. The main crop of corn was made up of these varieties: a large yellow corn, with very deep grain, sent us by M. C. Goltra of Jacksonville; a white corn; and a calico or speckled corn, which we found on the farm, and which matured early enough to escape injury by the early cold weather last fall. The large yellow and white corn failed to mature perfectly. Besides these, various kinds of corn and other seeds were planted in small quantities. In addition to those mentioned in the Regent's report, the following nine kinds of wheat were sown by Mr. Periam, on the experimental farm, in the fall of 1868:

Red Genesee, seed from S. M. Haywood; White May, seed from W. F. Bliss; Betera, seed from Ferry & Co.; German Red, Mr. Fanqueroth; White Bearded, seed from Mr. Fanqueroth; Alabama White, seed from Mr. Fanqueroth; Polish, seed from Agricultural Department; Talavern, seed from Agricultural Department; Rough Chaff, seed from Agricultural Department.

All these were much injured by the winter. The Red Genesee, the White May, and the Alabama White gave the best results, and we have them sowed again, in our experimental grounds, with Tappahannock and White Winter Towzelle. Of these the White Winter Towzelle, a variety received from the Patent Office, has suffered most from freezing out; the White May least.

The cultivation of the farms, during the past year, has been carried on under many disadvantages, and, consequently, at considerable cost. The heavy and long-continued rains in the spring, with the condition of the farm, made the mere work of cultivation and subduing of weeds a very laborious and expensive one. We had to choose between a shabby culture on one side, and an expensive one on the other. Had the farm belonged to a private individual we might have taken the former method, perhaps justifiably, considering the season; as it was we chose the latter, and no one will wonder at the money spent, considering the disadvantages under which we worked, the peculiarity of the season, the state of the farm in the spring, and its vastly improved condition in the fall. In addition to the crops mentioned above there were raised, on the experimental farm, 440 bushels of oats and some 500 bushels of corn.

IMPLEMENTS.

The plows used on the farms were Collins' cast-steel plow; the Princeton plow; Moline plow; a plow made at Urbana, by Tiernan & Call.

We used a roller manufactured by Furst & Bradley, Chicago.

We cut our hay with the Bucyrus and the Cycloid mowers—the latter a new machine, from Johnston, Huntley & Co., which did its work remarkably well.

Our wheat was sowed by hand, except some three acres put in with the Statesman drill, which was used also to sow a part of the oats side by side with a broad-cast seed sower and cultivator, made by M. L. Gotham & Co., without any appreciable difference in the crop.

The wheat and oats were harvested with Johnston's Self-raking Reaper, which performed well.

Our corn was planted mostly with the Vandiver corn planter (old patern), and cultivated with the Hoosier, Frasier, Furst & Bradley and Gopher Two-horse Cultivators, and the common double-shovel plow.

The potatoes were worked first with the Gopher Cultivator, then with the Hoosier double-shovel, and finally with the single shovel plow—after which they were cultivated by hand. The corn was worked four times with the cultivators—a part of it harrowed and worked by hand.

There were raised, on the stock and experimental farms, in 1869, in round numbers—

Oats, (bushels, by measure,)	1650
Spring wheat, (bushels)	216
Corn, "	3200
Potatoes, "	1500
Hay, (tons)	175

There were five and one-half miles of hedge set, and six or seven miles of fence either re-set, repaired or built anew, four bridges built, great and small, a well dug, some repairs made upon the farm house, and between 300 and 400 loads of manure hauled on the land—either from the town or made on the the farm.

In addition to the duties of an instructor, the Professor of Agriculture has had charge of the execution of the plans of the Committee on Horticulture, during the past year, and the superintendence of the farms. As either one of these is enough to fully occupy the time and thoughts of one man, he would respectfully request that he be relieved from the charge of the Horticultural Department and from the active superintendence of the farms.

Respectfully submitted,

W. F. BLISS,
Prof. of Agriculture.

APPENDIX D.

To the Regent of the Illinois Industrial University :

EXPERIMENTAL ORCHARD.

The trees of this orchard were purchased of A. M. Lawver, South Pass, Ill., the fall of 1868, and heeled in on the University grounds until the following spring. Roots were badly infested with *Pemphigus pyne*, Fitch, causing knotty excresences on the roots, commonly but incorrectly called in Illinois, the " *Woolly Aphis.*" In the spring, before planting in the orchard, we washed the roots clean and immersed them in strong lye, and heeled in again until the ground was prepared to receive them. The ground was deeply plowed and thrown in ridges, upon which the trees were set about the same depth they stood in nursery, in quincunx order, 24 feet each way ; every tenth row being left for a row of evergreens. Avenue running through the center, east and west, 60 feet wide.

Commenced planting May 7th, and finished May 14th. Immediately before planting, the bruised roots were cut smooth with a sharp knife, and well grouted. Holes were made large enough to receive the roots in their natural position, with a small mound in the center for the tree to stand on ; fine dirt well filled in around the roots ; trees leaned to the southwest, as most of our strong winds are from that quarter during the growing season. Most of the trees, at the time of planting, were cut back to 3 to 5 buds of last seasons' growth ; would have been better if they could have been cut back in the fall or *early* spring. Planted 2,193 trees, about 1,000 known varieties. Planted the orchard in corn, commencing June 2d, and finishing June 8th—lateness owing to the wet and backward season. Kept the ground *well* cultivated, which is one of the great secrets of successful tree culture ; well mulched with straw or course litter, is equally as good. Another is to keep off *all* injurious insects.

Insects found on the trees during the season, were brown and green Aphides, Catterpillars, Datana Minestra, and Clisiocampa Americana, Atticus Cecropia, Sphinx Gordius, Hammond's Leaf-Tiger, (*Acrobasis Hammondi*, Walsh.)

Our means of destruction of the insects were as follows : For the Catterpillars we adopted Dr. Hull's plan, "catch-and-kill," and the same for Hammond's Leaf-Tiger ; and for the Aphides, that infested the body and leaves of trees, strong soft-soapsuds, and also, a solution of 1¼ lbs. of salsoda, dissolved in a gallon of water, and washed all of the trees twice. The Brown Aphis was found on the bodies of trees, mostly places where the bark was bruised, clothed in a woolly covering—Green Aphides on the leaves and young shoots. We have lost about ½ per cent. of the trees. At the present, October 20th, the roots are in a very fair condition. The knots caused by the Pemphigus Pyri have grown smoother; the trees have made a growth of from 6 inches to 3 feet ; those that were cut back in the spring before planting, are in the best condition.

NURSERY.

We planted in nursery about 600 apple trees, one to three years old, for the purpose of filling in wet places in the orchard when drained, and replacing any that might die. Planted 3,000 Green Ash, 1 year; 1,000 White Elm, 2 years; 1,000 American Arbor Vitæ, 6 to 12 inches; 1,000 Balsam Fir, 6 to 10 inches; 1,000 Red Pine, 6 to 8 inches; 200 Austrian Pine, 12 to 15 inches; 100 Scotch Pine, 18 to 24 inches; 18 varieties of Pears, 3 years old; 2 varieties of Cherry; a few Tulip and Sycamore Trees, 2 years old; 400 Soft Maples, 2 years old. Forest Evergreens: 10,000 White Pine, 4 to 6 inches, donated by Samuel Edwards of LaMoille, Illinois; 1,000 White Spruce; 1,000 Red Pine; 1,000 Hemlock. A few nuts of the Black and White Walnuts, which have done very well; 1 peck of Catalpa Seeds, donated by W. C. Flagg, Alton, Ill., which, also, has done well.

We have lost about 2 per cent. of fruit trees; not any of the Green Ash and White Elm; about 10 per cent. of Arbor Vitæ; 7 per cent. of Balsam Fir; 80 per cent. of Red Pine; 10 per cent. of Austrian Pine; 2 per cent. of Scotch Pine; Tulip, Sycamore and Maples, none. Of the forest evergreens, about 1 per cent. of the White Spruce; 50 per cent. of the Red Pine; 20 per cent. of the Hemlock; 8 per cent. of the White Pine. The forest evergreens were shaded by lath frames.

We planted a few of the forest evergreens in open sun, by way of experiment; of the White Spruce we lost about the same as of those shaded; Red Pine, 98 per cent.; Hemlock, 65 per cent.; White Pine, 35 per cent. Those planted in open sun were well mulched with saw-dust.

HEDGES AND SHELTER BELTS.

We planted hedge, Osage Orange, around the Experimental Farm, except the wet places and 40 rods on north side, and 20 rods on east and west of arboretum, nearly 740 rods in all. The lines on the east side were set 8 inches apart in the row; south and north lines set 10 inches in row; west line, 12 inches in row. Commenced planting 1st June, and finished 7th June. We have been successful in getting a good stand, and it has made a satisfactory growth; looking well at present.

Shelter belts are set 12 feet inside of the hedge. About 60 rods on the north side of the orchard we set two rows of Silver Maples; first row 12 feet from hedge, and second, 8 feet therefrom, alternating; trees set 8 feet apart in rows. On the south side of orchard are 80 rods of Maples set in the same way as on the north. On the west side of orchard, 71 Norway Spruce, 3 to 4 feet; 110 Austrian Pine, 4 to 6 feet, being all we could get in season, of sufficient size, and set same distance as the other belts; Spruce on the west side and Pines on the inside; intend filling the whole line next spring. On the northeast side of "160," we set 120 Red Cedars, 4 to 10 feet, same as above. We lost 2 per cent. of the Spruce; 25 per cent. of the Red Cedar. They were planted June 7th, in good condition, and well mulched. Of the Austrian

Pines, lost 7 per cent. on account of fungus on leaves. Maples have all done well.

All the trees and hedges received good cultivation.

H. .K VICKROY.

On motion of Dr. Burroughs,

To refer the Regent's Report to a Special Committee, for apportionment, was carried, and Dr. Burrough's, Mr. Pickrell, and Dr. Kile were appointed committee.

RESOLUTIONS OF JUDGE BROWN.

Judge Brown of Pulaski introduced the following preamble and resolutions, which were seconded by Mr. Edwards:

WHEREAS, some dissatisfaction seems to exist with the plans and management of this Institution, as indicated by resolutions recently passed by the Northern Horticultural Society and otherwise; and, whereas, it is important that the University should be in sympathy, as far as possible, with an intelligent public sentiment; and, whereas, we desire to correct and amend our plans if they shall be found to be erroneous or imperfect; therefore,

Resolved, That those members of this Board who participate in the dissatisfaction alluded to above, if any such there be, be requested and invited to present to the Board, at as early an hour as practicable, during the present session, a definite and specific statement of the errors and imperfections complained of, and such amendments or alterations as they may have to propose, to the end that a full, fair and candid examination of them may be made.

Carried.

Mr. Johnson moved the appointment of a committee of three, to nominate standing committees for the coming year. The motion was carried, and Messrs. Johnson, Pearson and A. M. Brown appointed Committee on Nominations.

On motion of Mr. Blackburn,

The motion of Dr. Burroughs, to apportion the Regent's Report, was re-considered; and Dr. Burroughs moved the following amended form of his original resolution:

Resolved, That the Report of the Regent be referred to a special committee of three members, who shall report to the Board a proper distribution of the several subjects discussed therein, as they shall deem to need special consideration, among the appropriate standing committees.

Carried, as amended.

The minutes of the Executive Committee, subsequent to those printed in the Second Annual Report of the Board, were read by abstract, and approved.

ORDER TO PRINT THE REGENT'S REPORT.

On motion of Judge Brown,

It was ordered that the Corresponding Secretary cause to be printed, in pamphlet form, at as early a day as practicable, 5000 copies of the Regent's Report, for general circulation.

Adjourned, to meet in the library at 7½ o'clock, P. M.

EVENING SESSION.

The Board met in the evening, in the Library, pursuant to adjournment, and was called to order by Mr. Blackburn.

Judge Lawrence was called to the Chair, and suggested that Mr. Edwards be requested to present his views on the subject of Industrial Education. This Mr. Edwards proceeded, by general consent, to do, yielding the floor once, by request, to allow the motion of Judge Brown to be read, inviting the discussion, and finally presented the following scheme of studies, arranged in ten schools or departments, and moved its adoption :

1. A School of Agriculture.
2. " Horticulture.
3. " Mechanics.
4. " Chemistry.
5. " Geology and Mining.
6. " Zoology and Veterinary Science.
7. " Botany.
8. " Engineering and Military Science.
9. " Laws and Economics.
10. " Languages.

1. SCHOOL OF AGRICULTURE.

First Year.—Operations and methods.
Second Year.—Mixed agriculture; grains and grasses; feeding cattle.
Third Year.—Theory of agriculture; manures; drainage.

2. SCHOOL OF HORTICULTURE.

First Year.—Principles; culture; practice of propagation; the garden.
Second Year.—Orchard and vineyard; small fruits; forestry.
Third Year.—Landscape gardening; ornamental planting; hedges; arboretum.

3. SCHOOL OF MECHANICS.

First Year.—Principles and forces; natural philosophy of agricultural implements.
Second Year.—Machinery; physics; materials; buildings and bridges.
Third Year.—Powers employed; mechanism of animals; wind; water; steam.

4. SCHOOL OF CHEMISTRY.

First Year.—Principles; inorganic chemistry; mineralogy; analysis.
Second Year.—Analysis; organic chemistry; chemistry of agriculture.
Third Year.—In mines, ores, etc.; chemistry in the arts; blow-pipe and spectroscope; poisons.

5. SCHOOL OF GEOLOGY AND MINING.

First Year.—Principles; outlines; palæontology.
Second Year.—Of soils and natural manures; of building materials; of road-making.
Third Year.—In mines; of waters, wells, etc.; meteorology.

6. SCHOOL OF ZOOLOGY AND VETERINARY.

First Year—Comparative anatomy; comparative physiology; hygiene; veterinary.
Second Year—Stock breeding; natural history; birds; fishes; veterinary.
Third Year—Natural history; entomology; laws of life.

7. SCHOOL OF BOTANY.

First Year.—Vegetable physiology; principles of propagation.
Second Year.—Systematic botany, (or classification); geology of plants.
Third Year.—Botany applied in agriculture; botany applied in horticulture; botany applied in the arts.

8. SCHOOL OF ENGINEERING.

First Year—Laying out farms; surveying and drafting; mechanical drawing; manual of arms.
Second Year—Architecture; roads; bridges; drafting; free hand drawing; drill.
Third Year—Of mines and buildings; of draining; drawing; tactics.

9. SCHOOL OF LAWS AND ECONOMICS.

First Year—Constitution of United States and of the State of Illinois; personal rights and duties; book-keeping.
Second Year—Real estate and transfers; roads and water courses; fences and boundaries; book-keeping.
Third Year—Of trade, commerce and navigation; of transportation; of political economy.

10. SCHOOL OF LANGUAGES.

First Year—French; English literature.
Second Year—French; German; general literature.
Third Year—French; German; ancient literature.

Mr. Pickrell moved that the Board do now go into Committee of the Whole, to consider the course of study offered by Mr. Edwards; which motion finally prevailed, and the Board went into Committee of the Whole, Mr. Johnson in the chair.

The committee rose, announced that they were ready to report progress, and asked leave to sit again.

A motion to receive the report of the committee was lost.

A motion to allow the committee to sit again was lost.

A motion to refer the scheme of study, offered by Mr. Edwards, to a special committee was lost.

After some discussion, the previous question being ordered, the main question was put on the motion to adopt the course of study, proposed by Mr. Edwards.

The ayes and noes being called for, resulted in ayes 4, noes 18, and the motion was lost.

Those voting in the affirmative were Messrs. Dunlap, Edwards, Galusha and Van Osdel.

Those voting in the negative were Messrs. Bateman, Blackburn, Brayman, E. L. Brown, A. M. Brown, Burroughs, Cunningham, Goltra, Griggs, Kile, Johnson, Lawrence, Pearson, Pickard, Pickrell, Pullen, Slade, Wright, and the Regent.

Mr. Burroughs then introduced a motion that the Committee on Faculty and Course of Study be instructed to consider, in the light of the discussion of the evening, what modifications, if any, should be made in the course of study at the University.

Carried.

Adjourned to the next day, at 9 o'clock, A. M.

SECOND DAY.

WEDNESDAY, *March* 9, 1870.

The Board of Trustees met in the Library, at 9 o'clock, A. M., the Regent in the Chair.

The session was opened by reading the Scriptures and prayer, by Judge Lawrence.

On calling the roll, twenty members answered to their names, and the Regent announced that a quorum was present.

COMMITTEE ON REGENT'S REPORT.

Mr. Burroughs brought in the following report:

The committee to which was assigned the duty of proposing a distribution of the Regent's Report among the standing committees, beg leave to submit the following report:

We recommend that from pages

8 to 12,	inclusive, be	referred to	Committee on	Finance;
13 to 16,	"	"	"	Agriculture;
17 to 24,	"	"	"	Horticulture;
25 to 29,	"	"	"	Mechanical Department;
29½	"	"	"	Military Department.

J. C. BURROUGHS,
WM. KILE,
J. H. PICKRELL,
Committee.

On motion of Mr. Blackburn,

That the report of the Committee on the Regent's Report be received and adopted and the committee discharged, was carried.

The special committee to whom was referred the nomination of the standing committees here brought in their report, which, on motion of Judge Lawrence, was laid on the table, to be taken up at a future time.

VISITING COMMITTEE APPOINTED.

On motion of Dr. Burroughs,

Resolved, That a committee of five members, with J. S. Pickard as Chairman, be appointed to visit the several departments and classes now in session, and to report to the Board, at this session, in respect to the condition in which the same are found.

Messrs. Pickard, Bateman, Slade, Galusha and Burroughs were appointed said committee.

CLOSE OF YEAR FIXED.

Mr. Pickrell offered the following:

Resolved, That the fiscal year shall end on the last day of February, and that the committee year shall end on Wednesday after the second Tuesday in March: *Provided*, that members of all committees shall hold their office until their successors are appointed.

A division of the question was called for, and both parts adopted.

RECESS.

On motion of Judge Brown the Board agreed to take a recess until 11 o'clock A. M.

AFTER RECESS.

The Board resumed business at 11 o'clock, Dr. Bateman in the Chair.

On motion of the Regent, Prof. Powell was invited to make a statement in regard to the collections made by him for the University in his exploring expedition. Prof. Powell not being present, the Committee on Buildings and Grounds read their report.

REPORT OF THE COMMITTEE ON BUILDINGS AND GROUNDS.

The Committee on Buildings and Grounds then made the following report:

The Committee on Buildings and Grounds would respectfully report, that in pursuance of the authority of this Board, at the last annual meeting, the old roof on the main building was removed early last summer and its place supplied by one of the best tin, put on under the direction of this committee. Previous to letting the contract for this work bids were invited, and the work let at a price under the appropriation of the Board. The work was well and promptly done.

Instead of the cast-iron water-table authorized by the Board, it was found that one of tin and wood could be supplied at a much less cost and of greater service, which, by the advice of the Executive Committee, was substituted.

The basement walls, on the outside, and the corridors, have been painted as authorized; but the work on the outside of the main building (the cornice and the cupalo) has not been undertaken, on account of the necessity for retrenchment in our expenditures, apparent as the year progressed.

The sidewalk on the west side of the grounds, leading to the shop and experimental farm, has been completed.

A building, to be used as a green-house, is now in course of construction upon the University grounds, which, owing to the lack of funds at the disposal of the committee, and the apparent propriety, has been placed under the direction of the Committee on Horticulture.

The building is now in a good condition of repair, and the grounds under good cultivation.

All of which is respectfully submitted.

M. C. GOLTRA, *Chairman.*

The report of the Committee on Buildings and Grounds was accepted.

Prof. Powell was here introduced, and stated that the plants collected have already been properly put up and delivered to the University, by Dr. Vasey, and that the labor of sorting, classifying and identifying the specimens in several other departments was now in progress, but that some time must elapse before this work could be completed, as some of the specimens must be sent to distant places, and some even to Europe, for identification; that a collection of eighty or ninety mammals, embracing a grizzly bear and many of the most important animals of the Rocky Mountains, would be included. The specimens promised from his own private collections were ready to be delivered whenever called for. He added that another expedition was in contemplation, to explore some additional territory, and expressed a wish that the University should again participate in the expenses and the results.

On motion of Mr. Blackburn, it was

Resolved, That we have heard with satisfaction the statement of Prof. Powell, in regard to the collections designed for the University, and refer the same to the Committee on Library and Cabinets.

REPORT FROM COMMITTEE ON FACULTY AND COURSE OF STUDY.

The Regent presented the following report from the Committee on Faculty and Course of Study:

The Committee on Faculty and Course of Study, to whom was referred Mr. Edwards' propositions, respectfully report as follows:

In the wide difference of views between men who are all equally earnest to promote true industrial education, the only appeal left us is to the law. Some men would exclude some studies as useless, if not injurious; others, with equal earnestness and honesty, would welcome and provide for all as desirable, if not absolutely necessary. Argument cannot settle the question. Experiences vary. There is nothing left but to go to the law. By this all must abide, whether its decision be disagreeable or otherwise.

The law seems clear. It requires that, without excluding other classical and scientific studies, the branches of learning relating to agriculture and the mechanic arts shall receive the chief attention, shall be placed foremost in the courses, and taught with the greatest fullness. The question hinges on the expression "related to agriculture and the mechanic arts." What branches are thus related? Your committee are of the opinion that there are two ways in which a branch of learning may be related to agriculture and the arts: first, it may be *directly related*, as involved in agriculture and the mechanic arts, and necessary to explain their laws and processes; or, second, it may be indirectly *related*, as necessary to fit the farmer or mechanic to pursue his calling and to investigate or invent his art. Thus Chemistry is directly *related*, because involved in the knowledge of the composition of the soil. Book-keeping and arithmetic, on the other hand, are only *indirectly related*, because they simply fit the farmer to pursue his business with success. Neither class of these studies, it should be remarked, are necessary to the practice of the mere art of agriculture. A man can plow without knowing anything of either Chemistry or Book-keeping, and as well without the one as the other. Now, in the first class we find the following studies, Chemistry, Mineralogy, Geology and Physical Geography, as explaining soils and their position; Chemistry, Meteorology, and Astronomy, as explaining atmospheric phenomena and conditions of growth; Chemistry, Botany, and Vegetable Physiology, as explaining the phenomena of plant life and growth; Chemistry and Zoology in its several departments, as Entomology, Ornithology, etc.; Comparative Anatomy, Physiology, and Biology, as related to Animal Husbandry; Mensuration and Surveying, as involved in the measurement and subdivision of land; Leveling, Hydraulics, and Hydrostatics, as explaining the drainage of lands; Mechanical Philosophy, as involved in the machinery for working land; Property Law, to explain the titles of land; and Political Economy, as involved in the marketing of farm produce.

Besides these there is another branch of studies bearing a secondary relation to agriculture—since they are neeessary to the sciences just mentioned. Thus, Mathematics are necessary to mensuration, surveying and mechanical philosophy; the English language is necessary to all; the Latin and Greek languages are desirable, to some extent, for all the natural sciences; History is important for the study of property law, etc.

The second great class of related branches of learning—those necessary not to explain agriculture and the arts but to fit the agriculturist and mechanician to more thoroughly investigate, improve, and practice their arts—those needed in the language of the law "for the the liberal and practical education of the industrial classes in the several pursuits and professions in life"—embrace the following studies: Book-keeping and Commercial Law, to make them safe and intelligent business men; English language and literature to fit them to thoroughly and easily to understand and use their native tongue as it is used in the broad range of scientific readings and study necessary for them to pursue; the German and French languages, to give them access to those works of the great students of agriculture and mechanical science in Germany and France; Inductive Logic and some Mental Philosophy, to fit the students of the inductive sciences and arts to properly comprehend and use the facts they will need to examine.

On examination we find that all the above branches of learning are taught, and taught in their relations to agriculture and the mechanical arts.

We find, also, on examination, that the course proposed by Mr. Edwards differs only in form and not in substance from the course as now arranged, introducing no essential feature and omitting only the ancient languages.

We find, on examination, that the ancient languages hold only a very subordinate place in the teaching and affections of the University—no Greek being now taught and there being only twenty-seven students in Latin.

The committee do not feel that any good point will be gained by the omission of the ancient languages, since, while some would be gratified by such omission, others, and perhaps an equal number, would inevitably be offended, and we should be acting, in the eyes of many, in violation of the laws both of Congress and of the State. We should not even save a dollar of expense, as not one single teacher could be dispensed with by such omission.

It appears clearly, on full inquiry, that the study of the languages is not attracting the attention of either teachers or pupils from other studies; and that the evident and decisive drift of the Institution is increasingly in the direction of the scientific and practical studies related to the industries.

The committee would mention, as a most significant fact, in this connection, that while out of 77 students who entered here the first term, 29 or 30 chose Latin; now, out of 150 students or more belonging to the Institution, only 27 are pursuing the Latin language.

J. M. GREGORY,
C. R. GRIGGS,
N. BATEMAN,
A. BLACKBURN.

On motion of Mr. Dunlap,

To strike "Greek" from the report of the Committee on Faculty and Course of Study, was lost; and, on motion, the report of the majority was adopted.

Mr. Edwards, of the Committee on Faculty and Course of Study, presented the following minority report, which was ordered to be entered on the record:

MR. EDWARDS' MINORITY REPORT.

Whilst the report of the majority of the Committee on Faculty and Course of Study meets my general approval, I must respectfully and firmly dissent from admitting the necessity of our teaching the Latin and Greek languages, in order to answer the requirements of the act of Congress, our charter from the State, or the wishes of the industrial classes—whose servants we are.

Respectfully submitted.

SAMUEL EDWARDS.

The Regent reported 3480 volumes in the library.

Referred to Committee on Library and Cabinets, with instructions to report.

REPORT OF THE COMMITTEE ON MILITARY DEPARTMENT.

Gen. Brayman, from the Committee on Military Department, made the following report:

The Committee on Military Department, respectfully report:

That at the present time 131 students are receiving efficient instruction in military science and tactics. The good effect of daily drill upon the health, discipline and development are apparent, and give promise of great usefulness in this department, when proper facilities are at command for a full compliance with the requirements of the law.

The number of arms and accoutrements received from the State (100) being insufficient, it is proposed to make an application for an additional supply of 50 muskets, together with 25 swords and sabres for exercise.

The chapel, now used for a drill hall, is inconvenient, unsafe and inadequate. The committee respectfully recommend the erection of a drill hall, one story in height, not less than 135 feet in length, and 72 in width—upon a plan approved by the Committee on Buildings and Grounds—and that an appropriation, not exceeding $2000, be made for that purpose. A drill hall is indispensable to regular and systematic instruction, during inclement weather, and no part of the college building is fit for such uses.

The committee recommend an appropriation of $100 for cleaning and repairing arms, the purchase of fencing gloves, whalebone bayonets, and other articles incidental to instruction.

The committee adhere to the rule, heretofore established, requiring all students to take part in military exercises and studies—unless excused for sufficient cause. The country has a right to demand, as it has done, that those receiving the benefits of an education here, shall be prepared to render patriotic and skillful service in war, and no young man should be deprived of the honorable advantages which such instruction secures, should his service be required.

While it is the purpose of this department to conform in discipline and instruction to the national code of arms, as taught at West Point and other national schools, the want of adequate means must, for years to come, confine our instructions to such branches as are most easily taught, and are in most need in those emergencies which arise, calling our citizen-soldiery hastily into the field. What we want is, to prepare our young men to organize and instruct recruits, and to perform the usual duties of line officers, not to be compelled as heretofore, to learn duties while performing them, at such fearful risks to human life and national honor.

The committee, therefore, recommend the following, as approximating the list and course of studies most useful, until the means at command shall justify a wider range.

That a class be taught in military science and art, so far as is necessary to duty for officers of the line, comprising—

Infantry Tactics, complete,
Bayonet Exercise,
Sword Play,
Target Practice,
Military Administration,
Army Regulations and Military Law.
Military Fortifications.

OPTIONAL:

Artillery Tactics,
Drill at the Cannon,
Cavalry Tactics, (theoretical,)
Grand Tactics and Strategy.

From the class can be drawn officers for companies, and drill sergeants.

Practical instruction to be given in—

Manual of Arms,
Squad and Company Drill,
Bayonet Exercise,
Skirmish Drill,
Battalion Drill,
Guard and Picket Duty.

The whole military course to be so arranged as to make it possible for any course to be taken by the member of any other course, and to occupy no more than one hour's instruction or practice each day.

The Committee congratulate the Board on the success that, under many discouragements, has attended the operation of the military department. The proficiency in study, promptness, manly bearing, grace of movement and general good conduct of the students, already give evidence of the beneficial results to be expected from this branch of study. The results thus far attained are due, in a gratifying degree, to the zeal, efficiency and learning of Capt. Snyder, assistant professor of book-keeping, and instructor in military tactics.

M. BRAYMAN,
M. L. DUNLAP,
J. W. SCROGGS,
WM. KILE.

The report of the Committee on the Military Department was received and adopted, with the exception of that portion of it which called for the appropriation of money; which was referred to the Committee on Finance.

REPORT OF THE COMMITTEE ON MECHANICAL DEPARTMENT.

The Committee on the Mechanical Department, made the following report:

Your Committee, to whom was referred that part of the Regent's Report relating to the Mechanical Department, beg leave to report, that the appointment of Prof. S. W. Robinson, by the Executive Committee, as Professor of Mechanical Sciences, at a salary of $2,000 per annum, be confirmed.

The course in this department extends over three years, embracing Mathematics as applied to the Mechanic Arts, Architectural and Mechanical Drawing, Mechanical Forces and Strength of Materials, Metallurgy and Mining Engineering, with practical instruction in the Model Workshop.

We also recommend the employment of Mr. Alexander Thompson as Master Mechanic, in the Practical Department, and that his salary be fixed at $1,000 per annum.

Your Committee further recommend, that the action of the Executive Committee in preparing a shop to contain steam engines, lathes and other apparatus, to illustrate the mechanical forces practically, be approved; and they further recommend that the sum of $1,000 be appropriated to cover the expense of the practical branch of this department.

All of which is respectfully submitted.

JOHN M. VANOSDEL,
M. L. DUNLAP,
EDWIN LEE BROWN.

Judge Cunningham moved that the Executive Committee be instructed to secure uniforms, at least possible rates.

Carried.

Dr. Scroggs moved that Capt. E. Snyder be appointed Professor and Instructor in Military Science, and that his salary be $1,500.

Referred to Committee on Faculty and Course of Study.

Judge Brown read the report of the Standing Committee on Horticulture, and asked leave to withdraw the report in order to make some additions.

Leave was granted.

Judge Lawrence requested a call of the house, to see whether a sufficient number was present to amend the By-Laws.

The absentees were called, and it being found that the required two-thirds were present, it was ordered that further proceedings under the call be suspended, and

Judge Lawrence offered the following resolution:

Resolved, That article 21 of the By-Laws be amended, by striking out the words "two-thirds," and inserting the words, "a majority."

A call for the yeas and nays on the resolution, resulted in, yeas 24, nays 0.

The Committee on Horticulture presented their report:

REPORT.

The Standing Committee on Horticulture respectfully report as follows:

Of the 3,000 Apple trees obtained from A. M. Lawver, supposed to embrace about 1,500 varieties, 2,180 were planted permanently in orchard, and the remainder set in nursery to be planted the present season.

Of forest tree stock, intended for planting in arboretum, shelter-belts and forest plantations, we have growing in the nursery since last spring, the trees in the following list:

3,000	Green Ash	2 to 3 feet in height.
1,000	White Elm	15 " 24 inches "
680	Soft Maples	3 " 6 feet "
1,000	Am. Arbor Vitæ, transplanted	6 " 10 inches "
100	Scotch Pines	15 " 24 " "
100	Austrian Pines	6 " 8 " "
1,000	Norway Spruce, transplanted	6 " 10 " "
1,000	Am. Arbor Vitæ	From forest.
1,000	Hemlock	" "
1,000	Red Pines	" "
1,000	White Spruce	" "
10,000	" Pines	" "
12	Tulip	3 to 4 feet high.
200	Sugar Maples	3 " 6 inches high.
25	Sycamore	3 " 4 feet "
25	Comewell Willow	3 " 4 " "
25	Forbyana "	3 " 4 " "
108	Pear trees, 18 varieties	5 " 7 " "
28	Plum " 6 "	5 " 7 " "
12	Cherry " 2 "	4 " 6 " "
8	Crab "	4 " 6 " "
126	Apple " 21 varieties	1 year.
660	" "	2 to 5 years.
10,000	Catalpa, grown from seed.	

Of the shelter-belts, there have been planted about 50 rods on the west side of the orchard, in Austrian Pine and Norway Spruce; about 40 rods on north side, of Soft Maple; on the south side, about 80 rods of Soft Maple; on the north side, commencing at the northeast corner, about 60 rods of Red Cedar. If a sufficient number of trees can be obtained, of suitable size and kinds, the remainder of the shelter-belts will be completed the present season.

We have ordered, and will receive the present spring, about 143,000 trees, of various kinds, intended for arboretum, forest and shelter-belts, the cost of which, besides freight, will be about $953 50. These trees have been obtained at very reasonable prices. Of course, they are small, and must go into nursery for at least one season. The following is a list of these trees, with prices and memorandum of sizes:

4	barrels Walnuts, @ $3	$12 00
2	" Butternuts	6 00
20	M. White Ash, 6 to 12 inches high, @ $2 50	50 00
10	" " Sugar Maples, 6 to 12 inches high, @ $2 50	25 00
6	" " Elm, " " " @ $3	18 00
8	" Silver Maples, @ $6	48 00
14	" Norway Spruce, 3 years, transplanted, @ $11	154 00
2	" Red Pine, 6 to 12 inches, "	50 00
2	" Black Spruce, 6 to 12 inches, @ $25	50 00
2	" Butternut Seedlings, @ $6	12 00
8	" White Willow Cuttings, @ 50c	4 00
6	" Tulip, 6 to 12 inches, transplanted, @ $12	72 00
8	" White Pine, 1 and 2 years, transplanted from forest	88 00
2	" Apple Stocks, 1 year, @ $5	10 00
8	" Black Sugar Maples, 6 to 12 inches, @ $2	16 00
4	" Bass-Wood, 6 to 8 inches	24 00
3	" Hemlock, 1 and 2 years	45 00
6	" American Chestnut, 4 to 8 inches, @ $10	60 00
5	" Apple Stock, 2 years, @ $8	40 00
250	Arbor Vitæ, @ $15 per hundred	37 50
12	M. Arbor Vitæ for forest, 6 to 12 inches, @ $11	132 00
		$953 50

It has been suggested, that the place heretofore selected for the forest tree plantation, is not so suitable as can be found on the Stock Farm, both on account of the nature of the ground, and of the fact that the ground heretofore chosen for this purpose may, and probably will be needed for experimental farming, etc. Your Committee, therefore, recommend that all the trees intended for the forest, remain in nursery for another season. They think that no time will be lost by taking this course.

The trees planted last year have been well cultivated, and have made satisfactory growth.

The whole farm has been surrounded by hedges of Osage Orange, except small intervals of wet land, and has made a good growth.

Five thousand feet of under-drain has been put under the land intended for the arboretum.

A gardener's house and conveniences have been erected.

Materials for a green-house have been collected and prepared, and the building would have been erected last fall, but for the early setting in of cold weather.

The whole sum so far expended for the purchase of trees, erection of buildings, labor, etc., on nursery, orchards, etc., amounts to $5,359 74. The Executive Committee appropriated $1,000 for the erection of the green-house, of which about one-half has been paid out, and we have left out of the State appropriation, available for expenditure the present season, in even numbers, $14,000.

Your Committee recommend the appropriation of $600 for a small barn near the gardener's house. They recommend, also, the erection of a dwelling house on the Experimental Farm, at a cost of not more than $2,000. A barn is also needed on this farm, near the house last mentioned, of considerable size. We have no plans or specifications of this building, and would recommend that this matter be entrusted to the Executive Committee, with directions not to exceed a cost of $4,000.

Your Committee recommend the purchase of two good horses, and a market wagon and cart for the garden, and two horses and a two-horse wagon for the orchard grounds, besides harness, etc. These will cost about $800, for which an appropriation is recommended. For salaries of Head Gardener and Orchardist, cultivation of orchards, nursery, gardens, etc., and feed for horses, an appropriation should be made of $3,000.

Your Committee deem it essential that the Experimental Farm, so called, should be divided between the Horticultural and Agricultural Departments, and they propose, with the consent of the Chairman of the Agricultural Committee, that the latter Department have 80 acres on the east, the remainder to be used by the Horticultural Department for orchards, gardens, nurseries, and arboretum.

Your Committee also report, that they have received from M. L. Dunlap, Esq., trees and shrubs, on account Champaign county donation, $225, leaving balance still on said account of $353.

Your Committee recommend a further appropriation of $750 for the completion of the green-house, and the sum of $150 for the purchase of lawn mower, roller and other garden tools, and $100 for plants and seeds, for propagation.

Your Committee further recommend that the Professor of Agriculture be relieved of the care of the Horticultural Department, and that this be placed under the charge of Prof. Burrill.

A. M. BROWN, *Chairman.*

The report of the Committee on Horticulture was received and adopted, except so much of it as called for appropriations, which was referred to the Committee on Finance.

The Regent asked and obtained leave to insert in his report the details in regard to the library, drainage, and geological excursion.

The Special Committee appointed to visit the several departments, and classes in session, made the following

REPORT:

To the Board of Trustees of the Illinois Industrial University:

GENTLEMEN: Your Committee have attended to the duty assigned to them this morning, and beg leave to report as follows:

I. AGRICULTURAL COURSE.

Prof. Bliss has charge of two classes in Agriculture, numbering 5 in the Advanced Class, upon Soils, their origin and properties, and 15 in Elementary Study. Prof. Bliss has charge, also, of the farm.

Prof. Stewart has two classes in Chemistry, of 16 members each, with 20 students in the Laboratory.

Prof. Burrill has two classes in Botany, of 20 and 10 respectively.

II. NATURAL AND MECHANICAL PHILOSOPHY.

Prof. Robinson, assisted by Prof. Burrill and Mr. Bellangee, has charge of one class in Natural Philosophy, of 11 members; three classes in Mechanical Drawing, numbering 25; one class in Descriptive Geometry, numbering 7. Prof. Robinson has also charge of the shops.

III. MILITARY TACTICS, AND COMMERCIAL SCIENCE.

Prof. Snyder has a class of 18 in Military Tactics; 39 in Book-keeping, and 4 in Banking.

IV. NATURAL HISTORY.

Instruction given by Prof. Tenney, by lectures.

V. PURE MATHEMATICS, AND CIVIL ENGINEERING.

Prof. Robinson has two classes in Algebra, of 25 and 23, respectively.

Prof. Shattuck has a class of 4 in Civil Engineering; two classes in Geometry. Students in Agricultural Department taking the first five books of Davies' Legendre, number 26; 16 form the class now studying Spherical Geometry; a class of 10 is engaged upon Analytical Geometry, and one of 2 upon Calculus.

VI. ENGLISH LANGUAGE AND LITERATURE.

Two classes under Prof. Baker, numbering 54 and 9, respectively.

VII. FRENCH LANGUAGE AND LITERATURE.

The Regent has a class of 9, and Prof. Bliss a class of 5 members.

VIII. GERMAN LANGUAGE AND LITERATURE.

Two classes under Prof. Snyder, 47 in both.

IX. LATIN LANGUAGE AND LITERATURE.

Prof. Baker has one class of 5 in Horace, and Mr. Douglass has a class in Sallust of 4; a class in Cæsar of 9; a class in Latin Reader of 10; 28 in all.

X. GREEK LANGUAGE.

No class.

The young men seem to be very earnest in their work, manly in their deportment, self-reliant, and some of them enthusiasts in their departments.

The Professors are evidently working under some embarrasments, through the multiplicity of duties, which the limited funds of the Institution have heaped upon them, but their work seems to us thorough and hearty. We would suggest that some provision be made for more specific instruction in Horticulture, and that a little more attention be given to classification of students, through preparatory examinations.

The educational agency of school rooms and surroundings, seems to be hardly as much considered as your committee would be glad to see, and we would suggest that the janitor be paid a little higher salary, if by so doing the house could be kept in a little better order.

Signed by the Committee.

J. S. PICKARD,
N. BATEMAN,
J. C. BURROUGHS,
O. B. GALUSHA,
J. P. SLADE.

Report adopted and committee discharged.

Mr. Pickrell offered the following resolutions:

WHEREAS, The next census will give Illinois additional Congressional representation, and

WHEREAS, We believe that the present Board is even larger now than need be, incurring unnecessary expense to the University; therefore,

Resolved, That the Board suggest to the General Assembly the propriety of so amending the law in regard to the number of Trustees, that the Board shall hereafter consist of one member from each Congressional District, and the present members *ex officio;* a majority of whom shall constitute a quorum.

Resolved, That the Corresponding Secretary transmit a copy of these resolutions to the Governor.

The resolutions were adopted.

On motion,

The Board adjourned to meet at 1:30, P. M.

WEDNESDAY, MARCH 9.—AFTERNOON.

The Board was called to order at 2 o'clock, P. M.; Dr. Kile in the Chair.

Mr. Pickrell presented the report of the Committee on Agriculture.

REPORT.

To the Trustees of the Illinois Industrial University:

Your Committee on Agriculture beg leave to report, that they have expended, (as already reported by the Regent,) for the year 1869, as follows:

EXPENSE.

Farm labor	$2,803 54
Improvements and repairs	1,678 15
Implements (wagons, etc.)	380 00
Stock	567 38
General expense	551 55
Total	$5,980 52

RECEIPTS—FROM APPROPRIATIONS.

Appropriations by Board	$3,000 00
" " Executive Committee	1,202 52
" " State	1,778 00
Total	$5,980 52

RECEIPTS—FROM PRODUCTS.

Rent of Griggs farm (1869)	$1,650 00
Produce sold, of 1868	1,760 31
" " 1869	1,181 00
	$4,591 31
Estimated Products of 1869, unsold	2,199 00
	$6,790 31

We beg the privilege of stating why we went beyond our appropriations. (Reference is made to the Executive Committee's Report, for re-distributing the appropriations, etc.) It seemed indispensable for the next year's operations, that much plowing for next year's crops should be performed last fall, that the utmost precaution should be taken to prevent the seeding of weeds, etc. We respectfully call attention to the farms themselves to relieve us of reaching beyond the limits set for our expenditures.

We herewith present plans, specifications and estimates for barn on Stock Farm :

ESTIMATES.

Excavations	$ 250 00
65 cords rubble stone work, @ $24	1,560 00
30,000 brick work, @ $15	450 00
Cement floor manure pit	100 00
Carpenters and lumber	4,200 00
Painting and glass	375 00
Hardware and tin work	280 00
Cost to inclose and lay floors	$7,215 00
Stalls and partitions, stairs and stall floors	475 00
Completed	7,690 00

We would state, that no matter what should be the final disposition of the Stock or Busey farm, we have endeavored to present such a plan as might not be considered extravagant.

We ask from the general fund an appropriation for work account, $1,000, together with the products of the farm.

We would most respectfully report, that we have had that portion of the Regent's report that refers to the future management of the farm under consideration; especially that portion which suggests the idea of the possibility of renting to a tenant, to be farmed under our instruction. We would say that we think it impracticable, especially while we must be continually working upon improvements. We would also submit the plan of Prof. Bliss, for the management of the next crops.

We would also recommend, that the management of the farm remain in the hands of the Agricultural Committee, the same as last year, and they may report from time to time, as they may think best, to the Executive Committee for instructions.

J. H. PICKRELL,
J. S. JOHNSON,
WM. KILE,
A. BLACKBURN.

On motion, the report was adopted, with the exception of the part which called for an appropriation of money, which was referred to the Finance Committee.

Dr. Scroggs moved that the Regent and Faculty be requested to spend a reasonable portion of the time of the coming summer vacation in visiting the various sections of the State, in the interests of the University; and that the Regent be instructed to draw warrants to defray the expense of such canvass.

Carried.

On motion of Mr. Johnson,

It was reconsidered.

On motion of Mr. Blackburn,

It was received, and referred to the Finance Committee.

Mr. Pearson offered the following:

Resolved, That Article 12, of the By-Laws for the government of the Board of Trustees, be so amended, as to relieve the Regent from service on the following Standing Committees:

No. 9. Buildings and Grounds.
No. 11. By-Laws and Rules.

The yeas and nays were called.—Yeas, 17; nays, 0.

Carried.

On motion of Judge Lawrence,

The report of the Committee on Nominations was taken from the table, and recommitted.

On motion of Mr. Edwards,

The salary of Patrick Lamb, the Janitor, was made $40 per month.

Mr. Galusha offered the following:

Resolved, That the Committee on Faculty and Course of Study be, and they are hereby instructed, to provide for the teaching of Anatomy, Physiology and Hygiene.

On motion,

It was referred to the Committee on Faculty and Course of Study.

The Committee on Nominations presented the following report:

REPORT OF COMMITTEE ON NOMINATIONS.

The Special Committee, to whom was referred the nomination of the Standing Committees, reported as follows:

We, your Committee on Nominations, would respectfully recommend the following names for the several committees, for the ensuing year:

1. *Auditing Committee.*—Messrs. Lawrence, Dunlap, Cunningham, Edwards, and Galusha.

2. *Finance Committee.*—Messrs. Cobb, Burchard, Brown (of Chicago), Wright, and Burroughs.

3. *Committee on Faculty and Course of Study.*—The Regent, Bateman, Hayes, Pickard, Edwards, and Slade.

4. *Committee on Agricultural Department.*—Messrs. Pickrell, Johnson, Allen, Kile, and Blackburn.

5. *Committee on Horticultural Department.*—Messrs. A. M. Brown, Pullen, Galusha, Pearson, and Dunlap.

6. *Committee on Military Department.*—Messrs. Brayman, Scroggs, McMurray, Brown (of Chicago), and Kile.

7. *Committee on Mechanical Department.*—Messrs. Van Osdel, Allen, Pearson, Hayes, and Pickrell.

8. *Committee on Buildings and Grounds.*—Messrs. Goltra, VanOsdel, Griggs, Pullen, and Johnson.

9. *Committee on Library and Cabinets.*—Messrs. Bateman, Slade, Burchard, Scroggs, and Mahan.

10. *Committee on By-Laws and Rules for the University.*—Messrs. Burroughs, Mahan, and Brayman.

Executive Committee.—The Regent, and Messrs. Cobb, A. M. Brown, Pickrell, Cunningham, Griggs, Goltra, Lawrence, and Wright.

(Signed) J. S. JOHNSON,
JNO. M. PEARSON.

The report of the Committee on Nominations was received and adopted.

The Regent here took the Chair, and the following resolutions, offered by Mr. Blackburn, were unanimously adopted:

Resolved, That the Board records with sorrow, the death, since its last meeting, of General Edward Kitchell, an efficient friend and laborer in the cause of Industrial education, and a recently appointed member of this Board; and that we present our sincere sympathy and condolence to his bereaved family in this, their hour of deep affliction.

Resolved, That the Recording Secretary be directed to send a copy of these resolutions to the widow and family of the deceased.

Mr. Brown, of Chicago, offered the following resolutions:

1st. That the salary of Prof. Snyder be made $2,000, instead of $1,200, as at present.

2d. That the Committee on Library be instructed to procure all the Chicago daily papers.

3d. That the Executive Committee be instructed to endeavor to procure the passage of a law, by the next Legislature, prohibiting the sale of intoxicating liquors within a radius of three miles of the Illinois Industrial University.

The 1st resolution was referred to the Committee on Faculty and Courses of Study; and the 2d, to the Finance Committee. The 3d resolution was adopted.

Mr. Johnson offered the following resolution:

Resolved, That as Trustees of the Illinois Industrial University, we believe that the girls of the State of Illinois are equally entitled to an Industrial education with the boys; therefore, be it ordered, that they be admitted to all the classes of the University, and subject to all regulations, except military drill.

Mr. Brown, of Chicago, moved to amend, by striking out the words "except military drill."

Lost.

Mr. Wright offered the following substitute to Mr. Johnson's resolution:

Resolved, That, hereafter, female students shall be admitted to the lecture and recitation room of the University, on the same terms and conditions as male students.

Mr. Burroughs offered the following, as a substitute for Mr. Wright's substitute:

WHEREAS, The law of Congress declares the end of this University to be the liberal education of the industrial classes, with no limitations to one sex more than another; therefore, *Resolved,* That the Committee on Faculty and Courses of Study, be instructed to consider the practicability of extending the advantages of the University to young women, and to report to this Board at its next meeting.

Mr. Brown, of Chicago, was excused by vote of the Board, at his own request, but before leaving the hall expressed his desire to record his vote in the affirmative of Mr. Burroughs' substitute.

The yeas and nays being called on Mr. Burroughs' substitute, it resulted in—yeas, 10; nays, 10; and it was therefore lost.

Mr. Edwards moved to amend Mr. Wright's substitute by adding, after the words "male students," the clause, "as soon as means are at our command to furnish proper buildings for the purpose."

Mr. Wright's substitute, as amended by Mr. Edwards, was adopted.

The Treasurer's Report was read, and, with the Book-keeper's books, was referred to the Finance Committee.

TREASURER'S REPORT.

ILLINOIS INDUSTRIAL UNIVERSITY,
In account with JOHN W. BUNN, *Treasurer:*

To amount paid checks outstanding at date of last report		$345 66
To amount paid on account of appropriations for 1868		432 70
To amount paid on account of salaries		18,327 95
To amount paid Treasurer		500 00
To amount paid Corresponding Secretary		200 00
To amount paid taxes on lands		988 48
To amount paid expenses of Trustees		1,011 55
To amount paid for fuel and lights		1,180 56
To amount paid for stationery		179 33
To amount paid for incidental expenses		1,657 79
To amount paid for University grounds		1,039 26
To amount paid for Building account		2,783 05
To amount paid for Mechanical Department		1,358 97
To amount paid for Agricultural Department		4,212 52
To amount paid for two lots		425 00
To amount paid for Military Department		50 00
To amount paid for Geological excursion		200 00
To amount paid for Meteorological instruments		81 50
To amount paid on account of State appropriations:		
For Agricultural Department	$1,778 02	
For Horticultural Department	5,359 74	
For Chemical department	1,185 56	
For books and apparatus	6,247 26	
		14,570 58
Balance		21,201 40
		$70,746 30

1869.			
March 9	By balance from last report..................................	$1,324 59	....
April 1.... ..	By interest on $50,000 Sangamon county bonds..............	2,250 00	....
April 1	By tuition, matriculation fees, etc............................	612 00	....
April 1.......	By amount received of R. S. Walker for hay...................	22 61	....
April 1.......	By amount received of J. Periam for farm produce..........	102 84	....
May 8........	By amount received of Ed. Snyder for tuition, etc...........	72 50	....
May 8........	By amount received of Ed. Snyder for coal sold students.....	39 48	....
May 17.......	By interest on $100,000 Champaign county bonds	10,000 00	....
June 15.......	By interest on $25,000 Morgan county bonds................	2,500 00	....
July 6........	By interest on $109,000 Illinois 6 per cents.	3,270 00	....
July 6........	By interest on $25,000 Chicago 7 per cents..................	875 00	....
July 6........	By amount received on J. Heller's note for rent............	50 00	....
July 8........	By amount received of E. Snyder for tuition, etc............	34 00	....
July 8........	By amount received of E. Snyder for coal sold students......	15 05	....
July 8........	By amount received for flowers sold..........................	25 30	....
July 8........	By amount received for 2,293 bushels of corn................	1,134 47	....
September 6..	By amount received of J. O. Cunningham for rents in 1867...	196 45	....
October 1.....	By interest on $50,000 Sangamon county bonds..............	2,250 00	....
October 19....	By amount received of E. Snyder for tuition, etc.	946 50	....
1870.			....
January 3....	By interest on $25,000 Chicago water bonds..................	875 00	....
January 3....	By interest on $79,000 Illinois 6 per cent. bonds............	2,370 00	....
January 13.. .	By amount received of E. Snyder for fuel and lights.........	189 49	....
January 13....	By amount received of E. Snyder for tuition, etc............	164 50	....
January 13..	By amount received from sales from garden.................	25 17	....
January 13...	By amount received from sales of wheat......................	156 51	....
January 13...	By amount received from sales of hay, corn, oats, etc.......	351 65	....
February 26..	By amount received from tuition, etc........................	841 00	....
February 26..	By amount received from sales of corn.......................	447 23	....
February 26..	By amount received from sales of farm produce.............	193 23	....
February 26...	By amount received from sales of coal.......................	113 13	....
February 26..	By amount received from sales of broken glass..............	5 00	....
			31,452 70
February 26..	From State appropriation for Agricultural Department......	....	12,500 00
February 26..	From State appropriation for Horticultural Department.....	....	10,000 00
February 26..	From State appropriation for Chemical Department.........	....	5,000 00
February 26..	From State appropriation for books and apparatus..........	....	10,000 00
March 5......	By J. M. Gregory for chairs....................................	26 81	....
March 5......	By amount received for hogs and corn.......................	533 53	....
March 5......	By amount received from sales from garden.................	23 00	....
March 5......	By amount received for coal...................................	47 65	....
March 5......	By amount received from Illinois Central R. R. in freight...	1,162 60	1,793 60
			$70,746 30

JOHN W. BUNN, *Treasurer.*

CHAMPAIGN, *March* 8, 1870.

STATEMENT *of Receipts and Expenditures from March* 14*th*, 1869, *to March* 7*th*, 1870.

Accounts.	Appropriations made March 14, 1869.	Amounts actually expended	Resulting in unexpended balance.	Resulting in deficit.
Building account	$2,575 00	$2,783 05	....	$208 05
Mechanical Department	500 00	1,358 97	....	858 97
Military Department	50 00	50 00	....	....
Agricultural Department	3,000 00	4,212 52	....	1,212 52
Purchase of two lots	425 00	425 00	....	....
Salary of Treasurer	500 00	500 00	....	....
Salary of Cor. Sec.	200 00	200 00	....	....
Taxes on land	1,200 00	988 48	$211 52	....
Board meeting	1,000 00	1,011 55	....	11 55
Salaries	21,544 00	18,327 95	3,216 05	....
Students' labor	1,500 00	....	1,500 00	....
Fuel and Lights	500 00	1,180 56	....	680 00
Geological excursion	300 00	200 00	100 00	....
Meteorological instruments	100 00	81 50	18 50	....
Stationery	150 00	179 33	....	29 33
University grounds	1,000 00	1,039 26	....	39 26
Incidental expense	1,500 00	1,657 79	....	157 79
Appropriation of 1868 unpaid	....	432 70	....	432 70
Total	$36,044 00	$34,628 66	5,046 07	$3,630 73
State Appropriation.				
Agricultural Department	25,000 00	1,778 02	23,221 98	....
Horticultural Department	20,000 00	5,359 74	14,640 26	....
Chemical Department	5,000 00	1,185 56	3,814 44	....
Books and apparatus	10,000 00	6,247 26	3,753 74	....
Total	$60,000 00	$14,750 53	$45,430 47	....
Total expenditures	....	$49,199 24	....	....

Of the expenditures, warrants 1 to 528, amounting to ....$48,036 64, were drawn,
And from the Illinois C. R. R. donation...................... 1,162 60, were used.

$49,199 24

RECEIPTS.

Items.	Income as estimated.	Income receiv'd	Receipts below the estimate.	Receipts above estimate.
Balance	$900 00	$1,324 59	....	$624 59
Interest on bonds	25,290 00	24,390 00	$900 00	....
Farm produce on hand	1,500 00	1,760 31	....	260 31
Fees from students	1,800 00	2,670 50	....	870 50
Proceeds from farm, 1869	3,000 00	1,181 76	1,818 24	....
Rent of lands	1,500 00	246 45	1,253 55	....
Coal sales	....	404 81	....	404 81
Garden	....	73 47	....	73 47
Building and carpentry	....	31 81	....	31 81
Total	$33,990 00	$32,083 70	....	....

On motion of Judge Brown,

It was ordered that the Treasurer be authorized to have the bonds belonging to this Institution, except the Illinois bonds, stamped, so as to show that they are the property of the Illinois Industrial University.

On motion of Mr. Pickrell,

It was ordered that the sale of scrip made by the Committee to Messrs. Lewis & Co., be confirmed, and that they proceed to collect the money due from them for the amount sold.

The following report of the Auditing Committee was received and approved:

REPORT.

The Auditing Committee beg leave to report, that they have examined the following bills and find them correct, and recommend that warrants on the Treasurer be drawn for their payment:

M. C. Goltra, for traveling expenses in looking for lands to locate with scrip	$86 70
Samuel Edwards, bill for trees	27 00

We also report, that we have examined the Treasurer's report and vouchers and find the same correct, and have canceled warrants numbers 1 to 529, inclusive. Also, old numbers 113 and 403, and have returned them to the Treasurer for safe-keeping.

Respectfully submitted.

L. W. LAWRENCE,
M. L. DUNLAP,
O. B. GALUSHA,
J. O. CUNNINGHAM,
J. M. PEARSON.

Judge Brown moved that the Treasurer be authorized to draw from the State Treasury the amounts appropriated to the Agricultural and Horticultural Departments.

Carried.

On motion of Judge Brown,

It was voted that the Treasurer be authorized to pay the taxes on lands belonging to the University, in Minnesota and Nebraska, and that the Regent draw warrants for the amounts.

The Committee on Buildings and Grounds submitted the following:

REPORT.

To the Board of Trustees:

GENTLEMEN—The Committee on Buildings and Grounds would respectfully report, that the grounds around the University Building are in an imperfect and unfinished condition. The great need is better walks. We believe that by a small expenditure for gravel and coal-tar, the present walks might be made perfect for all seasons of the year.

The Committee also find, that the early construction of a drill-hall is essential to the success of the Military Department.

In view of these necessities, your Committee respectfully ask appropriations as follows:

For walks on grounds	$300 00
For drill-hall	2,000 00

Respectfully submitted.

M. C. GOLTRA, *Chairman.*

The report was received, and referred to the Committee on Finance.

The Corresponding Secretary made the following

REPORT:

The Second Annual Report of the Board of Trustees, already printed, exhibits about all that has been done in my department during the past year.

While it is a fact, as I have heretofore said, that the office and possible duties of the Corresponding Secretary can, and ought to be, made of first and primary importance to the University, it has not been a fact practically recognized; and whilst other departments have received some attention, and been furnished with the means to develop them, this has been left to my discretion, with the understanding that I must, above all things, be inexpensive. This, if nothing else, has been accomplished. I collected material for our first report by circulars, asking for specific details of a variety of agricultural, mechanical and scientific facts, at a trifling cost.

For our Second Annual Report, I depended on the material furnished by the course of Agricultural Lectures and discussions, held at the University in January, 1869; which material was also provided at a slight expense, additional to the cost of holding the lectures and discussions.

My salary, amounting to $100 the first year, and $200 the second, has not done much toward depleting the treasury.

In short, I look to the economical character of my office with much more pride than I do to its efficiency.

Among the cheap methods of collecting and diffusing valuable agricultural information, my attention has been specially given to agricultural lectures and discussions. Under the discretion given by the Executive Committee, the Faculty and myself arranged for three courses of lectures and discussions to be held at Champaign in the central, Centralia in the south, and Rockford in the north part of the State. A four-days' course was held at Champaign at the beginning of the winter term, from January 10th to 14th; at Centralia, January 24th to 27th; and at Rockford, February 21st to 24th.

The general result of these courses has been, I think, highly encouraging, although the attendance on some of them was not as large as could be wished. They excited a great deal of local interest among the more intelligent and progressive farmers, who expressed themselves highly pleased and profited by them. They gave a good many facts that were highly interesting not only to the practical farmer, but to our professors of sciences bearing on the agricultural art. As calling attention to the Industrial University, and to the great want and lack among our farmers of the education that can here be obtained, I consider the courses as very valuable.

The total expenses of these three courses, including circulars issued, expenses of lecturers and a small bill for expressage, freight and telegraphing, was $348 75, the details of which are as follows:

1000 Circulars	$12 50
Champaign Meeting.	
Dr. H. Shimer	35 90
Dr. Manley Miles	60 00
C. W. Murtfeldt	15 00
Dr. H. J. Detmers	35 00
W. C. Flagg	14 50
J. M. VanOsdel	14 50
D. Gere	14 55
Centralia Meeting.	
Prof. A. P. S. Stuart	1 00
C. V. Riley	9 00
Ed. Snyder	2 00
S. W. Shattuck	4 00
C. W. Murtfeldt	3 00
B. S. Hull	9 00
W. C. Flagg	12 00
Express and telegraph	2 00
Dr. Gregory	1 50
Rockford Meeting.	
Dr. Gregory	$10 15
James Shaw	8 00
A. P. S. Stuart	11 90
J. G. Knapp	12 00
Samuel Edwards	4 70
L. W. Lawrence	1 10
Elmer Baldwin	10 20
S. W. Shattuck	10 90
O. B. Galusha	16 00
W. C. Flagg	18 35
Total	$348 75

Many gentlemen, especially several of the Professors and Trustees, gave unremunerated time and trouble to this work, and in lack of more substantial reward deserve the hearty thanks of this Board, and of all friends of Industrial Education.

Looking at the future, in the light of our present experience, I would urge that these annual meetings be continued, extended and improved. I regard them as, above all other present proposed methods, best adapted to popularize the work of this Institution, and bring it home to the hearts and minds of the people. And this is our first and most necessary work. As soon as we make farmers understand and appreciate their educational necessities, the rest will speedily follow. The demand will increase the supply.

I would also suggest, though this is treading on other ground, perhaps, that the special courses of lectures, like those of Dr. Warder, put in such time and sequence that a person could spend a winter month in attendance upon them, and find his time filled up with the acquirement of the more practical scientific principles and facts, would be an important sequence and continuance of the agricultural lectures and discussions, and ought to receive the early and favorable attention of the Trustees.

I have transmitted, by mail, to the Agricultural Colleges or Secretaries of forty-five States and Territories, and to the Secretary of the Interior, one or more copies of our Second Annual Report.

There should be, I think, in view of some opinions I have heard expressed by members of the Board, some instructions given to the Recording or Corresponding Secretary in regard to making up the reports of the Board and the Executive Committee. Shall the minutes of the Executive Committee be printed? Shall the proceedings of the Board be condensed any farther than they have been?

All of which is respectfully submitted.

W. C. FLAGG, *Cor. Sec'y.*

The report was received, approved, and referred to the Executive Committee.

Mr. Griggs read the following communication from Prof. Stuart:

To the Special Committee of the Board of Trustees, on the Chemical Department:

GENTLEMEN: Inasmuch as a large part of the State appropriation of $5,000 for the Chemical Department is unexpended, and since much apparatus is yet needed to put the laboratory in an efficient condition, the undersigned respectfully asks permission of the Board to expend the balance of the appropriation for such apparatus as is best suited to render the department as efficient as possible.

State Appropriation	$5,000 00
Amount expended	1,185 50
Unexpended balance	$3,814 44

A. P. S. STUART.

I. I. University, March 9, 1870.

On motion of Judge Cunningham,

It was ordered that the balance of the fund on hand, to the credit of the Chemical Department, be expended for apparatus for such department, under the direction of the Professor of Chemistry.

On motion,

The following resolution was adopted:

Resolved, That the thanks of this Board are due and are hereby tendered to the Hon. C. R. Griggs, President of the Indianapolis, Bloomington and Western Railroad, for his liberality in furnishing passes to the members.

The Board now took a short recess.

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5 O'CLOCK, P. M.

The Board was called to order by the Regent.

The Regent asked and obtained leave to communicate with his report a report of Prof. Burrill on Geological Excursion.

A letter from Mr. Pettit to Judge Baldwin, in regard to Entomological collection of Dr. Walsh, was read.

On motion of Judge Cunningham,

The question of purchasing Dr. Walsh's cabinet was referred to the Executive Committee.

The Board then adjourned to meet at 7, P. M.

EVENING SESSION.

Meeting called to order by the Regent, who called Judge Lawrence to the Chair, and then presented the Report of Committee on Faculty and Course of Study, which,

On motion of Mr. Blackburn,

Was accepted, and its recommendations adopted.

REPORT.

The Committee on Faculty and Course of Study recommend, that Prof. S. W. Shattuck be employed as Professor of Civil Engineering and Instructor in Mathematics, at a salary of $1,800 per annum; Prof. T. J. Burrill, as Professor of Botany and Horticulture, at a salary of $1,800 per annum; Prof. Edward Snyder, be Professor of Book-keeping and Teacher of Military Tactics, at a salary of $1,500, and that $300 per annum be allowed him as Book-keeper.

That the Executive Committee be instructed to employ the necessary assistant teachers, at such salaries as they may find proper.

J. M. GREGORY, *Chairman.*

Judge Brown, in the absence of the Chairman, Mr. Cobb, presented the

REPORT OF THE FINANCE COMMITTEE.

The Committee on Finance have directed me to make the following report:

Your Committee recommend the re-engagement of Prof. Snyder, as Book-keeper of the University, and that his salary be made sufficient to compensate him for his labor. They would propose the sum of $300.

The 50,000 acres of land scrip which was unsold at our last meeting, and which the Chairman of this Committee and the Treasurer were authorized to sell at discretion, were sold to G. F. Lewis at 89 cents per acre. He has paid for 8,000 acres, but wishes to abandon the contract. Your committee recommend that he be held strictly to his contract.

Mr. Goltra and the Treasurer were authorized to locate 25,000 acres, but have not yet been able to do so. It is thought best that this scrip be retained until other lands come into market.

Your committee have information that our lands in Nebraska and Minnesota are appreciating in value with satisfactory rapidity, and it is thought best that no attempt will be made to dispose of them until, at least, the patents are received.

Your Committee estimate the receipts for the current year, exclusive of the legislative appropriations, as follows:

Interest on Champaign county bonds	$10,000
" " Morgan " "	2,500
" " Sangamon " "	4,500
" " Chicago water "	1,750

Interest on Illinois 6 per ct. bonds	4,740
" " Pike county "	2,000
Farm produce on hand	1,500
Produce from farm	3,000
Matriculation and other fees	2,500
Rent of Griggs farm	1,532
Back rent due, about	2,000
	$36,022

Out of the General Fund, the following appropriations are recommended:

Salaries	$20,000
Board expenses	1,000
Salaries of Corresponding Secretary and Treasurer, each $500	1,000
Taxes on lands	1,500
Fuel and lights	1,000
Stationery, advertising and printing	1,000
Painting and repairing building	1,000
Incidental expenses	1,000
Balance, deficit of last year	1,728
Military Drill Hall	2,000
Mechanical Department, for labor, etc	1,000
For labor in Agricultural Department	2,000
Three Fire Extinguishers	225
Insurance	400
Total	$34,853
Outstanding accounts	500
	$35,353

They recommend the following appropriations out of the funds derived from the legislative appropriations:

FOR HORTICULTURAL DEPARTMENT.

For plants, seeds, etc., for garden	$200
For lawn mower, roller and other tools	150
For the 2-horse wagon, cart, etc., for gardener	400
For building barn near gardener's house	600
For labor in garden and on grounds	2,000
For green house	1,500

FOR ORCHARD DIVISION.

For trees and seeds	$1,200
For labor	1,500

It is recommended that the appropriations for buildings, etc., on the Expermental and stock farms be referred to the Executive Committee, as the estimates are not in, but a sum of $2,000 should be appropriated for the purchase of materials that may be needed before that Committee can have a meeting.

The Horticultural Committee asked an appropriation out of the fund belonging to that Department, for a dwelling-house, and barn near it; but your Committee, upon fuller information, are of the opinion that these buildings are wanted for the use of the Experimental farm, and should be placed upon the land devoted to that object. The cost therefor should come out of the fund appropriated for that Department.

Your Committee cannot, in the present condition of our finances, recommend the canvass for students proposed in the resolution of Dr. Scroggs.

A. M. BROWN, *Chairman.*

On motion of Mr. Pearson,

The report was received, and each item voted upon separately.

All the items were adopted except the appropriation of $2,000 from the general fund, for labor in the Agricultural Department.

It was thought by many of the members of the Board, that this labor could be paid for legally out of the State appropriation for the Agricultural Department. On this ground, a motion of Mr. Pearson to strike out the appropriation of $2,000 from the general fund, for labor on the farm, prevailed.

On motion of Judge Brown,

There was made, from the State appropriation for the Agricultural Department, an appropriation of $2,000, for labor on the farm, and the whole subject was referred to the Executive Committee, with instructions to make use of the State appropriation to pay for labor on the farms as far as they thought legal.

The Auditing Committee submitted the following additional report:

The Auditing Committee beg leave to report further, that they have examined the bill of B. C. Beach & Co., for coal, amounting to $34 40, and find it to be correct, and recommend that a warrant be drawn for its payment.

L. W. LAWRENCE, *Chairman.*

On motion,

The report was approved, and the warrant ordered to be drawn.

Gen. Brayman offered the following resolutions, which were adopted:

Resolved, That this Board earnestly desire the passage of a bill, now pending in Congress, for furnishing aid, in the appropriations of money and the appointment of instructors to colleges and universities in the several States, for the instruction in military science and tactics.

Resolved, That the Regent furnish our Senators and Representatives copies of the foregoing resolution, with such documents and explanations as may aid them in attaining said object.

MOTION FOR REMOVAL OF STATE GEOLOGICAL COLLECTION.

Mr. Galusha offered the following:

WHEREAS, In the opinion of this Board, the Illinois Industrial University should be made the depository of the State geological collection, now at Springfield; therefore,

Resolved, That Messrs. Brayman, Griggs, and A. M. Brown, be and are hereby constituted a committee, to petition the next General Assembly for the removal of that collection to this University, and to secure the services of the State Geologist as lecturer on geology.

Laid on the table.

The report of the Committee on Library and Cabinets, was read and adopted:

REPORT.

To the Board of Trustees Illinois Industrial University:

The Committee on Library and Cabinets submit herewith the catalogue of the books in the library, and recommend that the Faculty be authorized to expend the remainder of the State appropriation for library and cabinets, in the purchase of such books as, in their judgment, are most needed for their several departments.

J. M. GREGORY, *Chairman.*

Mr. Edwards moved that the Regent be paid $250, for expenses incurred in purchasing books, while in Europe, out of funds not otherwise appropriated.

Carried.

On nomination of Judge Brown, the Hon. W. C. Flagg, was unanimously elected Corresponding Secretary, and Prof. W. F. Bliss, Recording Secretary of the Board.

In accordance with a resolution adopted by the Executive Committee at their January meeting, 1870, the Regent was invited to make a report on the Agricultural schools in Europe.

On motion,

The Board adjourned.

MINUTES OF MEETINGS OF EXECUTIVE COMMITTEE,

JULY MEETING, 1869.

UNIVERSITY BUILDING,
URBANA, ILLINOIS, *July 7th*, 1869.

The Executive Committee held its regular monthly meeting in the old Library room, Judge Cunningham in the Chair, in the absence of the Regent.

On motion of Judge Brown,

Prof. William M. Baker was elected Regent, *pro tempore*, in accordance with the recommendation of the Regent, who is absent in Europe.

The statement of the Book-keeper was then read, as follows:

I have the honor to herewith submit the statement of expenditure, since your last meeting, May 4th, classified as follows:

Board expenses	$48 20
Salaries	1,757 31
Regent's salary to September 1st	1,333 33
Stock farm account	952 81
Experimental farm account	134 27
University grounds	53 35
University building	44 40
Chemical laboratory	69 82
Library	21 60
Students' labor	547 43
Carpentry	270 30
Fuel and lights	35 82
Incidental expenses	91 73
Taxes on lands	988 48

Stationery	$38 08
Special appropriation for Geological excursion	200 00
Special appropriation for military buttons	25 00
On account of State appropriation for Horticultural Department	58 00
On account of State appropriation for cabinets	9 00
On account of State appropriation for mechanical apparatus	28 90
	6,707 83
Amount reported at May meeting	6,927 80
Total expenditure since March 12th, 1869	$13,635 63

The following collections were made for the Treasurer:

Tuitions and fees	$34 00
Sales of flowers	25 30
Collections from students for coal	15 05
Sales of 2,293 bushels of corn from stock farm	1,134 47
Collections reported at May meeting	849 43
Total	$2,058 25

E. SNYDER, *Book-keeper.*

On motion,

The report was accepted, and ordered to be placed on file.

The following bills were then examined, and allowed :

J. Davis Wilder, slating blackboards	$80 56
A. M. Lawver, 3,100 fruit trees	820 00
Dudley S. Crandall, advertising	6 00
J. S. Edwards, fruit and ornamental trees	294 80
J. A. Warder, balance for lectures	100 00
E. Snyder, payments of farm, and carpenter expenses	348 66
J. M. Campbell, board of farm hands	55 83
W. H. Mann & Co., hedge plants	56 00
Western Rural, advertising lecture course	92 70
Journal of Agriculture, advertising lecture course	15 00
Prairie Farmer, advertising lecture course	87 00
Rural World, advertising lecture course	27 00
Prof. T. J. Burrill, geological cabinet	500 00
Park & Roger, hard lumber	17 58
Flynn & Scroggs, printing and advertising	16 00
F. M. & A. Avey, blacksmithing	15 00
C. G. Larned & Co., hardware	823 05
Joseph Rolf, mason work	132 75
J. Hutchinson, livery teams	6 00
J. Jefferson & Son, livery teams	6 00

C. B. Peterson, stationery	$16 33
Trevett & Green, hardware	30 37
Ed. Snyder, payments of farm hands	48 12
Chas. W. Rolfe, pump for well	15 25
Trevett & Green, hardware	9 60
I. C. R. R. Company, back freights	39 51
Dodson & Hodges, hardware	13 00
Adams, Blackmer & Lyon, 1 receipt book—mill order	21 75
Ed. Snyder, postage and petty expenses	35 72
Hoffrey & Hevor, garden line and hoes	9 25
Beach & Co., 1 plow, and half ton of coal	23 10
S. J. Teachner, plastering chemical laboratory	35 10
S. J. Teachner, plastering cabinet	9 00
Angle, Sabin & Co., 1 knife grinder, and 2 tons of coal	20 00
E. L. Gurley, Eng. Inst	28 90
W. W. Cranston, 3 hogs	18 38
F. M. & A. Avey, blacksmithing	17 70
Miller & Toll, canvas and grain sacks	17 70
J. N. Richards, adv. prop. for roof	4 00
Tiernan & Call, repairs of agricultural implements	21 50
W. S. McWilliams, carpenter work	42 00

On motion of Judge Brown,

It was resolved, that $300 be appropriated as a contingent fund for the payment of small bills, current expenses of the University building, farm, garden, etc.; which fund shall be placed in bank to the credit of the Book-keeper, who shall pay it out upon the order of the parties employing the labor or making the purchases, and who shall keep a correct and full account of said payments, taking receipts therefor, and report the same to the next meeting of the Committee.

A warrant upon the Treasurer shall be drawn for the sum above appropriated in favor of Prof. Ed. Snyder, the Book-keeper.

On motion of Judge Cunningham,

It was voted, that Rob. B. Warder be employed as Assistant in the Chemical department, at the salary heretofore agreed upon by the Regent and himself.

Mr. Pickrell, Chairman of the Committee on Agriculture, then presented the following

REPORT:

The Committee on Agriculture beg leave to report, that they have had the buildings of the farm under consideration; and, after due deliberation, herewith submit a plan for a barn on the Busey, or stock farm; and ask of the Executive Committee that they proceed to contract for and build, such size barn, out of such material, as they may deem best and consistent with the appropriation made by the State for the Agricultural Department.

J. H. PICKRELL, *Chairman of Committee.*

On motion of Judge Brown,

It was ordered, that the rough plan reported by the Chairman of the Farm Committee, be recommitted to the committee, with power to employ a competent architect to prepare plans and specifications for said building, with estimates of the cost. They shall have separate estimates of cost of brick and wood, on stone basement.

On motion of Mr. Goltra,

Prof. Baker was authorized to purchase the gravel and coal tar necessary to finish the walks in the ornamental grounds.

On motion of Judge Brown,

It was ordered that warrants be drawn for salaries of Professors, for July and August.

On motion of Mr. Goltra,

It was voted, that, inasmuch as the Board of State Charities is in the Regent's office, they be notified that the Executive Committee is now ready to give them any information they may desire regarding the University.

Mr. Goltra was appointed a committee to give such notification.

On motion of Mr. Pickrell,

It was ordered, that the Regent, *pro tempore*, be empowered to purchase such quantity of soft coal as may be thought necessary for winter's use, in addition to the hard coal already authorized.

On motion of Mr. Goltra,

It was voted to take a recess for dinner, and visit the farm.

After visiting the farms, the Committee convened again in the University Building, Prof. Baker in the Chair.

On motion of Judge Brown,

It was voted, that the bill for roofing the University Building be paid, as soon as the work is completed to the satisfaction of Judge Cunningham.

The Committee directed that a cistern and well be provided for the Gardener's house, and that a small wing or L be added to it.

On motion of Mr. Goltra,

It was ordered, that the regular August meeting of this Committee be omitted.

On motion,

The Committee adjourned to the first Wednesday in September.

W. F. Bliss, *Secretary*.

SEPTEMBER MEETING—1869.

University Building,
Urbana, Illinois, *September 1st*, 1869.

The Executive Committee met pursuant to adjournment, and was called to order by Prof. Baker at 11:30 A. M.

Present—Messrs. A. M. Brown, Cunningham, Goltra, and Wright.

The question of the introduction of gas into the University Building was discussed, and referred to a committee of three, consisting of the Regent, Prof. Baker, and Judge Cunningham.

On motion of Mr. Goltra,

It was ordered, that the purchase of tools, requested by Mr. Searfoss, for the Mechanical department, be authorized, (estimated cost, $50).

The Book-keeper's statement was then read, and accepted:

Expenditure since last meeting, July 7th, 1869, reported as follows:

Board expense	$73 65
Salaries	1,978 66
Stock farm	1,102 65
Experimental farm	647 55
University grounds	78 55
University building	1,208 04
Library and Cabinets	1,544 13
Carpentry	803 46
Incidental expense	66 68
Stationery and Printing	65 00
Dr. Warder, balance on lectures	100 00
Advertising for lecture course (winter of '69),	221 70
Bills of trees (Lawver)	820 00
" (Edwards)	294 80

Gardener's house, plastering and mason work	$324 47
To Book-keeper, on account	300 00
Total	$9,629 34
Carried forward from July 7	13,635 63
Total expenditure	$23,264 97

The Book-keeper's account of disbursements was then examined and approved; and,

On motion of Judge Brown,

A warrant was ordered to be drawn on the Treasurer for balance, for $199 15.

The following bills were then audited, and approved:

J. K. Engledow, plastering gardener's house	$173 10
Elisha Eldred, lumber for gardener's house	326 28
Henry Swannell, glass, paint and putty	32 44
Joseph McCorkle, hardware	12 20
Flynn & Scroggs, printing letter-heads	24 25
S. J. Teachner, plastering and whitewashing	190 13
F. M. & A. Avey, blacksmithing	15 15
Heath & Mulligan, paints	17 29
Illinois Central R. R., back freights	23 05
E. S. Barnes & Co., books for library	23 20
J. M. Campbell, boarding farm hands	76 83
H. J. Foote, 3,498 bricks for well	34 98
John Bingham, digging wells in garden	18 62
J. M. Gregory, (purchase of app. in Europe—draft for £150 in gold)	1,020 93
Heath & Mulligan, glass and paints	22 02
Hurlburt & Herrick, locks and keys	76 56
Elisha Eldred, lumber for cab. cases	174 70
J. M. Campbell, boarding farm hands, August, 1869	65 60
Johnson, Himltey & Co., reaper	100 00
Flynn & Scroggs, printing circulars and questions	30 75
Webb, Carson & Co., 1 Shars' harrow	29 00
Trevett & Green, hardware	2 65
F. M. & A. Avey, blacksmithing	14 11

The bill of C. G. Larned & Co., for guttering, etc., $196 22, was referred to the carpenter for examination.

Prof. Baker was directed to see if the necessary arrangements could be made for side track from the Horse Railroad, for the use of the University.

On motion of Judge Brown,

It was voted, that the Regent be directed to procure plans for a greenhouse, and submit the same to the Executive Committee.

It was voted, that $300 be appropriated for a contingent fund, and a warrant be drawn for said sum in favor of the Bookkeeper.

On motion,

It was voted to adjourn to the second Wednesday (13th) in October.

OCTOBER MEETING—1869.

UNIVERSITY BUILDING,
URBANA, ILLINOIS, *October* 13*th*, 1869.

The Executive Committee met pursuant to adjournment, in the Regent's office.

Present—Messrs. Cunningham, Goltra, Griggs, Pickrell, and the Regent.

On motion of Judge Cunningham, seconded by Mr. Pickrell,

The proceedings of the last meeting were approved and ratified.

The Regent then read the Book-keeper's report, as follows:

STATEMENT OF EXPENDITURES FROM SEPT. 1ST, TO OCT. 13TH, 1868.

Board expense	$ 55 90
Salaries	1,857 31
Stock farm	497 27
Experimental farm	281 49
University grounds	42 05
Chemical laboratory	519 15
Library and cabinet	2,499 58
Carpentry	439 94
Fuel and lights	345 00
Incidental expense	31 25
Sundries	580 65
	7,149 58
Amount expended to Sept. 1st	23,264 97
Total expense	30,414 55

The Treasurer reports the following receipts, up to date:

Interest on bonds		$21,145 00
Balance, per account		1,324 59
Fees and room rents		773 03
Rent of Griggs farm		246 45
Proceeds of sales of produce		1,285 22
Current income		$24,774 29
Appropriations received:		
For chemical laboratory	$5,000 00	
For apparatus and books	10,000 00	
For Horticultural Department, 1 quarter	5,000 00	
For Agricultural Department, 1 quarter	6,250 00	
		$26,250 00
Total receipts		$51,024 29
Deduct expenditures		30,414 59
Balance in hands of Treasurer		$20,609 74
Amount collected, fees and room rents for fall term, and deposited with Gardener & Co		$946 66

The following bills were then audited, and approved:

Oct.	11	James Green, Meteo. Inst		$81 50
"	9	Wier & Lane, plastering rect. room 24		3 55
Sept.	28	E. V. Peterson, fifes, and drum cord		5 25
"	12	W. Price, painting roof	$141 56	
"	12	" " laboratory	19 33	
				160 89
"	10	Hubbard & Herrick, tools	46 56	
"	10	" " mort. machine	28 00	
"	10	" " drawer locks	27 00	
				101 56
"	25	Hovey & Heffron, garden tools		6 00
"	28	J. F. Luhme, chemicals		469 00
Oct.	4	J. F. Feagan8, plastering chemical rec. room		12 00
"	2	A. S. Barnes, freight (books from Europe)		93 84
Sept.	23	McElvee, threshing		14 85
"	28	Prof. A. P. S. Stuart, purchase of spectroscope		38 15
Oct.	13	E. Snyder, expense of contingent fund		329 08
"	13	J. Kelly, seed rye		48 88
"	13	C. G. Larned, guttering roof		119 1s
"	13	A. G. Pickrell, pair of mules		475 00
"	13	A. H. Andrews		87 50

A bill from the Journal Printing Co., for $70 65, dated June 28th, was referred to the Regent for information.

It was ordered, that Prof. Snyder's account be approved and a warrant drawn for balance, $29 08.

On motion of Mr. Goltra,

It was voted, that Messrs. Cunningham and Griggs be a committee to rent the Griggs farm for the coming year.

On motion of Judge Cunningham,

It was voted, that Prof. Bliss be authorized, either alone or with Mr. H. K. Vickroy, to visit such nurseries as he may think proper, and select the necessary trees for planting next year.

After a discussion of the methods of heating the building, the question was referred, on motion of Mr. Pickrell, to a committee consisting of the Regent, Judge Cunningham and Mr. Griggs, with power to act.

On motion of Judge Cunningham,

$1,000 were set apart from the State appropriation for the Horticultural Department, for a green house.

On motion,

The employment of Mr. Douglas, as assistant to Prof. Baker, was ratified, and the Regent authorized to continue the engagement.

On motion,

The question of purchase of additional drain tile and draining tools was referred to a committee consisting of the Regent and Professors Shattuck and Bliss.

On motion,

A committee, consisting of the Regent, Judge Cunningham and Mr. Griggs, was appointed to carry out the order of the Board of Trustees for the painting of the University building, adopted March 14th, 1869.

The Regent and Prof. Bliss were authorized to procure the necessary lumber, for ceiling the shop, and to purchase one or two cargoes of lumber, at their discretion, for building purposes next year, part of which may be used, under the direction of the Faculty, as a temporary drill hall.

On motion of Mr. Goltra,

$300 were appropriated for a contingent fund, to be expended by Prof. Snyder.

On motion of Mr. Griggs,

It was voted, that Dr. Warder be requested to give twelve lectures next winter—the price not to exceed $50 per lecture.

On motion, it was

Resolved, That the Faculty be authorized, in consultation with the Corresponding Secretary, to make the arrangements necessary for a winter course of Agricultural Lectures.

On motion,

The committee adjourned to meet the —— Wednesday in December, or when called by the Regent.

J. M. GREGORY.

W. F. BLISS, *Secretary*.

NOTE.—By general consent of the members, obtained in writing, the next meeting was called on December 13th.

DECEMBER MEETING—1869.

UNIVERSITY BUILDING,
URBANA, ILLINOIS, *Dec.* 13th, 1869.

The Executive Committee met in the Regent's office, at 9 o'clock, A. M.

Present—Messrs. Brown, Cobb, Cunningham, Goltra, Pullen, Wright and the Regent.

The minutes of last meeting were read and approved.

The Regent, as Chairman of the Committee on Building Lumber, reported that the committee had been disappointed in getting a cargo of lumber, as directed, and asked that they have the power to purchase lumber in smaller quantities, as it should be needed. It was agreed that the power of purchasing a cargo included the power of purchasing in smaller quantities.

The Regent reported, as Chairman of the Committee on Greenhouse, that 15,000 brick had been provided and were on the ground, but cold weather had intervened to prevent commencement of the building this fall.

The plans of the green-house were laid before the Executive Committee.

The Regent reported, as Chairman of the Committee on Heating the Building, that, after investigation and the examination of two bids received, it had been thought best by the committee, on account of the lateness of the season, to let the matter drop for the present.

Judge Cunningham reported, from the Committee on Renting the Griggs Farm, that the farm was advertised to be rented to the highest bidder, Saturday, December 18, 1869.

The Regent read the statement of the Book-keeper, as follows:

Board expenses	$69 40
Salaries	2,823 94
Stock farm	1,369 76
Experimental farm	398 66
University grounds	22 88
University building	515 46
Chemical laboratory	222 74
Library and cabinets	316 74
Student labor	634 81
Carpentry	357 15
Fuel and lights	133 10
Incidental expenses	121 83
Contingent fund	300 00
Stationery	55 35
Appropriation Horticultural Department	86 50
	$7,426 46
Expenditures reported at Oct. meeting	30,414 54
Total expenditure	$37,841 00

The following collections were made for the Treasurer:

Collections of fees from students	$164 50
Collected for coal	86 41
Proceeds of sales from garden	25 17
Sales of wheat, Oct. 7th	156 51
Carpenter, from students, for drawing boards and T squares	5 00
	$437 59
Collected to Oct. 4th	3,004 89
Total collections	$3,442 48
Contingent fund	300 00
Expenditures	261 16
Cash balance	$38 84

Carpenter reports work turned out, to date, as follows:

Stock farm	$45 56
Chemical laboratory	9 95
Drawing tables and furniture	180 20
Building repairs	118 01
Repairs in shop	39 45
Total	393 26

The following accounts were then audited and approved:

Oct.	29	W. L. and E. Gurley, eng. chain	$16 50
"	9	Dodson & Hodge, hardware and farm implements	96 61
"	21	Hulburd & Herrick, locks, pullies and cabinet cases	14 79
"	27	Hovey & Heffron, bulbs and seeds	10 73
"	26	J. F. Luhme, chemicals	102 45
Nov.	8	Union Coal Mining Co., 2 cars coal	40 00
"	8	H. Swannel, oils and paints	10 70
"	10	Elisha Eldred, lumber for cabinet cases	109 05
"	5	Brazellon & Carr, painting basement	211 60
"	4	F. and M. Avey, blacksmithing	13 52
"	4	Prof. W. F. Bliss, expense visiting nurseries	56 40
"	24	Luther Gwinnup, plastering farm building	14 88
"	7	Fuller, Finch & Fuller, linseed and carbon oil	91 23
"	7	Fuller, Finch & Fuller, vial corks for cabinet	17 87
"	23	H. K. Hosford, oil and lamp chimnies	16 10
"	25	W. C. Flagg, expenses as Corresponding Secretary	51 50
"	18	Union Coal Mining Co., 2 cars coal	40 00
"	29	A. S. Barnes & Co., shipping charges on books	65 18
"	30	Ely & Burt, repairs and blacksmithing	15 45
"	30	Walker Bros., moulding and saw mill work	6 55
Dec.	13	Prof. A. P. S. Stuart, Chemical Department	11 57
"	"	C. G. Larned & Co., stove fixings	11 40
"	"	C. G. Larned & Co., hardware, etc.	40 48
"	"	J. M. Gregory, traveling expense	23 20
"	"	Angle & Sabin, tile and seed	78 60

On motion of Judge Cunningham,

A claim of $10, for drafting legislative bill for appropriation, presented by Dr. Scroggs, in favor of Judge Parker, was allowed.

On motion,

Authority was given to Professor Snyder for the purchase of an automaton battalion, 2 bugles and 24 fencing guns for bayonet exercise, provided said guns cannot be made at the work-shops of the University. The following preamble and resolution, offered by Judge Brown, and seconded by Judge Cunningham, were carried by an unanimous vote:

WHEREAS the Chairman of the Committee on Faculty and Courses of Study has recommended the appointment of Prof. S. W. Robinson, of Michigan, as Professor of Mechanical Science and Engineering, and has presented to this Committee abundant proof of his fitness for the position,

Be it Resolved, That the said S. W. Robinson be and is hereby appointed to said Professorship, at a salary of $2,000, (two thousand dollars).

On motion of Judge Brown,

The Regent was authorized to make arrangements with Prof. Sanborn Tenney, to deliver a course of 30 lectures before the University, for the stipulated sum of $600 for the course, or $20 per lecture.

On motion of Judge Cunningham,

It was ordered that the arrangements for the courses of winter lectures be referred to the Regent and the Corresponding and Recording Secretaries, who were authorized to contract with the Lecturers, and to draw on the Treasurer of the Board for the several amounts necessary to meet the traveling expenses of said Lecturers. The Regent read the following recommendation from the Faculty, which,

On motion of Judge Cunningham,

Was approved and adopted.

1st. That two or more fire-extinguishers be purchased for the University, one of which shall be kept in the library, and one in the possession of the Adjutant of the building.

2d. That the following rules be adopted for the guidance of the Faculty and the students of the University.

Rule 1st. In case of an alarm of fire, the students will form in their several halls, and wait for direction from some member of the Faculty, or the Adjutant, with the following exceptions: Should the fire be in a student's room, he, and those from whom he may request immediate aid, will not fall into the ranks; nor shall this rule prevent any student from immediately using a fire-extinguisher, or any other proper means to put out a fire.

Rule 2d. The University building will be divided into wards, each ward being under the charge of a member of the Faculty, who will adopt some plan of operations to be carried out in case of fire; but any member of the Faculty will take charge of operations, should the one whose special duty it is, be absent. Should there be fire in more than one of the wards, the senior officers of such wards will take charge, the Regent directing in any case as he may see fit.

Rule 3d. At least once each term a supposed case of fire will be had, when the students will be drilled as for a real one. Special instruction will be given in the use of the extinguisher, so that every student shall understand its use.

Rule 4th. Each member of the Faculty will make it his duty to acquaint himself with the working of these rules, attending the above-mentioned drills for that purpose. [Signed,]

S. W. SHATTUCK,
A. P. S. STUART.

On motion of Judge Brown,

The Regent and Judge Cunningham were made a committee to procure an insurance on the University building, not to exceed $40,000 in amount, and to purchase not to exceed three fire-extinguishers.

Ordered, That $2,000 of the State appropriation for apparatus and books be set aside for the Mechanical Department, and that such purchases as may be necessary before the next meeting of the Executive Committee, be made under advice of Prof. Robinson.

On motion of Judge Brown,

It was ordered that the material for the green-house be paid for out of the unexpended portion of the State appropriation for the Horticultural Department for the present year.

On motion of Judge Cunningham,

It was ordered that all warrants drawn by the Regent and Secretary on the Treasurer, specify, so far as possible, to what fund the amount should be charged, and where impracticable at the time the warrant is drawn, so to indicate, that the Treasurer be informed at the earliest moment possible, and that the regular statement made to this Board by the Book-keeper, specify items, and to what account chargeable.

On motion of Judge Cunningham,

Resolved, That the Governor of Illinois be requested to fill the vacancies in the Board of Trustees, occasioned by the expiration of the term of Hon. M. L. Dunlap, resignation of Hon. H. C. Burchard, and the acceptance by Hon. J. W. Scroggs of the office of member of the General Assembly.

On motion,

The Committee adjourned to meet the second Wednesday in January, (12th).

J. M. GREGORY.

W. F. Bliss, *Secretary*.

JANUARY MEETING—1870.

University Building,
Urbana, Ill., *Jan.* 12*th*, 1870.

The Executive Committee met in the Regent's office at 10, A. M. The Regent in the Chair.

Present—Messrs. Brown, Cobb, Cunningham, Goltra, Pickrell, Wright, and the Regent.

The minutes of last meeting were read and approved.

The Regent then stated that Prof. Robinson had a communication to lay before the Executive Committee, on the subject of the Mechanical Department.

On motion of Judge Brown,

It was voted that Prof. Robinson be invited to appear before the Committee and present his communication in person.

Prof. Robinson was then introduced, and read the following statement, which,

On motion of Judge Cunningham,

Was ordered to be placed upon the minutes of the Executive Committee.

STATEMENT OF PROF. ROBINSON.

URBANA, ILL., *Jan.* 10*th*, 1870.

To the Regent and the Executive Committee of the I. I. U.:

GENTLEMEN:—Having entered upon duty the first of January, pursuant to the desire expressed by Regent Gregory, in notifying me of your appointment of myself to the chair of Mechanical Philosophy and Engineering, permit me to say that I come to join heartily, and with my whole energy in the work expected of me in connection with this Institution.

I have endeavored, by examining into the intentions of those who established the Institution, by conversation with those familiar with its objects and aims, and by all means at my command, to ascertain as accurately as possible what are the real wants of the Mechanical Department. As it has been wisely adopted as the policy of this University to mingle practical instruction with theoretical, permit me to say that I regard this plan of instruction as especially important to the practical mechanical engineer. He should have a thorough acquaintance with, and almost an intuitive judgment regarding, the strength, weight and durability of steel, iron, brass, wood, etc. This cannot be acquired by listening to lectures, or reading scientific journals. Indeed, an apprenticeship of three or four years would prove of great value to the designer of machinery. Pattern-making should be thoroughly understood, in order to fully realize the importance of so shaping the parts of a machine intended to be of cast-iron, that they may be made with strict reference to their being drawn from the moulder's sand at the foundry, and at the least cost. It is difficult to acquire this without practice at pattern-making. Machinery should be also so made, that the parts may be easily got at when repair is necessary. The designer, moreover, should have such a knowledge of the materials of construction, that the parts of many machines may be by judgment alone.

Machinery, more than any other constructions, is often subject to shock. For such machines calculations from theoretical considerations profit nothing—such, for example, as locomotives, rock-drilling machines, power-hammers, etc. As a substitute for an apprenticeship, I think it extremely advisable, particularly in Industrial Institutions, that liberal means be provided for practical culture; and not only free use of illustrative models of machine, ry, but by practice in constructing parts of machines, and, if possible, making whole machines. For example: let the student make the design, the patterns, mould them, cast them in heated metal, such as can be fused in a forge, when such materials are suitable, and finish them. Our models for illustrating parts of machinery may be made in this way. As these models must be had, I submit the suggestion, that their manufacture in our own shop will not only cost as little outlay as importation from the old world, where alone they are now made, but this manufacture would afford much of the desired practical instruction for students, and might furnish here, as it does in some European schools, a profitable application of student's labor.

Thus models, not only for the Mechanical, but for all the departments, may be made. When the castings for these models are ordered or made by ourselves, as above suggested, a good number from each may be secured at the same time, and all finished together. In this manner, several duplicates of each model can be cheaply procured, and mostly offered for sale to other institutions. And, indeed, as these models are not now made in this country, their sale will probably prove profitable. As our object in imparting practical instruction will be, primarily, to teach the student, it is not altogether improbable that as much of that class of education may be secured here, in six months of diligent application, as would be if apprenticed for two or three years to an indifferent master, whose main object is to make money. The apparatus for the machine shop will itself furnish, to quite an extent, the necessary models of illustration, and at the same time be true working models, which, of course, are the best. The cylinder of the steam engine may be so made as to admit the application to it of various gears, to convert the engine at pleasure from one to another. In this way, the common slide-valve engine may be changed into a Corliss, or to a regulating cut-off engine, or any other for which we have the suitable valve-gear. Thus, one of the most important of all machines may be exhibited in its various modifications, as an actual working model, to the class. The Mechanical Department, thus equipped, will afford valuable aid to the Agricultural Department, for the repair of agricultural machinery and implements.

The power at hand in the shop will undoubtedly be applied to many useful purposes, to supply a want already felt, such, for instance, as threshing grain, shelling corn, grinding grain, running the carpenter's lathe, buzz saw or other machinery, for the benefit of the Agricultural Department. Indeed, complete machines, experimental or otherwise, can be made, such as it may be desirable to try on the farm or in the shop, and which, on account of originality, cannot be found in the market. On account of these numerous advantages to the Agricultural Department, undoubtedly that department will be glad to hasten the introduction of the shop, by sharing the expenses of fitting up, in providing room for it, and procuring a boiler. As an encouragement to this fitting up of the Mechanical Department, allow me to state, that while all the Mechanical students were before me for the purpose of having explained to them the duties of the Mechanical Engineer, and what acquirements he should attain to, after stating the importance of practical culture, I ventured to take a vote to ascertain how many wished to engage in labor in the Mechanical shop, provided one be established here. Every man was swift to vote in favor of work.

My own conviction is, that a shop should be immediately provided. I would, therefore, respectfully ask the Executive Committee to sanction the purchase of the following named machinery and apparatus for that purpose:

I. An engine of 8 or 10 horse power, with regular cylinder, made to order, in such a manner as to be susceptible of receiving different valve-gears, for $250 or $300.

II. A machinist or engine lathe, from the Putnam Machine Company, of Fitchburg, Massachusetts, of 14 inch swing, having all the modern improvements, and being itself a model of workmanship, which can be purchased at reduced rates for this institution, at $310.

III. A chuck, drills, etc., for, say $40.

IV. Twenty feet of ½ inch shafting at, say $20.

V. Material and apparatus for, or perhaps a portable forge, for $20 or $40.

VI. Anvil, vises, hammers, etc., say $40. The necessary shop room may be provided for by raising the roof of the present carpenter's shop, thereby adding a second story, which will perhaps cost $130, making room for the present for the machine and carpenter's shop, both of which can be supplied by the same power. This enlargement of the building, and also, the purchase of a boiler for $300 or $400, perhaps the Agricultural Department will be willing to undertake first, because the appropriation to the Mechanical Department for the purchase of models and machinery is small, and second, on account of the many benefits to the Agricultural Department arising from the presence of the shops. It is my belief, that the $2,000 appropriated to the Mechanical Department for providing models, etc., can be best used in first procuring apparatus for a shop, as above indicated, and then paying students for work producing models.

I think it is also advisable, that the Executive Committee sanction the employment of an experienced workman, to be present at the shop, engaged at model work, and when not there myself, having the immediate oversight of students at work in the shop. Mr. Alexander Thompson, a graduate of Michigan University, is such a man, and a rapid worker, whom I can recommend in the highest terms. He can be secured for $1,200 per year, and if permanency cannot be promised, I would very strongly recommend as an economical measure, his temporary employment for model work, etc., till the $2,000 already appropriated for illustrative models, be exhausted. I submit the following estimate of expenses and receipts for the year, for which the Mechanical Department will be liable on account of the shop, if instituted:

Expenses	$750 00
Cost of machinery	200 00
Wages of mechanic	1,200 00
Materials	400 00
	$2,550 00

RECEIPTS.

Models on hand, or sold	$500 00
Value of work done for other departments	200 00
	$700 00
Expenditures over receipts	$1,850 00
Appropriation	2,000 00
Balance on hand	$150 00

S. W. ROBINSON,

Prof. Mech. Phil. and Engineering.

On motion of Judge Brown,

It was voted that the Regent and Prof. Robinson be authorized to purchase, at once, for the Mechanical Department:

1. An engine of 8 or 10 horse power, of the description mentioned in his memorial, and a suitable boiler for same.
2. A machinist's or engine lathe, of the size and character recommended in the same paper.
3. Chuck, drills, etc.
4. Twenty feet half-inch shafting.
5. A suitable forge.
6. One anvil, two vises, and the necessary hammers for the shop.
7. The raw material necessary to commence operations.

They were also authorized to raise the roof of the shop, to furnish room for the shop of the Mechanical Department.

The Regent then read the statement of the Book-keeper, as follows:

Statement of the expenditures of the University from March 12th, 1869, to January, 1870; arranged under titles of Appropriations, as made by the Board of Trustees and the State:

Board expense	$846 00
Salaries	14,126 13
Farm account	4,227 87
University building	2,753 11
" grounds	588 62
Student labor	1,442 29
Fuel and lights	573 92
Incidental expense	1,281 71
Treasurer's and Corresponding Secretary's salaries	700 00
Taxes on lands	988 48
Purchase of two lots	425 00
Military buttons	50 00
Geological excursions	200 00
Meteorological inst.	81 50
Stationery	179 35
Appropriation of 1868	432 70
Carpenter's shop, material on hand	939 82
Total expended from Board appropriation	$29,836 00

Agricultural Department	$1,563 67
Horticultural "	3,332 90
Chemical laboratory	1,151 86
Books and apparatus	4,986 25
Total expenditures from State appropriation	$10,972 67
Grand total	$40,808 67

COLLECTIONS FOR THE TREASURER TO JANUARY 10TH.

Collected from G. S. Upstone, from sales on farm to January 1st, 1870	$153 05
Collected for coal, from students	103 08
Fees, from students	378 50
Prof. W. F. Bliss, for sale of farm produce	198 60
	$833 23
Previous collections	3,442 48
Total collected for Treasurer	$4,275 71

Very respectfully,

E. SNYDER, *Book-keeper.*

On motion,

Adjourned to 3 o'clock, P. M.

The Committee met pursuant to adjournment.

The report of the committee appointed at the last meeting, to effect an insurance on the University building, was received and approved.

REPORT OF COMMITTEE.

The undersigned, to whom was referred the question of the insurance of the University building, library and apparatus, at the last meeting of your Committee, would report, that insurance was effected as follows:

On Building.—Underwriters', $5,000; Lumberman's of Chicago, $5,000; Home, of New Haven, $5,000; State, of Chicago, $5,000; North American, of Philadelphia, $5,000; Illinois Mutual, of Alton, $5,000; Hartford, of Hartford, $5,000.

Library and Apparatus.—Sangamo, of Springfield, $5,000.

That said insurance was effected at nine-tenths of one per cent., from Dec. 19th, 1869, to Dec. 19th, 1870, on representing to the agents that the Trustees had ordered two fire extinguishers, and had effective aid for extinguishing fires on the premises. Dated Jan. 12th, 1870.

J. M. GREGORY,
J. O. CUNNINGHAM.

The same committee, consisting of Dr. Gregory and Judge Cunningham, were authorized to effect an insurance on the Gardener's house.

Judge Cunningham made the following report for the committee appointed to rent the Griggs farm:

REPORT OF COMMITTEE.

In pursuance of the authority given at a previous meeting, and in the absence from the State of Mr. Griggs, I advertised, by hand-bills, to rent the lands belonging to the University, known as the Griggs farm, to the highest bidder, on the 18th day of December last. The bidding for the lands was spirited, and resulted in letting them as follows:

J. I. Toy	s ½ sw ¼ sec 21	80 acres	at $3.60	$288
C Weeks	n ½ sw ¼ sec 21	80	" " 2.80	224
G. W. Burton	s ½ se ¼ sec 21	80	" " 4.00	320
" "	nw ¼ se ¼ sec 21	40	" " 4.05	162
W. Hill Burton	ne ¼ se ¼ sec 21	40	" " 4.05	162
M. Dare Burton	sw ¼ ne ¼ sec 21	40	" " 5.00	200
C. Burnett	se ¼ ne ¼ sec 21	40	" " 4.40	176
Total				$1,532

I took from each tenant his note, with good security, for amount of his note, to the 25th of December, 1870, to the University.

Respectfully submitted.

January 12, 1370. J. O. CUNNINGHAM.

On motion of Mr. Goltra,

The report was received and adopted.

The following bills were then audited and allowed:

Beidler & Kratz, lumber	$ 60 73
Fuller, Finch & Fuller, paint and varnish	43 66
" " " glass	9 80
Hulburd & Herrick, drawing tools	11 50
J. Ely, spring wagon and repairs	163 35
Union Coal Co., 3 cars coal	60 00
F. M. & A. Avey, blacksmithing	3 68
Recording Secretary's account, postage, etc	10 80
Prof. W. F. Bliss, petty expense for farm	53 79
J. M. Turnell, 2 bugles and mouth-pieces	17 00
Park Royer, lumber account	67 50
George Upstone, petty account for farm	74 68
" " expense to fairs	19 20

Dr. Gregory presented a report, giving some details of his visit to European schools, and presented the bills of purchase of books and apparatus, stating that the books have all arrived and the last of the apparatus was on the way.

The bills were allowed.

Dr. Gregory was requested to make, at the next meeting of the Board of Trustees, a full report of his visit to European schools.

Mr. Cobb offered the following preamble and resolution:

WHEREAS, It appears upon an examination of the accounts of the Book-keeper, that in some cases the appropriations of the March meeting, 1869, for the current year, were insufficient, and in others excessive, but that the aggregate amount appropriated is believed to be nearly sufficient for all requirements; therefore, be it

Resolved, That the Regent and Book-keeper be authorized to re-arrange the amounts appropriated, so as to cover all the necessary expenses for the current year, ending March 1st, 1870, and report said arrangement immediately to the Treasurer.

Carried.

Mr. Pickrell, of the Farm Committee, presented a plan of a barn for the Stock farm, explaining that he had been unable to get the specifications for it, and could consequently present no formal report.

On motion of Mr. Cobb,

The Farm Committee was instructed to obtain specifications for a barn, to be built of wood, on a stone foundation.

On motion of Judge Brown,

Voted, that the Regent be authorized to purchase the seeds needed for the Vegetable and Flower gardens, and also such floral plants as he may deem proper and necessary.

On motion of Mr. Cobb,

Resolved, That $100 be allowed to Prof. Snyder for his services as Assistant Secretary for the past year, and that a warrant be drawn for said amount.

On motion of Mr. Goltra,

Adjourned to meet at the call of the Regent,

J. M. GREGORY.

W. F. Bliss, *Secretary*.

APRIL MEETING, 1870.

University Building,
Urbana, Illinois, *April 6th*, 1870.

Pursuant to call, the Executive Committee met in the Regent's office, at 4 P. M.; the Regent in the Chair.

Present—Messrs. Brown, Cunningham, Cobb, Lawrence, and the Regent.

The minutes of the last meeting were read and approved; after which,

The Committee adjourned to visit the farm.

EVENING.

The Committee convened at 8 o'clock.

Present, in addition to the members mentioned above, Messrs. Goltra and Pickrell.

The Regent read the Book-keeper's statement, as follows:

CURRENT APPROPRIATION.

Board expense	$328 00
Salaries	2,592 98
Fuel and lights	32 00
Stationery and printing	44 10
Mechanical Department	323 04
Incidental expense	132 67
Corresponding Secretary's salary	470 00
Treasurer's salary	500 00
Appropriation for unpaid bills	482 87

STATE APPROPRIATION.

Horticultural Department	634 69
Agricultural Department	160 34
Books and apparatus	359 62
Total expenditures	$6,060 31

I have collected for the Treasurer—

Term fees, amounting to	$174 00
Payment for coal, from students	87 72
Total	$261 72

I also respectfully present to you my account for petty expenditures, amounting to $27 44.

There were advanced by me, on receipts approved by Prof. Bliss, $132 17, for farm labor.

Very respectfully,

E. SNYDER, *Book-keeper.*

Judge Cunningham moved to pay the bill for farm labor out of the State fund.

An amendment was offered by Mr. Pickrell, that an item of $2 00, for repair of cistern, be charged to State appropriation, as coming under the head of "Improvements."

A division of the question being called for, it was voted, that the item for repairs be charged to the State Appropriation, and that the labor be charged to the General Fund.

The following bills were then audited and allowed:

March	10	G. S. Upstone, farm labor, and repairing cistern	$132 17
"	11	Champaign Gas Light Co., gas fixtures	181 22
"	"	" " pipes, etc.	115 00
"	31	Fuller, Finch & Fuller, glass for green-house	242 54
"	22	J. J. Thomas, 1 rotary harrow	23 25
"	28	Elisha Eldred, lumber for garden barn	206 45
"	"	Union Coal Co., 2 cars of coal	30 00
April	6	E. Snyder, account of petty expense	27 44
"	"	Prof. Bliss, postage stamps	5 30
"	"	Cobb & Warrener, Norway oats	26 00
"	"	J. Moore, old barrels for garden	3 00

It was ordered, that Mr. Frank's wages be fixed at $75 00 per month; and that he be charged at the rate of $100 per year, for house rent; and that the Regent be authorized to allow him a garden spot, and such other needful things, as a pump for the cistern, and shrubbery to adorn the grounds, at the discretion of the Regent.

On motion, it was ordered, that Norway spruce be substituted for Austrian pine, in the shelter belt on the south side of the orchard.

A plan, presented by the Regent, for a house on the Experimental farm, was adopted, except that it was ordered to be built two stories high, with such changes in roof as the change in plan might require.

On motion of Judge Brown,

It was voted, that the Regent and Mr. Cobb, be authorized to purchase all necessary lumber and building material for the buildings.

On motion, it was ordered, that the gardener's barn, and the house on the Experimental farm, be built by the carpenter of the University.

On motion of Judge Cunningham,

It was ordered, that the Regent advertise for separate sealed bids for the stone work, carpenter work, painting, and excavation, (carpenter work to include plumbing), for the farm barn; these bids to be filed by the next meeting of the Executive Committee.

On motion of Judge Cunningham,

It was voted, that when the committee adjourn, it adjourn to the 2d Thursday in May (12th).

On motion of Mr. Pickrell,

It was voted, that the Chairman of the Finance Committee be requested to secure a renewal of the bond of the Treasurer of the University.

On motion of Judge Cunningham,

The Faculty were authorized to publish such a catalogue and circular, and in such number as they may deem necessary.

On motion of Mr. Pickrell,

One thousand dollars were appropriated from the General Fund, for labor on the farm.

On motion of Judge Brown,

It was voted, that the Regent be authorized to take such steps as may be necessary to secure the Walsh cabinet, and prepare a proper place for it.

The minutes of the present meeting were read, and approved.

The Committee adjourned, to meet as provided for by the motion previously made by Judge Cunningham, on the 2d Thursday (12th) of May.

MAY MEETING—1870.

UNIVERSITY BUILDING,
URBANA, ILLINOIS, *May* 12*th*, 1870.

The Executive Committee met, pursuant to adjournment, at 4 P. M., in the Regent's office.

The members present were—Messrs. Goltra, Cunningham, Pickrell, Wright, and the Regent.

The Regent read statements of the work done, since the March meeting, on the farms and gardens, and in the shop; and presented the following

STATEMENT OF THE BOOK-KEEPER:

I have the honor to respectfully submit herewith the expenditure since the last meeting of the Executive Committee:

Board expense	$124 15
Salaries	1,649 96
Farm labor	335 24
Fuel and lights	61 00
Stationery and printing	132 90
Carpenter's shop	196 33
Mechanical Department	83 33

Building repairs	$1 00	
Incidental expense	177 02	
Total, from current appropriations		$2,760 93
Horticultural Department	$2,063 33	
Agricultural Department	219 32	
Books and apparatus	364 56	
Total, from State appropriation		2,637 21
Total amount		$5,398 14
Amount reported at last meeting		$5,717 93
Total expense to date		$11,116 07

The following collections were made for the Treasurer:

Fees from students	$202 16
Coal from students	34 15
Sales from garden and hot-house	67 55
Sales from farm	214 86
Total	$518 72
Amount reported at last meeting	261 72
Collections to date	$780 44

I also submit a list of bills presented for auditing, and my own account of petty expenses, amounting to $40.

Very respectfully,

E. SNYDER, *Book-keeper.*

The following bills were then examined and allowed:

Union Coal Mining Co., 2 cars of coal	$30 00
Fuller, Finch & Fuller, glass and paint	36 54
Hall, Kimbark & Co., machinery	39 65
T. J. Burrill, sundry expense	4 45
Nast & Fleming, 3 cubic yards of sand	5 25
Joseph McCorkle, lots, etc	13 34
Beach & Co., coal for forge, etc	21 25
Thom. Franks, petty expense	4 80
E. Snyder, petty expense	40 00
Sam'l Edwards, bill of trees	425 25
F. K. Phœnix, bill of plants	79 10
Douglas & Son, bill of trees	48 50
W. A. Nourse, "	43 25
Lacon Nursery "	53 80
Purdy & Hance, bill of small fruit	19 05
Parker & Roye, lumber	19 87
Dr. J. M. Gregory, balance on books	12 12

The Regent stated, that in accordance with an order of the Board, 5,000 copies of the Regent's report, made to the Board in March, had been printed, and in part distributed.

On motion of Mr. Goltra,

It was ordered, that the matriculation fees paid by students, from and after March 9th, 1870, be especially set apart, and devoted as a fund for library purposes.

On motion of Judge Cunningham,

It was ordered, that $25 be allowed Prof. Burrill, to purchase materials needed for the cabinet of Natural History.

A proposition of students Ricker and Cantrell, to make a spring wagon, for the use of the Horticultural Department, was referred to the Regent and the Professor of Horticulture.

On motion, the Committee took a recess.

—

EVENING.

The Committee convened at 8 o'clock, P. M.

Bids for the excavation, stone work, carpenter work, and painting of the barn on the Stock farm, were opened.

It was decided to defer the question of painting, until the next meeting.

On motion of Mr. Pickrell,

It was voted, that the parties making the excavation, and furnishing the stone and brick work for the basement, be required to finish the same by the 1st of July, 1870.

Judge Cunningham moved that the parties doing the carpenter work be required to finish the same by the 1st of September, 1870.

Carried.

On motion of Mr. Goltra,

It was voted, that the barn be painted with three coats of paint, the University furnishing the material; and that the time for putting in bids for the painting be extended to the time of the next meeting of the Executive Committee, June 7th, 1870.

On motion of Judge Cunningham,

It was voted, that the painting should be done, as wanted, during the progress of the work, and shall be entirely finished by the 1st of October, 1870.

On motion of Mr. Pickrell,

It was ordered, that, inasmuch as all the bids for the work on the barn were found, on examination, to be incomplete, they be all rejected.

Mr. Goltra moved that the whole matter of the contracts for building the barn be referred to a committee, consisting of the Regent, Mr. Griggs and Judge Cunningham, with power to act.

Carried.

On motion of Judge Cunningham,

It was ordered, that a contingent fund be placed in the hands of Prof. Snyder, to meet incidental expenses.

On motion of Mr. Pickrell,

It was voted, that the salary of the Corresponding Secretary be paid quarterly.

Judge Cunningham moved that the next meeting of the Committee be held on Tuesday, June 7th.

Carried.

On motion of Judge Cunningham,

The Regent and Faculty were authorized to prepare and cause to be printed, in such manner as they see fit, certificates of scholarship for the first or full grade and of the partial grade.

Minutes of the present meeting were read and approved.

On motion of Mr. Goltra,

The Committee adjourned to Tuesday, June 7th.

JUNE MEETING.

UNIVERSITY BUILDING,
URBANA, *June* 7, 1870.

The Executive Committee met in the Regent's office at 9½ o'clock, A. M., the Regent in the Chair.

Present—Messrs. Brown, Cobb, Cunningham, Goltra and Wright.

The Regent read a report of work done in the shop since the last meeting.

The committee to whom the contracts for building the barn on Stock farm had been referred, reported that they had made a contract with Dickinson & Collier, to do the carpenters' work for

$1,500; with Cornelius Sullivan, to make the excavation at 25 cents per cubic yard; and with Mr. Plank, to do the brick and stone work.

The committee reported further that they employed Mr. James Bellangee to superintend the building of the farm barn and other buildings, to be erected this summer. Mr. J. Bellangee has agreed to remain on the grounds during vacation, and give his personal superintendence to the work, for $200.

On motion of Judge Brown,

It was voted, that the action of the committee, in employing Mr. Bellangee be approved.

The Regent then read the Book-keeper's report, as follows:

I have the honor to herewith submit to you the following statement of expenditures, since the last meeting of the Executive Committee:

Current funds:	
Board expense	$89 25
Salaries	1,483 30
Fuel and light	58 50
Building and repairs	145 39
Mechanical Department	138 88
Carpenter shop	83 33
Farm labor	135 64
Incidental expense	160 45
State appropriations:	
Agricultural Department	$76 65
Horticultural Department	961 04
Library and apparatus	514 44
Total	$ 3,846 87
Reported last meeting	11,116 07
Total expenditures to date	$14,962 94
Of which, from current funds	9,632 45
Of which, from State appropriation	5,330 49

I have made the following collections for the Treasurer:

From University farm, for produce sold	$44 18
From University gardens, for vegetable and flower sales	74 07
Fees collected from students	151 50
Collected for coal	9 75
	$279 42

Inclosed please find also list of bills presented for payment, and my own account of petty expenses, amounting to $56 55, which leave in my hands $18 45 from the contingent fund of $75.

I would respectfully beg that this bill be allowed—which would again replenish the contingent fund to the amount established.

E. SNYDER, *Book-keeper.*

The Book-keeper's account of $56 55 was then audited and allowed, leaving in his hands an undiminished fund of $75 for incidental expenses, between this and the next meeting.

The following bills were then audited and approved:

Fuller, Finch & Fuller, oil and paints	$63 33
C. G. Larned & Co., hardware and repairs	40 42
C. F. A. Hinrichs, insect pins	5 20
A. S. Davis, double-shovel plow	6 00
Chaddon & Hesse, sawing timbers	10 36
David Ford, castings for engine	2 42
Hovey & Co., blue grass seed	2 25
E. V. Peterson, stationery and crayons	16 70
Angle & Sabin, seeds and tile	23 75
Champaign Gas Co., gas for May, 1870	2 80
F. M. & A. Avey, blacksmithing	10 30
Western Fire Extinguisher Co., 3 Babcock extinguishers	132 05

On motion of Judge Brown,

It was ordered, that Prof. Stuart be authorized to purchase the apparatus embraced in the list presented by him, and such other apparatus and articles for the laboratory, within the limits of the appropriation, as he should think proper.

A motion of Judge Brown,

That the Regent and Professor of the Mechanical Department be authorized to purchase such material as may be needed, not exceeding the appropriation, was carried.

The bids for painting the farm barn were then opened, and the contract was awarded to J. H. Dowell, a student of the University, at $100 for the job, the glazing at 1½ cents per light.

On motion of Judge Brown,

It was ordered, that warrants be drawn in favor of the Regent, and such of the professors as desire it, for their salaries for the months of June, July and August, 1870; and, if agreeable to them, we would be gratified if they would employ as much time and effort as they can spare, during the vacation, in making known, throughout the State and wherever else they may happen to be, the plans and advantage of the University, with a view of attracting students to it.

On motion of Mr. Cobb,

The wages of students working on the farm were fixed at $22 50 per month, for the three months of vacation.

Twelve o'clock had arrived, and the committee took a recess for dinner and visiting the farms.

AFTERNOON.

The Committee convened at 2½ o'clock, P. M.

On motion,

The following resolution was adopted:

Resolved, That Dr. H. J. Detmer be employed to give courses of lectures on Veterinary Science, and to conduct a clinic, prepare skeletons, and do such other teaching as he may be required to do, during the winter term of 1871, and that his compensation be fixed at $600.

On motion of Judge Cunningham,

It was voted, that Mr. James Bellangee be employed the coming year at $1000 per annum, with $200 extra, for work in vacation, as previously provided for.

On motion of Judge Cunningham,

It was voted, that Robert B. Warder be employed for the coming year, at a salary of $600.

On motion of Judge Brown,

It was voted that Mr. H. M. Douglas be employed for the next year, at a salary of $1000, to take charge of the library and render such services in teaching as may be necessary.

On motion,

It was ordered, that the Regent cause to be purchased such amount of cadet gray cloth as he may deem necessary, and that such fabric be sold to the students at cost.

The Regent then presented the following communication from Prof. Bliss:

To the Regent and Executive Committee of the I. I. U.:

I am compelled, by the requirements of my own business, to resign my place as Professor of Agriculture, to take effect at the end of my year, and have thought it best, at the same time, to tender my resignation of the Recording Secretaryship, to take effect at once, because the improvements to be carried forward this summer will make it desirable that the countersigning officer should be at the University, constantly, during vacation, while I shall necessarily be away much of the time.

Respectfully,

W. F. BLISS.

The resignation of Prof. Bliss was accepted, and the following resolution, offered by Judge Cunningham, was adopted:

Resolved, That, in accepting the resignation of Prof. Bliss, this Committee desire to express the high sense entertained by the University of his qualifications as an educator and a gentleman; and that the best wishes of the members of this Committee will follow him on his retirement.

On motion of Judge Cunningham,

Prof. E. Snyder was appointed Recording Secretary, to fill the vacancy made by the resignation of Prof. Bliss.

The Committee then took a recess to hear the address of Dr. Bateman, in the University chapel.

After which the Committee adjourned.

CATALOGUE OF LIBRARY ILLINOIS INDUSTRIAL UNIVERSITY.

Titles of Books.	No. Vols.
AGRICULTURE:	
Agriculture of the U. S. in 1860, from Eighth Census—J. C. G. Kennedy, (duplicate,) Washington. 1864	2
Allen, R. L.—American Farm Book; or, Compend of American Agriculture—Judd, 1849	1
" New American Farm Book. Revised and enlarged by L. T. Allen—Judd, 1870	1
American Agricultural Annual, illustrated—Judd, 1867-70	1
" Institute, Reports of, for 1847-8, and Transactions of, for 1856—Albany, 1847-48-57	3
Andrews', G. H.—Modern Husbandry; practical and scientific treatise on Agriculture—London, 1853	1
Armstrong, J.—A Treatise on Agriculture; origin, progress, present condition, theory and practice—Harper, 1864	1
Bailly. See "Maison Rustique"	1
Beheim, Schwarzbach, H.—Beitrag zur Kenntniss des Ackerbaues der Römer—Cassel, 1866	1
Bixio. See "Maison Rustique"	
Blake, J. L.—Farm and Fireside—Beardsley, 1852	1
Bornmer, G.—Method of making Manure. Judd, 1867	1
Boussingault, J. B.—Economie Rurale dans ses rapports avec la Science—Paris, 1851	2
" Agronomie, Chimie agricole, et Physiologie—Paris, 1860	4
Buel, J.—Farmer's Companion; or, Essays on American Husbandry—Boston, 1839	1
Bunker, Timothy.—Tim Bunker Papers; or, Yankee Farming—Judd, 1868	1
Caird, James.—Prairie Farming in America, with notes on Canada and the United States—Longman, 1859	1
Chapman, J.—Cotton and Commerce of India, as related to interests of Great Britain—London, 1851	1
Chaptal, J. A.—Chemistry applied to Agriculture—Boston, 1838	1
Coin, R. L. de.—History and Cultivation of Cotton and Tobacco—Chapman, 1864	1
Commissioner of Agriculture. Reports of, 1862-3-4-5-6 and 1867—Washington, 1863-8	2
Copeland, R. M.—Country Life; Hand-book of Agriculture, Horticulture, and Landscape Gardening—Judd, 1867	1
Courtney, W. S.—Farmers' and Mechanics' Manual, revised and enlarged by G. E. Waring, (miscellaneous tables and information.) New York, 1869	1
Crocker, H.—See "Report on the destruction of trees, &c."	
Dana, S. L.—Muck Manual for Farmers; a treatise on soils, manures, &c. Judd, 1855.	
Darlington, Wm.—American Weeds and Useful Plants. Judd, 1859	1
Davy, Sir H.—Elements of Agricultural Chemistry. Longman, 1839	1
Donaldson, J.—British Agriculture: Cultivation of Land, Management of Crops, and the Economy of Animals. London, 1860	1
Donovan, M.—Domestic Economy. Longman	2
Doyle, Martin.—Cyclopædia of practical Husbandry: enlarged and revised, by W. Rham. Bohn, 1851	1
Dünkelberg, W. F.—Die landwirthschaft und das Capital. Wiesbaden, 1860	1
" Der Wiesenbau. Nebst einem anhang über die Entwasserung. Illustrirt. Braunschweig, 1866	1
" Cultur-Ingenieur. Polytechnische Kenntnisse und Landwirthschaft. Braunschweig, 1868	1
Ebert, C. J.—Landwirthschaftliche Verhältnisse für das praktische Bedurfniss. Prag, 1857	1

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Elsner, J. G.—Erlebnisse und Erfuhrungen eines alten Landwirths. Hamm, 1865....	2
" Fortschritte der deutschen Landwirthschaft bis auf unsere Zeit. Stuttgart, 1866	1
Emmons, E.—Agriculture of New York, comprising soils, waters, climate and productions. Appleton, 1846-54....	5
Enfield, Edward—Indian Corn: its value, culture and uses. Appleton, 1866....	1
Farming for Boys: what they have done and what others may do. Illustrated. Author of "Ten Acres Enough." Ticknor, 1868....	1
Farnham, E. W.—Life in Prairie Land. Harper, 1847....	1
Fessenden, T. G.—Complete Farmer and Rural Economist: Epitome of Agriculture and rural economy. New York, 1852....	1
Flint, C. L.—Grasses and Forage Plants. Crosby, 1860....	1
Foster, J. W.—Mississippi Valley: its physical geography. Griggs, 1869....	1
Fraas, C.—Schule des Landbaues, Leichtfasslcher Unterricht in der Landwirthschaft. München, 1861....	1
" Ackerbaukrisen und ihre Hielmittel. Brockhaus, 1866	1
French, H. F.—Farm Drainage: principles, processes and effect of draining land. Judd, 1859....	1
Fürstenhaupt, Fr. G.Der Boden.—Cultur durch Entwässerung, Bewässerung und Umwandlung. Berlin, 1860....	1
Gasparin, Graf von.—Grundsätze der Ackerbaukunde. Berlin, 1860	1
Gasparin, Cte. de.—Cours d'Agriculture. Paris....	6
Gloger C. W. L.—Nützlichste Freunde der Landwirthschaft unter den Thieren. Berlin. 1858....	
Grant, E. B.—Beet-root Sugar and Cultivation of the Beet. Lee, 1867....	
Gray, J. C.—Essays: Agricultural and Literary. Little, 1856....	
Grouven, H.—Bericht der Agriculturchemischen Versuchstation zu Salzmürde.. Halle, 1862....	1
Hamm, W.—Das Wesen und die Ziele der Landwirthschaft. Jena, 1866....	1
" Die Landwirthschaftlichen Geräthe und Maschinen Englands. Braunsweig, 1858....	
How to get a Farm and where to find one: by the author of "Ten Acres Enough." New York, 1864....	1
Illinois State Agricultural Society, Transactions of, from 1853 to 1867. Springfield, 1855-68....	7
Iowa State Agricultural Society, reports of, from 1860 to 1866. DesMoines, 1861-6....	5
Jacques, D. H.—The House: a manual of rural architecture, or how to build country houses and out-buildings. Woodward, 1868....	1
Johnson, C. W.—Farmer's and Planter's Encyclopædia of Rural Affairs. Lippincott, 1868....	1
Johnson, S. W.—How Crops Grow: treatise on composition, structure and life of the plant. Judd, 1868....	1
" Peat, and its uses as a Fertilizer and Fuel. Illustrated. Judd, 1866.	1
" Essays on Peat, Muck, and Commercial Manures. Hartford, 1859...	1
Johnston, J. F. W.—Elements of Agricultural Chemistry and Geology. Duplicate. Blackwood, 1856....	2
" " Lectures on Applications of Chemistry and Geology to Agriculture. New edition. Judd, 1865....	1
Kennedy, J. G. C.—See "Agriculture of U. S. in 1860."	
Kirchbach, J. V.—Handbuch fur angehende Landwirthe. Fünfte Auflage. Leipzig, 1857	2
Klippart, John H.—Principles and Practice of Land Drainage. Illustrated. Cincinnati, 1861....	1
" " Wheat Plant: its origin, culture, varieties, diseases, etc., with remarks on Indian corn. Moore 1860....	1
Knapp, J. G.—See "Report on the Destruction of Forest Trees."	
Knop, W.—Kreislauf des Stoffs. Lehrbuch der Agricultur-chemie. Leipzig, 1868....	1
Lapham, I. A.—See "Report on the Destruction of Trees."	
Lavergne, L. de.—L'Agriculture et la Population. Paris, 1865....	1
Lecoteux, E.—Principes de la culture ameliorante. Paris, 1866....	
Liebig, Justus V.—Natural Laws of Husbandry. Edited by John Blyth, M. D. Appleton, 1863....	1
" " Organic Chemistry in its applications to Agriculture and Physiology. Cambridge, 1841....	1
" " Letters on Modern Agriculture. Edited by J. Blyth, M. D. Wiley, 1859....	1
" " Principles of Agricultural Chemistry: with late researches in England. Wiley, 1859....	1
" " Der Chemische Process der Ernährung der Vegetabilien. Braunschweig, 1865....	2
Loudon, J. C.—Encyclopædia of Agriculture. Longman, 1857....	1
Low, David—Landed Property and the Economy of Estates. Longman, 1856....	1
Lyman, J. B.—Cotton Culture: with a chapter on cotton seed and its uses. By J. R. Sypher. Judd, 1868....	
Maison Rustique du 19e siecle, Avec 2,500 Gravures. Bailly, Bixio, Malpeyre....	5
Malaguti, F.—Chimie appliquee a l'Agriculture. Precs de lecons, 1852-62. Paris, 1862	3
Malpeyre—See "Maison Rustique."	

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Marsh, G. P.—Man and Nature; or, Physical Geography, as modified by human action. Scribner, 1867	1
Missouri State Board of Agriculture, Reports of, for 1865-66-67-68. Jefferson City, 1866-9	4
Mitchell, Donald G.—Wet Days at Edgewood, with old Farmers, old Gardeners, and old Pastorals. Scribner, 1865	1
" " Pictures of Edgewood, in a series of Photographs by Rockwood, with illustrative text. Scribner, 1869	1
Michigan State Board of Agriculture, Reports of, for 1865. Lansing	
Nichols, J. R.—Chemistry of the Farm and Sea: with other Chemical essays. Boston, 1867	1
Ohio State Board of Agriculture, Reports of, for 1849-53-55-65	14
Olcott, H. S.—Treatise on Sorgho and Imphee, the Chinese and African Sugar Canes, Moore, 1857	1
Our Farm of Four Acres, and the Money we made by it. New York, 1865	1
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Patzig, G. C.—Der Praktische Œconomie—Verwalter. Leipzig, 1867	1
Pedder, James—Farmer's Land-Measurer, or Pocket Companion. Judd, 1854	1
Petzholdt, Alex.—Lectures to Farmers on Agricultural Chemistry. New York, 1846	1
Pierre, J. G.—Chimie Agricole. Agriculture dans ses Rapports Avec la Chimie. Paris, 1863	1
Quincy, J.—The Soiling of Cattle, as illustrated by experience, with memoir. Boston, 1868	1
Reports on the Disastrous Effects of the Destruction of Trees in Wisconsin. Lapham, Knapp, Crocker. Atwood, 1867	1
Reports of Commissioner of General Land Office for 1867. Washington, 1867	1
Reports—See "Commissioner," "Iowa," "Michigan," "Missouri," "Ohio," "Patent Office."	
Riley, C. V.—First Annual Report of, in Missouri Agricultural Report for 1868	
Ronna, A.—Les Industries Agricoles. 75 Gravures. Paris, 1869	1
Roosevelt, R. B.—Five Acres too Much. The attractions of the Country. Profit and loss in amateur Farming, &c. Harper, 1859	1
Russell, Robert—North America: its Agriculture and Climate. Edinburgh, 1857	1
Schultz, Fleeth, C.—Der rationelle Ackerbau, die Ergebnise der Naturforschung. Berlin, 1856	1
Solly, Edward—Rural Chemistry: introduction to the study of the science as related to Agriculture. Philadelphia, 1852	1
Stephens H.—Book of the Farm: with notes and remarks by John S. Skinner. Moore, 1857	2
Stewart, F. L.—Sorghum and its Products. Lippincott, 1867	1
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" " Young Farmer's Manual. Manipulations, laying out, buildings, tools, &c. Woodward, 1870	2
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Tull, J.—Horse-Hoeing Husbandry: treatise on the principles of vegetation. Introduction by Wm. Cobbett. London, 1829	1
Turner, J. A.—Cotton Planters' Manual: compilation of facts on culture, natural history, analysis, &c. Saxton, 1857	1
Ville, G.—Les Engrais chimiques. Entretiens donnes à Vincennes, 1869	1
Waring G. E.—Draining for Profit and Draining for Health. Illustrated. Judd, 1867	1
Wheeler, J. T.—Madras versus America. Hand-book to cotton cultivation. New York, 1866	1
Wilson, J. M.—Farmers' Dictionary; or, Cyclopædia of Agriculture. Edinburgh, 1868	2
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" " Architecture and Rural Art. No. II. Suburban and Country Houses. Woodward, 1868	1
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Daubeny, C.—Lectures on Roman Husbandry. The system of Agriculture, treatment of animals, and horticulture. Behn, 1857	1
DuBreuil—The Scientific and Profitable Culture of Fruit Trees. Adapted for English cultivators, by W. Warble. London, 1862	1
Farmer's Magazine: May, 1834, to December, 1867. London, 1834-67	67
Farmer's Highland and Agricultural Society of Scotland, Transactions of, July, 1843, to March, 1865. Blackwood, 1845-65	11
Journal of Agriculture. July, 1845, to April, 1866. London	12
McCombie, W.—Cattle and Cattle Breeders. Revised. London, 1869	1
Morton, J. C.—A Cyclopedia of Agriculture: practical and scientific: the theory, art and business of farming practically treated. Blackie, 1855-62	

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Allen, J. Fisk—Practical Treatise on the Culture and Treatment of the Grapevine. Moore, 1858	1
American Horticultural Annual. Illustrated. Judd, 1868	1
American Rose Culturist: practical treatise on propagation, cultivation and management of the Rose. Saxton	1
Baker, C. R.—Practical and Scientific Fruit Culture. Lee, 1866	1
Beecher, H. W.—Plain and Pleasant Talk about Fruits, Flowers and Farming. New York, 1859	1
Breck, Joseph—New Book of Flowers. Judd, 1866	1
" " The Flower Garden. Judd, 1865	1
Burr, T.—Field and Garden Vegetables of America. with description of 1,100 species and varieties. Boston, 1865	1
Chorlton, W.—American Grape-grower's Guide: practical treatise on cultivation of the Grapevine. Judd, 1852	1
Clarke, C. C.—Adam the Gardener. Boston, 1843	1
Cobbett, Wm.—American Gardener: treatise on gardens and green-houses. Saxton, 1819	1
Cobbett, Wm.—The Woodlands: planting, care, uses, and cutting of forest trees. London, 1825	1
Cole, S. W. American Fruit Book: with description of best varieties of fruit. Boston, 1849	1
Cope, F. J. See "Grape Question."	
Downing, A. J. Country Residences: with notices and principles of the art of Rural Architecture. Putnam, 1850	1
" " Fruits and Fruit Trees of America. Revised and corrected by Chas. Downing. Wiley, 1867	1
" " Second revision, with large additions. Wiley, 1869	1
" " Cottage Residences and Cottage Grounds: with many designs. Wiley, 1868	1
" " See "Loudon Mrs."	
" " Rural Essays: Horticulture and Landscape Gardening. Edited by S. W. Curtis, with memoir. New York, 1860	1
Eastwood, B. Complete Manual for Cultivation of the Cranberry, with description of best varieties. Judd, 1866	1
Elizabeth, Charlotte. Floral Biography; or, Chapters on Flowers. New York, 1840	1
" " The Flower Garden; or, Chapters on Flowers. Sequel to Floral Biography. New York, 1840	1
Elliott, F. R. Western Fruit Book; or, American Fruit Grower's Guide for the Orchard and Fruit Garden. Judd, 1859	1
" " Popular Deciduous and Evergreen Shrubs, for planting in Parks, Gardens and Cemeteries. Woodward, 1868	1
Field, T. W. Pear Culture. Manual for the propagation, planting and management of the Pear Tree. Moore, 1859	1
Flagg, W. J. Three Seasons in European Vineyards: vine-culture, wine-making and wine-drinking. Harper, 1869	1
Forbes, J. Hortus Woburnensis. Catalogue of 6,000 plants cultivated at Woburn Abbey. London, 1833	1
Fuller, A. S. Grape Culturist: treatise on the cultivation of the native Grape. Judd, 1867	1
Grape Question, Both Sides of: by Wm. Saunders, F. J. Cope, and J. M. McMinn. Saxton, 1860	1
Harrison. See "Horticultural Register."	
Henderson, P. Gardening for Profit. Judd, 1867	1
Hooper, E. J. Western Fruit Book. Moore, 1857	1
Hoopes, J. Book of Evergreens: practical treatise on the Coniferas. Illustrated. Judd, 1868	1
Horticultural Register. Edited by Joseph Paxton, Wm. Harrison, and James Main. London, 1831-36	5
Humphreys, H. N. River Gardens. London, 1857	1
Husmann, G. Cultivation of the American Grape, and the manufacture of American wines. Woodward, 1868	1
Johnson, G. W. Cottage Gardener. London, 1849-59	22
Kemp, E. How to lay out a Garden, with numerous plans, sections, and sketches. Wiley, 1860	1
Leuchars, R. B. Practical Treatise on Hot-houses. Judd, 1850	1
Lindley, John. Theory of Horticulture, with notes by A. J. Downing. Wiley, 1852	1
Loudon, J. C. Gardener's Magazine, and Register of Rural and Domestic Improvement. Longman, 1826-40	16
" " Landscape Gardening and Architecture of Repton. Notes. Illustrated. Longman, 1840	1
" " Villa Gardener. Illustrated by numerous engravings. Edited by Mrs. Loudon. London, 1850	1
" " The Horticulturist; or, the Culture and Management of the Kitchen, Fruit, and Forcing Garden. Bohn, 1860	1
" Mrs. Gardening for Ladies, and Companion to the Flower Garden. Edited by A. J. Downing. Wiley, 1853	1

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McDonald, Alexander. Complete Dictionary of Practical Gardening. London, 1807..	2
McMahon, Bernard. American Gardener's Calendar. Eleventh edition. Revised by J. Jay Smith. Lippincott, 1857	1
McIntosh, Charles. Book of the Garden. Vol. 1, Structural; Vol. 2, Cultural. Blackwood, 1853-5	2
McMinn, J. M. See "Grape Question."	
Mead, P. B. Elementary Treatise on American Grape Culture and Wine Making. Harper, 1867	1
Meehan, T. American Hand-book of Ornamental Trees. Lippincott, 1853	1
Mohr, F. The Grapevine; scientific treatise on its management. Translated from the German by Horticola. Judd, 1867	1
My Vineyard at Lakeview. By a Western Grape-grower. Judd, 1866	1
Pardee, R. G. Complete Manual for the Cultivation of the Strawberry, with description of best varieties. Moore, 1858	1
Parsons, S. B. The Rose; its history, poetry, culture, and classification. Wiley, 1856	1
Paxton, Joseph. See "Horticultural Register."	
Phin, John. Open Air Grape Culture: practical treatise on the culture of the vine, with Thomery system of culture. Sheldon, 1867	1
Quinn, P. T. Pear Culture for Profit. New York, 1869	1
Randolph, C. J. Parlor Gardener. Translated from the French. Boston, 1861	1
Redding, C. History and Description of Modern Wines. Third edition. Bohn, 1851	1
Rivers, Thomas. Miniature Fruit Garden; or, the Culture of Pyramidal and Bush Fruit Trees. Judd, 1866	1
Robinson, W. Parks, Promenades and Gardens of Paris. 400 illustrations. Murray, 1869	1
Saunders, Wm. See "Grape Question."	
Schenck, P. A. Gardener's Text-Book, with directions upon the formation and management of the Kitchen Garden, &c. Judd, 1851	1
Stewart, Sir H. Planter's Guide. Essay on the best method of giving effect to Wood by transplanting. Blackwood, 1848	1
Strong, W. C. Culture of the Grape. Boston, 1866	1
Thomas, J. J. Fruit Culturist; adapted to Climate of Northern States, with directions for management of the Orchard. New York, 1846	1
Transactions Illinois State Horticultural Society for 1863-4-5-6-7-8. Alton and Chicago, 1864-9	6
Warder, J. A. American Pomology. Apples. 290 illustrations. Judd, 1867	1
" " Hedges and Evergreens. Complete Manual for the United States. Moore, 1858	1
Wood, J. G. Our Garden Friends and Foes. Routledge, 1864	1
Woodward, G. E. & F. W. Woodward's Graperies and Horticultural Buildings. Woodward, 1865	1
ANIMAL HUSBANDRY:	
Allen, L. F. American Cattle; their History, Breeding, and Management. New York, 1868	1
" R. L. History and Description of the Horse, Mule, Cattle, Sheep, Swine, Poultry, and Farm Dogs. Judd, 1847	1
Armatage, Geo. The Horse: how to Feed Him, avoid Disease, and save Money. London, 1868	1
Bement, C. N. Rabbit Fancier. Treatise on Breeding, Rearing, Management, &c., of Rabbits. Judd, 1855	1
" " American Poulterer's Companion. A practical Treatise on Breeding, Rearing, and general Management. Illustrated. Harper, 1867	1
Book of Home Pets. How to Rear and Manage Birds, Rabbits, Bees, Ponies, &c. London	1
Brandt, Louis. Infallible Guide to discover the Age of Horses. New York, 1867	1
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AGRICULTURAL LECTURES AND DISCUSSIONS.

The Agricultural Lectures and Discussions for 1870, instead of being held at Champaign during two weeks, as in 1869, were this year held at Champaign, Centralia and Rockford, and confined to one week at each place. By this change, the northern, central and southern parts of the State were made more acquainted with, and interested in, the education of the farmer, and the officers and faculty of the University brought in contact with the masses of the people. There is no doubt but both were benefited—both still farther convinced of the important part that industrial education has yet to perform in the work of the world, and that each came to a better understanding of one another, and prepared to co-operate for the common good.

Some omission of valuable matter has been necessary, in order to bring the report within the usual bounds, which will account for the absence of some things which, to a part of our readers, would be of special interest.

Office Corresponding Secretary, Board of Trustees,
Illinois Industrial University, *Champaign, Dec.* 24, 1869.

The Second Annual Course of Agricultural Lectures and Discussions, instituted by the Illinois Industrial University, will be held at the University, in Champaign, commencing Monday, January 10, 1870, and continue during five days of that week, with three sessions in each day.

This is intended to be an annual gathering of the farmers of the State, and of their sons and daughters, for the purpose of discussing the best methods of agriculture; and it is earnestly hoped that all who desire to improve our tillage, our crops and our live stock, will be present and lend a helping hand.

No charge is made for admission. The University provides a hall, properly warmed and lighted, and pays the expenses of the gentlemen who have kindly consented to open the discussions.

Each lecture, essay or "talk," will be followed by a discussion on the same subject, in which all are invited to participate.

Dr. John A. Warder, author of American Pomology, will also lecture daily from 4 to 5 P. M., on the subject of Fruit Culture, to the students. These lectures will be open to the public, and well worth the attendance of all farmers.

Good boarding places can be had convenient, and at reasonable rates.

Railroads will be solicited to return persons in attendance, at reduced rates.

J. M. GREGORY, *Regent.*

W. C. FLAGG, *Corresponding Secretary.*

PROGRAMME.

MONDAY, JANUARY 10:

Afternoon, 4 *o'clock*—Dr. Warder's Introductory Lecture.

Evening, 7 *o'clock*—Entomology, Dr. H. Shimer.

TUESDAY JANUARY 11:

Morning, 9 *o'clock*—Breeds of Cattle.

Afternoon, 2 *o'clock*—Feeding of Cattle,

Evening, 7 *o'clock*—Dairy Farming.

WEDNESDAY, JANUARY 12:

Morning, 9 *o'clock*—Veterinary Science. Dr. H. J. Detmers, of Quincy.

Afternoon, 2 *o'clock*—Pleuro-Pneumona. " " "

Evening, 7 *o'clock*—Rural Literature. W. C. Flagg.

THURSDAY, JANUARY 13:

Morning, 9 *o'clock*—Drainage. Prof. S. W. Shattuck, of the University.

Afternoon, 2 *o'clock*—Manures. D. Gore, of Carlinville.

Evening, 7 *o'clock*—Ornamental Grounds. Dr. J. M. Gregory.

FRIDAY, JANUARY 14:

Morning, 9 *o'clock*—Rural Economy.

Afternoon, 2 *o'clock*—Laws of Highways and Inclosures. Judge J. O. Cunningham.

Evening, 7 *o'clock*—Rural Architecture. John M. Van Osdel, of Chicago.

A similar course will be held at Centralia, January 24, 25, 26 and 27, 1870, the citizens of that place having appointed a committee to co-operate with the Faculty of the Industrial University, and agreed to furnish a hall for the use of the Convention. The following gentlemen have kindly consented to aid us in opening the discussions upon the subjects named:

MONDAY, JANUARY 24.—*Evening*, 7 *o'clock*—Introductory Address: Rural Adornment. Dr. J. M. Gregory.

TUESDAY, JANUARY 25.—*Morning*, 9 *o'clock*—Agricultural Chemistry; Prof. A. P. S. Stuart, of the Industrial University. *Afternoon*, 2 *o'clock*—Soils of Southern Illinois; H. C. Freeman, of the State Geological Survey. *Evening*, 7 *o'clock*—Insects Injurious to Fruit; C. V. Riley, State Entomologist of Missouri.

WEDNESDAY, JANUARY 26.—*Morning*, 9 *o'clock*—Agricultural Book-keeping; by Prof. Geo. Snyder, of the Industrial University. *Afternoon*, 2 *o'clock*—Supply and Demand of Fruits; Mr. J. S. Taylor, of Centralia. *Evening*, 7 *o'clock*—Pear Culture; A. M. Brown, of Villa Ridge.

THURSDAY, JANUARY 26.—*Morning*, 9 *o'clock*—Drainage; Prof. S. W. Shattuck, of the Industrial University. *Afternoon*, 2 *o'clock*—Dairying; C. W. Murtfeldt, of the "Rural World." *Evening*, 7 *o'clock*—Pruning; Dr. E. S. Hull, State Horticulturist.

A similar course will be held at Rockford, February 21, 22, 23 and 24, embracing the following topics:

MONDAY, FEBRUARY 21.—*Evening*, 7 *o'clock*—Introductory; Dr. J. M. Gregory, Hon. Anson S. Miller.

TUESDAY, FEBRUARY 22.—*Morning*—Soils of Northern Illinois; J. Shaw, Mt. Carroll, of the State Geological Survey. *Afternoon*—Agricultural Chemistry; Prof. A. P. S. Stuart, of the Industrial University. *Evening*—Timber Planting; Samuel Edwards, LaMoille, Bureau county.

WEDNESDAY, FEBRUARY 23.—*Morning*—Manures, Judge L. W. Lawrence, Belvidere, Boone county. *Afternoon*—Dairying; Sylvanus Wilcox, Elgin. *Evening*—Rural Economy; Hon. Elmer Baldwin.

THURSDAY, FEBRUARY 24.—*Morning*—Drainage; Prof. S. W. Shattuck, of the Industrial University. *Afternoon*—Sheep Raising; Graham Lee, of the Illinois State Agricultural Society. *Evening*—The Fence Law; O. B. Galusha.

The gentlemen named have been invited to open the discussion on the several topics, and it is hoped and believed, will generally respond.

LECTURES AND DISCUSSIONS.

In accordance with the circular, the first of the Farmer's Institutes convened at Champaign, January 10th, 1870. Besides the students of the University, who attended in considerable numbers, the following persons, besides others whose names were not handed in, were in attendance:

F. F. Adams, Urbana; J. K. Barber, Rantoul; J. W. Boatman, Champaign; Eli Bogardus, Belvidere; J. J. Bogardus, Champaign; A. M. Brown, Villa Ridge; B. Frank Burr, Philo; Jackson Burt, Urbana; E. E. Chester, Champaign; J. O. Cunningham, Urbana; H. J. Detmers, Quincy; H. J. Dunlap, Champaign; M. L. Dunlap, Champaign; M. M. Dunlap, Champaign; Geo. L. Eaton, Homer; Charles Ells, Champaign; E. Ells, Champaign; C. M. Fillmore, Champaign; H. A. Francisco, Champaign; W. N. Goodwin, Urbana; D. Gore, Carlinville; S. Houston, Champaign; A. O. Howell, Champaign; A. Jewell, Champaign; J. Lawhead, Champaign; J. M. Lewis, Urbana; Manly Miles, Lansing, Mich.; H. Michener, Homer; Charles Miner, Champaign; John Murray, Manchester; John R. Parks, Tolono; Jonathan Periam, Chatsworth; W. H. Pierce, Champaign; G. M. Rice, Champaign; George S. Rice, Champaign; James R. Scott, Champaign; John M. VanOsdel, Chicago; A. Wallace, Canfield, Ohio; A. D. Walker, Champaign; John A. Warder, Cincinnati, Ohio; G. N. White, Champaign; George Whitney, Winooski, Vermont; J. S. Wright, Champaign; John M. Yates, Southampton; Abraham Yeagel, Homer; James Yeagel, Homer.

Judge A. M. Brown, of Villa Ridge, was elected Chairman of the Convention.

INSECTS.

Dr. Henry Shimer, of Mt. Carroll, read an essay on the study of Entomology, after which the subject was discussed.

Dr. Gregory, Regent of the University, said the practical importance of Entomology consists in the necessity of fighting injurious insects. Insects are probably on the increase and are certainly doing an immense amount of mischief, particularly in the south part of the State. In his boyhood, he had known the agriculture of New York changed by the devastation of the midge or weevil. Now, the weevil having died out, wheat can be again grown where it was previous to the prevalence of the midge.

He thought the American Entomologist should be in every farmer's home; that general inteligence on this important subject might become more diffused.

Dr. Shimer called attention to the fact that, in his part of the State, the chinch bug had been swept away by a disease. He indorsed the importance of sustaining the American Entomologist.

Dr. Miles considered the subject important. It is difficult to secure the advantages of science in practical affairs; hence, agricultural colleges. But, meanwhile, we want facts, and the immediately best thing is the wide circulation of such a paper as the American Entomologist. It corrects nomenclature. The midge is frequently called the weevil, and dealers in grain have hence been deterred from buying grain from the midge districts.

Dr. Warder said, I am not a scientific, but a practical Entomologist. Still, I do not call caterpillars, worms, nor beetles, bugs. Read the Practical Entomologist.

In one or two respects, insects are valuable aids to mankind. Dr. Kirtland, of Cleveland, introduced the Ligurian Bees, and found that they brought the pollen of the Sheperdia, from the farm of Ex-Governor Wood, four miles distant, and fertilized his own heretofore barren trees of the same species.

Many plants are so constituted that they do dot fertilize themselves even with perfect flowers. Insects carry pollen from one flower to another, and in entering the second, impregnate it with pollen from the first.

Bees are said to visit only one class of flowers on the same day. If they begin with the turnip, for instance, they will stick to the order cruciferæ during the day.

Children are easily interested in the study of Entomology; and I saw at Elizabethtown, Kentucky, once, a child of only three or four, who already showed a strong predilection for this branch of study. He was a natural Naturalist.

Dr. GREGORY—Natural history is generally not made interesting in our schools, because the *things* themselves are not studied. The study may be made as valuable for culture as any other study.

TUESDAY, *Jan.* 11, 1870.

Dr. MANLY MILES, Professor of Practical Agriculture in the University of Michigan, gave a very interesting address at 9 A. M., on

BREEDS OF CATTLE,

Of which the following is an imperfect abstract:

It is impossible, of course, to give a full or satisfactory discussion of this topic, within the limits of a single lecture.

Domestic animals, in anything like a complete system of husbandry, are of the greatest importance. Where the greatest attention is paid to their improvement, we find the best results in the practice of agriculture.

Our American Agriculture is not yet old enough to furnish the least illustration of their importance. On new and cheap lands, grain crops are grown, and we have also to look to paying our way as we go. Yet it is certain that grain may be grown cheapest, where cattle are made the most prominent.

This may be illustrated by English experience. When the corn laws were repealed, and grain was imported, farmers were forced into growing meat. The best system practiced, was the result. Prominent attention was given to the growing of cattle foods. Hence, the turnip crop. "Give us a good turnip crop and we are sure of every other in the rotation," is a saying that expresses its value in British husbandry. But after a series of years of this kind of husbandry, it was found that although a smaller area was sown in grain, that the aggregate product was greater than ever.

But in new countries, special products as grain are grown and cattle are neglected. Farmers rush from one crop to another, and suffer great loss in frequent changes. A friend of mine, some years ago, had a few good cattle. But cattle were low; so he sold out, and in a year and a half had 1,300 or 1,400 sheep, course and fine wooled, on his hands. Then sheep came down, and he sold out his last sheep at a dollar a head, and when last heard from, was buying cows for dairying, at 4 and 4½ cents per lb., whereas he had sold his cattle at 2½. All this involved great loss, such as no merchant or other business man could stand.

Continuous grain growing impoverishes the soil, weeds increase, and half crops are grown. Statistics show a great falling off in the average yield per acre, in this country. Corn on the best farms produces 50 to 75 bushels, but the average is 20 to 25 bushels an acre. The average yield of wheat in the United States is 12 to 15 bushels to the acre. In England, it is nearly 30 bushels.

Increased production of meat in cattle, called attention to breeds. There were several pure breeds in England, such as Devon, Galloway, Short Horn, etc. They were pure breeds, but lacked early maturity, and hence attempts to improve them, giving rise to distinct breeds, each having characteristics adapting them to particular localities and for particular purposes.

Our domestic animals have what Damin calls, power of variation. I do not agree entirely with Damin's theory. There seems to be a persistency of type, combined with a flexibility of organization. The variety of breeds now established, is the result partly of the character of the original stock, partly from the influence of locality, but more particularly to the standard adopted by those concerned in their improvement.

It is important to acknowledge in the start, that our breeds are not the result of accident; and this leads me to enumerate some of the qualifications which a good breeder must possess to attain the highest success in the art.

1. Definite ideas as to the kind of animal he wishes to produce. With many there is a lack of analytical power in determining good points. A man judges as a whole instead of in detail.

2. Persistence and perseverance in adhering to the plan marked out. A change of standard will result in failure.

3. A correct and educated eye, capable of detecting slight variations in form and quality. One must keep the balance adjusted in breeding, and be able to correct slight variations. Anatomy and physiology should be understood, though not technically.

4. The breeder should be free from prejudice and bias. The ownership of an animal should not blind him to its defects.

5. He should have good judgment, and be apt in tracing causes and effects. Many have failed in this respect.

6. He should be cautious, and not prone to jump at conclusions from insufficient data.

7. He should be an *Artist*, capable of forming an ideal model of perfection, and then of approximating to the conception already formed by moulding the plastic organization of the animal, so as to give it expression. Bakewell, Collins, Booth, Bates, Webb and Quartley, were men of this class. Breeding in fact is a fine art, and one of the most interesting and fascinating of pursuits.

Our native cattle are of diverse origin and have serious defects, the result of their mixed origin, and of a hap-hazard mode of breeding. One of their most marked types is the Texas cattle, originated from the Spanish cattle, and still somewhat resembling the cattle found around the Mediterranean.

Our native varieties also have little in common, and vary a great deal among themselves. Hence it is desirable to improve our breeds.

In agriculture generally we find an advantage in the division of labor and so in breeding. It is desirable to breed for milk and for beef. It is hardly possible to combine the two with the best success. The native animals have no special qualities, or definite character.

The advantage of the improved breeds is, first, that they have a definite character from a long course of breeding. The quickest way to get this fixedness, is to get established breeds. The attempts to make breeds in this country have generally failed. Colonel Jacques, although a cattle man, failed in the attempt. There are too great a variety of elements to work with, and it is a saving of time to begin with the established breeds. In the second place, we can select according to our needs and the locality. Different places need different breeds. At one of our Michigan fairs, farmers from Northern Michigan were inquiring "which is the best breed of sheep?" I replied, "you might as well ask which is the best turnip or potato. I don't know your farm or mode of farming. Each breed is adapted to a particular purpose, and you must choose accordingly."

Mistakes will occur from the diverse modes of treating the same breed. Mistakes are made in condemning small sized breeds, as the Devon, Galloway, etc. These are adapted to peculiar places and purposes. The Short Horn is admirably adapted to certain ranges.

In selecting animals, look first to purity of blood. The pedigree is the recorded evidence of breeding, but does not necessarily show purity of blood. The value of a pedigree depends on its completeness, and the character of the ancestors. Two animals of undoubted purity of blood would differ in value, if their ancestors were not of equal merit. "Like produces like," not precisely, but like the various ancestors as a whole. Ancestors of unequal merit result in unequal offspring.

Herd books are not always reliable. There are the dangers of accident and of imperfect recollection. The breeder should also be familiar with the history of the breed he adopts, and with the origin and peculiarities of certain families. Certain strains will not sell among breeders.

These general observations apply to all the breeds.

There was great diversity of breeds in Great Britain originally, and a uniformity in localities, whence we have: 1, Long Horns; 2, Middle Horns; 3, Short Horns; 4, No Horns. The Long Horns were some like the Texas cattle. The Devon and Hereford were Middle Horns.

LONG HORNS.

The Long Horns are connected with the history of breeding through Bakewell, before whose time little attention was given to the systematic breeding of cattle. Robert Bakewell of Dishley, County Leicester, was born 1725, and commenced devoting himself to the improvement of stock in 1755. The Long Horn Cattle, and Leicester Sheep, were the breeds to which he turned his attention, and from which he gained a reputation in breeding.

His success was so marked that a complete account of his system of breeding would be valuable to breeders. But he was a speculator and a money maker, and kept his own counsel, and we have but a meagre record of his principles of breeding. His great object appears to have been quality. "All is useless that is not beef," was one of his sayings. He endeavored to improve the best parts, and kept joints of meat preserved in his house, so that he might always see what he had attained and what he lacked. He was careless of the size of animals, which is a very taking point with most persons.

The Long Horns were peculiar to the west of England and portions of Ireland. Their color was black and brown, with white, particularly on the back. They had long lopped horns, which we occasionally meet the type of in this country, abundant hair, long bodies, flat sides, heavy shoulders and light hind quarters. They were slow feeders and slow to mature. Their flesh was dark and their fat yellow. Bakewell made the neck thin, the legs shorter, the shoulder better, the ribs arched, the loin broader, the meat on it thicker, and the hind quarters longer. The color of the meat and fat he did not correct. Although the breed was so popular in his time, it has since declined, and was soon replaced by the

SHORT HORNS.

In the northeast of England were found early in the last century a variety of cattle quite distinct from the Long Horns of the western side. They had thinner skins, shorter hair, and shorter horns. In the fens of Lincolnshire they were large and coarse, with a dingy skin and short, blunt horns. To the north, in the valley of the Tees, they were less in size, though tall and coarse, their color varied, and their horns of medium length. Their origin is in doubt, but it is supposed they came from importations from Holland, etc. It had been improved by Mr. Millbank and others, before the time of Bakewell. The breed was brought into notice by Charles Collins and his brother Robert, who commenced their improvements in 1770. In 1799 Collins exhibited the Durham Ox, weighing 3,024 pounds, and a white heifer afterwards fed by him weighed 2,300 pounds. She was small, but had exceeding compactness and ripeness of points.

Many advantages have been gained since. Early maturity is one. This breed is the best understood and the most fashionable. Every one knows them. There is none I admire so much. They are large, and require abundance of food and more protection than some others. They are sold at fabulous prices. Five thousand dollars are not an uncommon price for some animals.

DEVONS.

The county of Devon lies south of the British Channel, in the southwest of England. Its cattle, classed with the breeds of the higher country, are intermediate in size between the Highland on the one hand, and the Short Horns and Herefords on the other. The old Devon ox was originally not a symmetrical animal. He had a long neck, narrow chest, flat sides and long limbs, and required better feed than some of the smaller Highland breeds. Breeders in Devon did not themselves appreciate them until there was a demand from other localities. They have high value as a grazing animal. They are very active, and can travel eight miles an hour. They are classed as North and South Devons, but I speak only of the North Devons, which are the only ones that have been introduced into this country. Vancouver, in his report on the farming of Devonshire in 1808, mentions a decline in the quality of Devons, from the best having been purchased to go to other countries. But Mr. Quartly of Molland, commenced their improvement by purchasing the best cows and breeding from them. In 1834, at the meeting at Exeter, he took 8 out of 10 prizes; and in 1835 he entered in the 12 classes, and swept the purses in each. In 1850, at the meeting of the Royal Agricultural Society at Exeter, 7 prizes were awarded to the Quartly stock, leaving but 2 for the remaining 64 entries.

Capt. T. T. Davy, a noted breeder, and his grandfather, a breeder 130 years ago, originated the Devon Herd-Book, and published three volumes. It is now edited by John Tanner Davy.

In the first three volumes of the Herd-Book, 29 prize bulls are described, 27 of which are descended from Forester, (Quartly). Of 34 prize cows, 29 are descended from Cow Curly, (92). Note here the persistent in and in breeding, where good points were found. In and in breeding will not improve or deteriorate stock *per se*, but it fixes character. You can mould an animal, taking him as a calf, but not by breeding. In and in breeding fixes not only the desirable, but the undesirable qualities. The breeder may safely breed in and in after all bad qualities are eliminated, but he must develop by food, exercise, treatment, etc.

The Devons are adapted to localities, requiring a wide range of pasturage. They are the standard of excellence in beef. A Short-Horn breeder, at the Royal Agricultural Society's meeting, at Chester, in 1858, remarked of them: "I find we short-horn men have yet much to learn of the true formation of animals; their beautiful contour and extreme quality of flesh, surprise me."

The Devons are a breed for beef and work. The oxen are very active. The trot is a frequent gait with them in Devonshire. They are nearly equal to horses on the farm. Like the Short-Horns, they are not deep milkers.

HEREFORDS.

The Herefords have been introduced, but are not so well patronized as they deserve. They are not so large as Short-Horns, but better for work. They are somewhat like the Devon. The Hereford and Short-Horn are most alike in being beef animals. At the Smithfield Club, the Herefords excelled as oxen and steers, the Short-Horns, as fat cows and heifers.

The following were the awards of prizes at the Smithfield Club, from 1798 to 1807, and from 1815 to 1852:

Herefords,	207	prizes,	amounting to	£2,989
Short-Horns,	174	"	"	2,532
Devons,	48	"	"	663
Scotch,	43	"	"	500
Sussex,	12	"	"	214
Long-Horns,	10	"	"	153
Cross Grades,	14	"	"	209

But on abundant pastures, the Herefords will not approach the Short-Horns.

GALLOWAYS.

The Galloways have been introduced into Canada. They are exceedingly hardy, and have the best quality of flesh. They get a living where other breeds would starve. They are about the size of the Hereford. They have thick hides, and long hair. We have them at the Michigan Agricultural College.

AYRSHIRES.

Perhaps no breed will give as much milk, for the same amount of food, as the Ayrshire. It is of good average quality. A cow I had gave 44 pounds a day, in July. A New York cow is said to have given 63 to 84 pounds a day during July and August.

A serious objection heretofore made to the Ayrshire is, that you must ultimately sell them for beef. But they are now improved—perhaps too much so—in this respect, and fatten well when dry. They are equal in quality to the Devon.

I must omit the discussion of the Alderney and other cattle, for lack of time.

The great point with all these breeds is the cost of production of beef. To answer this, we need further experiments in that direction.

It is impossible, as yet, to stock a farm with pure bloods. Get, therefore, the best grades. Have a definite idea of what you want. Take no inferior animals. Have a pure blood male, and work to a given point. Keep your bull a number of years, *if he has no defects;* and hence, get the very best bull you can.

DISCUSSION.

Pickrell, of Harristown—I agree in the main with the lecturer. The subject is comprehensive, and the treatment of the different points necessarily condensed, so that I may not understand all the qualifications he would make. I agree with him as to the necessity of purity of blood. And wherever we have plenty to eat, as in Central Illinois, we want Short-Horns.

I think our breeding is much improved in the last fifty years. We change form and habit by feeding, climate, etc. It is some times thrown up to me that we keep our cattle too fat. I think it essential to keep breeding cattle fat, because it tends to make fatness a second nature. I believe in keeping no cows that are not good milkers; but I want animals that will grow fast, and fatten readily. The quick penny is the object. Selling a bullock the third year is the most profitable, as we can make a given weight of beef in the first and second years more cheaply than ever after. The quality of beef improves after the third year, but it wont pay.

I am afraid of the continuous use of one bull. Few men have succeeded in that way. Where there has been a wide cross, a cross upon the bull's own offspring might answer. In pure breeding, we must not get too far apart.

The first cross of grade animals is universally improved if the male is at all good. The greatest change is made in the first cross. But the offspring may breed back on the wrong side.

MURTFLDT, of St. Louis—The male will fix his own type on the first cross indelibly. But men suppose that a male grade so produced, is better than he really is, and by using him, lose all the benefits of the cross.

As regards keeping breeding animals fat, I noticed that although John Wentworth exhibited a mature bull in very low condition, yet J. N. Brown, one of our leading breeders, exchanged with him and used his bull in spite of its lack of flesh.

MILES, of Michigan—An animal, with insufficient food, matures slowly. If he can work up and assimilate food rapidly, early maturity is insured.

In and in breeding has failed from errors in judgment simply. I would breed in and in because the male comes nearest my ideal. If I find a defect, I look back in his pedigree, to ascertain whether the defect is individual or not. If it is, I get a male from the same blood.

I would impress what Mr. Murtfeldt says against using grade bulls. I have known animals not so good as the grade stock, to be the result.

PARKS, of Tolono—I have seen a good many examples of grade breeding, and think breeders mistake in supposing that the characteristics of animals are divided according to the amount of blood. It is only the prominent points, or main characteristics, that seem to be so divided.

WHITNEY, of Vermont—Facts frequently contradict theories. In Vermont, in horse-breeding, it has been found specially necessary to look after the peculiarities of the mares. Some always breed like the horse, and are specially desirable.

Mares used for breeding, are bred *first* to the best horse that is within reach, because this is thought to fix the character of the subsequent offspring. Mares bred to jacks are thought to produce coarse colts afterwards.

PICKRELL—I think it a question of "sympathy." Dont believe in the theory of infusion of the blood of the male into the female through the embryo offspring.

MILES—I have no sympathy with the sympathetic theory. I can't explain the facts; but if called on for a theory, should say that it was done through the blood of the embryo entering the blood of the mother.

[NOTE.—Damin, "Variation of Animals and Plants under Domestication," vol. 1, p. 486, after noticing the frequently observed fact that the male animal affects the future offspring of the female, says: "Some physiologists have attempted to account for these remarkable results, from a first impregnation by the close attachment and freely intercommunicating blood-vessels between the modified embryo and the mother. But it is a most improbable hypothesis, that the mere blood of an individual should affect the reproductive organs of another, in such a manner as to modify the subsequent offspring. The analogy from the direct action of foreign pollen on the ovarium and seed-coats of the mother-plant, strongly supports the belief that the male element acts directly on the reproductive organs of the female, wonderful as is this action, and not through the intervention of the crossed embryo."—SEC.]

AFTERNOON SESSION—2 P. M.

Dr. MANLY MILES delivered the following Lecture on the

FEEDING OF STOCK.

The progress of science has been so great that much is expected of it in its application to the art of farming. But there is one great difficulty in the way of its direct application—the want of numerical determinations of values in science and agriculture. For instance, the blow of the hammer produces heat in the iron; but how much? The corn fed to animals is converted into meat; but how much? Manure produces an increase in the crop of corn; how much? The great problem in the scientific world is to reduce its facts to exact numerical data. In agriculture, the same exact determinations are to be made by rigid experiments before science can be applied to aid our progress.

Practical men have been led into error by adopting theories in science and applying them as guides in practice. For instance, the combustive theory of respiration of Liebig, which divided foods into combustive or carbonaceous and non-combustive or nitrogenous, is shown, by more modern researches, to be incorrect, yet it still appears in our agricultural papers.

Chemistry cannot be taken as a guide in the feeding of animals, except in the valuation of the manure produced. It explains the value of manures by analysis, and, in this direction, agricultural chemistry is of very great aid.

Farming is an empirical art, in which experiment and observation are the guide, and science is explanatory. With this explanation, or, as politicians would say, "platform of principles," we will proceed to consider some of the results of experiments having a practical value in the feeding of animals.

Our limited time, and the extent of the subject, which might embrace the entire range of farm economy, make it difficult for me to speak properly of all I would like to discuss. The topics embraced in the subject include:

1. Manures and the productiveness of the farm.
2. Rotation of crops.
3. Relative value of different articles of food.
4. Economy of different modes of preparing.
5. The influence of cattle feeding upon the production of grain.
6. The number and kind of stock that can be profitably kept under a system of mixed husbandry.
7. The management of animals, with reference to shelter and the arrangement of buildings, to secure economy of labor and feed.
8. Profit of feeding at different ages.

A discussion of the subject of feeding, without a consideration of these and other topics, would be imperfect and liable to lead to error.

The great defect of American husbandry is its want of system, so that each crop and interest may bear upon another. Special cultures and interests are more liable to loss from depressed markets, and to have their aggregate profits diminished, and the progress of the art as a whole is thereby retarded.

The system of feeding giving the greatest profit will depend upon the peculiarities of the farm and the surrounding circumstances of climate, soil, markets, value of land, cost of labor, and the value of the vegetable products to be consumed.

Our limits will not allow a full discussion of all these conditions. We will, therefore, consider the subject with reference to a system of mixed husbandry, as this, in the long run, will be found most profitable on an average American farm.

Our domestic animals have been compared to machines, converting food into meat and making manure. The simile is a good one, and, perhaps, will aid us in illustrating our subject.

There is a demand for food in animals:

1. To supply waste of tissue.
2. For the manufacture of special products, as meat, milk, wool, etc.

We feed animals with two leading objects in view:

1. The conversion of vegetable products into force, (in working animals), meat, milk, wool, etc.
2. The manufacture of manure from the refuse resulting from the first process.

High feeding is important, in gaining both these objects. The food that has been partially incorporated, it is well covered and left in the bowl from three to four hours. During this time the salt dissolves and loses its identity in the butter. After one or two actual weighings the quantity of salt can be determined by measure. Then the butter is worked for the last time; the little brine which again accumulates is poured off, and the butter is ready to pack away. The color of this brine will also indicate whether your butter has been thoroughly purged of the buttermilk.

COOPERAGE.

White oak and ash firkins of uniform size, free from worm-holes or sap in the staves, are best. They should be well soaked and scalded before using. This is best done by filling the firkin with good sweet hay, and then pouring over this boiling hot water, allowing the whole to stand forty-eight hours. A final scalding and scouring is then given, and the vessel is ready to receive the butter. The custom of buyers is to require two pounds of soakage with the tare on a hundred pound firkin of butter; hence, it is best to weigh the firkin before soaking, and plainly mark the weight on the bottom. The so-called Welsh-tubs are very desirable.

PACKING.

Sprinkle a handful of dairy salt evenly over the bottom of the firkin, then pack your butter in even layers. If the "churnings" are not large enough to form a good layer, then extend them only half across the firkin. As you proceed, rub a very little salt on the sides also, so that your butter will cleave therefrom when wanted for use. Color in butter is a great point. It should be *natural* and *uniform.* If, for some reason, there is a variation, such a churning should be kept for immediate sale or the table. A sufficient family supply should always be on hand, before any tub is attempted to be filled. None should be taken out either for the table or sale, and the firkin filled as soon as possible. Milk and cream *need air*, butter should be kept *from the air*, because, when exposed, it will rapidly deteriorate. A double cloth, with the addition of the open head, will form a sufficient covering while the firkin is being filled. When within half an inch of full, a clean white cloth, free from starch, and fitting neatly, should cover the butter, and upon this place as much salt as will allow the head of the firkin to fit in tightly, and head up at once. It should have been noticed above, perhaps, that butter keeps best when very tightly packed.

SALES.

The *very best* time to sell butter is in the latter part of autumn. Then it can be moved with safety any distance, from Maine to California, if necessary. Then families lay in their winter supply, and business, *generally*, is best, and the pocket-book plethoric. Then the quality of fresh butter rapidly deteriorates, etc. Reasons might be multipled, but I deem it unnecessary. Where contracts can be made to deliver weekly supplies of fresh butter, directly to consumers, that is of course desirable. Also, where a dairyman lives suffihas been partially incorporated, it is well covered and left in the bowl from three to four hours. During this time the salt dissolves and loses its identity in the butter. After one or two actual weighings the quantity of salt can be determined by measure. Then the butter is worked for the last time; the little brine which again accumulates is poured off, and the butter is ready to pack away. The color of this brine will also indicate whether your butter has been thoroughly purged of the buttermilk.

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DISCUSSION.

MILES—In the long run, I don't think dairying will be as profitable as mixed farming. In a New York discussion of permanent pastures, I noticed that the dairymen favored them, whilst the mixed farmers were against them. The dairymen wanted old pastures and grasses. But they did not keep any more cattle than in the wheat growing districts. Permanent pastures, mean inferior grasses, and these, inferior manures. Mixed husbandry gives us the largest quantity of manure.

WHITNEY—In the west, dairying is, probably, not best as a specialty. In Vermont, it is so, rather as a necessity. No State, proportionally, produces more or better butter and cheese. But making good butter is not so easy a matter. Cleanliness is indispensable. Washing butter, with us, is still a mooted question. Vermont is not adapted to a mixed husbandry, and the result is permanent pastures. Some have top-dressed these, with excellent results. Dairying has produced a large amount of manure for the ploughed lands, but at the expense of the permanent pastures.

MILES—Will the quantity of water drank increase the milk? I have heard it affirmed that the quantity of milk could be increased by salting the cows and making them thirsty.

DETMERS, of Quincy—In Hanover, cows are fed wetted food, distillery slops, etc., and a great yield of milk is the result. But the cows die in two or three years, of a complication of diseases, arising from the feed, the damp places in which they are kept, and the confinement.

Dr. GREGORY—I am glad to hear that dairying will pay, for I hope it will induce more of our farmers to go into it. We suffer in this region for the lack of good butter. I found a brother-in-law in Dutchess county, New York, sending milk to New York city, at three cents a quart, delivered at the railway station. It was considered remunerative at that price. There, unlike the lecturer, they milk the hind teats first and the fore teats afterwards, because they say the hind teats give the most milk.

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WHITNEY—Milking in the "fore and aft" style, is a good deal "in your eye." I prefer the diagonal style, but think that every man should be left to milk according to the dictates of his own conscience. [Great applause.]

——Is it best to put out salt for cattle to go to at will?

MURTFELDT—I think not. Experiments show no apparent advantage, except that salted cattle have the glossiest coats.

MILES—I prefer to salt a little and often, or else give it so that the cattle can go to it at will. Recent investigations show that salt is an article of food, or a proximate constituent of food. The soft glossy coat of salted animals proves its value.

WHITNEY—In former years, our people got large masses of rock salt, and placed under sheds or in the fields, for cattle to lick at will. In my own experience, I have found it best to salt twice a week, in small quantities. I have had cows and oxen that would not touch salt; but thought they did not thrive quite so well.

Adjourned.

WEDNESDAY MORNING, *Jan.* 12, 9 A. M.

In the absence of Judge Brown, Mr. Whitney was called to the Chair.

Dr. H. J. Detmers, Veterinary Surgeon, of Quincy, read a lecture upon

VETERINARY SCIENCE.

Mr. Regent, Ladies and Gentlemen:

This is the first time in my life that I am to speak, in English, before such a learned audience as I have the honor of seeing before me. As the English language is not my native tongue, and as it is but a little over four years since I commenced learning English, my pronunciation may not always be correct and my construction of the sentences may not always be grammatical, therefore, for errors of that kind, I beg you will excuse me.

I am called upon to lecture on Veterinary Science and Veterinary Surgery, and for this lecture will try to answer the four questions:

1. What is Veterinary Science?
2. Is it necessary for a farmer, who wants to advance in his profession, to study Veterinary Science?

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1. What is Veterinary Science?
2. Is it necessary for a farmer, who wants to advance in his profession, to study Veterinary Science?

3. What branches of Veterinary Science are for a farmer the most essential and should especially be studied?

4. In what method should Veterinary Science be taught in an Agricultural and Industrial University?

First. What is Veterinary Science? Those men who think that the knowledge of a few remedies against the common diseases of our domestic animals, especially horses, constitute Veterinary Science, that men who are perhaps able to treat a few common diseases of animals deserve the name of Veterinary Surgeons, are badly mistaken—and still this belief is most common and far spread. Nay, more: not long ago, in some veterinary schools, and yet now in some agricultural colleges, even in Europe, Veterinary Science is taught in such a superficial manner, that, apparently, no other aim is endeavored to be reached than to teach the students the symptoms of the diseases of our domestic animals and the remedies against them. We have to take it in a different light.

Veterinary Science makes us acquainted with the organization and the process of life of our domestic animals, instructs us how to treat them and keep them in a healthy condition, teaches us how to restore their health, when lost, and advises us how to improve, to breed, and to use them to our greatest advantage. This is is what we call "Veterinary Science."

It embraces a great many very important studies, which may be discriminated in general, special and auxiliary studies. The general or fundamental studies are: Anatomy, Physiology and General Pathology, General Surgery and General Therapeutics. Of them, Anatomy is the foundation of all; it makes us acquainted with all the different parts and organs of the animal organism, it describes the form, situation, size, number, connection, color, consistence, structure and texture of all the different parts and organs of the animal body. The anatomy of our domestic animals we call Zootomy. Further, we distinguish a Physiological and a Pathological Anatomy; the former describes the organs, when in a normal and healthy condition; the latter is, generally, treated of, together with Pathology, and describes the organs when in an abnormal and diseased state. After we have studied Anatomy, and learned the constitution of the animal organism, the study of Physiology hasto follow. Physiology of animals is called Zoophysiology; it teaches the functions of the different organs of the animal body, as well those of the organs as single ones as in their reciprocal action, or, in other words, it teaches us the animal economy and the process of life of our domestic animals, when in a normal and healthy condition. Among all branches of Veterinary Science, Physiology is one of the greatest interest and importance. Without having studied Anatomy and Physiology we cannot go any further. These studies are the foundation, the key to Pathology and Surgery, to Exterior and Hygieina, etc.; without knowing the organs of the animal body and the normal functions of the same, we can neither learn to keep an organism in a healthy condition, nor judge properly, by external marks, of the qualities of an animal, nor can we study the anomalies and abnormities in the functions of the organism (diseases).

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It embraces a great many very important studies, which may be discriminated in general, special and auxiliary studies. The general or fundamental studies are: Anatomy, Physiology and General Pathology, General Surgery and General Therapeutics. Of them, Anatomy is the foundation of all; it makes us acquainted with all the different parts and organs of the animal organism, it describes the form, situation, size, number, connection, color, consistence, structure and texture of all the different parts and organs of the animal body. The anatomy of our domestic animals we call Zootomy. Further, we distinguish a Physiological and a Pathological Anatomy; the former describes the organs, when in a normal and healthy condition; the latter is, generally, treated of, together with Pathology, and describes the organs when in an abnormal and diseased state. After we have studied Anatomy, and learned the constitution of the animal organism, the study of Physiology hasto follow. Physiology of animals is called Zoophysiology; it teaches the functions of the different organs of the animal body, as well those of the organs as single ones as in their reciprocal action, or, in other words, it teaches us the animal economy and the process of life of our domestic animals, when in a normal and healthy condition. Among all branches of Veterinary Science, Physiology is one of the greatest interest and importance. Without having studied Anatomy and Physiology we cannot go any further. These studies are the foundation, the key to Pathology and Surgery, to Exterior and Hygieina, etc.; without knowing the organs of the animal body and the normal functions of the same, we can neither learn to keep an organism in a healthy condition, nor judge properly, by external marks, of the qualities of an animal, nor can we study the anomalies and abnormities in the functions of the organism (diseases).

General Pathology and General Surgery are scarcely of less importance; the former makes us acquainted with the interruptions or disturbances of the normal functions of the organism, or with the irregular proceedings in the process of life, their causes and terminations. General Surgery treats the same subject, as far as those interruptions and irregular proceedings are external or require only a local treatment. General Therapeutics give the general rules of the art of healing. It is not advisable to separate these three branches—at least there is no just cause to separate General Pathology and General Surgery, especially as external and internal diseases are very often reciprocal to each other; so, for example, an external sore generally causes more or less fever, a typhoid fever frequently causes swelling of one or more legs, and thereby lameness, and so on. General Therapeutics bear so close a connection to General Pathology and General Surgery, that it is most natural to study these three branches together; a separation would cause loss of time and a great many useless repetitions.

The special studies embrace: Hygieina, Special Pathology, including Pathological Anatomy and Special Therapeutics, Special Surgery, including Therapeutics, Pharmacology, Obstetrics, Exterior and Principles of Breeding of our principal domestic animals, and, if not already included in Special Pathology, the Epizootical and Contagious diseases. Hygieine is the science that teaches us how to treat our animals, and to keep them in a healthy condition, how and what to feed them with advantage. Special Pathology treats of the different (mostly internal) diseases our animals are subject to, or of the interruptions in the functions of the single organs, and the anomalies and abnormities of the same, their causes, terminations and treatment. Special Surgery treats of such (mostly external) diseases and abnormities as consist, especially, in a change of the organic structure, concerning form, size, situation, cohesion and number of the different organs, or being caused by the presence of foreign bodies, and require, for examination and treatment, the dextrous use of the hands or the application of local (external) remedies, and their treatment, including operations. Veterinary Pharmacology teaches us the knowledge, the preparation, the effect and the use of those medicines which are used in the treatment of sick animals. Veterinary Obstetrics treat of the art of judiciously rendering assistance to our domestic animals at their delivery, especially where, from one cause or another, this act is very laborious, or, under circumstances, impossible without assistance. Veterinary Obstetrics embrace, further, the first care for the mother animal and the young, and the treatment of those diseases of mother and young caused by or closely connected with the act of delivery.

Exterior is the science of judging on Anatomical and Physiological principles of our domestic animals, as individuals, in regard to their value for breeding purposes, for service or other uses (milk, meat, wool, etc.) and for the market. The Principles of Breeding rest, in a great measure, upon the Exterior, and are combined with it of high interest and great importance.

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Epizootic and contagious diseases belong to the province of Special Pathology, but are of so great an importance and interfere so often with the public welfare, that it is judicious to separate them and treat them as a special study. The principles of Horse-shoeing, based on Anatomy and Physiology, belong also in the department of Veterinary Science, and are of no little importance, especially as but very few horse-shoers understand anything of the construction of the horse's foot, and make, therefore, the grossest mistakes and cause many a lameness. This study includes also the diseases of the horse's hoof and their treatment.

The auxiliary studies are: Zoology, Natural Philosophy, Chemistry and Botany. Of these, Chemistry is a necessary and important auxiliary to Physiology, Pathology, Pharmacology and Hygieina; Botany, to Pharmacology and Hygieina; Natural Philosophy, to Anatomy, Physiology and Exterior; and Zoology aids to the studies of Exterior and Breeding. But as these studies are taught in any university and in every well conducted college, it is not necessary for me to say any more about them, and can go over to answer my second question.

Second. Is it necessary for a farmer, who wants to advance in his profession, to study Veterinary Science? I think it is; and not only that, but I think it must be also exceedingly pleasing to an intelligent farmer to have studied and to be acquainted with the organism and the process of life of his noble horse, his valuable cattle, his useful swine and his fine sheep; to know the laws which govern their health, and to be enabled to render help and assistance in cases of disease to those of his fellow creatures who are, next to human beings, the noblest part of God's creation on earth, our domestic animals, the most precious gift God gave to man; it is but for them that we are a civilized people; nay, more, that we are able to exist.

No country in the world is as rich in stock, in proportion to its population, as this country of ours. In our own State, soil and climate are well adapted to stock raising, and make it a prominent and very important branch of farming. The domestic animals in our great Prairie State are very numerous, and, concerning quality, perhaps better than in many of our neighboring States at least at the last St. Louis fair our Illinois stock received more blue ribbons than all the other stock combined. Our domestic animals represent a value of many millions of dollars; we have among our horses different very fine breeds for every kind of service; among our neat cattle several herds which, if not superior, are at least equal to any herd in the world; we have breeds of fine sheep for any purpose; and our various breeds of swine need not fear any comparison with the best ones in England, and still the Veterinary Science is so much neglected. The veterinary practice is, with a few exceptions, entirely in the hands of quacks, horse jockeys and ignorant blacksmiths. Maltreatment kills in this country more valuable animals than there die by diseases. Contagious diseases often spread till they become a public calamity, because their nature is not early enough understood; so called horse doctors treat contagious and incurable diseases without taking the least precaution; so, for example, glanders and farcy, till other animals have been infected. But enough of this; every one knows it, and it is not necessary for me to tell. A great many farmers endeavor to improve their stock; many a one spends welfare, that it is judicious to separate them and treat them as a special study. The principles of Horse-shoeing, based on Anatomy and Physiology, belong also in the department of Veterinary Science, and are of no little importance, especially as but very few horse-shoers understand anything of the construction of the horse's foot, and make, therefore, the grossest mistakes and cause many a lameness. This study includes also the diseases of the horse's hoof and their treatment.

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Some one may say, we have in our State some excellent stock men who succeed very well; have they studied Veterinary Science? I say, some of them have, at least to some extent, though may be not in colleges; they are men of a penetrating mind, and have studied the laws of nature; others have spent much time and a great deal of money, and have suffered costly experiences before they have succeeded.

This age of ours is an age of progress and improvements. We cannot get along with that amount of learning our fathers could, and of our sons will be required still more. Men have to battle for life harder than ever, and can only gain victory by the assistance of learning. Of our farmers is required a great deal our fore-fathers did not dream of. In this our inventive age, this age of steam and lightning, our farmers cannot keep pace without having studied Natural Philosophy, Chemistry and Botany; no unprejudiced man will deny it. I say a farmer, especially a stock raiser, who wants to make his business pay, cannot succeed without studying Veterinary Science, at least to some extent. It will not pay, in this progressive age of ours, to do as our fore-fathers did, and raise common, unimproved stock, and to have them running at large; it may do in Texas, but not here any longer. The country is getting thicker settled, wild land is getting scarce, and improved land increases from year to year in value; food is getting higher, labor is expensive, and the requisites of life increase in refinement and expenses, therefore our income has to increase also, and we have, necessarily, to improve our products. But, by doing so, we have first to know how to do it. As Natural Philosophy instructs us how to save labor, how to judge about, to use and to invent our agricultural machinery, as Chemistry and Botany teach us how to improve our soil and our crops, so Veterinary Science instructs us how to improve our stock, how to keep it to our greatest advantage and in a healthy condition, and how to restore the health of our domestic animals, when lost. A few years' study and making use of other men's experiences will save us much time and a great deal of money of our own, and will prevent our suffering heavy losses and expensive experiences.

Perhaps some one may say, it would take a farmer too much of his valuable time or he would have to neglect too many other studies if he has to study Veterinary Science; would it not be better, like in Europe, to educate professional veterinary surgeons, of whom the farmer could get advice, when money and buys blooded stock at a great expense, and does not succeed. Why? He don't know how to do; he makes mistakes and neglects at least some law of nature, because he has not prepared himself for his profession by studying the principles of Hygieina and Breeding, and their fundamenta sciences. I know a wealthy farmer, in Whiteside county, who wished to raise fine woll, and bought as fine a flock of sheep as money could buy; after a year the one-half of his flock was dead, the other half diseased. What was the cause? His pastures were not adapted for sheep raising, and full of sloughs; but instead of accusing them, the true cause, he inclined to accuse the man, whom he had bought the sheep of, of having sold him bad and diseased stock.

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This country of ours is a great deal thinner settled than Western and Middle Europe, consequently a veterinary surgeon would, in the most cases, be too far off, and not to be got, especially when most needed; the veterinary surgeons would crowd in the cities, where business is more concentrated, and the rural districts would be always without them. Further, in this country, where is liberty of trade, farmers have fallen so often in the hands of imposters and suffered heavy losses, that they have lost almost all confidence in a veterinary surgeon; therefore, it takes the latter a long time to build up a reputation and to make his business pay; and, therefore, I think but a few persons would be willing to study Veterinary Science with a design to make Veterinary Science their exclusive profession. Still I think it very desirable to have some educated veterinary surgeons, who may locate in the cities and larger towns; but, for the reasons named, it would take a long time to supply the country. Even in Europe the necessity has been understood to have farmers study Veterinary Science, as in almost every European agricultural college a veterinary chair has been established. What a man knows himself he does not need to seek counsel for and depend on others, who are not familiar with all the peculiarities of his farm and his stock; therefore, permit me to say it again, our farmers, especially those who intend to make stock raising or dairy their business, or a prominent part of it, will gain considerable by studying Veterinary Science, and it is just of the same importance to them as it is to a nurseryman to study Botany, Vegetable Physiology, Pomology and Entomology. Every educated farmer, I have no doubt, will agree with me. Even our uneducated farmers, men who have to labor hard in the field all day, seem to feel, instinctively, the importance of Veterinary Science for their profession. It is well known how eagerly they peruse a book on diseases of our domestic animals, whenever such a one happens to fall into their hands, though the most of those works are written for the sole purpose of making money, and are generally very superficial and of not much account. The better class of books on the diseases of our domestic animals are but seldom studied, for the simple reason of being too scientific and not understood, because the student lacks the knowledge of the fundamental sciences, Anatomy, Physiology, etc.

Third. What branches of Veterinary Science are for a farmer the most essential and should especially be studied? All branches of Veterinary Science are of great value to the farmer, but the most essential are, undoubtedly, Hygieina, Exterior and Principles of Breeding, as also their fundamental studies, Anatomy and Physiology, and next to them General Pathology, General Surgery and General Therapeutics. What branches should especially be studied, depends a great deal upon how long a time the student wants to stay at the University, and how many hours a week he can bestow upon Veterinary Science. If he can manage to bestow upon it, at an average, eight hours a week, wanted? Let us see about that. Would it take a farmer too much time to study Natural Philosophy, Chemistry or Botany? I think not. I think time spent in those studies is well spent, and so it is in Veterinary Science; it is, when understood aright, of no less importance than any other study.

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Of the special studies I call the most important for a farmer, Hygieine, Exterior and Principles of Breeding. Of less importance, though of great value, are Special Pathology, Special Surgery, Special Therapeutics, Pharmacology and Obstetrics, at least can be shortened to some extent. Horse-shoeing may be partially dropped and partially included in Special Surgery. Some gentlemen may not agree with me in rating Hygieina, Exterior and Principles of Breeding higher for a farmer than Special Pathology, Special Surgery, etc. The reason is, that the former come into application on a farm almost every day, and the latter but seldom. I value it higher to know how to improve our domestic animals, to be able to judge correctly about the value and qualities of the same, for a certain purpose, and to learn how to keep them healthy and to the greatest advantage, because this knowledge, if a farmer makes constant use of it, will not only prevent many diseases, so that Special Pathology, Special Surgery and Special Therapeutics, etc., will but seldom come into practice, but will add more to his wealth, by improving his stock and saving expenses, than he may ever lose, even if all those animals of his, that get sick, should die.

Still, if diseases or a surgical case should happen, a farmer who has studied General Pathology, General Surgery and General Therapeutics, and has but good judgment and common sense, will make no grave mistakes even if his limited knowledge of Special Pathology, Special Surgery, etc., should not suffice; at any rate he is enabled to get advice of any good scientific book on Special Pathology, Special Surgery, etc., according to the case, or else he may ask advice of a professional veterinary surgeon; at least he is armed against any imposter.

Fourth. In what method should Veterinary Science be taught in an Agricultural and Industrial University? In German veterinary schools, as also in the better class of agricultural colleges, Veterinary Science is taught in three different methods: 1. By lectures; 2. By illustrations on skeletons, other anatomical and pathologic-anatomical objects and preparations, on healthy and sick animals; 3. By practical exercises in the anatomical preparation room, by practice in the hospital, and by performing surgical operations in the operation hall. Concerning the different branches of Veterinary Science, the method of instructing is not always the same, according to the different nature of the studies.

Anatomy ought to be taught in the three different ways: by lecture, by illustrations on anatomical objects, and by dissections, for the purpose of preparing the same. The first two methods cannot be dispensed with, even if it is intended to educate, exclusively, farmers. The third method is of special value to one who wants to become a professional veterinary surgeon, by it being not only a great help in the study of Anatomy, but especially a good prepatory school and exercise for surgical operations, and is indispensable if the education of practical veterinary surgeons is also aimed at. Lectures on Anatomy should always be illustrated with defining the subject on skeletons and other anatomical preparations, either of muscles, vessels, nerves, etc., else they can be of but little value, and are very dry and tedious. Anatomy, Osteology excepted, for reasons not necessary to mention, can only be taught in winter. If a three years' course can be granted for the study of Veterinary Science, I would advise to teach that part of Anatomy most important to a farmer as much as possible in the first, and the balance in the second winter, for one winter term will not be sufficient to finish the whole study. As Osteology has to precede everything else, it would be best to teach it in the first fall term.

For the study of Anatomy it is necessary to have a special building, or at least a separate hall, not too near any other place, as some smell and nuisance, even by the most exact cleanliness, cannot be prevented. It would be best to have a separate, well ventilated, one story building, containing one large and one smaller room, with a cellar below, and, if possible, a well or cistern within the large room, or very near it. The larger room has to be used as a dissecting and preparation room, and the smaller for an anatomical museum. The building does not need to be large and expensive—a wooden shanty will do, at least for some time to come, though a substantial brick building would be preferable. The size must be according to the number of students that are expected to study Anatomy. A great deal of furniture is not required:

two stout tables, two and a half feet high, the top being about eight or ten feet long, three and a half feet wide, and two and a half inches thich, and the six legs on rollers, some seats for the students, a tub, some wash basins, some ropes, etc., and a fire hearth and a large kettle in the cellar, is about all that is needed. On preparations, a skeleton, each of a horse and a cow, is needed, skeletons of the other domestic animals are desirable. For other anatomical preparations a few old horses, the leaner the better, should be bought every winter, other domestic animals will likely be too expensive and can be done without, as the anatomical differences can be explained by occasional *post mortem* examinations of deceased animals or by good drawings.

The lectures on Physiology should, according to the subject, be illustrated by anatomical and microscopical preparations, physical apparatus and good drawings. Anatomical preparations for that purpose, such as do not keep in summer time, can always be got at a butcher shop. Physiology is closely connected with and based upon Anatomy, therefore the study of the former should follow that of the latter immediately; still the first part, the so called Anatomical or General Physiology, may be taught at the same time with Anatomy.

General Pathology, General Surgery and General Therapeutics can be taught by lectures, and have to follow the study of Physiology, or may be given, at the same time, with it.

These general or fundamental sciences would constitute the main studies of Veterinary Science for the first three terms (provided three years for a full course). In the next three terms I deem it desirable to have those special studies follow that are of the greatest importance to a farmer: Hygieine, Exterior and Principles of Breeding, so that an agricultural student, who does not want to take a full course of Veterinary Science, may be able to finish his veterinary studies in two years. I think it is scarcely necessary for me to mention that the auxiliary sciences, Natural Philosophy, Chemistry, Zoology and Botany, should be studied in the first year.

Hygieine can be taught, principally, by lectures, and should follow the Physiology, being so closely connected with it.

The lectures on the Exterior and the Principles of Breeding, combined, must be illustrated on skeletons and especially on living animals, which, properly done, makes these studies not only very interesting but also exceedingly useful to the student. Moreover, practical instructions on animals, in judging about the qualities of our domestic animals, etc., judiciously guided, will prove a great and lasting benefit, and should, by no means, be neglected. These three studies, and besides them Anatomy in the winter, would make up the main studies for the second year.

Special Pathology and Therapeutics are partially taught in lectures in the lecture room, partly by illustrations and observations on sick animals, and partly by practical exercises in making the diagnosis of diseases and treating sick animals.

Special Surgery has to be studied in the same way, only with this difference, that the practical exercises embrace also surgical operations. I consider these clinical illustrations, observations and exercises of a great and lasting value to the student: if he had to spare them, the lectures would do him not much more good than the reading of a book; therefore, an infirmary for sick animals should be established, in connection with any institution where Veterinary Science is taught. A little more about this afterwards.

Special Pathology, Surgery and Therapeutics may be commenced within the second year, and should constitute the principal studies of the third.

Lectures on Pharmacology may be given during the first term of the first year, and may, perhaps, one hour a week, run along with the other studies till finished, or be given when there is time best to spare, and should be illustrated on those drugs, in substance, that are principally used in the veterinary practice,

Veterinary Obstetrics have to be given in lectures, illustrated on drawings, a phantom or a manikin, as an opportunity for practical exercises but seldom occurs when wished for, and have to follow the study of Special Surgery, where they naturally belong to.

Lectures on Horse-shoeing can nicely be illustrated on anatomical preparations, specimens of horse-shoes, etc., on drawings and living animals, and should be given either in the third or second year, whenever there is most time to spare.

For two reasons I would recommend to make Epizootical and Contagious diseases of our domestic animals a special study, especially in an institution like the Illinois Industrial University. My first reason is the great importance of these diseases themselves; and, secondly, it is very probable that some of the students of this University may afterwards be called upon, by the people, to become legislators, either as city or town officers, Assemblymen, State Senators or Congressmen, and as our stock raising and stock trade is increasing from year to year, and a source of great wealth; further, as contagious diseases not seldom ruin the trade, but sometimes even become a public calamity, the time may not be far that laws concerning the prevention of those diseases and the protection of healthy stock will be required.

As practical exercises and illustrations, that what our eyes have seen and that what we have observed ourselves, make a far more more lasting impression on our mind, and are generally better understood than what is simply taught us in lectures, I think, as I have said before, an infirmary for sick animals is absolutely indispensable for the instruction in Veterinary Science, therefore permit me to sketch out what way such an infirmary, answering the purpose, may be established with but little expense. First, a building may be erected, containing one room, about thirty feet square, for operation hall, all other clinical purposes, as examining patients, illustrating Pathology and Surgery on sick animals, for illustrating Exterior on living animals, and practical instruction in judging living animals, concerning their qualities, etc., especially in winter time and in bad weather. This hall should have a large skylight, besides the regular windows, to have always plenty of light, especially from above, very essential, by performing surgical operations, etc. The main door should be a large barn-door, wide enough to admit a wagon loaded with hay or straw. Each corner of the hall may be provided with a cup-board for the veterinary tools and instruments, the medicines in use, etc. To this building may, symmetrically, be added two wings on opposite sides, each about sixteen feet wide and thirty feet long, and containing the stalls for the sick animals. In one of these wings, at least one so-called "loose-box," about 10 by 12, should be made of, or lined with, strong timber, for the reception of the colic patients—patients with so-called "blind-staggers," and inflammation of the brain, etc. The other space may be divided up in so-called single stands, wide enough to make the patients comfortable—say five feet. About six such stalls for horses, and two for neat cattle, may at first be sufficient, as sick neat cattle are seldom brought to an infirmary. In one wing may be made a room of about 10 by 12, for the veterinary medicines, and the preparation of the same. Each wing should have three doors leading to the outside, and one leading to the hall. Up stairs would be room for hay, straw, etc., and as the loose-box and the length of the stalls do not require the whole width, there would be left at the side of the former, a place of four feet wide for a feed-box, and behind the stalls a space of five feet, for a passage. In case, that after some time these two wings should not suffice, there can be added another one to the third side of the hall, opposite the main door, without spoiling the symmetry of the building.

A small building or shed, containing two stalls for animals with contagious diseases, should be erected separately, and not too near the main infirmary, for reasons not necessary to explain.

To secure, always, patients as an object of instruction, an offer may be made to the public, especially to the citizens of Champaign, Urbana and vicinity, to bring all their sick animals to the Infirmary, and have them treated there, with no other charge than the actual cost of food and medicine used, as it is practiced in most of the European Veterinary Schools. Sick neat cattle, sheep and swine, if not too far off, and those sick animals that cannot be transported, may be treated on the premises of their owners by the more advanced veterinary students, under the superintendance of the Professor of Veterinary Science. I am sure such an offer would always supply the Institution with patients and material for instruction.

For illustrations in Exterior and Principles of Breeding, the domestic animals on the farm, belonging to the University, may be used.

Mr. Regent, and gentlemen of the Board of Trustees, allow me to lay before you, at the close of my lecture, two plans of studies, one of a three, and one of a two years' course. The one, though being calculated on three years, and about eight hours a week, gives all those studies most essential for a farmer, in the first *two* years, and permits, also, any diligent student to take a nearly complete course of Veterinary Science in two years, if this be necessary. In that case, the student, after he has studied in the first year the fundamental and auxiliary sciences, would have to take in the second year all the special studies, assigned by me to the second and third year. The other plan is a somewhat abridged one, and calculated on two years.

Veterinary Studies—Two Years' Course.

FIRST YEAR.	Hours a week.	SECOND YEAR.	Hours a week
Fall Term:		*Fall Term:*	
1. Anatomy, (Osteology in the first part, and Myology in the latter part of the term)	5	1. Exterior and Principles of Breeding.....	3
2. Physiology (Anatomical).........	2	2. Practical instruction in judging Animals........................	1
3. Pharmacology	2	3. Special Pathology and Therapeutics............................	2
		4. Special Surgery, etc..............	2
		5. Clinical exercises, (half an hour a day)............................	3
Winter Term:		*Winter Term:*	
1. Anatomy..........................	5	1. Exterior and Breeding...........	2
2. Dissections......................	2	2. Special Pathology, etc............	3
3. Physiology	4	3. Special Surgery, etc..............	3
		4. Clinical exercises................	3
Spring Term:		*Spring Term:*	
1. General Pathology, Surgery and Therapeutics..................	4	1. Special Pathology, etc............	2
2. Hygieina........................	3	2. Epizootical and contagious diseases........................	3
3. Exterior and Breeding............	3	3. Obstetrics........................	1
4. Practical instruction in judging Domestic Animals.....	1	4. Horse-shoeing....................	1
		5. Clinical exercises................	3

Plan of Veterinary Studies—Three Years' Course.

FIRST YEAR.	Hours a week.	SECOND YEAR.	Hours a week.
Fall Term.			
1. Anatomy, (Osteology)...........	3	4. Spec. Pathology and Therapeutics..........................	2
2. Physiology, (Anatomy)...........	2		
3. Pharmacology...................	2		
Winter Term.		*Spring Term:*	
1. Anatomy, (Myology,) Splanchnol, Angiol, Neurol, Organs of Sense, etc........................	5	1. Exterior and Breeding............	2
		2. Spec. Pathology, etc..............	2
		3. Spec. Surgery, etc................	2
2. Anatomy, Dissections and Preparations, etc........	2	4. Practical instruction and Clinic. exer., *i. e.*, half an hour every day...........................	3
3. Pharmacology...................	1		
Spring Term.		THIRD YEAR.	
1. Physiology	4		
2. Gener. Pathology, Surgery, and Therapeutics.................	4	*Fall Term:*	
		1. Spec. Pathology, etc..............	3
SECOND YEAR.		2. Spec. Surgery, etc................	2
Fall Term:		3. Clinical exercises and practice, half an hour every day, Saturday not excepted..............	3
1. Hygieina........................	3		
2. Exterior and Principles of Breeding..........	4	*Winter Term:*	
3. Practical instruction in judging Domestic Animals, etc........	1	1. Spec. Pathology, etc..............	3
		2. Spec. Surgery, etc................	2
		3. Clinical exercises, etc............	3
Winter Term:			
1. Exterior and Breeding...	2	*Spring Term:*	
2. Practical instruction in judging Domestic Animals............	1	1. Epizootical and contagious diseases.........................	3
3. Anatomy (continuation and Chondrology, Syndesmology, etc.) Dissections and Preparations, etc...........................	3	2. Veterinary Obstetrics.............	1
		3. Horse-shoeing.....................	1
		4. Clinical exercises................	3

DISCUSSION.

PICKRELL—The subject is a very important one. I do not believe in nor practice doctoring sick animals much, because all the veterinary surgeons, so-called, we can get hold of, are generally quacks. We want and must have a school of Veterinary Science.

Warder—Thirty-five years ago, I was very anxious to learn something of Veterinary Science. I could only get information in the ordinary medical school. We have made progress, in that we are willing to consider the subject, and want a Veterinary Department.

Burrill, of Champaign—I think we should have such a department. There is no such school in our State, nor perhaps in any State. I think the breeding animals should be left to the Professor of Agriculture. Anatomy is partly reached in other departments.

Whitney—The lecturer has not overrated the importance of the subject. I have been a blacksmith since I was eleven years of age. I had an intense desire for knowledge, especially of my trade, and informed myself by such means as came within my reach. I used to bring in the dried up legs and hoofs of dead horses, and study their anatomy. The result was, that I excelled in horse-shoeing. That partial study of the anatomy of horses was worth more to me than I could tell to-day. Anatomy is necessary to the proper judgment of a horse. I knew a fine horse offered for a song, because of a lameness in one of his fore feet. My knowledge of anatomy enabled me to shoe him, so that he was entirely freed from his lameness.

Most of our blacksmiths are ignorant and our farmers are stingy. They want a horse's shoes to stay on the longest time, and the blacksmith shoes on this one principle.

The Kannuck horses are very active. They have small hoofs, the legs are almost round, and the pastern is almost over the hoof. There is very little room for articulation. Hence, they are great for draught. A (Canadian) Frenchman going up hill with a load, gets upon his horses back to hold him down. But in fast travel, they pound their hoofs, and give out at the end of the first day.

An ox with high shoulders don't pull the best. We want one with heavy forequarters.

Detmers—I am very much pleased with the excellent remarks we have just heard. I wish every blacksmith would do as well. The French pony mentioned is a fine example. We must have an angle for fast horses, but not for draught.

Whitney—From dissection, I found I could perform many operations in shoeing. In the case of quarter-hoof, for instance, I noticed the bar shoe and hoop shoe, but thought I could improve upon them. Where the shell of the hoof was thick enough, I bored a gimblet hole each side of it, put in a wire, and tied the parts together. Horses that get pricked, have a wrinkled hoof. I found that a wrinkle outside means a depression inside, and that I must avoid driving a nail into the wrinkle. Some punch shoes with perpendicular holes. The heel nails should be straight, and the others incline more and more, as they go towards the toe. They need not be clinched at all.

Over-reaching, I don't understand. I would not buy an over-reaching horse. It is an insuperable objection. Interfering behind makes no trouble. It is caused by a difference of construction. Usually, the horse settles on the pastern behind, considerably, and toes out, so that when he steps and settles, he throws the foot in the way of the coming foot. The usual rule is, to turn the inside cork the other way. But the horse does not interfere with the heel, but with the toe. Hence, never pare the inside of the hoof more than you can help, and pare the outside all you can, especially next the toe. Keep the inside of the shoe as nearly straight as you can. Let the shoe run back well, and have a long cork. On the outside, cut the shoe off, and have a short cork. Make the shoe light—especially in summer. Once, and certainly two such shoeings, will make all right.

(In answer to a question.) I can generally tell whether a horse will over-reach before it is worked. To look at the gait of a horse, we should look at it in front and behind, and not at the side.

DETMERS—Most horses that over-reach have not, proportionally, angle enough in the fore feet, and are too short.

Adjourned.

WEDNESDAY AFTERNOON—2 P. M.

Dr. H. J. Detmers, of Quincy, read a lecture on

PLEURO-PNEUMONIA.

We frequently read in the newspapers accounts of epizootic diseases among the neat cattle in the Eastern States—New York, New Jersey, Pennsylvania, Maryland, Delaware—and those of New England. Sometimes this disease is simply called a plague; sometimes it is mistaken for the so-called "cattle plague" (Pestis bovina); sometimes even for "Texas fever" or "Texas cattle disease;" sometimes it is called by its true name, "Pleuro-pneumonia." These different appellations seem to prove that this disease is but little understood by our agricultural population, therefore it may not be out of place, that I have chosen to lecture to-day on that subject, especially as Pleuro-pneumonia is a malady that belongs undoubtedly to the most destructive diseases to which our neat cattle are subject.

Pleuro-pneumonia—Lat. "Pleuropneumonia contagiosa," or "Pleuropneumonia interstitialis; Germ. "Lungenseuche," and Fr. "Peripneumonie epizootique"—is a chronic and contagious disease of the lungs, which befalls only neat cattle, and that but once in their life, and is characterized by peculiar and constant pathologic changes in the texture of the lungs, and especially in the interlobular tissue; a disease of which a spontaneous development yet never could be proved, and of which a contagion is the only known cause of propagation.

The first authentic intelligence we have of the existence of Pleuro-pneumonia comes from middle and western Europe, especially Germany, Switzerland and France, where it was common in the last century; but it has not been ascertained where and when it first originated, for each nation claims that it has received this disease from a neighboring country. Only one thing is certain, that is, that it has not originated in America, but has been imported by European cattle from Europe, most likely from Holland.

In countries where Pleuro-pneumonia breaks out, there it soon becomes a gnawing worm on the dairies and a calamity to stock raising. It is very contagious, and having once broken out, hard to suppress; in propagating further it follows, as a general rule, the direction of the cattle trade, that is in Europe from the East to the West, and fortunately for us, in this country, from West to East. This is perhaps the cause that, in a country like ours, where the health of our stock is so little protected by laws against contagious diseases, our State is yet free from this destructive calamity; still, if it should spread among our cattle, no State east of us would be exempted.

Symptoms.—In the beginning the disease makes generally but slow progress; between the moment of infection and the visible outbreak of the disease passes a period of at least some days, but freqnently of some weeks, and sometimes even, as has been claimed, of twenty weeks. During this period, the so-called "occult stage," the patient appears to be without fever; a peculiar short and dry, though yet moderately powerful, cough is the only remarkable symptom. In the beginning this cough is only heard in the morning, when the stable door is opened and the cold air is coming in, or when the cattle arise from their bedding or are driven to the tank and drink cold water; afterwards the coughing becomes more frequent, and changes to a weak and painful hacking cough, whereby the animals arch their backs and stretch their necks. The other symptoms during this stage are not very characteristic, and are in the beginning often overlooked. At first the respiration is but slightly accelerated, afterwards the same is more remarkable, as the nostrils are opened wider at each breath; the motions of the flanks increase; the expiration is sometimes groaning, and pressure on the sides of the breast, on the withers, and the loins, apparently causes pain; the appetite, and with milk cows the secretion of the milk is getting less; the hair gets a rough and dead appearance, and sometimes emaciation and discharges of a limpid or a smeary fluid from the nose appear. Still, all these symptoms are not much different from those accompanying the beginning of other diseases of the respiratory organs; and, therefore, except perhaps the peculiar cough, are not characteristic, and remain easily unnoticed; more valuable, even at this stage, are the results of the physical exploration of the thorax.

After a continuance or increase of these symptoms during a shorter or longer period, the disease enters into the second, evident or feverish, stage. The pulse is accelerated; the motion of the heart is either imperceptible or beating; the tip of the nose and the upper lip are dry; the ears and horns alternately either too warm or too cold, and the temperature of the whole body changeable, sometimes cold shiverings can be observed; the appetite and rumination stop entirely; the excrements are dark colored, and the secretion of milk ceases. The patients stand with the elbows of the fore legs turned to the outside, trip with the hind legs, and either lay not down at all, or but for a short time, and then rest on the breast bone, "sternum," having the legs under the body and the feet stretched out forward. The walking is difficult, slow, heavy; the respiration is very much accelerated, apparently performed with difficulty, by opening wide the nostrils and heavy motions of the flanks. The animals cough oftener than in the first stage; the cough itself has a dead sound, and is very painful. These symptoms, too, though being a great deal more decided than those of the first period, are not characteristic enough to enable a sure diagnosis, as they appear more or less in other diseases of the breast also. More characteristic and more reliable indications during this stage are found by the physical examination of the thorax.

After the disease has arrived at this height, there is no more hope of recovery, and death is fast approaching. The respiration is getting still more difficult and uneasy; the exhaled air has sometimes a bad smell, and coughing is getting more frequent. From the nostrils and the eyes is discharged a purulent fluid; the skin gets dry, hide-bound, looks dirty; the hair gets rough, of a dead and brittle appearance; the pulse is small, weak and very much accelerated, and the heart is beating forcibly. The animals appear to be stupified and indifferent against painful influences; at last they are unable to stand on their legs, lay down, mostly on the side, have the neck stretched out and the mouth opened wide, discharge from it a viscous slaver and groan loud. Finally, a bad smelling diarrhœa ensues, and the animals, emaciated almost to skeletons, die in about two or three weeks after the beginning of the feverish stage. Frequently, however, they die a great deal sooner by suffocation.

Of far greater importance than those symptoms just given, is the result of the physical examination of the thorax, especially during the first stage of the disease, where the other symptoms are yet insignificant.

First—the auscultation:

On the healthy side of the breast we hear an increased, though normal, vesicular murmur; on the diseased side the result is a different one, according to the pathologic anatomical changes that have already taken place in the lungs: 1. We hear a faint vesicular murmur, in case the exsudation is new, yet fluid and limited to the cellular tissue between the lobules, and the latter themselves yet pervious. 2. We find perfect silence and absence of any kind of noise or murmur, when the lobules have become perfectly impervious to air, and the bronchial tubes have been closed up. 3. We hear a bronchial murmur, a kind of a blowing or whistling sound, more or less high, like the pallatal sound "ghy," where the lobules are impervious to the air, and the yet open bronchial tubes belonging to them, communicate with a larger bronchial tube that is connected with, and leads air to, a yet pervious part of the lungs, so that that way a kind of whistle is formed. 4. We hear a pleuritic rubbing sound, when more or less thick layers of plastic exsudation are deposited on the pleura, and the lungs at that place being yet pervious and in action. If the lungs are there already obstructed, hepatized, and impervious, a rubbing sound is not heard, because the lungs are not in action and do not move at that place.

Sometimes but one of these signs can be observed at a time; sometimes they are complicated and the sounds mixed, and sometimes different sounds at different parts of the thorax can be heard, according to the different pathologic changes that have taken place. Sounds formed in the larynx, groans, in the so-called bronchial respiration, are distinctly heard on the sides of the thorax, (Bronchophony.)

Percussion: We find on the healthy side a full sonorus tone, having not seldom a slight metallic sound; on the diseased side we find, according to the pathologic anatomical changes, either: 1—a faint, rather dull sound, with but little resonance, by imperfect hepatization of the lungs, the lobules being partly filled with exsudation, but for the larger part yet pervious to the air; 2—a dull sound without any resonance similar to that of percussing a solid limb like a leg, where complete hepatization has taken place, or the breast is filled with water; or, 3—a thin and clear, but rather faint sound, where a small part of the lungs is yet pervious and healthy, but immediately surrounded by already hepatized portions.

The physical examination of the thorax is perhaps in no other disease of our domestic animals of greater importance for a correct diagnosis, is at least in no other disease of the respiratory organs of neat cattle so characteristic as it is in Pleuro-pneumonia; but as it is so very difficult to give a correct description of certain sounds, further as an unexperienced ear frequently hears not anything, where one, who has repeatedly practiced auscultation and percussion, can distinguish distinctly, the physical exploration has its full value only for the experienced. However, we have other diagnostic signs, which admit of no mistake, and are easier to apprehend by every one; these are found in the *post mortem* examination, and consist of

THE PATHOLOGIC ANATOMICAL CHANGES.

Wherever there should be doubt about the presence or absence of Pleuro-pneumonia, the *post mortem* examination gives, under all circumstances and during all stages, full information, the very first stage, before the animals appear to be really sick, not excepted. Even in animals that have recovered long ago, the autopsy proves with certainty and leaves no doubt, whether those animals had Pleuro-pneumonia or not; therefore, it is of great importance to know the pathologic anatomical changes of this disease, the more so, as a correct diagnosis is absolutely required, especially in epizootics. First we have to distinguish between the products caused proximately by the disease, and the metamorphoses of those products.

1. Changes caused directly by the disease itself:

Abundant exsudation of coagulable lymph at first, and mainly in the spongy interlobular tissue (between the lobules of the lungs), next on the pleura and in the bronchial tubes, and necrosis (dry gangrene or mortification) of smaller or larger parts of the lungs, without the least trace of suppuration or decay of the texture, constitute always the basis of the characteristic anatomical changes. The diseased wing of the lungs is enlarged in different degrees, sometimes to the size of its extension when in full inspiration; it is solid, and the absolute weight, as well as the specific gravity, is increased; small and limited diseased spots form firm knots. If extensive portions of the lungs have been attacked, then the enlargement is very considerable, and the lungs increase in weight frequently as much as twenty or thirty, and in extreme cases. even as much as fifty pounds, and in specific gravity enough as to sink in water. Generally but one wing is suffering; sometimes, however, both sides are diseased, but then one side in a less degree. The larger part of the exsudation is deposited in the spongy cellular tissue between the single lobules, so that the latter are enclosed by exsudated beds forming as system of partitions. These beds are from one-twelfth to one-fourth of an inch in diameter, and look on the cut like a net work of pale yellowish color, in the mashes of which are imbedded the rhomboidal lobules. The lobules themselves vary in color, as some of them appear almost normal, some light red, some dark red, some blackish red or brownish, others yellowish brown or yellowish gray, etc., and produce thereby on the cut the so-called "marbled appearance" of the diseased lungs. Next to the diseased parts generally some œdema is found. In those parts of the lungs, in which the infiltrated exsudation has become firmer (perfect hepatization), the bronchial tubes and blood vessels are closed up, the former by coagulated exsudation, the latter by coagulated blood, that has yet partly its natural red color, but partly is discolored by the solution and diffuse separation of the coloring matter of the blood, and looks grayish red. Necrosis appears only in the highest degrees of degeneration, and then in the center of the degenerated part, provided a stagnation in the blood vessels has taken place; it is frequently limited to a few single lobules, but extends sometimes over large parts, while in some few cases even the fourth or third part of a wing as one coherent mass is mortified. On the pleura, either on one place only, corresponding to the diseased part of the lungs, or in a great extension, on the entire surface of the diseased wing or wings of the lungs, on the pericardium and even on the pleura of the inside of the thorax, beds of coagulated exsudation are deposited, and form either but thin layers, or consist of one or two inches thick yellowish and spongy exsudation, that is similar in appearance to an omelet or a pudding, and encloses in small round cells a yellowish fluid.

This exsudation on the pleura causes frequently conglutination of the pleura of the lungs with that of the thorax, so that the lungs appear to be grown together with the inside of the ribs. In cases where these deposits of exsudation on the pleura or pericardium are abundant, an effusion of yellowish water (serum) in the thorax or pericardium takes place, and then the morbid changes in the texture of the lungs themselves are less developed, but never wanting.

The cause of the severe attack of the pleura or pericardium in such cases we do not know; only one thing is certain, that it is erroneous to claim this as a sign of self-development, as has been done, for it has been observed often enough in cases where a communication of the disease, by means of the contagion, could be proved with certainty.

The morbid changes develop themselves by degrees in a peculiar and characteristic manner. On perfectly healthy animals the first perceivable traces appear generally in an edge of the lungs; sometimes in other places, or even in the center of a wing, and represent small acute limited knots of about one or two inches in diameter, and already a marbled appearance on the cut, as the interlobular cellular tissue is infiltrated with a yellow and gelatinous exsudation, and the enclosed lobules themselves are hyperæmical. After some time the marbled appearance of those knots is somewhat changed, as the exsudation in the cellular tissue coagulates, gets firmer and of a grayish white color, while the enclosed lobules, in the beginning only reddened, get darker colored, first brown red, then black red; afterwards they get paler again, brown yellow and yellowish gray, and finally whitish gray. These colors get darker as the hyperæmia increases, and get paler again, when the red coloring matter of the blood is dissolved and separated. The degeneration commences either at one or more places, and after a shorter or longer pause spreads over a smaller or larger, but always acute limited neighboring portion of the lungs, and that way sudden extensions occur after shorter or longer intervals of time; the patients, however, show no material external symptoms of disease, until the degeneration has reached a certain extent, perhaps of five or six inches in diameter. This peculiar proceeding is also the cause that, in an extensive hepatization, diseased spots with fixed limits and of different age and color always present themselves on a cut. New infiltrations are characterized by narrow and yellowish enclosures of yet healthy lobules, as the interlobular cellular tissue is infiltrated with a yet fluid watery exsudation of a yellowish color. In older infiltrations the exsudation in that cellular tissue is more or less coagulated, so that the net work becomes more firm, and the color is changed from yellow to a whitish gray, while the enclosed lobules are hyperæmical and of a more or less dark red, or even blackish red color, (the so-called "red hepatization"). Still older portions are characterized by a change of the inclosed lobules, as they have lost more or less their red color, which has changed to a yellowish brown or yellowish gray, and are also infiltrated with exsudation, which makes them more firm and solid, so as to lose their characteristic structure (so-called "gray hepatization"); at the same time fibrinous coagulations are found in the bronchial tubes. The very oldest degrees finally show the general features of the gray hepatization; further, the lobules are more or less blended with the interjacent exsudation, the whole mass is firmer and more compact, a new building up process has ensued along with the amorphous exsudation (beginning induration). In case that the sudden degenerations have taken place in short intervals, the differences between the various stages are less conspicuous, while new infiltrations and very old ones are found close together, if the intervals have been long.

2. Further metamorphoses of the products of the disease ensue, if the patients have not died too early, and consist of resolution, incasing and healing.

As far as the texture of the lungs has not been mortified, a resolution of the deposited fibrin can take place, therefore the so-called hepatization is always to be looked upon as a transitional pathologic anatomical state; the yet fluid or soft exsudation disappear very soon, and therewith the normal condition of the texture of the lungs is restored; that way it can happen, that after the cessation of the morbid process, complete restitution ensues in a few days. Larger, firm and compact fibrinous masses are but slowly resolved, and never without a simultaneous formation of new cellular tissue. The coagulated fibrin, deposited in the cellular tissue, on the pleura, pericardium, etc., acts like a foreign body, it causes and supports a neoplastic process in the covered organic textures; the latter soon get a rough surface, from which runners of new formed or recently enlarged blood vessels enter into the amorphous mass, of which the layers nearest to the organic texture resolve and disappear. The longer this resolving process continues, the longer continues also the neoplastic process in the interlobular cellular tissue and in the serous membranes (pleura, etc.) The further consequence thereof is hypertrophy of the cellular tissue, organic thickening of the pleura, etc., and real coalescence of the lungs with the pleura lining the inside of the thorax, or with the pericardium. The infiltrated or hepatized, but not mortified, texture of the lungs perishes partly by the resolving process, the lobules get smaller and richer of cellular tissue. Accordingly we find at the close of the resolving process always permanent enlargement (hypertrophy) of the cellular tissue, and atrophy in the pulmonary texture in very different degress, from the slight preponderance of the cellular tissue and the yet almost normal appearing lobules up to that very point of organic degeneration, in which but traces of the red pulmonary texture can be found in the hypertrophic cellular tissue. In the latter case the diseased parts of the lungs have lost their soft and elastic nature, get paler, and become an appearance like that of a sinew or a ligament.

The coagulated fibrin in the bronchial tubes is eliminated in another way; it shrinks little by little, lays then loose on the surface of the bronchial mucous membrane, separates finally, fills no more the entire diameter of the bronchial tube, is afterwards surrounded by the secretions of the mucous membrane, in which traces of air in form of foam are soon appearing, and gets thus ready for elimination. Therefore, the more loose the fibrinous mass in the bronchial tubes appears, and the more it is surrounded by foamy mucous, the older it is.

Where the lungs are degenerated to some extent, it is very seldom that necrosis is entirely absent, but is generally found, at least in some lobules, if not in larger parts. The mortified texture remains always for some time in an intimate cohesion with the living parts; not until later, after some weeks or months, the separation commences with the loosening of the cellular tissue and the pulmonary texture, then the surface of the living parts appears granulating and suppurating; the larger bronchial tubes and blood vessels are afterwards severed, and their ends project over the suppurating and granulating surface; finally a distinct membrane is formed on the whole granulated surface, incases the mortified part, and gets thicker from time to time. In mortified parts of small extent, the larger tubes and blood vessels are exempted from the necrosis, get loosened from the surrounding mortified part in the same manner as other living texture, and cover themselves also with a granulating membrane. In the inclosed mass, though being mortified, is still a kind of organic metamorphosis going on in a physical way, as the incasing membrane is continually secreting and absorbing, whereby the incased mass not only gets imbibed, but also loses a part of its fluid again, especially in the outside layers; the smaller it is, the sooner it undergoes a change. Shortly after the separation and incasing, the mortified parts still represent the marbled appearance on a cut, but is changed, as the red coloring matter of the blood in the lobules more and more diffuses and disappears, and a nearly uniform yellowish gray color is substituted. Concerning the structure, the spongy texture of the lobules and the more compact stripes of the infiltrated cellular tissue can be discriminated for a long time, as long even as the texture as such is existing. Large masses generally retain their structure, as long as the animal lives; smaller ones, however, crumble by-and-by to a grayish yellow detritus, mixed with a purulent secretion of the incasing capsula. The cavity thus formed finally contains a pappy and fluid substance, and is getting smaller little by little, as the contents get absorbed and the inclosing capsula exerts some pressure. After the contents have disappeared, the inside surfaces of the incasing capsula come in contact, and finally grow together. By mortification of single lobules this process can be finished in one or two months, therefore such capsulas or cicatrixes are sometimes found already, when the animals have died by the progressive degeneration in other parts of the lungs. Such cicatrixes are distinguished as grayish white, firm and fibrous spots of an oblong, round, or irregular form. The healing up of larger cavities of about three inches in diameter takes always six months or a year. In some cases, where a larger bronchial tube is within the mortified part, it happens that that tube opens, and the contents of the cavity are discharged through the opening and get into the windpipe.

Development, course, duration and termination. How long after an infection the development commences is not positively known, as it begins without showing external symptoms. After an inoculation it generally commences in the third or fourth week, seldom earlier or later; this period may also be corresponding to the time of incubation, where the disease is communicated by the contagion acting upon the lungs. From the first infection to the full development of the disease, two stages are discriminated. The first is that of the concealed disease, the "occult stage;" it lasts from three weeks to three months, and under circumstances even longer, and is therefore also called the "chronic stage;" it is without fever and ends when fever and other plain symptoms of disease present themselves. During this period the animals have the already mentioned cough, which, in the beginning yet vigorous, gets weaker towards the end of this stage, when also some disturbance of the health manifests itself by a dull look of the eyes, less liveliness, less gloss of the hair, and a somewhat accelerated respiration, etc. The *post mortem* examination of a patient being killed or slaughtered during this stage, reveals the described degenerations in their first beginning, and smaller or larger diseased knots, or towards the end of the same, and especially when some external symptoms of disturbance of health have been present, hepatizations of larger extension are found in the lungs. The morbid changes are in the latter case not seldom of such an extent, that it is astonishing that no stronger indications of pneumonia have been shown by the patient when living.

The second period, that of the evident disease or the evident stage, frequently called also the feverish or acute stage, commences with the appearance of the fever and the evident symptoms of pneumonia, that have already been specified. It sometimes continues only a few days, but generally one or two weeks; in some instances, however, a great deal longer. The change from the first to the second stage is either little by little, and the symptoms develop themselves slowly to higher degrees, or it comes suddenly and at once, so that animals that appear almost healthy to-day, are very sick and show plain symptoms of pneumonia within two or three days. After the disease has advanced so far, a constant progress goes on under an increase of all symptoms to a certain height, or a pause, and even a little bettering takes place for a few days, or sometimes for a few weeks, when generally a sudden increase appears again, so that frequently a patient that gives one day the best hope of recovery, is the next one a sure candidate for death.

The termination of the second stage is a three fold different one, in death, recovery or consumption. Death is generally caused by suffocation, and ensues after the respiration has become extremely difficult; in some not very frequent cases, however, the animals die before the difficulty of breathing has become very great; then death has not been caused by suffocation. In the latter cases we find at the *post mortem* examination always very important morbid changes on the pericardium, and in proportion not very extensive degenerations in the lungs.

Recovery may commence at any time during this stage, and ensues according to the degree of degeneration that has already taken place, either in a shorter or longer time, from some days to some weeks, and results either in almost perfect restoration, or leaves some difficulty of breathing behind.

The third possible termination is that in consumption, then the morbid process stops, the fever and the indications of pain disappear, and the appetite returns, a little relief results, but the symptoms of pneumonia remain at the same, or nearly the same, height; emaciation follows earlier or later, and terminates finally in death within some months, half a year, or sometimes still longer time. In such cases the autopsy reveals always necrosis to some extent, inclosing capsulas and further metamorphoses of the mortified parts of the lungs; sometimes also metastases, especially abscesses in the liver, can be found.

Pleuro-pneumonia pursues not always, however, this full course; the morbid process can stop at any point of development, as well in the first stage as in the second, and thus it can happen that some animals have already recovered before they have been known to be sick; such cases, wherein the disease has made its course in occultness, come therefore only then to knowledge when an opportunity is given for *post mortem* examination. The cause of these various differences is to be found in the course and manner of the progress of the morbid process in the lungs; thus, the patients appear to be getting better during a long interval between the sudden spreadings of the hepatization; they get worse little by little without remission, when the disease spreads over but small parts of the lungs after very short intervals, and finally they get very bad at once, in case the degeneration is suddenly extended from a small to a large part of the lungs.

The conditions, under which the disease advances or pauses, are partially known; they are to be found in the intensity of the contagion, in the individuality of the animal and in external influences.

The Intensity of the Contagion.—It is an undeniable fact that the intensity of all the known contagious matters is different in the different attacks of illness. For example, there are horses with glanders that communicate the disease almost immediately to any horse they come in contact with, while with others it frequently takes a long time before an infection is effected. There are cases of anthrax, where the least contact with the blood or the secretions of the sick animals communicates the disease not only to warm blooded animals, but to human beings also, while in other cases the soiling of the hands with blood, even for some time, remains unpunished. Such different degrees of intensity are not only observed in single cases, but it also has been found that the contagion of epizootic diseases is more intensive at one time than it is at another; thus we find not only a great difference in the malignancy of the sporadic cases, but have also to distinguish between comparatively mild and very malignant epizooties of all the contagious diseases, Pleuro-pneumonia not excepted, as the main cause of this is given in the degree of intensity of the contagion. Moreover, at the beginning of the attack and during the convalescence, the contagion of Pleuro-pneumonia is always milder than it is at the height of the disease. It has been further observed that the quantity of the contagion that has been taken up, and also the length of time that the animal has been exposed to the influence of the same, make some difference, as indeed Pleuro-pneumonia attacks those animals most always slower and in a milder form that have been exposed but once for a very short time, or have received the disease of such patients that are in the first stage or already convalescent, *i. e.*, if an uncommon predisposition is not existing. Those, however, that have repeatedly or for a long time been exposed, or have received the contagion from a very sick animal, generally get the disease in the worst form.

The Individuality.—The individual predisposition founded on unknown circumstances, appears to be of great importance. Even after inoculations it can be observed that under the very same conditions some few animals show an uncommon reaction, get the disease in a violent form and die, while on the greater majority but a moderate effect, and on some no effect at all can be perceived. Of less, but always perceptible influence are constitution, age and genus; fat animals are sooner taken ill, and suffer more than lean ones; young animals recover oftener than old ones; milk cows are attacked more violently than steers, and bulls suffer generally less, and recover more frequently than all other neat cattle. In milk cows, being in an advanced state of pregnancy, the disease generally makes slow and but little progress, and frequently remains a long time in the occult stage. If it happens that the cow calves during this period, then a change appears and the disease either stops and the patient recovers, or it changes to the worse, the cow suddenly gets very bad and dies. If abortus occurs during the first stage, the disease generally terminates favorable, but after an abortus, during the second stage, it takes in the most cases a fatal turn.

External Influences—.In large herds, kept in small and damp stables, Pleuro-pneumonia is always more malignant than it is under contrary conditions; cold and dry winds are of a bad influence, and accelerate the outbreak and the progress; feeding with good dry food, especially good hay, and keeping the animals rather short, is more beneficial than all medicines, while feeding with plenty of wet food, especially distillery slop, etc., always advances the progress of the disease. Good dry pastures, sweet grass and pure water, have a beneficial effect on the course of the disease; wet and swampy pastures, sour grass and impure stagnant water, exert a bad influence.

Pleuro-pneumonia, when making its appearance as an epizooty in a large herd, has a peculiar course, caused by the different duration and termination of the occult stage in the different individuals. In the beginning of the epizooty generally occur but a few single cases; after some weeks the evident attacks are frequent and numerous, and after that not as frequent again and in longer intervals. The whole course of the epizooty in a large herd standing in one stable, or being in one pasture, terminates within about half a year or eight months. A smaller or larger number of cattle in a herd are not always afflicted but lightly, are not coming out of the occult or chronic stage, and sometimes get well before they are known to be suffering; other animals have to suffer a little more, but also recover before they have reached the full second stage. The larger part of the herd, however, generally from one-half to about three-fourths of the whole number, are taken ill under the characteristic symptoms of pneumonia, and enter the full second, evident or feverish stage; among these latter ones the mortality is great, and of them from thirty to sixty per cent. die; especially in those that have first been taken sick, the disease is most always fatal.

Diagnosis.—Symptoms, course, the features of the *post mortem* examination and propagation, constitute the basis for the determination upon the presence or absence of Pleuro-pneumonia. In regard to the symptoms and the course, it is always to remember that the hepatization exists, to a certain extent, earlier than any external signs of disease, that the external symptoms are always only the result of the extension of the exsudation and hepatization. The products of the morbid process produce the external symptoms, even therefore is the physical exploration of the thorax of such great importance and contributes so essentially to a correct diagnosis. The presence of extensive hepatization, ascertained by auscultation and percussion, is always characteristic, especially in such patients that appear to be not much suffering, or have shown pneumonitic symptoms but lately, but a few days since. In cases where the hepatization is mainly in the fore lobes of the lungs that are more or less inaccessable to the physical exploration, or where the hepatized parts are covered towards the ribs by a yet healthy portion of the lungs of two or three inches in diameter, there the diagnosis remains doubtful in sporadic cases, as traumatic inflammation of the breast and pulmonary tuberculosis are accompanied by the same symptoms. Further, where by an early and predominant attack on the pericardium, dropsy in that organ develops itself earlier than an extensive hepatization in the lungs, a mistaking for rheumatic or traumatic pericarditis may be possible. In all such dubious cases the diagnosis has to be postponed for a few days, as in the most cases a few days will be sufficient to develop either plain indications of pericarditis, or advance more evident symptoms of Pleuro-pneumonia. In such cases, where the difficulty of breathing is very great, where at the same time on both sides of the thorax a plain vesicular respiration and various dry rattling sounds can be heard, where also a full and sonorous percussion sound is found on the whole surface of the thorax, there is evidently no Pleuro-pneumonia present. In an epizootic appearance of the disease, the taking sick of many animals at the same time and under the same symptoms, aid materially to the diagnosis.

The *post mortem* examination gives always full information, even if the patients have not been examined or observed, when living. The already described marbled appearance of the lungs on a cut, and the fibrinous layers on the pleura, are always characteristic, and appear combined in no other disease. A further criterion is given by the acute limitation of the hepatized parts of the lungs from the healthy substance, and the strict limits between the different degrees of hepatization, that are plainly to be seen on the surface of a cut. This so-called "marbled appearance" is made possible by the peculiar anatomical structure of the lungs of neat cattle, but is produced by the peculiar morbid process of Pleuro-pneumonia, the sudden and repeated infiltrations with gelatinous and plastic exsudation, at first and mainly in the interlobular cellular tissue, and then the hyperæmia, and the peculiar changes in the lobules.

Pouring medicines into the wind-pipe, also, sometimes produces hepatization of the lungs, but then always of a uniform, and never of a marbled appearance.

Causes.—We know Pleuro-pneumonia only as a contagion. A spontaneous development caused by fixed, pernicious influences, yet never could be proved, although it has been repeatedly claimed by many authors. Almost everything that is known to the theoretic and empiric hygieina as being pernicious to the health of neat cattle, has at times been accused as a cause of self-development, but has, in all the costly experiments that have been made for that purpose in Europe, entirely failed to produce a single case of Pleuro-pneumonia. However, if we examine without prejudice, the authentic facts recorded the last fifty years, we come to the conclusion, that the contagion has to be considered as the only provable cause of the propagation and permanency in a country, locality, or even a herd. At least, in the greater number of epizooties, the contagion has been directly proved as the source, therefore, till the cause of a spontaneous development is known, and the latter has been proven, the existence or not existence of the same, is an idle question, and belongs not in the province of the healing art, as that has to do with facts, and not with philosophical hypothesis.

The Contagion.—It is always present, it develops itself already in the beginning of the disease, when the animals appear yet perfectly healthy, and is, also, still present for some time after the same have recovered from the disease, and that the longer, the more important the morbid changes have been. The contagious matter appears to be exhaled from the lungs as long as the direct products of the disease, the exsudated masses, as such, are yet present, and the mortified parts of the lungs are not encased; at least, it has been often observed empirically, and is a fact, that cattle that had been attacked in a higher degree, are able to communicate the disease, even as late as two or three months after their recovery. Thus, the source of the disease, the contagion, can exist in one individual, and be propagated by the same, for half a year and longer, while that individual itself has shown but little external symptoms of disease. In cases where Pleuro-pneumonia has come to a termination during the occult stage, and the animals are not slaughtered, and the lungs are not examined, or no other opportunity for *post mortem* examination has been given, there the source of infection frequently may remain undiscovered. The degree of intensity of the contagion corresponds to the degree of development of the disease; at the height of the latter, the contagion is the most intensive, and produces the quickest and surest infection, while during the occult stage, or after apparent recovery, it wants, generally, an exposure to the influence of the contagion for some time, to produce an infection. The contagion is contained in the exsudation in the lungs, and in the air expired from the lungs, is very volatile in living animals; but after death, the volatility of the contagion, if existing at all, is but very little, and, therefore, infections by dead bodies are very seldom. If the contagion is not affected by a current of fresh air, then its tenacity of life is very great; especially porous bodies, that prevent a free access of air, as straw or hay, etc., heaped up in large masses; rotten wood and other porous bodies can preserve the contagion for a long time—for several months, perhaps for over a year; thus, those frequently experienced facts find an explanation, that in stables and in farm yards, that had been infected by a longer prevalence of Pleuro-pneumonia, the disease frequently appears again among cattle that has been purchased and imported more than half a year after the last diseased head has left the premises, if the latter have not been thoroughly cleaned and disinfected. Still, the indirect infections—those by infected stables excepted—are not frequent, compared with the direct communications by diseased animals. The exhaled contagion accumulates in the surrounding air, and produces a contagious atmosphere of not over fifty yards in diameter, in open air and stagnant stratums, but in a current of air, extends in one direction, over one hundred yards. In warm and damp stables, the accumulation of the contagion appears to be denser, and moves onward in a certain direction, if driven by currents of air, so that frequently, further off standing animals are infected first.

For a successful infection, a susceptibility of the animal for the contagion, and a certain quantity of the latter appears to be necessary. The susceptibility is apparently different in the different individuals, so that under the same conditions, some animals are early, others later, and some few not at all attacked. Those that have recovered from Pleuro-pneumonia, have lost for the future all susceptibility for the same, and are secured against a second infection; on this peculiarity is based the doctrine of the inoculation. Our other domestic animals, as horses, sheep, swine, etc., have no susceptibility at all for Pleuro-pneumonia.

The peculiar qualities of the contagion explain the following facts:

1. Cattle, though coming from a locality that is entirely free from Pleuro-pneumonia, can propagate the disease, in case they have taken up the contagion on the road, in infected railroad cars, stables, etc.

2. Cattle, apparently healthy themselves, can carry the contagion over large distances, hundreds of miles—even over the ocean to another place.

3. Cattle, that are the bearers and propagators of the contagion, may show no pneumonitic symptoms before two or three months after their importation, as the occult stage, frequently, is a very long one; neither is it necessary that such cattle get sick first, as other animals that are infected by them, may have more predisposition for Pleuro-pneumonia, and enter quicker the evident stage.

4. Cattle can carry the disease into a stable or locality without getting sick themselves, if they either had the disease before, or recover from the occult stage.

5. Pleuro-pneumonia may not come to an evident outbreak before half a year, or eight or nine months after the importation of that animal, that has brought in the contagion, *i. e.*, if the first infected cattle are but little diseased, so that the malady becomes evident but then, when a further propagation has taken place.

6. The disease cannot continue in a herd, if no neat cattle are imported, as it befalls one and the same animal but once in its life. However, Pleuro-pneumonia gets stationary, if always new animals are purchased and imported, before the disease has entirely abated, and the infected stables, etc., have been thoroughly disinfected, as those imported animals not only get infected

themselves, but infect, also, the localities again, and preserve the contagion from time to time. That way, a source of continual propagation is created.

The Prognosis is, in general, unfavorable; and the owner of a herd, in which Pleuro-pneumonia has broken out, can be satisfied, if not more than thirty per cent. of the whole number of his cattle die; if he loses but one-fourth, he may call it very favorable, as in some epizooties, half or more of the whole herd will perish, especially if the patients have not come under a rational treatment during the first stage. However, in the single cases, the prognosis depends, to a great extent, first, on the more or less malignant character of the epizooty, then on the constitution, age and genus of the patient, the stage of the disease the patient is in, and on great many other circumstances already mentioned. The hope of recovery increases, when liveliness and appetite return, when the fever decreases, the coughing becomes easier and the groaning disappears.

Treatment.—If we consider that Pleuro-pneumonia has its only known source in the contagion, that it makes most always its appearance as an epizooty; further, that such an epizooty is always of a long continuance, and very destructive; and finally, as it gives so many opportunities for the propagation of the contagion, that are not always to prevent, the best method of treating Pleuro-pneumonia, and the best prevention of its further propagation, undoubtedly consists of the immediate killing, of not only those cattle that are known to be afflicted with Pleuro-pneumonia, but of those, also, that are presumed to be infected; the immediate disinfection of the stables, yards, etc., and the burning of that straw or hay, that is presumed to be containing the contagion, and can in no other way be disinfected or made harmless. Then the disease is at an end, and no new outbreak, no further propagation has to be feared. If this treatment, the so-called "club," is applied early enough, then the loss will not be very great, especially as those cattle that are slaughtered during the occult stage, when there is yet no fever, are perfectly good for beef; those of course that are killed, when already in the evident or feverish stage, are not any more fit for human food, and should be buried. In such cases, where the strict execution of this method should cause too great a loss for the owner or owners of the diseased and infected cattle, there it would be in the interest of the community, county or State, to offer a fair compensation for the net loss, and thereby induce, or better, compel him or them to kill not only the diseased cattle, but, also, all those that may possibly have been infected, at once, as this would be the only sure way to stop the propagation of the disease, to save all other cattle, and to avoid further losses. In the most cases, the real loss caused that way would not be a great one. A law, as they have in some States in Europe, that compels every one to kill immediately, all those animals of his, that are afflicted, or very likely infected, not only with Pleuro-pneumonia, but also, with all other destructive contagious diseases, that have their only source, as far as is known, in the contagion, would prove beneficial, and would save a vast amount of money every year.

Only in those cases, where the strictest precautions are taken, that make a further propagation absolutely impossible, or where the disease has already too far spread, so as to make the method of killing impracticable, a medical treatment is advisable, and has to consist of a dietary and a medicinal treatment. The first is sometimes of more importance than all medicines.

First, the patients ought to be separated, and have to be kept in well ventilated, dry, and not too small stables or inclosures, that protect them perfectly against the inclemency of the weather. The sick animals, as also the suspected ones, should be kept a little short, and their food has, if possible, to consist of well harvested and good hay, made of sweet grass, and has to be given in small portions; pure water, best a little warmed, has to be given to drink. Further, it is to recommend to keep the patients not only as clean as possible, but also to clean and rub their skin every day, as this increases the activity and perspiration of the same; covering with blankets, etc., however, should be avoided, as that will always accelerate the respiration and the circulation of the blood.

Concerning the medicinal treatment, there is scarcely a remedial agent in the veterinary pharmacology, that has not been recommended or tried against Pleuro-pneumonia, the most of them, of course, with a very dubious effect. Neither has there been want of partially very ridiculous and superstitious arcana, that have been used without success.

The treatment, in general, has to be antiphlogistic. If the patients are robust and in good condition, and yet in the first stage of the disease, then the treatment may commence with a good bleeding of from eight to sixteen pounds of blood, according to the size and constitution of the animal. Weak and emaciated animals should not be bled, as to them a bleeding would be hurtful. Externally, the application of blisters on the sides of the thorax, and a seton below the breast, is useful in the most cases. The best blister would be a liniment made of one part of cantharides, and four parts of oil; ointments of tartar emetic, arsenic, corrosive sublimate, or euphorbium, are not necessary and should never be used, as they frequently not only mortify the skin, but sometimes, even the muscles and other textures beneath it, also.

A piece of a thin rope, or a strap of leather, will do as well as anything else for a seton. Internally, large doses of sulphate of soda, with nitrate of potassa and tartar emetic, may be given in the first stage, or, if fever suddenly appears, digitalis may be added. In cases where the hepatization of the lungs is extensive, the use of carbonate of potassa has been recommended.

If the patients have already entered the second, feverish or evident stage of the disease, then the treatment must be somewhat different. Bleeding has to be avoided, as the patient will soon enough decline without. Tartar emetic and carbonate of potassa—the latter, where the exsudation is extensive—may be continued with, as long as the patients are not emaciated; but after they are getting weaker, sulphate of iron, about two drachms given three times a day, promises the best success. Alum, tanin, the mineral acids and tar-water, also, have been recommended, the latter especially, where the disease has terminated in consumption. During the convalescence, muriate of ammonia, red antimony, sulphur, fennel-seed, anis-seed, juniper-berries, etc., may be given with advantage. Where the disease has terminated in consumption, a treatment, is in most cases, of no avail.

In all those cases, where is considerable difficulty of breathing, the medicines have to be given in form of an electuary, and not in a fluid form, as fluids frequently will be poured into the wind-pipe, instead of being swallowed, especially as the breath of the sick animal is short, and the medicine is not taken voluntarily, but always has to be given by force. To make an electuary a little marsh-mallow root powder, is the best and most innocent agglutinent.

Finally, let me say a few words in regard to inoculation. It has been found out long ago, that, concerning a disease like Pleuro-pneumonia, a prevention is of a far greater value than an attempt at a cure; therefore, in those countries where Pleuro-pneumonia has become a stationary plague, in Holland, Belgium, Switzerland and Upper Italy, it has been experimented to find a successful preventive, or protective remedy, against this destructive disease. In 1852, de Saive, in Cologne, and Willems, in Brussels, recommended inoculation as a successful protection against Pleuro-pneumonia, analagous as vaccination against small-pox. These gentlemen claimed to produce, by the inoculation, a milder and local form of Pleuro pneumonia, restricted to the place of inoculation, and thereby, to protect the cattle against genuine attacks for life, by extinguishing all susceptibility. This theory received for some years, a great deal of attention, and great many experiments have been made, but with different results. The inoculation is performed in the following way: A robust animal, that is sick in the first stage, and has Pleuro-pneumonia in a mild form, is killed, then the lungs are taken out, cut to pieces, and the gelatinous exsudation that flows out or is gently pressed out of the interlobular cellular tissue, is taken up and used for inoculation matter. This matter is then inserted on the backside of the lower third of the tails of those cattle that are to be inoculated, in the same way as the vaccine matter is on the arm of a child. It would lead me too far to relate all the experiments, results and different theories about the inoculation of Pleuro-pneumonia. It will be enough to say, that frequently after an inoculation, the disease has been near as malignant as a genuine attack; that, also, great many losses have been met with; on an average, about fourteen or fifteen per cent. of the inoculated animals have died. Further, in all those countries where inoculation is in general practice, there the contagion is always preserved by the same, and becomes never extinct. Thus, the inoculation may become a source of the disease, instead of a preventive. Only in one instance it may be a real benefit, *i. e.*, where Pleuro-pneumonia has broken out in a locality, or in a large herd, and but a few animals are yet attacked, there it would be advisable to inoculate all those animals that are exposed to an infection. As a successful inoculation protects the cattle against a genuine attack, the losses will be fewer, and as the period of incubation, after an inoculation, is at an average but three or four weeks, the epizooty will quicker be brought to a termination.

At the International Veterinary Convention, in 1863, in Hamburg, the following resolutions, moved by Prof. A. C. Gerlach, in Hannover, have been passed in the session of the sixteenth of July. Prof. Dr. Ed. Hering, from Stuttgart, in the chair:

1. For the extirpation of Pleuro-pneumonia, the killing of the attacked animals is to be recommended.

2. All animals being exposed to an infection, should be inoculated.

3. Within the first year after the termination of the epizooty, all those cattle that have recovered, as well as those that have been in contact with the diseased or infected animals, should be slaughtered for beef.

The first of these resolutions was nearly unanimously adopted.

WEDNESDAY EVENING—7 o'clock.

W. C. FLAGG, Corresponding Secretary of the Board of Trustees, read a paper on

RURAL LITERATURE.

On so taking a topic as this, it would be easy to write a readable if not a useful lecture, provided it were proper to confine myself to the Belles lettres of the subject; but in view of the fact that what I have to say must be compressed within the limits of a few pages, and that the more useful, if not the more readable, portion of rural writing, falls without the limits of what our grandfathers called polite literature, I find it necessary to give up the more pleasing task of the literary critic for the drier duties of an enumeration of what has been written on the practical, as well as the ideal, life of the country—of the prose as well as the poetry of rural life.

Literature in its most general and comprehensive sense, includes all that is written and printed, in contradistinction to what is spoken, and it is in this general sense we speak of the literature of any given subject. It is in this sense I speak of rural literature; meaning thereby all that has been written concerning rural life, whether it be pastoral poetry, agricultural chemistry, or farm accounts.

We have, or are getting to have, a literature upon about every subject under the sun, from base ball to the doctrines of the future life. The stamp collector has his magazine, and the metaphysician his journal of speculative philosophy; and meanwhile, though the fact is hardly recognized, a rural literature has grown up. I suppose the fact has been less noticed, because our writers on rural affairs have been generally men of little culture on the one hand, or less experience on the other, and have consequently not commanded the attention that writers better fitted would have deserved in the republic of letters. In looking over our various cyclopædias and hand books of literature, one is surprised to see how little attention is paid to the literature of any industrial pursuit, but especially of one that for thousands of years has engaged the attention, and employed the energies of a large part of the civilized world. Perhaps it is a relic of that primal barbarism that saw nothing of spiritual or political significance in the common life of the common people; and that found only in the life and social conditions of the ruling few, the fitting objects of its study and thought. Perhaps, too, there has been greater lack of *continuity* in agricultural literature and thought, than is creditable to the farming class. Like history, farming repeats itself, and there has been a great amount of rediscovery of agricultural arts, and no sufficient remembrance of what has been proven, as any one may see who compares the old and new works.

But times change, and we change with them. To-day a part, at least, of our agricultural population, begin to understand their necessities and the proper way to supply them. We have learned that the movements of the masses are more significant than the chronicles of kings. The historian of to-day, traces with difficulty but with intelligent diligence, the nearly obliterated footsteps of the plodding hind of past ages, as the best indication of the movements of human progress. There is no present danger that the industrial classes, their movements, their ideas and their sentiments will not be carefully studied. But this study will bear its fruit in the future. At present we are in the transition stage, and I find a lack of authorities and well digested bibliographies, when I come to inquire into the amount and quality of rural literature.

Loudon, in his Encyclopædia of Agriculture, has given a considerable list of books upon agriculture and kindred topics; and Donald G. Mitchell in his Wet Days at Edgewood, has made the first attempt I know of, at a literary history of the more readable writers on rural affairs; but neither attempts are complete bibliography, although affording important aid for the compilation of one.

I could not hope within the scope of this brief paper, to make good their deficiencies, even if my information were complete; but I will attempt a classification of the various books on rural affairs, and name under each head so far as I can, the more important works on each topic.

I follow in this classification, a scheme of more general application adopted by Mr. Lesley of the American Philosophical Society at Philadelphia, and described by him in the Smithsonian Report for 1862. This, as modified and adapted to the more limited topic now in hand, may include:

1. A general or miscellaneous class, embracing Bibliographical works, Encyclopædias, Transactions and Reports of Societies, Annuals and Periodicals, and other works treating of a variety of topics.

2. Mathematics as applied to Agriculture, embracing Meteorology (though this is a questionable classification), Surveying, Leveling, Drainage, Irrigation, and other Agricultural Engineering, Book-keeping and Physics, or Mechanics.

3. Inorganic Science applicable to Agriculture, including Agricultural Chemistry and the Mineralogy and Geology of Soils, etc.

4. Organic Sciences applicable to Agriculture, including Biology or General Physiology, Botany, Zoology, and Veterinary Science.

5. Historical Science as applied to Agriculture, can embrace only histories of Agriculture and rural life, which are rare, and books of travel by agricultural, horticultural, botanical, and sometimes other scientific tourists.

6. Social Science as applicable to Rural Affairs, specially embraces Agricultural Statistics, Rural Economy, Farm Manufactures and Rural Law.

7. Spiritual Science when limited to rural life, includes the attractive topics of rural, imaginative and descriptive literature, prose and verse, landscape and other ornamental gardening, Rural Architecture and Agricultural Education.

8. Personal Science or Biography in this relation may include the biographies of persons identified with the progress and history of agricultural art.

Other divisions might be suggested that would possibly be more interesting in a general survey of the literature of the subject. A chronological and ethnological arrangement would be one, going back to the time

"When Adam delved and Eve span,"

and tracing downward so far as possible, the course of agricultural progress in all times and ages.

A division according to the generally accepted analysis of the human mind suggests itself—including theoretical, imaginative and practical rural literature. This I should personally prefer as the most philosophical.

But looking at literature as we find it: often miscellaneous and nearly always unphilosophical, I regard the division first given as the most available, and will now enter upon its discussion more in detail.

1. Under the general or miscellaneous class we may group all books that treat of a variety of rural topics, and which consequently cannot be distributed except piece meal under the special heads of which they variously treat. Of this class were most of the early and many of the later works on agriculture. Mago, the Carthagenian, of whose works only a fragment has come down to us, probably made a compilation of miscellaneous matter. Hesiod, the oldest of Greek writers on agriculture, whose works have come down to us, is very hetorogeneous in his matter. The curious book of Nabathean Agriculture, compiled a thousand years ago from earlier writers, and attracting a great deal of attention from the high antiquity claimed for its original authorities, is equally miscellaneous in its scope, as see the review of it in the New Englander for July, 1862. Of nearly a contemporaneous date in its compilation is the Geoponica, a Greek compendium of a number of preceding writers. It is described somewhat at length in the Wet Days at Edgewood, and is equally miscellaneous in its character. Much later, but still a compendium of more ancient writers, is the Scriptores rei rusticae made by Gesner, I bebelieve in 1735, and containing the writings of Cato, Varro, Columella, Palladius, and other Roman authors. Another book of this class, notable for its perennial character, is the Maison Rustique of Etienne and Liebault, dating back into the sixteenth century, but with successive revisions and additions, brought down to the present day as a standard French authority, on a great variety of rural affairs, and as such now placed on the shelves of the library of this University. Loudon's Encyclopædia of Agriculture is a still

more remarkable work in the amount of learning, diligence and general accuracy it displays. It is a monument of the literary toil and patient industry of its author, and no doubt the most complete book of its kind. Of American works of a kindred character, Copeland's Country Life and Allen's American Farm Book will suggest themselves as desirable ; but the Rural Affairs of J. J. Thomas, although subject to the drawbacks of periodical publication and repetition of views, are to my mind the best miscellaneous work on rural affairs yet written for American use.

Of Bibliographical works, I only name the Wet Days at Edgewood, which is always readable and generally instructive, and the bibliographical notices in Loudon's Encyclopædia of Agriculture. The list of American works in the Report of the Commissioner of Agriculture for 1868 is valuable.

Under the general or miscellaneous head, also comes a formidable lot of Reports and Transactions of government departments, societies, clubs, boards, etc. Of our American States, the following, have published reports : Maine, Massachusetts, Connecticut, Rhode Island, New York, Pennsylvania, Ohio, Indiana, Illinois, Michigan, Wisconsin, Iowa, Missouri, Nebraska, Tennessee, California and Oregon. Besides these we have the reports of more local or private organizations, and the Patent Office Reports followed by the more valuable reports of the Commissioner of Agriculture, which two last, since 1847, have furnished a national report of more or less value to the farmer. In British America, some of the provinces, I believe, publish annual reports. The various Agricultural Societies of Great Britain have their reports, but I know very little of them. Among them are the Bath and West of England Society, organized in 1777 ; the Highland Society of Scotland, organized in 1784 ; the Board of Agriculture in 1793, and the Royal Agricultural Society in 1838, twenty-five of whose volumes are now on our library shelves. France has numerous societies, and I presume more or less reports. Germany still more. In fact, we find that in England, Germany, and France, we must look for the great proportion of modern thought on Agriculture.

Agricultural annuals, quarterlies, and monthly and weekly publications, are mostly of this character. We already have several valuable annuals in this country, in the shape of the Rural Register, of the Country Gentleman, the American Agricultural and Horticultural annuals of the American Agriculturalist, the Prairie Farmer Annual and the Western Rural Annual of our own State. There are similar publications in England which I have not seen ; a very excellent one, L'Annee Agricole, besides Almanach du Cultivateur, Almanach du Jardinier, etc., in France, and others in Germany. Little has been done in this country in the way of Agricultural quarterlies or magazines, although the more exhaustive and well considered treatment of topics that they would bring with them, makes them much to be desired. The writing done for our American agricultural papers is often ill considered, generally hastily and carelessly expressed, and is never thorough, for that implies an extent of space in the columns of a newspaper that the public taste for variety will not brook. In England they have the Farmer's Magazine and the Quarterly Journal of Agriculture. In France, Les Chroniques de l'Agriculture et de Horticulture (monthly), Journal de l'Agriculture des pays chauds (monthly), Le mois Agricole (monthly), Revue des Jardins et des Champs (monthly), etc. In Germany, numerous monthly and quarterly publications, such as the Landwirthschaftliche Monatschrift, Die Landwirthschaftlichen Versuchs Stationen, etc. Of farmers' periodicals, however, the weekly appears to be the favorite and popular form, as the Revue Agricole of France, the Gardeners and Farmers' Journal and the Mark Lane Express of England, and the Country Gentleman, Rural New Yorker, Hearth and Home, Prairie Farmer, Western Rural and many others evince. But all, or nearly all, our American Agricultural papers are so far hybridised with the so called family newspapers as to lose in a great degree their distinctive character of special periodicals. This may be a fine thing for the family newspaper and profitable for the publisher, but it detracts a good deal from the advantages derived from the division of labor in newspaper publication, and will not give the best result in agricultural practice.

No country, I believe, unless it is France in the Moniteur de l'Agriculture, has a daily agricultural paper; but I confidently predict that the "coming" American farmer will receive an agricultural daily, with telegraphic reports of the state of the weather and crops, and possibly an omission of the last city murder or forgery.

2. Mathematical science as applied to agriculture gives rise to works on agricultural meteorology, surveying, drainage and irrigation, book-keeping and physics in their relation to agriculture. Of works on meteorology, I find Blodget's Climatology of the United States of considerable practical interest, though now out of print, and a costly work at first. Loomis' Treatise on Meteorology is a text book, and not of special application, but is desirable. Surveying, of course, has a special interest, and frequent application to farming, but there is no work specially designed for the farmers' use. Perhaps it is hardly needed, as the common books of Gillespie and others, answer a good purpose. Drainage, which is almost a subordinate branch of surveying, has been written upon by French, Klippart, and Waring, of American authors. All of these seem to me valuable, though all things considered, I would take Waring's work if I could have but one. The English writers on this subject I have only read in quotations, but I presume their methods would not suit our systems of agriculture. Agricultural book-keeping has been taught as a distinct branch of book-keeping, and we have some small treatises and elaborate blanks to teach the young farmer how to post his books. I confess, however, that I have found none of these very satisfactory, and am strongly inclined to believe that a study of the principles of ordinary book-keeping, and the application of them in common books, as common sense teaches, to a given form, will be more satisfactory. I hope the coming farmer will keep books, and keep them well, but there is so broad a margin of guessing, or estimate necessitated in farming, that we must not anticipate very accurate results. Who can properly tell, for instance, the waste or gain of a farmer's capital—his land—in a given year?

Under the head of physics may be arranged a class of books, of which there is too scanty a supply. Thomas' Farm Implements is about the only exclusive work on the subject that I know of in this country. Some of the writings of S. Edwards Todd, and the report of J. Staunton Gould, in the New York Agricultural Report, which ought to be printed as a separate work, are of a similar character. I presume works of the kind are more common in Europe, but I have not chanced to see more than the names of a few of them.

3. The inorganic sciences applied to agriculture, are chemistry, mineralogy, and geology. Agricultural chemistry has had a proper share of devotees since Sir Humphry Davy's time, down to Professor S. W. Johnson, whose How Crops Grow is, I believe, considered our best work on its topic, in the English language. His forthcoming work, How Crops Feed, will be looked for with interest. Johnson's book on agricultural chemistry, though now behind the age, is still commended and read. Caldwell's Agricultural Chemical Analysis, I presume to be valuable, but have not examined it. Emil Wolff's Ackerbau, and Knop's Kreislauf des Stoffs, are among the most valuable of the German works, Prof. Stuart informs me; yet more valuable, perhaps though in a chaotic condition, are the publications of the many Versuchs Stationen, some of which are already gathered in our libraries, and which were largely drawn upon by Prof. Johnson, as he informs us, in the preparation of his valuable works. Boussingault's Chimie Agricole, I judge to be one of the most valuable of the French books on this topic.

As to mineralogy and geology, in this connection, Prof. Johnson's How Crops Feed (I add this in revising for the press), first suggests itself as latest and most valuable at least, so far as in its consideration of "the soil as related to vegetable production." There is something in Johnson's Agricultural Chemistry, and Norton's Scientific Agriculture. We need very much a popular treatise on our Illinois soils, such as our State Geologist will be probably prepared to produce, when the Geological Survey of Illinois is concluded.

4. The organic sciences as applied to agriculture open a wide field of thought, experiment and literature, naturally much the largest, under the general head of husbandry. For here we have biology, or general physiology, botany, zoology and veterinary science. Under the general head of biology, I suppose we ought to class such books as Darwin's Variation of Animals, and Plants under Domestication, whose facts, whether we accept his conclusions or not, are of wonderful interest to the farmer, and an excellent practical book of Gray, his Field, Garden and Forest Botany; then Darlington's Weeds and Useful Plants. How Crops Grow, makes a re-appearance, and Carpenter's Vegetable Physiology (English), is worth looking into. Our friend, Dr. Warder, thinks highly of the works of Schleiden, and since this lecture was first written, I have procured and found very valuable De Candolle's Geographie Botanique raisonee. Leaving these general works bearing on agricultural botany, and coming to more special works, we are getting to have many valuable books. Flint's Grasses and Forage Plants is the only book I have seen upon its subject, and that is rather limited in the area for which it was designed, and is now perhaps a little behind the times. Klippart's Wheat Plant and Todd's

Wheat Culturist are native works, but I am not familiar enough with them to characterize them. There have been several works on Indian Corn written, such as D. J. Browne's Memoir on Indian Corn, Edward Enfield's Treatise on Indian Corn, the appendix to Mr. Klippart's work on Wheat, Bonafon's Histoire Naturelle du Maize—the last of which is said to be a magnificent work. Metzger and Von Bibra have written works in which the cereals, as a whole, are considered—the former, Die Getreidearten, the latter, Die Getreidearten und das Brod, which is referred to by Prof. Johnson as an authority.

Culinary vegetables have been the subjects of a good deal of research and writing. Fearing Burr's Vegetables of America, is a very complete work, and very finely illustrated. Henderson's Gardening for Profit is practical and good. Buist's Kitchen Gardener is, or rather was a good book, that needs bringing up to the present time. Several of the annual catalogues of our Seedsmen, as Bliss, Vicks, Hovey, etc., are pretty complete treatises in themselves. We may soon expect special works on the more important and variable vegetables, such as the potato, tomato and cabbage; in fact, the Germans already have one on the cabbage plants, and we have some small pamphlets, such as Gregory on the Squash, and Potato Culture.

Upon textile plants we have Turners' Cotton Planter's Manuel, Lyman's Cotton Culture, Flax Culture, and treatises, now out of date, on Hemp, etc. Several American books have been written on sorghum and the sugar cane proper. Dr. James Grainger, an Englishman, resident at St. Christopher, wrote a poem on sugar cane, intended to mingle instruction with the charm of poetry, I suppose, but it does not seem to have had a marked effect on the West Indian staple. Books have been written, also, on hops, tobacco, etc.

Fruit books have been produced in this country in considerable quantity, and of very good practical quality. The new and large edition of Downing's Fruit and Fruit Trees of America is one of the most complete works on general pomology yet published, though one may expect to see it surpassed by Andre Leroy (d'Angers) Dictionnaire de Pomologie, the first and second volumes of which, containing 1390 pages, treat of Pears! But Mr. Downing's work describes 1855 varieties of the apple, 1006 of pears, and other fruits in proportion. The Fruit Culturist of John J. Thomas is a smaller but very practical and valuable work, and as befits its Quaker origin, is a thoroughly honest book in matter, type and paper. The special works of Dr. Warder on apples, Quinn and Field on pear culture, of Husmann, Fuller, and others on the grape, of Fuller on small fruits, Eastwood on the cranberry, etc., readily come to mind. Fulton, since this lecture was first written, has published a special work on the peach. English works on fruits are comparatively rare, but some of them very good, especially Lindley's Guide to the Orchard and Dr. Hogg's work on apples. McEwen has written a brief work on the peach and nectarine; Brehaut, one on peach pruning. The Germans have published some valuable and erudite works on fruits, judging from Christ's old work published in 1817, and the later Handbuch der Obstkunde of Lucas and Oberdieck and others, that I have seen. The French, probably from their more favorable climate, have turned more attention to the subject of fruits.

I have already alluded to the great work of Leroy. Carricre, Bengy-Puyvallee, and other's works on the peach, excel those of other countries on that fruit, both in number and quality. A special work on the strawberry by a French author, I have seen highly commended. D'Albret and Du-Breuil, and many others, have written books on pruning superior I believe to those of any other country.

Books upon ornamental and forest trees are numerous and good. The works of Michaux and Nuttall are still standards, but are not up with the age. Browne's Trees of America is worth having, but seems to be an ill judged compilation. Fuller's Forest Tree Culturist has its value as a compact and practical treatise, but hardly meets our western wants. Loudon's Arboretum, though an English work, and now many years published, is still the best general work, and is a prodigy of energy, industry and research. Of more special books the Book of Evergreens of Josiah Hoopes is very complete, scientific and practical. The Hedges and Evergreens of Dr. Warder was valuable at the time of its publication, but needs revision to bring it up to the existing state of knowledge on this subject. On flower culture we are getting to have a variety of valuable books, among which are the general works of Buist, Henderson and Rand, and the special ones of Parsons and Parkman, on the rose, Rand upon bulbs, etc. There is also quite a number of works on culture under glass, among which are Saunders and Hovey's editions of Rivers' Orchard Houses, Woodward's Graperies, Leuchar's How to Build Hot Houses, etc. This whole subject, however, I suspect demands a revision of the extant books. They seem to be based too much on European experience.

Under this head also may be placed a large number of horticultural annuals and magazines. Of annuals we have the American Horticultural Annual of the American Agriculturist, and did have the Record of Horticulture, now discontinued. There are similar annuals in France and England, such as Almanach du Jardinier, etc. Of our horticultural magazines first in order comes Hovey's Magazine, started in 1835, but merged at the end of 1868 in the Journal of Horticulture, itself started in 1867. The Horticulturist, started by Downing in 1845, came next, and is now in its 25th year. The Gardener's Monthly appeared in 1859, and under the very able editorship of Thomas Meehan may now be regarded as about the best of our horticultural periodicals. In Britain there are many horticultural magazines, such as the Floral Magazine, Floral World, Florist and Pomologist, Gardeners' Chronicle (a weekly), Gardeners' Magazine, Journal of Horticulture, and Scottish Gardener. In the French language are the valuable Revue Horticole, started in 1829, now published weekly; La Belgique Horticole, 1851, monthly; Flore des Serres, 1845; Horticulteur Francais, 1851, monthly; Illustration Horticole, 1854, monthly; Journal de la Societie imperiale et centrale d' Horticulture, 1855, monthly; Revue de l' Horticulture, tri-monthly, 1867; Revue des Jardens, 1860, monthly; Verger, 1851. The French have, moreover, Le Moniteur vinicole, and Revue viticole, just as we have at St. Louis The Grape Culturist, edited by Mr. Husmann. German magazines, etc. of the horticultural sort, are sufficiently numerous, such as the Illustrirte Monatshefte, Pomologische Zeitschrift, etc.

Zoology applied to domestic animals also introduces a large class of books. Tenney's Natural History, Goodale's Principles of Breeding, are general works, to which a good deal may be added from Darwin's Animals and Plants under Domestication. In English we find recommended general works such as Low's Domestic Animals. Of more special ones we have Allen's American Cattle, Flint's Milch Cows and Dairy Farming, Quincy's Soiling of Cattle, and the various herd books devoted to cattle. Dobson on the Ox is an English text book. La Connaissance Gen. du Boeuf is a French work of probable value. Guenon's work on Milch Cows is curious at least. Special works on the horse are numerous, such as Herbert's Hints to Horse-keepers, Jennings' Horse Training made easy, Mayhew's Illustrated Horse Management, and a late and highly commended work, The Horse, by Stonhenge, the *nom de plume* of a brother of our late State Entomologist, Mr. Walsh. We have also works on particular breeds, as Percheron Horses, translated from the French, and Lindley's Morgan Horses. There are even works on particular parts of the horse, as Miles on the Horse's Foot, and the new book on Horse Shoes and Horse Shoeing, noticed in the first number of Old and New. Germane to works on the horse, is Riley's book on the mule.

Books on Swine are comparatively scarce. Heretofore we have had in popular use only the little manual of Richardson, which is entirely inadequate. Since the first writing of this lecture, however, Harris on the Pig, an American work, has appeared, which does much towards supplying the deficiency. Von Nathusius has written a book on Die Racen der Schweines, which Darwin cites as an authority, and there are many books, both French and German, on the subject. In France there is even a Pork Almanac.

The Sheep has more attracted the attention of American writers. We have the works of Morrell and Randall, both very good, and the English book of Youatt, reprinted. The Germans have a work by Fitzinger, Ueber die Racen des Zahmen Schafes, which must be curious in its speculations according to Mr. Darwin. Of course there are numerous French treatises, such as Emile Baudemaut's book on Les Merinos, Lanson's Les Mouton's Viellerot's Betes a laine, etc. There is even a treatise on Wool Growing and Merino Breeding, published in Australia.

There are numerous books on Domestic Birds, of which Bement's Poulterer's Companion is probably the best for our use. Tegetmeier's Poultry Book (English) is later, but expensive. Saunders' Domestic Poultry and the American Bird Fancier are smaller and less praised books. Then there is Wright's Practical Poultry Keeper and Geyelin's Poultry Breeding. Numerous books have been written in Europe solely upon the Pigeon, as one may see in the foot notes of Darwin's Animals and Plants, but in this country the division of labor in authorship is hardly so far extended.

We have some books on other and less common domestic animals, such as Bement's Rabbit Fancier, Richardson on the Dog, the Dog by Dinks, Mayhew and Hutchinson, Basse cour pigeons et lapins, by Madame Millete Robinet, etc. Books upon Fish Culture have been written by Norris, etc.

Books upon what we may call the domestic insects are in vogue, especially hose upon the Bee, upon which Quimby in his Mysteries of Bee-keeping

Langstroth on the Honey Bee, and others have written copiously. Of the French books, Debeauvoys Guide de l' Apiculteur has reached a sixth edition, and Emile Le Fevres Les Abeilles a second. The Germans appear to have numerous authors on the subject, as well as Transactions of Societies and periodicals, such as the Bienenfreund, the Bienen Zeitung, now twenty-five years published, etc. I note several Italian works as indicative of an interest in that region, and a Handy Book on the Honey Bee, published at Aückland, New Zealand. The Silk Worm has long been of interest, and there is considerable literature on the subject. I have even an American work published in 1835, pending the morus multicaulis fever. Haraszthy in his work on Grape Culture, reprints a Bavarian treatise on the subject, and a Mr. Prevost, of California, has lately written a book on the subject, a result of the great interest awakened in that State. We have one periodical devoted to bee culture. In France we find numerous treatises on the Silk Worm and Mulberry, and Society Annals, and even special works on the Ailanthus and other silk worms. Monographs are written also on the diseases of the silk worm, and one translation of a Japanese work, "Sira-Kawa," has been published at Paris. Many works on this subject also may be found in the Italian.

Books upon noxious insects are increasing with the demand, but we still lack a good manual. The best practical work I suppose, is still Harris' Insects Injurious to Vegetation, but we may commend also the less accessible writings of Fitch. Packard's Guide to the Study of Insects I do not find much commended by our practical men. The reports of Mr. Walsh and Mr. Riley and their periodicals, the Practical Entomologist and the American Entomologist, furnish the most valuable aids to the western farmer. Entomological periodicals are published in Canada, England and France, and I presume in other European countries.

Under the head of Applied Zoology, we must also notice Veterinary Science, with an extensive literature, especially upon the diseases of the horse. Among books written or reprinted in this country are Cole's Veterinarian, Dadd's Modern Horse Doctor and his American Cattle Doctor, Youatt and Spooner on the Horse, Youatt on Cattle, etc., Jenning on the Horse and his Diseases, Mayhew's Illustrated Horse Doctor, etc. Valuable but less common are Gamgee and Law's Anatomy of the Domestic Animals, Gamgee's Domestic Animals in Health and Disease, Chauveau's Anatomie comparee des Animaux Domestiques, Reynal's Dictionnaire de Medecine Veterinaire, Percivall's Hippopathologie, and Leyh's Handbuch der Anatomie der Hausthiere.

5. Under the head of Historical Science, we may place histories of agriculture, agricultural and horticultural tours, and the like. Books of the kind are as yet scarce in this country, though not absolutely unknown. Loudon gives something of a history of agriculture in the beginning of his Encyclopædia of Agriculture. Morton's Cyclopædia of Agriculture, I believe, does the same thing; as also Caird's English Agriculture. Cancalon has written a Histoire de l' Agriculture. Colman's European Agriculture and Caird's Prairie Farming are both in their different ways interesting examples of agricultural tours. Olmsted's Walks and Talks of an American Farmer in

England are exceedingly good. Robinson's Gleanings from French Gardens, is another late work of the kind. There are many old books of the kind by Young, and others, but they are now perhaps more curious than useful. Such books as Gourey's Voyage Agricole en France Allemagne, Hongrie, Boheme, Belgique, Lavergne's Economie rurale de la France, depuis 1789, Essai sur l' Economie rurale de l' Angleterre de l' Ecosse et d' Irlande, etc., are apparently quite common in French agricultural literature, and are not unknown in German and other languages.

6. The Social Sciences applicable to Agriculture are, Agricultural Statistics, Rural Economy, Farm Manufactures, or Rural Industries, and Rural Law.

Agricultural Statistics, I am sorry to say, we have but few of, and those not very reliable. Our National Government gives us a decennial census, but it is very inaccurately taken, and omits to secure some of the more important facts. The attempts of our Commissioner of Agriculture to secure more frequent information in regard to crops, though necessarily only partially successful are pointing the way to something better. Ohio, Iowa, California, and other States, are collecting annual (I believe) statistics of agriculture, which seem to be valuable. Our own State collects a few meagre items, through the assessors in the annual assessment. But I believe we are far behind some European countries, both in frequency and accuracy of our agricultural statistics.

Rural Economy, although an important subject, has a scanty literature. It may be defined as the general management of landed estates. There is a good English or rather Scotch book on the subject, by Prof. Low, and we have a translation of Boussingaults's work of that name, though it can hardly be properly called so. In French, I see named Breton's Economic Agricole, De Dombasle's Economie politique et agricole, Gaucheron's Cours d'Economie Agricole, etc., and in German a good many books bearing more or less directly on the subject. Todd's Young Farmer's Manual, and Thomas' Rural Affairs, have a good deal of the same character.

Farm Manufactures may be regarded as including those industries of a simple character, the material for which is produced upon the farm, and which either from its bulk or other difficulty of removal, or from lack of a good market, or from the desire to employ the farm work when field labor is impracticable, it is thought best to work up at home. Such are cider, wine and vinegar making, the canning of fruits ; the making of beet and maple sugar, sorghum syrup, starch, cheese and butter, etc. Not much has been written upon these as specialities in this country. Sorghum manufacture has drawn out a few manuals by Hedges and others. Hussmann and Reemelin have written on wine making. We have Flint's book, mainly devoted to dairying and society transactions on the same subject. The Northwestern Dairyman's Association, mainly an Illinois Society, has held three meetings, and published their proceedings in pamphlet form.

In Europe these rural industries occupy a more prominent place, and we find special works on wine making, dairying, etc., in considerable numbers.

Rural Law, so far as I know, furnishes few or no separate works, unless we may count the compilations for the use of Town and Township officers as such. As for instance, Mr. Haines' Township Organization Laws, where we find a great part of the laws affecting the rural population gathered together. I find Die Landwirthschaftlichen Gesetze Bayerns advertised, showing that a compilation of the agricultural laws of at least one of the German States has been made. A compilation and collection of the rural laws of the different American States ought to be made, with a view to the perfecting them by comparison. The plan lately adopted by the Prairie Farmer and other agricultural papers, of publishing laws passed by the different Legislatures of the North-west, and affecting the farmer, will do this thing in part.

7. Under the head of Spiritual Sciences applicable to rural life, we may properly include rural literature, properly so-called, or the Belles Letters of Rural Life, Landscape Gardening, Rural Architecture and Agricultural Education.

Of Rural Literature there is a large amount, much of it superior in quality, and well calculated to idealize and render attractive country life and country scenes. It includes more or less of all literature from the beautiful Biblical pastoral of Ruth, and the Homeric pictures of the "Ionian Father," to the Maud Muller of our own Whittier. It includes Hesiod, Theocritus, Bion and Moschus among the Greeks; Virgil, Horace and Columella among the Latins; Tasso and Guarini of the Italians; Delille and St. Pierre, of the French, and Burger, LaMotte Fouque and Auerbach among the Germans. I name but a few, and those, perhaps, not the best chosen, but those of whom I happen to know most. But as we come to our native English, we are overwhelmed with profusion. Not only have the English been leaders in agricultural progress, but we also find their imaginative writers specially alive to the beauty of nature, and the quiet grace of country living, and country thinking. We trace this right through from Chaucer to Tennyson. We have Sir Philip Sidney, and his somewhat dreary Arcadia, and Christopher Marlow with his not at all dreary "Come live with me and be my love." We have "the pastoral parts of Spenser," and the quaint, if somewhat affected picture of "A fair and happy Milkmaid," by Thomas Overbury. We have Shakspeare, who was at home in the fields, by virtue of his early life, as well as of his omniscient genius. We have Robert Herrick and his daffodils and primroses; Cowley and his "Pleasures of Country Life;" Milton and his Lycidas, his Penseroso, and L'Allegro, whose charmed verse we can never forget, breathing as it does the very odors of spring, and colored with the dun sereness of autumn. There is Isaak Walton, and his completely inspiring Angler, and Pope, with those affected and finished pastorals, which like other epidemics, seem to need to have their run among the poets of every nation. Thomson and his Seasons, I need but name, and Collins' Ode to Evening, is as fine as his other Ode to the Brave; Gray's Elegy teems with the beautiful and blessed, if somewhat pensive and sad thoughts of the rural thinker; and Burns in his Cotter's Saturday Night, has placed the peasant beside the prince; James Graham's Sabbath Morning, seems to me almost as perfect a picture as Gray's Elegy, and Mrs. Heman's Homes of England breathes the rich quietude of that land of parks and verdure; Eliza Cook's Old Farm Gate is full of home touches, and the Talking Oak of Tennyson makes one see trees as men. I need only name Our Village and its pleasant gossip to those who have read Miss Mitford's writings.

Coming over the water, the first thing, for lack of a better, that strikes my fancy, is Barlow's Hasty Pudding, whose truthfulness atones for its other lack of merit. Skipping a wide interval, both of time and taste, I mark next the Old Oaken Bucket, of Woodworth, as one of the songs of which Americans may be proud. Irwin's pictures of rural scenery in his Tales of the Hudson, are worth the study of the farmer as well as of the artist. But Bryant in his Waterfowl, his Death of the Flowers, and the Planting of the Apple Tree, has to my mind placed himself easily first among the rural poets of America. Yet I hesitate as I say it, for not only here comes Morris with his Woodman Spare that Tree, but Longfellow with his multitude of beautiful pastorals, Evangeline, April, November, and many another poem "tender and trewe," as the Douglass himself; and Whittier with Maud Muller, and Cobbler Keezar's Vision, and others, too many to be told of songs, as rural in their aspirations as unflinching in their fierce democracy. Here too, is Hawthorne and his delineation of New England country life; Willis and his Saturday Afternoon; Lowell Under the Willows, and last but not least, the two philosophers of Concord, Emerson and Thoreau, who, each in his way, has said things well worth reading, about the country.

I stop the enumeration here, not because any way complete, but because sufficient to give an idea of the mass of rural literature in the English language. Alice Carey, Thos. Buchanan Read and many others might well be named. Meeker's Life in the West is curious in this respect, and perhaps Ten Acres Enough, and the class of books it represents, might as well be placed here.

Landscape Gardening, which is not only painting in living colors, but the sculpture of animate and changeable forms, and therefore a most difficult and meritorious fine art, as it seems to me, has been written upon by Downing, Kern and Elliott, in this country, and by Price, Repton, Loudon and Kemp, besides others in England. I do not know that the Germans or French have done much for this branch of rural art; though I find a good many writers on the subject among the French books, such as Traite de la Composition et de l'Ornementation des Jardins, 6th edition, Duvillers Parcs et Jardins, etc.

Rural Architecture has commendably attracted a good deal of attention in this country, and we have numerous works on the subject, by Downing, Vaux, Wheeler, Woodward, Harvey, Jacques, etc. Loudon seems to be still a leading English authority, but English books are apparently more monographic and complete on details than our own. But we can hardly go to Europe, unless it be to Italy, for hints as to domestic architecture for our climate.

Agricultural Education may be placed under this head, but we must refer to pamphlets and parts of books for its American literature. Prof. Turner has written at least two meritorious pamphlets, "Industrial Universities, 1853," and "Industrial University Education, 1864." Evan Pugh's writings are valuable. Flint's Agricultural Schools in Europe, 1864, and the notices of them in Barnard's Education in Europe, give a good deal of information of the old world agricultural education. Bollman, (of the agricultural department), 1864; Klippart, 1865; Olmsted, 1866 and 1867, have written pamphlets of merit.

Under this head it may be proper to mention agricultural text-books, designed to advance the condition of agriculture, by making it a part of the common school education of the people. We have such in Waring's Elements of Agriculture, and Emerson and Flint's Manual of Agriculture. In France they have a Bibliothique Agricoles des Ecoles Primaires, including a dozen volumes on subjects more or less germane, such as a'Cours Elementaire d'Horticulture, Traite d'Agriculture Elementaire et pratique, Grammaire Francise raisonees ave exemples Agricoles, etc.

8. Personal Science or Biography in its application to rural affairs embraces the biographies of men eminent in the various departments of agriculture. It includes the biographical sketch of Downing, prefixed to his Essays by George William Curtis. It should include a biography of Buel, of Colman, of Norton and Porter, and other Americans eminent in extending agricultural knowledge. A life of Loudon has been written; and those of such men as Tull and Young, Bakewell and Davy, ought to be. The biographies of such men are an inspiration for genius and a spur to indolence. The French, I think, do well to place among their elementary school books of agriculture, the Biographie des Agriculteurs. The lives of such men, though not yet so common as the biographies of murderers and conquerors, should be gathered together, and set up on our shelves as guides and incentives to the young in the better way of honest industry, scientific endeavor and public improvement. I hope the time is not far distant when the life of the eminent farmer will be thought worth writing and worth reading.

I thus conclude an imperfect sketch of a small part of the many books bearing upon rural life and its pursuits; but perhaps I have given enough to show that no occupation calls forth so various information and utilises it in practical life; and that none has been so richly adorned with the prodigal gifts of poetic genius.

DISCUSSION.

Dr. Gregory—I was struck when I was abroad with the miscellaneous character of agricultural books, and the tendency to a more limited range of subject and more scientific treatment. This literature is more extended than I had supposed, and I collected a pretty good lot of it. The work of hunting the books up is great. Many, even of the modern ones, are out of print. There is a steady and rapid improvement in agricultural papers. There is a great increase in numbers and in quality, especially in their scientific value arising from the employment of competent editors in special departments, such as Horticulture, Veterinary Science, etc. I am struck with the hopefulness of the lecturer, and hope also that when our young men go out from this and similar institutions, we may expect from them assistance in building up an agricultural literature. For though there is a great mass of it, there is a deficiency in quality, and especially of text books.

DR. MILES—This is an important subject. I am a collector of the old books on agriculture, and am often asked why I call for the old books. I answer because I find the ideas and practices of to-day recommended in many cases in these old books. We should keep ourselves posted on what has already been done. Hoskyns has written a very excellent history of agriculture. Low's Practical Agriculture and his Domestic Animals are good and cheap. Morton's Cyclopædia of Agriculture is more limited in its range, but later than Loudon's. Loudon's is valuable for its history. The Cyclopædia d' Agriculture in France, of which twelve volumes are out, is very complete and good. Three more are to appear. The improvement in agricultural journals is quite marked. So is that in books. Previously we had only compilations, that brought book farming into disrepute. Our works on domestic animals were all reprints from Youatt and others.

PROF. BLISS—The Germans and French are pretty active now in agricultural publication. Their lands are getting poor, and they feel more need of science. One publication is entirely devoted to the reports of Experiment Stations. These experiments are generally carried on under cover, where the conditions can be controlled. Many of these experiments are of no immediate value; but the Germans claim that they are laying the basis of a scientific agriculture. There is a quarterly, Der Chemische Ackersmann, edited by Stockhardt at Leipsic, and a quarterly at Berlin, in which topics are treated of more scientifically and less ephemerally. There are histories of agriculture in German that are valuable. Some of the English periodicals are of value, as the Journal of the Royal Agricultural Society. There is a great deal about drainage in them, and I think of more value to us than the lecturer supposes.

FLAGG—I consider it very important to secure for the University Library files as complete as possible of the agricultural papers of the country, and especially of the West. They contain some very valuable material.

DETMERS—Apropos of the need of text books. Professors of Veterinary in Vienna are required to produce at least one text book.

Adjourned.

THURSDAY MORNING, *January* 13*th*.

PROF. S. W. SHATTUCK, of the Industrial University, read a lecture illustrated by a map on the black board, on

DRAINAGE.

Considering what I should say to you about drainage, I soon came to the conclusion that my greatest difficulty would be to decide how much to leave unsaid; that the field was too broad to be even skimmed over in an hour. Such being the case, I adopted the policy of cultivating only a portion of it. My remarks, then, will be confined to Tile Drainage in its recent applications for agricultural purposes.

I wish to have it understood that though I advocate tile drainage, I do not at all condemn other methods; even surface drainage is better than none, in most cases.

Thorough tile drainage removes stagnant and surplus water from the soil, in the quickest and best way possible; this is the primary result. There are many secondary ones, such as: it warms the soil; it carries soluble fertilizing substances to the roots of plants; it prevents injury from drought; it prevents injury from frost; it improves the quality and quantity of the crops; it deepens the soil; it lengthens the season. Others might be named. The matter is certainly one that *demands* the attention of every cultivator of the soil.

The veteran Marshal P. Wilder says: "The time has arrived when no great permanent progress can be made in agriculture or horticulture in the States, until a system of under-drainage is adopted."

The history of under-drainage in England, shows that four different systems gained each considerable prominence. For reasons before stated, I shall consider only the Deanston System, named from the place in England where it originated. It is also called the Frequent and the Gridiron System. As in general use, in 1832, its leading principles are:

1. Frequent drains, at intervals of from ten to twenty-four feet.
2. Shallow depth, not exceeding thirty inches, designed for the single purpose of freeing that depth of soil from stagnant and injurious water.
3. Parallel drains, at regular distances, carried throughout the whole field, without reference to the wet and dry appearance of portions of it, in order to provide frequent opportunities for the water rising from below and falling on the surface, to pass freely and completely off.
4. Direction of the minor drains, up and down the steep; the main, along the bottom of the chief hollow; tributary mains being provided for the lesser hollows.

5. Large conduits. Mr. Smith, the originator of the system, changed his views somewhat, with continued practice. At the time of his death, in 1854, he recommended a depth of three feet, and even four in some cases, but opposed a general greater depth than three feet increased distance between mains or small conduits.

In 1846, a modification of the system was advocated by Mr. Parks, the leading English Drainage Engineer, for many years. He proposed:

1. Less frequent drains, at intervals, varying from twenty-one to fifty-one feet.

2. Deeper drains, at a minimum depth of four feet, designed with the two-fold purpose of not only freeing the active soil from stagnant and injurious water, but of converting the water falling on the surface into an agent for fertilizing—no drainage being deemed efficient that did not both remove the water falling on the surface and keep down the subterranean water, at a depth exceeding the power of capillary attraction to elevate it near the surface.

3. General arrangement of the drains, the same as in the original system.

4. Small, round tile for the parallels; size for mains depending upon amount of land drained by them.

Mr. John Johnston, of New York, has the credit of introducing tile drainage into the United States. In 1835, he imported patterns of tile from Scotland, his native country. He then made tile by hand, for use on his farm. He was much ridiculed by his neighbors, one and all affirming that he was a great fool to put crockery under ground; but Mr. Johnston's burial of crockery was such a profitable operation that the much derided example was soon followed by observing neighbors, and to-day is going on all through the best cultivated portions of the United States, at the rate of many hundred miles every year.

It may be remembered that the difference between the Deanston System as introduced by Mr. Smith, and its modification, in the practice of Mr. Parks, was, depth of drains, distance between them, and size of tile. There was a severe contest in England, between the advocates of the two methods, which resulted in the general adoption of Mr. Parke's views. But judging from what I have noticed, even in my short experience, the ground will, in part, be gone over again, in this country—large tile and shallow drains being the practice of one party, while another adopts the results of the English experience, deep drains and small round tile for the parallels. Under these circumstances, it will be well for us to consider the relative merits of the two methods, in connection with "*How drains act and affect the soil.*"

The natural tendency of water, in the soil, as well as out of it, is to descend vertically towards the centre of the earth, from the force of gravity. If it meets water dammed up in the soil, having an outlet at a certain elevation, as at the floor of a drain, it will raise the general level of the water, and force it through the outlet. If it meets water that has no outlet, it will raise its level until the soil is filled or an outlet is made from the pressure of the accumulated water. The upper surface of the water is called the water table or line; it moves up and down, according to the amount of water in the soil. It is not likely to be at the same depth throughout, between two drains. It might be quite irregular, if the soil was not homogeneous. Only after considerable dry weather, would it assume an horizontal position. It is the weight of the water, which is in proportion to the height of the water table above the floor of the drain, that forces it into the tile, mainly through the joints and from below, very little passing through the pores of the tile or from the top or sides of them. To illustrate this action of the water, suppose we fill a barrel, on end, with any porous soil, make two holes of the same size, in the side, one a few inches from the bottom, the other a foot above the first, pour in water, little or none of it will run out until the soil is saturated up to the lower hole, through which it will then run. Raise the water table of our miniature field to the upper hole, by pouring in more water than the lower one can discharge, when it will come from both of them, but not in equal amounts—the lower one discharging the greater amount in a given time. This illustration may explain the fact, which many at first doubt, that of two drains near each other the deeper one will discharge first after a rain. It also indicates that the first two feet of soil would be cleared from surplus water quicker by a four-foot drain than by a three-foot one. The advantage would increase as the water table approached the bottom of the latter.

The forces that operate to move the water in a drain are dependent upon the height of the water-table above the floor of the drain, and the weight of the water in it. This weight is dependent upon the angle or fall of the drain, and the area of the section of the conduit (supposing it is full), that is, the greater the section and the fall the greater the weight of the water. The forces that tend to retard the movement depend mainly upon friction, shocks arising from obstructions, irregularities or change of direction, and height of the water in the reservoir at the outlet, should the outlet be below the surface of it. The amount of friction with a given area of the conduits in proportion to the length of its perimeter. The force of a shock depends mainly upon the abruptness of the irregularity, obstruction or change of direction.

It may be seen from these principles that a perfect tile drain would have a uniform grade, a clear outlet, a circular cross-section of the conduit, and be without change of direction. That if a change of cross-section were made, it should be a gradual one. If a change of direction were made, the two directions should be connected with a curve tangent to them. Two joining drains should be connected in like manner. In addition to having a circular cross-section for the conduit of a drain, (because such a form presents the least friction), it is well to have the cross-section of the tile circnlar, for several important reasons.

It is quite difficult to lay tile of any other form so as to form a good conduit. This comes from several reasons: one is the form of the section, another is the warped condition many of them are in, caused by the unequal burning of parts because of their varying thickness. Round tile are also preferable, because collars can be used with them. I do not think it necessary to use these in all cases, but it is certain that we get the best drain with them, for the conduit is less broken, the water has a better opportunity, and silt less, to enter the tile. Round tile, better than any other kind can be laid by a person standing above the trench. This gives a large saving in the cost of trenching.

The above reasons might all be theoretical ones, but they are not such; they are the result of the many years experience in England, confirmed in this country. The horse-shoe tile with separate soles, the sole tile, the flat bottomed one, each had its trial in England more than twenty years ago. Round tile, or pipes, as they are called there, came into general use between 1840 and 1850. I have given this matter considerable prominence, because the greater part of the tile used in this country, especially in the west, are sole tile.

The size of the tile to be used depends upon the area to be drained, amount and regularity of rain-fall, amount of foreign water to be provided for, climate, amount of fall in the drain, depth of drain, etc. It is a problem which is not susceptible of definite solution. After carefully considering the matter, I have adopted Col. Wearing's views. He says: "The following directions are given as perfectly reliable for drains four feet or more in depth, laid on a well regulated fall of even three inches in a hundred feet,

For	2	acres,	1¼	inch pipe,	(with	collars.)	
"	8	"	2¼	"	"	"	"
"	20	"	3½	"	"	"	"
"	40	"	2.3½	"	"	"	"
"	50	"	6	"	"	Sole	tile.
"	100	"	8	"	"	"	" or 2 6-inch.

I suppose these drains provide for the rain-fall of the drained surface only. Provision for taking away foreign water must be made according to the circumstances of the case. Neither is it expected, they will immediately take all the water of the heaviest storms, but that they will do it soon enough for all practical purposes.

If tile without collars are used, they should be of a larger size than given for the first two sizes. The capacity of tile depending upon the area of the cross section of its conduit, other things being equal, the capacity of a round tile is as the square of half the diameter of its conduit into 3.1416. Thus, the capacity of one with a two-inch conduit is as $\frac{2}{2}^2 \times 3.1416=3.1416$ square inches. One with a four inch conduit is as $\frac{4}{2}^2 \times 3.1416=12.5664$ square inches. The two areas are to each other as $2\frac{2}{1} \times 42$, that is as the squares of the diameters. The one with a four inch conduit will have four times the capacity of the two inch. A six inch one would have nine times the capacity of the latter. The area of the cross-section of an ovoid shaped conduit may be taken as equal to one-half least diameter into one-half greatest one into 3.1416. Suppose an oval cross-section to be two inches in its greatest diameter and one and a half in its least one, its area is equal to $\frac{2}{2} \times \frac{15}{2} \times 3.1416=2.3562$ square inches. The capacity of sole tile are to each other, then, as the products of half at least diameter into half greatest one.

The use of larger tile than necessary to carry off the surplus water, is not only a useless expense, but it is a direct evil. Experience shows that many obstructions which will collect in a larger conduit will not do so, under the same circumstances, in a small one.

An undrained soil is cold, from the pressure of too much water, or the absence of it. I mean it is cold, because it is saturated with water, which being a very poor conductor of heat, does not allow that of the sun to reach the undersoil. The poor conducting power of water is well illustrated by the experiment of boiling water at the surface in a glass tube, while the temperature of the lower portion is but little increased. A soil is cold, when water has been removed by evaporation. It is hard to decide, which is the greater evil. We expect nothing from the land in the first case; we get very little in the second one. It is a well known fact, which can be verified by experiment, that it takes five and one-half times as much heat to reduce any given quantity of water to vapor as it would to raise the same amount from the freezing point to the boiling one. Wearing says: "An idea of the amount of heat lost to the soil by the evaporation of water, may be formed from the fact, that to evaporate by artificial heat the amount of water contained in a rain-fall of two inches on an acre (200 tons), would require over twenty tons of coal." The average yearly rain-fall in the United States is about 42 inches; that of Illinois is near 44. In some cases, this amount, and even more is evaporated from an underdrained field. Experiments show, that 56 inches will evaporate from a vessel in the open air in our climate. In England, with the damp atmosphere, the evil is a great one; but I believe, that in our prairie country, where the wind and sun have full play, it will be found to operate in its fullest extent. It is true, all of the heat taken up through evaporation does not come from the soil, but enough of it comes from that source to make a great difference in its temperature. Dr. Madden, of England, found that the soil of a drained field, in which most of the water was removed from below, was 6½ deg. warmer than a similar soil undrained. The 6½ deg. is equal to a difference of nearly 2,000 feet in elevation. Several other causes operated in connection with the prevention of evaporation, to give the increased temperature. By the removal of the surplus water, the air has free circulation between the particles of soil, imparting to it a portion of its warmth, in the season of plant growth. The summer rain-fall passing through a drained soil affects its temperature.

Mr. Parkes made simultaneous observations on a drained portion and an undrained portion of a field. The result was, that from a mean of thirty-five observations, during the spring and early summer, the drained soil, at 7 inches depth, was 10 deg. warmer than the undrained, at the same depth. The highest temperature of the undrained soil was 47 deg., while that of the drained went up to 66 deg. at 7 inches, and 48 deg. at 31 inches, after a thunder storm.

The rain-fall upon an under-drained field, is not only a source of warmth to the under soil, but it is an agent that causes the fertilizing properties in the water as it falls, and those taken from applied manures, to the roots of plants; they thus receive much that with an undrained soil would be lost by evaporation or surface flow.

That under-draining prevents drought can be shown by theory and facts. By the action of the atmosphere and frost upon the undersoil, it becomes more porous and friable, so that the roots of plants penetrate further, reaching soil not affected by the drought. The vapor of the atmosphere which penetrates to the cool undersoil is condensed and becomes water. Dew, which amounts to several inches in a year, is quicker absorbed, and hence in a larger amount by a porous soil than by a compact one.

A committee of the New York Farmers' Club, which visited the farm of Prof. Mapes, in New Jersey, in the time of the severe drought of 1855, reported that the Professor's fences were the boundaries of the drought—all the land outside being affected by it, while his remained free from injury. This was attributed, both by the committee and Prof. Mapes, to thorough drainage and deep tillage. Injury from frost to crops is caused by a saturated soil.

In the Transactions of the New York Agricultural Society for 1855, the statement is made by Maxwell & Brothers, of Geneva, that a clay field which previously could not be worked in season for spring crops, and heaved so badly that winter ones were ruined, after drainage was as mellow and productive as could be desired, being in condition to work immediately after a rain.

Mr. Johnston, speaking of results on his farm, says: "Heretofore many acres of wheat were lost on the upland by freezing out, and none would grow on the lowlands. Now, none is lost from that cause."

Drainage lengthens the season, this must be evident from the statements already made. I will give one example only. I take it from French's work on drainage, and made by a gentleman of Maine: "The frost came out of the drained land about one week sooner than from the adjoining undrained portion, and was in working condition at least ten days earlier. * * * Usually, when the soil is protected by snow, the frost goes off with the snow or earlier, and within a few days the land becomes in good condition for plowing—quite two weeks earlier than the dryest of any undrained fields, or any others in the vicinity."

We are now prepared to discuss the points, general depth of, and distance between drains. They must be deep enough to be out of the way of frost. They must give sufficient room for the roots of plants above the water table, because of the evil effects of stagnant water, and the intrusion of roots. Deep enough to prevent evaporation of the water arising in the soil from the force of attraction, or at least to reduce it to a small amount. Experiments show that capillary attraction operates with considerable power at eighteen inches. They have also shown that water coming from a thirty-inch drain is two or three degrees colder than that taken from a depth of four feet, and that this is a little cooler than that from a greater depth. We must draw the conclusion that evaporation has considerable effect at thirty inches, and but little at four feet. Four feet, then, seems to be the standard minimum depth; it cannot be always had, but better go deeper than not so deep, when possible.

Col. Wearing says: "In the drainage of the Central Park, after a mature consideration of all that had been published on the subject, and of a considerable previous observation and experience, it was decided to adopt a general depth of four feet, and to adhere as closely as possible to a uniform distance of forty feet. No instance was known of a failure to produce good results by draining at that distance, and several cases were recalled where drains at fifty and sixty feet had proved so ineffieient that intermediate lines became necessary. After from seven to ten years' trial, the Central Park drainage, by its results, has shown that, although some of the land is of a very retentive character, this distance is not too great, and it is adopted here for recommendation to all who have no especial reason for supposing that greater distances will be fully effective in their more porous soils."

Horace Greeley, in his bold way, has stated that all land which was worth plowing, would be benefited by draining, and that he thought the time would come when it would be done. The statement may be true enough for a general one, but we know there are soils which, for all practical purposes, are sufficiently drained by nature. But all soils which, at any time during the period of plant growth, contains stagnant water within reach of the roots of plants, needs draining.

A French writer says: "Whenever, after a rain, water stays in the furrows; whenever stiff and plastic earth adheres to the shoes; whenever the sun forms on the earth a hard crust slightly cracked; whenever three or four days after a rain slight depressions in the ground show more moisture than other parts, one may affirm that drainage will produce good results."

We may be satisfied that good results would follow drainage in a given case, but most of us, before making the improvement, would do well to first count the cost. Will it pay? An important question, which can only be answered when the circumstances of the case are known. It depends upon the cost of tile delivered on the ground, the cost of labor, the condition of the land, the increased value of it, etc. Each of the named conditions would be dependent upon local ones. Hundreds of cases might be cited where it has paid; time will permit only one or two. The first tile drainage in the United States paid for itself in two years by the increased crops.

Mr. Johnston says tile draining pays for itself in two seasons; sometimes in one, an instance of which he had on his farm in a ten acre lot. He also states, in a recently published letter, that he has rented for a series of years, all of his tile drained land, to be used as an orchard, at a yearly rental of $25 per acre; that the land undrained would not have been taken free of cost for the purpose.

Mr. Henderson, in his book "Gardening for Profit," relates that a man, who, by his advice, laid out $500 in tile draining, made $2,000 profit in six years from his garden of eight acres. In finishing, he says, I honestly believe that had he gone on without draining, he would not have made $1200 in twelve years, far less $2,000 in six.

These are exceptional cases, but we should consider tile draining a permanent improvement. A well burnt tile will last more than two thousand years. Tile drains have been taken up in France, in good working condition more than two hundred years old.

The natural course for the practical operations of thorough draining may be given as follows: 1. Prepare a map of the field to be drained. 2. Plan on the map the proposed system of drains. 3. Decide upon the amount and size of tile required. 4. Order tile. 5. Set out the drains upon the land. 6. Take the sections of them. 7. Decide upon depth and grade of them. 8. Trench, lay the tile and cover. 9. Amend the map.

At the request of the Secretary, PROF. SHATTUCK has subjoined the following account of his experience in draining a part of the University grounds:

As you requested, I make the following statement in regard to the draining operations on the University grounds last fall and this spring, (1870.)

After a careful inspection of the field to be drained, taking the levels of several of the most important points, a general plan was adopted, which we have since followed. It involved the two methods of having the laterals empty directly into an open ditch, and that of first collecting them into a main. I wish to give the matter a further trial before giving a preference for either; both worked well so far as I know.

The general depth of the drains was from 3½ to 4 feet. On account of the shallow depth of the open ditch at their outlets, they were only 20 inches at that point. These outlets, for a time in the spring, were from one to two feet below the surface of the water in the ditch, but worked well—the water of the ditch having a good current at that time.

The general distance between drains was 40 feet, but two were laid the distance between, which varied from 40 to 50 feet. Intermediate ones will be laid for about 100 feet from the open ditch, if needed—the present ones have done good work, so far as keeping the surface dry, but the spring was an exceptional one, I believe.

The general fall was about one foot in 100, and the least was five inches in 100 feet.

The ditches were opened 20 inches in width; that of the bottom being just wide enough to take the tile used.

I found some trouble in having this the case, also in getting the tile laid with good joints, but by keeping the same parties at the work, as much as possible, and inspecting it before the tile were covered, I believe it was done quite well.

The common sole tile, 2 x 1½ inches, was used; about 1000 feet 3-inch and 500 feet 2-inch round tile being the exception. Some 10,000 feet were laid in all.

The draining, I suppose, will be continued this coming fall, when I intend to take careful notes, as to cost, time required to put in 100 feet of drain, etc.

DISCUSSION.

Miles—Many drains put down are worthless from the lack of attention to a few points. One objection to deep drains is their expense. It ordinarily costs twice as much to go to the depth of four feet as it does to dig to the depth of three. The distance depends a good deal on the nature of the soil. I would put the drains close together in clay land, from 18 to 30 feet apart. In England they have some six feet deep drains, but they are unnecessary. Practically, I prefer three feet. One lack of attention is in not giving an *uniform* slope. Tile laid in an undulating manner will fill up with silt; for water will not force silt over an undulation. Large tiles are less liable to fill up than small; and a person without experience had better not use tiles smaller than two inches, and I generally recommend such to farmers. I find you can't get men to use the burning rod of Wearing. I take fork handles six to six and a half feet long, put a socket of gas pipe on one end of each, and an iron band on the other, and put on it a light bass-wood arm fitted, with a wooden key to tighten it, at right angles with the handle, and put one down at each end of a slope which I wish to make uniform with the arms extending over the ditch, and a line drawn tightly from the arm of one to that of the other, and sloping at the proper inclination. Then I take a board of the proper length to reach from the line to the required bottom, and try it along the line, and deepen as required. I use a scoop hoe, and a scoop spade, so to speak, one to draw, the other to push, in finishing the ditch. It is important not to dig out below the required line when you are laying small tiles. I would enforce the value of round tiles. The old horse-shoe form is very objectionable. I found that a square box sewer of slight fall required to be taken up every three or four months. I took off the top, and put in two boards in the shape of a V in the cross-section, and have had no trouble with the sewer in several years. I would use collars for tiles if I could get them; if not, would put sods, shavings, straw, or something over the joints. You must be careful in putting in the first earth not to knock the tile out of place; it is a frequent cause of failure. But the earth should be packed as hard as you can do it. Throw a double furrow on top of the ditch when you get it filled. The important advantage of tile draining is getting more time to farm. Begin at the upper end to lay tile. Stop up the first one carefully with stone, tile or brick, so as never to let vermin get into it. But in layiug tile in quicksand it may be found best to begin at the lower end, dig short distances, and keep the upper one plugged up all the time. A box of straw in this case should be used at the lower end, and the laterals laid subsequently. The price of tiles is extortionate. They can be made cheaper than brick. Two-inch tiles ought not to cost over $8 per thousand here. In Michigan they were delivered on the cars at one place for $10.

GORE, of Carlinville—I have had a little experience in this during the last three years. I desired to collect water for stock purposes, and had very little fall—only half an inch to the rod, and it was necessary to be very exact. I had a tool made, a kind of scoop, to finish the bottom; but I found I could not get it finished true enough. Then I made a guage of plank half a rod long, set on edge with a spirit level and sights, which I placed beside the ditch, and kept at the proper incline and worked to, and it answered perfectly. I ran 122 rods, and came out within three inches of the proper place.

Adjourned.

THURSDAY AFTERNOON—2 P. M.

DAVID GORE, Esq., of Carlinville, addressed the Convention on the subject of

MANURES.

[Mr. Gore, on being introduced said, I do not feel able to handle this subject, except from the stand point of the general farmer. I do not consider manures for the horticulturist and gardener. We have learned and scientific men present, and I will be glad to have any errors into which I may fall corrected.]

The subject of maintaining the fertility of the soil is one of great importance to the agriculturist; indeed it is the subject, above all others, that engages the attention of the intelligent farmer. For as agriculture is the basis of all other professions and pursuits, and as all other callings flourish and prosper in about the same ratio that the agriculture of the country does, so, also, do the productions of the agriculturist, in a very great measure, depend upon the fertility of the soil; and, of course, the productions of the soil depend, in a great measure, upon the amount of fertilizing properties it contains.

We have a soil in this great State at least as fertile as that of any other in this, or any other country. But is it necessary to argue the necessity of returning to the soil, in the way of manures or fertilizers, to the same extent that we have taken these properties from it, in the shape of crops reaped therefrom? I think not. We have sufficient evidence on this point, when we bring a new piece of land into cultivation, by the side of one that has been cropped for 12 or 15 years without manure. In such a case as this, from the same mode of cultivation, we often see from one-fourth to one-third, and sometimes one-half more grain reaped from the new field than the old. Therefore, it is not necessary to go back to the Atlantic States, or Europe, to find evidence on this point; we have it right before us, and of a convincing character.

The importance and necessity of manuring granted, I will now proceed to try to show in as practical a manner as I can how to prepare and apply manures. I do not deem it necessary, even if I was able, to enter into a chemical examination of soils and manures. I shall, therefore, use such names and phrases as farmers use and understand. In other words, I shall discuss the surface of the question, and leave a closer examination to more competent hands. Particular culture may require particular manures; but the standard manure is that of the stable or barnyard, which contains all the elements of food for plant or vegetable growth. Hence it is obvious that the preparation and application of this kind of manure should occupy a large share of our attention on the present occasion. It is doubtless true that good results may follow the application of lime, ashes, plaster, or gypsum, bone and guano in certain cases where a succession of crops have been taken from the land, wherein some particular property contained in these manures are made deficient in soil. But how much of any one or more of these manures should be applied in such cases is a question, and a question of difficult solution. To act intelligently in this matter, it would require that every farmer should be a chemist, (or at least obtain the services of a chemist); even then it is doubtful, under the present stage of the science of chemistry, whether or no satisfactory results could be obtained in every case, owing to the acknowledged probability of divisions and sub-divisions, that yet may be made in at least some of the divisions already made of matter by the science of chemistry. Consequently, it is very plain that we do not know exactly how to use these manures in every case. But that chemistry has given a great deal of valuable information upon this subject cannot be denied, and that there is a bright field in the future for the chemist is not disputed.

We have the record of some valuable practical experience in the use of some of these manures, in the record of an old Farmer's Club, that has been at work for over twenty-five years, at Sandy Spring, Maryland, as given by W. H. Farquhar, of that place, and published in the agricultural report of 1867. Mr. Farquhar quotes this from the records of this club. He says: "I obseree in the early records of this club, such entries as these: 'The use of lime on this farm has evidently produced the most beneficial effect wherever applied, and great encouragement is held out to persevere in the use of it.'" After making several quotations, running through several years' record of the club, Mr. Farquhar again says: "I find this disparaging entry: 'Several large lime heaps showed themselves in the cornfield, suggesting the inquiry, why they have not been spread?' Answer not satisfactory." Mr. Farquhar also says, "a new fertilizer now appeared which was destined soon to absorb the interest of our farmers, and to put a stop to the use of lime. This fertilizer is guano and bone." The records of this club show, upon the whole, that by manuring and the improved cultivation, in a given series of twenty-four years, brought the average of wheat up 100 per cent., corn 160 per cent., oats 77 per cent., potatoes eleven fold, and hay four fold. This improvement was made by the same farmers, some nineteen in number, except, says Mr. Farquhar, in three cases, where the son succeeded the father. These results appear upon their face very satisfactory; but we are not informed how much expense for labor and manures was incurred, so that we cannot tell whether these farmers are really any better off in dollars and cents, than when they commenced, but of one thing we are quite certain, and that is this, if they had not manured, they would, ere this time, have been unable to produce a sufficiency for their support. Now it must be seen, at once, that this mode of manuring is quite expensive at last, and it is very doubtful whether these results can be definitely obtained, for the reason that these manures do not contain all the food that our crops require, and may act more as a stimulant than a permanent manure.

If this state of the case be true, is not our proper course and duty plain? Our experience teaches us that it will not do to persist in the practice so prevalent in some localities in this State, of growing grain and other produce and shipping it out of the country, without making a return to the soil, in the form of manures, for it must be borne in mind that we have just so much material; we may work it over, and and over again; it may be dissolved and be united again; it may be removed from one place to another; assume one shape here and another there, yet there is no more nor less of it. Hence when we ship a cargo of grain to Europe we have just that much less material left on this continent. Europe is the gainer and we are the loser. Again, I say, our proper course seems to be marked out; we should adopt more system and order in the arrangements of our farming operations; we should leave off so much of special farming (if the special grain grower be entitled to the name of farmer); we should lay down more land to grasses and grow more live stock, sufficient, at least, to consume a large share of the produce of our farms. By this means we would produce our own manure, and of the very kind our soil requires.

I will now indicate a practice to save and apply barn-yard or stable manure. Where the lay of the yard will permit, that is if the surface is inclined sufficiently, to make a slight or shallow excavation toward the lowest part of the lot in order to create a slight bank on the lower side of the yard. This bank should be formed in such a shape as to insure the accumulation of all the wash in time of showers, to flow directly into it. Into this excavation should be thrown all the litter from the stables and stock-sheds, and it should be well tramped or packed down. This tramping may be very well done by permitting hogs to run upon it, as they seem to be at home on a manure heap, but of course they should not be (for the good of the hogs) allowed to sleep in it. In a situation like this, we are enabled to conduct all the water and its accumulations directly into the manure heap, which seems to be essentially necessary to insure the best results. If left loose and dry, it will heat, and the valuable gasses it contains will escape and float off in the air. Observation and experience teaches us this. Boussingault says on this point, "Mixed with litter and thrown loosely upon the dunghill, horse dung heats rapidly, dries and perishes unless the mass be supplied with a sufficient quantity of water to keep down the fermentation, and the access of the air be prevented by proper treading, there is always without the least doubt a considerable loss of principles which it is of highest importance to preserve."

It is also recommended to form a tank or cistern, in the ground along side of the manure heap, and arranged so that it will fill in a wet time, to be pumped upon the manure heap at intervals during a dry time. It seems that the two grand requisites in preparing the manure-heap are *solidity* and *humidity*. This practice is just as applicable to the compost heap where straw, corn stalks, weeds, and in fact any and everything on the farm, unsuited for food for stock, may with profit be thrown, except in the compost heap there may be a light coating or layer of lime occasionally applied to assist decomposition. This practice is recommended where immediate results are desired from the application of manure, but if more lasting results are desired, then it is best to spread it at once upon your meadows, or grass lands, and thereby prevent any loss that might occur, during a state of fermentation, which is always more or less.

Another very important item in saving manure is, that a plentiful supply of straw or other litter should always be at hand and freely used, not only for the comfort of the stock, but also for the purpose of absorbing all the liquid parts of the manure, which are of more value than the solid parts, or at least they will give quicker returns after application. How, when and where to apply manures of this kind to obtain the best results is yet a question with some. My own practice of late years is to spread it upon my meadows or grass lands during the fall or winter. I believe this practice is advocated by a large majority of farmers at the present time.

A short time since I put this question to some of the best and most practical farmers of our county, men noted for their close observation and good judgment, men who have been raised farmers and who have not only had experience in this matter, but who have been and are looked to for information on all matters connected with our farming operations. John Tunnell, of Plainview, says the best results are to be obtained from spreading barn-yard manure on grass lands. Josiah Whipple, of Chesterfield, says it has always paid him well on any kind of land, but thinks he has obtained the best results from spreading it on corn land, and plowing it in. Messrs. Addison and Moses Eldred, of Carlinville, are very decided in favor of applying it to grass or meadow lands. I could give the testimony of a number of others, but will only add the testimony of the Maryland Farmers' Club on this point. Mr. Farquhar says, on this important question, the majority in favor of leaving barn-yard manures spread on the surface increased from year to year, so that in 1857, sixteen out of seventeen farmers present, prefer surface manuring. From all the information we have on this point, it seems to me that it is a pretty well established *fact* that the best results from the application of barn-yard manures are obtained from spreading it on meadow or grass lands.

The plowing in of green crops is very much in favor with some farmers, especially is the turning under of clover of very great value to every cropped land. A rotation of crops is of great value also, especially so where a fallow can be made every four or five years. In this I have had some experience, attended with good results. In making a fallow the land should be plowed about the first of August, or about the time the weeds have obtained the most sap, and before their stems become hard and the seed ripe; turned under in this condition the weeds decompose readily, and at seeding time are not in the way as would be the case if they were allowed to ripen. A rotation of crops with frequent fallows and the plowing in of green crops are the only hope for the special grain-grower.

Whilst the above practice is believed to be a good one for managing and applying manures of the barn-yard, and that the method of treating green crops and fallows are also believed to be good, and that every good farmer ought and will save and apply all the accumulations thus obtained to his land; yet it is but an auxiliary to the great and main source of fertilizing our soil. The main source of fertility is in the air and rain, the free gifts of heaven; but to avail ourselves of their help to the fullest extent, as in all other gifts of God, we have as intelligent beings a part to perform. The way in which we can perform our part in this case, is in the preparation of the soil, for the reception and retention of their valuable fertilizing properties. This can be done in various ways; first, a deep and thorough stirring of the soil is necessary, in order to bring about a complete disintegration of all its parts; deep and thorough plowing, and deep and thorough harrowing are also necessary. Remember, if you plow deeply, it is also necessary to harrow deeply, that the clods may be brought to the surface and crushed by the roller.

Another very great help in this matter is in a system of thorough under-draining; the laying down to grass is also of great service, as has already been intimated. Soil treated in this manner will more readily absorb the rains and extract all the elements of fertility therein contained, which are essential to plant growth, and that portion not wanted in the soil will pass off through the drains, after having all the fertilizing properties filtered or leached out by the soil. Soil in this condition will also admit the air to a much greater depth than undrained soil will; for it is very plain that whatever amount of water is drawn off by the drains, or dead furrows, the same amount of air must take its place, thus the rain and air, warmed as it is by the rays of the sun, pass down and permeate the entire soil, warms, nourishes and impregnates it with all the valuable material contained therein, which we know to be indispensable to a free and healthy growth of vegetation.

In the case of meadows or grass land, this same process goes on in a somewhat different form. The combined action of the roots and leaves of the grass upon the soil and air, and more especially so in mixed grasses, that require a somewhat varied composition of material for food; the deep rooted grasses, such as clover for instance, bring up food from the subsoil, the tops of all take in food from the air and deposit it in the soil, in the make up of both top and roots, valuable fertilizing properties. Thus it appears that by a thorough preparation of the soil, a happy blending of all the material food contained in the rain and air for vegetation may be increased in our soil. How many, or what proportion of our farmers are pursuing a course like this, or how many are there that are not every year making their land poorer by improper cultivation, and a continued cropping with grain, and shipping it out of the country. I will venture the assertion that there are not more than 20 per cent. of the farmers that are maintaining the fertility of their land.

It would seem that in some localities the farmers were determined to get rid of the fertility of their soil, as in St. Clair, Madison and Jersey counties, and a part of Macoupin also, where their all is staked upon wheat, wheat, wheat. It is an old saying that the loss of one is the gain of another. This is true along the railroads, where the farmers have to pay exorbitant prices to have their grain shipped out of the county; and at the present rate of deterioration thus caused, how long will it be before the same farmers or their successors, will have to pay those railroad monopolies for bringing it back, or its equivalent, in the shape of manures.

Thus it appears that the special grain-grower is fast getting rid of his most valuable means of support, and that ere long he will have to return it with great difficulty and expense.

As a rule, it is a much easier task to point out the defects or failures in the practice of any pursuit than to suggest or apply a remedy. But in this case it is not so, the remedy is easily understood, and within the reach of all; and that I may more clearly show how this remedy may be practiced, I desire to draw a picture, not from imagination but from real life.

We have in our county a few good farmers who are *not* guilty of the crime of robbing their soil, without making any return thereto; but who have maintained, if not increased, the powers of production. Among these farmers are John Tunnell, of Plainview, and Addison and Moses Eldred, of Carlinville. I will draw my picture from the practice of these gentlemen, more particularly from that of the Messrs. Eldreds. They have been on their farm about 12 years; they commenced with but very little capital; they adopted the practice from the start of doing every thing well and in the proper season, and have practiced a *mixed* husbandry, with the most satisfactory results; they keep a large portion of their land laid down to grass, and keep a sufficient number of stock to consume it upon the farm. By this means the crops are returned to the land in an improved condition, being more highly nitrogenized than before; their stock is of the best breeds, and they appear to have the happy faculty of making them better. They grow some of all the grains usually grown in our section, but they seem to care more for the number of bushels they harvest than for the number of acres they cultivate; they also feed all, or nearly all, of the grain they grow on the farm; they may spare a little occasionally for seed; everybody knows that Eldreds always have *seed corn;* in fact, they have the best of every thing. They prepare their ground thoroughly, and deeply, and never miss getting a crop.

The past season, whilst their neighbors harvested from nothing to thirty bushels of corn per acre, the Eldreds harvested from fifty to seventy-five bushels per acre, and their land naturally is not any better than their neighbors. The most remarkable feature about the improvements of this farm is, their substantial and convenient constructions and the great number of them, all admirably suited to the purpose for which they were built. "A place for everything and everything in its place," seems to be the leading idea about this farm.

The practice of managing and applying manure on this farm are much the same as that of which I have before spoken.

The next improvement these men intend making is, to thoroughly underdrain. It may occur to some as it did to me when there, that all that is found done there could hardly have been made from stock, etc., produced and sold in so short a time, knowing them not to be traders or speculators, but their answer to me was that they had stocked and improved the farm from the produce of the same.

Is it not strange that farmers, and intelligent farmers too, will persist in a mode of culture that is so notoriously disastrous to their best interest, and go heedlessly on from year to year, robbing their soil without making any returns thereto? More especially is it strange when they have living examples before them of the proper way by which they may make more money with less labor, and at the same time keep up their stock in trade, the soil.

Now, on a well regulated farm, where system and order are characterized everywhere; where the fertility of the soil has been so managed as to give everything on it a fresh, vigorous and healthy appearance; where various kinds of stock are kept, all provided with ample shelter and food for winter; fine pastures of luxuriant grasses, dotted over with shade trees and herds in summer; with the long and beautiful lines of hedges surrounding the waving grain and rustling corn-fields; with the well set and cared for fruit orchards, surrounded by handsome belts of deciduous and evergreen trees; a comfortable dwelling in the midst of well laid out grounds, planted with a choice selection of shrubbery, fruit trees and flowers—all yielding their fruits of comfort and pleasure; where the beautiful birds will want to linger and discourse their cheerful songs of praise; out in the pure breeze and sunshine of heaven; away from the throng and vices of the city; where all nature is spread out before us, suggesting the wisdom, power and goodness of the Great Ruler of the Universe. If all this is to be realized on a farm, and it *can be*, who would not be a FARMER?

DISCUSSION.

FLAGG—I am glad to hear the condemnation of excessive wheat growing, nine-fourteenths of the land reported in crops in St. Clair county for 1869, were in wheat, and adjoining counties were not much better.

Dr. Gregory—It is questionable whether if all quit growing wheat, we shall in the villages have any grain to eat.

Gore—I would not be understood to say that we are to do without bread. I think that a proper rotation of crops will give bread enough.

Whitney—How much would you rot manure before you put it on?

Gore—Fresh manure is more lasting; rotted manure more immediate in its effect. It is my practice to apply manure during the fall and winter.

Warder—How right after haying? That is the common practice in Ohio.

Gore—I do not know.

Rice of Champaign—What is the value of different kinds of manure? That from wheat our Michigan professor told us was nearly least in value. The wheat crop then would injure the farmer most.

Gore—Boussingault or Johnston, I think, gives a table of manures. Where that from the sheep is valued at 80, when stable manure is worth 100. But the former probably gives quicker results.

[This is perhaps an error. In the table of comparative value of manures given in Boussingault, farm land dung being put at 100, sheep manure is put at 65 in a dry state, and 36 in a wet. —Secretary.]

Prof. Stuart—Is vegetable mould or humus of any special value?

Gore—I think so.

Stuart—I want to get at the depth of black soil. Its color, we suppose, comes from decayed vegetable matter. Is it as deep with you as here? Does your experience lead you to believe it is a valuable manure.

Gore—The depth of soil with us is from one to three feet thick.

DEEP AND SHALLOW PLOWING.

Geo. Rice of Champaign—I came here two years ago from Madison county, and found farmers using shovel plows. They said it would not do to plough deep, and the fact does appear to be that deep plowing (eight inches) does not always produce good corn. A neighbor of mine has raised this last year more corn with one team than another with two. The latter said he had plowed too deep.

BOGARDUS, of Champaign—I would pay a man more money to plow four inches deep than seven.

MITCHENER—I have lost several crops by deep plowing, especially when the ground was new. I found the ground was very open, and the corn roots ran deep. The decay of grass, etc., seems to be a subsoiling process.

PICKRELL—I am glad to know the peculiarities of Champaign; but we want to know more of manures. I would like to ask the lecturer how long manure will be advantageous without renewal.

GORE—I can't answer directly. In one case barn-yard manure applied to grass showed for eight years. There may be something in the soil here bad for deep plowing, but if there is nothing poisonous in the sub-soil, the trouble is that they don't harrow deep enough. In that case they will find cavities as big as their fists, which will hold water; and a root encountering a clod or water perishes.

SCOTT, of Champaign—As for deep plowing in this vicinity, my experience is in favor of it. I plowed forty acres of sod land, half in the fall with two plows, to the depth of twelve inches, and the remainder with the double Michigan plow in the spring, to the same depth. It raised the best crop I ever had. With the same plow, and others, I plowed fifteen acres to the depth of twelve to fifteen inches. The corn on those fifteen acres, as compared with other land, other things being equal, besides the plowing, yielded ten bushels more per acre. I made a similar experiment this year with the same plow. There is a marked difference in the corn as shocked. This was on old meadow sod land. I harrowed heavily, say six or seven inches deep.

WHITNEY—There is nothing so good as thorough harrowing.

MILES—I think plowing not out of place in this discussion. Manure comes from manœuvre, to work. I have been gratified with the views presented by the lecturer. They are in accordance with the latest views of science. I would heartily qualify them. Jethro Tull claimed that soil was the food of plants. This is not in accordance with science, but he called attention to pulverization. Lawes and Gilbert, tried the experiment of cultivation without manure, and Mr. Lawes has shown that absolute exhaustion is almost impossible. In twenty years there has been an averagc yield of seventeen and a half bushels peracre.

As to sheep manure, the *animal* makes no difference. The *food* determines the value of manure. The feeding value of corn and beans is the same, but the latter is much the most valuable for manure.

I would not put so large an amount of land in grass. I would raise less permanent crops, such as clover, beans, etc. I would only "piece out" with commercial fertilizers.

The formation of the barn-yard, as described by the lecturer, is complete. The only source of waste is the leaking. Evaporation don't hurt. The entire mass should be kept moist.

I would not turn hogs on manure. The muscular exertion detracts from their fattening. The best thing to keep manure is the box system, and letting the stock tramp the manure under them. I would not have a manure cellar, it is bad for the animals above. The manure lies loose the liquids do not stay in it, and are not put back. I would keep manure piles flat and packed.

Top dressing is the best mode of applying manure. Light sandy soils should be manured differently from clay soils. Never pile it, but spread as you haul, so as to give all parts of the land an equal chance. Dr. Volcker, of England, investigated top dressing and the supposed waste of ammonia resulting, and he concluded that top dressing and the practical men were right. Spread manure whenever the ground is not frozen deeply; even if there were a waste of ammonia, it would be cheaper on the whole to spread as we haul.

Top dressing enables us to spread our manuring through the year. In turning under clover, the later you plow the better. You may remove a crop of seed, and then turn under to the best advantage, because the roots are thus the best developed.

Poa pratenses, (blue grass), is very good for pasturage, but one of the very worst for cultivated lands. Use clover.

Manure lasts according to its condition, whether soluble or not.

Adjourned.

THURSDAY EVENING, 7 P.M.

Dr. J. M. GREGORY, Regent of the University, delivered a lecture on

ORNAMENTATION OF GROUNDS.

There is a hunger of the eyes as well as of the stomach. "Let me see, let me see," is a cry as natural to childhood as its cry for food. And it is not confined to childhood. "Show me something new, something beautiful, wonderful, picturesque or grand," is a perpetual longing of the heart of man. To be blind is counted the most pitiable of defects; to be immersed in the dark, the most dreadful of punishments. To see—to enjoy strange sights—is the most coveted of pleasures. To gaze upon Alps or Andes, to explore London or Paris, men travel at great expense to remote lands, braving all perils of land and sea. Millions are expended annually to witness shows of all sorts, and he who can feed the hunger of the eyes reaps larger and more freely given rewards than he who feeds the ears or fills the mind.

The great primary use of dress is not to warm the body but to gratify the eyes. People will sooner run the risk of freezing than meet the eyes of their fellow men in unfashionable clothing, and the national debt costs less than the colors and cut of the people's clothing. Every artizan, after fitting his products for their uses, doubles his care and toil to make them beautiful to the sight. Instances might be multiplied without end, to exhibit and prove this mighty and insatiable hunger of human eyes.

And the food of the eyes has a market value. Beauty is as merchantable as beef. In the markets the best looking article, other things being equal, sells quickest and for the best price. Red apples sell quicker than white or russet. The beauty of a horse adds often a hundred per cent. to the price he would otherwise bring. A farm in fine appearance will sell for as much again as the same farm in a slovenly condition.

In advocating, then, the ornamentation of grounds, I am not advising to an idle and profitless expenditure of money—a useless waste of labor, permitted to the rich, but ruinous to the poor. If you and I had farms lying side by side, of nearly equal value in site and soil, and you should spend $500 in solid improvements—in drainage and manures—and I should spend the same sum in ornamentation—in drives, walks, evergreens and shade trees, and in making tasteful and neat fences and buildings—my farm would sell soonest and for most money. Nay ; you yourself would give more.

Nor is all this unreasonable. The *hunger* of the *eyes* is as real as that of the stomach, and its gratification is as important not only for our pleasure but to our power and progress. If I eat bread, it affords a momentary pleasure, and helps to maintain my animal life. If I *see* some scene of beauty or rare product of nature or art, it affords a higher gratification and aids to maintain and enlarge the higher, intellectual life. Digested food forms flesh, blood and bones. Digested visions give ideas, arts and civilization, motives, aims and mental power; and these, in turn, are easily transmuted into solid things, which sell for greenbacks. And thus what we see not only does us good and increases our pleasure and wisdom, but also adds to our wealth. The steam in the boiler has neither wheels nor spindles, but the great factory would be a sorry scene of idleness were the hot vapor to cease its impulsions. And little would the plow accomplish were it not for the many motives which urge the farmer to his industry. Whatever adds to the number or power of these motives, or to the intelligence and skill which directs their efforts, must add also to the wealth of results.

These principles have a reach and richness much beyond these simple illustrations here used. But these are enough to prove that it will pay the busiest farmer to ornament his grounds and make his home beautiful. Let me emphasize this statement, for until it is proved that it is remunerative in money values, we can scarcely expect the poor farmer, who may be struggling with debt, and having hard work to make the year's ends meet, or the grasping farmer, who has only an eye for solid profits, to go into the work of ornamentation. The farm is no exception to the great law that beauty always adds value to any product.

But beauty is something more than other products.

"A thing of beauty is a joy forever."

Even though the pecuniary profit of ornamental grounds could not be made out, the argument for such grounds would by no means fail. Beauty gives us joy even more surely than money; and no beauty is so various in kind, and so enduring in effect as the beauty of the landscape. The poets, those inspired priests and prophets of the beautiful, have always presumed upon man's love of nature. Their most effective verses are those in which they paint natural scenery. The grand old forests with their wild dark recesses, the piled mountains with craggy heights and frowning fronts, massive, great and eternal, awaken the sublime emotions in all hearts. The flowery meadows, striped with silver streams, and decked with clumps of noble trees, fill all beholders with the sweet sense of the beautiful. Ten thousand hearts have been touched with tenderness by the sweet melancholy of the pictures in Gray's Elegy. There is the vividness of a great painting and the melody of a sacred song in this opening stanza:

"The curfew tolls the knell of parting day,
The lowing herd winds slowly o'er the lea;
Homeward the weary plowman plods his way,
And leaves the world to darkness and to me."

But the poet's eye and heart are not needed to see the beauties of nature, and to revel in their enjoyment. No taste is so early or so easily kindled, and none is so abundantly provided for as this taste for nature's beauties. Her pictures are not limited to the narrow stretch of canvas, nor hung in remote and rarely visited galleries. They are not shut up in the homes or haunts of the rich and the great. They cannot be bought up at enormous prices and hid away in palaces. The all-embracing sky is her star-lit dome. Hung upon the hill-sides, scattered through the valleys, clustered in every grove and by every water-course; changed and replaced by each successive season of each succeeding year, retouched by penciling sunbeams with each passing day, retinted and gilded by dew fall and shower, rich in every variety of scene and every style of art, nature's pictures appeal as no others can, to all eyes and hearts. It needs but brief teaching to awaken into undying ardor the taste for her scenes.

And these beauties belong of right to the farmer's home. Far from the brick walls and the dusty streets of the great cities, the farmer dwells amid nature's scenes, and she invites him by every consideration of added value to his land, and added pleasure to his life, to cultivate for beauty as well as for bread; and this culture is often as cheap as it is productive. It will cost no more to lay out roads and fields, and plant orchards and groves in a picturesque way, than to do it in the too common tasteless way.

A hundred dollars judiciously expended in planting in the right places a few fine evergreens and other ornamental trees, and in making the home lot on the farm beautiful and attractive, will add two, if not five, hundred dollars to the selling price of any farm in Illinois, and will render the sale twice as prompt and easy. Between a house cosily nestled amid surrounding groups of beautiful or picturesque trees, and looking out upon a pleasant lawn crossed by graceful walks and drives, and a house standing bare and unprotected in the midst of a corn field or potato patch, with no tree in sight, none of us would long hesitate which to buy; or if we should, our wives and daughters will not; and their argnments will easily persuade us into the purchase of the former, with its farm attached, at five or ten dollars an acre more than we would give for the other, though the soil and natural situation may be fully equal.

If it be plead that the time is all needed in the hay or harvest fields, or amongst the growing corn, it may be replied that when the ornamentation is once begun, and the interest is thoroughly kindled, time enough will be found among the waste hours to keep the pleasure grounds in the highest order. It will be recreation and rest in the evening hour to tend the trees, trim the borders, and add new beauties to the scene.

But there remains a weightier argument in behalf of ornamentation. It is found in the new and necessary attraction it would lend country life; and in its certain influence in retaining our young men upon the farms. Who can wonder that so many of our farmers' sons desire to exchange scenes so devoid of beauty and a life so devoid of high pleasure as are found around and within too many of our farm houses, for the more elegant surroundings of city life? Make the farm home more attractive and beautiful, and then, if the wayward youth strays to the distant city, he will soon turn back, like the prodigal, to the fireside that nursed him, and to the beautiful scenes where he played in childhood.

I trust I have made the argument already so strong that I do not need to fortify it, as I might by reference to the powerful humanizing, elevating and inspiring influence with which beautiful surroundings, as a slow acting but perpetual force, exert on all characters, and penetrate all lives; nor yet to the educating power which such surroundings have to develop a better taste and a sounder judgment, even in the useful arts and vocations. The habits of neatness, order and grace cultivated in any one department of our life or work we are quite apt to carry into other departments. Who then can doubt that the taste and tendencies cultivated on that bit of pleasure grounds lying about the farmer's dwelling and barns would soon show themselves in his fields, and go on till they had pervaded the whole farm, including yards, pens and stables; and till even the dumb brutes, that own him as master, should grow sleeker, fatter, and both happier and more profitable?

Nor would it stop here, but like a blessed contagion it would affect the neighborhood. There is nothing we are so quick to see and imitate as matters of taste and fashion. The flower patch is almost as catching as a new style of bonnet. And so in the end the community would come to feel the bright influence, and repay it by each man's additions to the general landscape. I had the pleasure of seeing, during the past summer, some such results in the old world. A fellow traveler one day stopped me as we were walking through the suburbs of a European city: "See," said he, "do you notice that not a house here is without a flower box in its windows." Nor need we go abroad to see this result. I know a small city in the West which has become famous for its beauty on account of the number of flower gardens which are found along all its streets.

Permit me now to leave the arguments for ornamenting grounds, and turn to the consideration of the laws and principles which ought to guide us in this ornamentation. Without some knowledge of these principles, one may spend thousands in an endeavor to beautify his estate, and have nothing to show except the evidences of bad taste and failure.

Landscape gardening is one of the fine arts, and as such requires, like painting and sculpture, a genius for it, in order to its highest results. But there are some simple and well settled principles and rules which any one of ordinary good taste may easily learn to apply, and which will save the novice even from ridiculous failure.

The simple elements of an ornamental ground—the elementary parts of a beautiful landscape—consist, *first*, of beautiful and picturesque objects; and, *secondly*, of beautiful or picturesque arrangements of such objects.

The terms *beautiful* and *picturesque*, used in this connection, need to be carefully distinguished. An object may be beautiful without being especially picturesque, and many objects are picturesque without being at all beautiful. A smooth shaven, velvety lawn, a symmetrical tree, a bed of flowers, will always be beautiful, but never picturesque in themselves. An old stump, a gnarled oak, a ledge of rocks, will not, by many, be counted beautiful, but they are often very picturesque.

If I were to distinguish the *beautiful* and the *picturesque* by their effects on the mind, I should say that the former awakened pleasurable feelings without necessarily exciting thought, while the latter directly inspires thought and arouses the imagination. If the beautiful excites thought, it does so by first exciting emotion. The picturesque excites emotions by first exciting the imagination.

The outline of the beautiful has roundness and completeness; it suggests the perfect and finished; it calls for no additions or changes, and asks no new inventive effort of the creative imagination.

The picturesque has an irregular and fragmentary outline; it suggests the incomplete and provokes the creative faculties to interpret and finish the picture, or to clothe it with fresh meaning.

Of the two, the beautiful is the most satisfying; the picturesque the most exciting. We repose and dream amid the beautiful; we are alert and studious amid the picturesque. The former is a paradise won; the latter a heaven hoped for.

In landscape gardening we may mingle the beautiful and the picturesque, but the style will be determined by the predominant element. Thus the first great classification of styles is into the picturesque and the beautiful. The natural style is picturesque; the geometric is beautiful.

The beautiful may be divided into beauty of *form* and beauty of *color*. The latter is the lower in rank, but it is simpler and more easily appreciated by the uncultured and young. Infant nations and ignorant people love bright colors, with but little regard for form. Only more cultivated and refined people prefer beautiful forms and soft and subdued colors. For this reason, perhaps, the earliest attempts made at the ornamentation of grounds seek only to deck them with large and gaudy flowers. A maturer and finer taste looks to ornamental groupings of beautiful trees, and a pleasing arrangement of walks and drives, of vistas and lawns.

The production of ornamental grounds requires some knowledge of the several beautiful and picturesque objects which may be used for such ornamentation. The following comprises the most common and important: Trees, shrubs, flowers, and groups or beds of the same; lawns, terraces, verges or borders; hedges, avenues, walks or drives; hills, mounds, rocks, and water either in streams, lakelets or fountains. Of artificial objects, there is a still greater variety: as houses, barns, green-houses, summer-houses, arbors, trellises, frames, rustic seats, vases, flower stands, statuary, columns, basins, fountains, cascades, bridges, gates, fences, screens of endless variety of forms and materials. And these objects may be according to their forms and groupings, either beautiful or picturesque.

There is scarcely any object in nature which may not be incorporated in the landscape in which it occurs. By a skillful arrangement of his trees and vistas, the landscape gardener may make the entire visible horizon, with all it contains of beauty or grandeur—its distant hills, mountains or cities—all enter into the living picture or panorama on which he looks forth from his window or door step.

The number and character of the objects one may introduce into his grounds will depend both upon the size and character of the ground—it being a fundamental rule to *avoid crowding*, *confusion* and *incongruity*. This rule is often violated by beginners, and their grounds are crowded with every new tree or other object that strikes the fancy, till they resemble a botanic curiosity shop more than a landscape scene.

Grand effects can only be produced on extensive spaces. Tne picturesque, as a general rule, requires larger spaces than the beautiful, and the grand picturesque, which is full of noble expression and sublime sentiment, when seen in its own native greatness, often becomes absurd and ridiculous when reduced to miniature size. The leap of Niagara is sublime, but the sheet which pours over the mill-dam is common place, and the waterfall made by damming a ditch is absurd. A mountain is always grand. A mole hill, even if built prettily in one's door yard, is ridiculous.

It is evident, then, that the first step to be taken in the ornamentation of any ground is to consider its extent; and this leads to our first division of the subject. We may naturally and conveniently discuss, first, the ornamentation of a simple village lot; second, the ornamentation of the suburban lot or villa of several acres; and, finally, landscape gardening on the larger estate. The first two of these will alone receive attention now, as it is in these that most of us here present are concerned.

THE VILLAGE LOT.

[A plan was shown on the black board.]

The common village lot in our Western towns is only four rods in width by eight in length, though it is not uncommon for the lot to be double this size. Our suburban lots usually contain from two to five or six acres. As it is not to be expected that our farmers will attempt to give their whole farms for a landscape, but may undertake to cultivate, in a somewhat ornamental way, the four or five acres on which are situated their buildings, gardens and fruit grounds, the discussion of the villa ornamentation may be considered as adapted to their wants. I shall, therefore, not miss my mark entirely in confining my attention to these two classes of ornamental grounds already defined.

The Village Lot.—The ornamentation of the village lot may seem to some almost an absurdity. Its extent is so restricted, and its shape so block-like and unpicturesque, that the ornamentation must be exceedingly limited in amount and character. But a little attention to some simple principles of art would rid us of the unsightly and grotesque scenes that greet us in most of our new towns. Let us proceed in order:

1. The architecture of the buildings must of course conform to the wants or the wealth of the owner. It is not my purpose to discuss here the several styles of architecture, but simply to show that any style may be made more beautiful than our village houses usually are.

Take the simple box-like house so often seen. Add to this house broad projecting eaves that shall give a sheltered look to the house. Add also a plain veranda, however cheap and simple, covering the front door and windows, and your high dry goods box will become at once a human dwelling in look, suggesting shelter and cosy comfort. Add to the eaves and gables some sawed drapery and an element of beauty is introduced; and now, in place of the ghostly white, so fashionable, and so frightful to all true taste, give the house a coating of some neutral tint, with its corner boards painted a darker shade of the same color, and the eye rests pleasantly upon the picture. White may do for a house seen at a distance, and mostly hidden in a grove deeply shaded, but all true taste revolts at it when seen unrelieved, at the roadside or in the open prairie.

A more beautiful architecture is of course desirable, and might easily be had without much additional expense, if our house-builders knew the simplest principles of their art.

2. The next point is the position of the house. The common notion seems to be that all the ground left in front of the house is wasted, and all that is behind the house is saved. Hence the house is crowded close to the dusty street, all exposed to the gaze of every passer, with a mere patch of green in front, and a huge chip yard in the rear. Let the house be placed at least half way back in the lot, leaving room behind it only for the wood yard, bleaching ground, barn, and other out houses. A few trees and vines will easily find place, and perhaps a few beds for garden vegetables. In front, a small but beautiful lawn may now be had, with a clump or two of handsome trees and shrubs and a flower border. These may be fruit-bearing if desired. The house thus placed will look retired and home-like, and from its front door and windows a scene of beauty may shut out the dirt colored streets.

The walk, instead of running down through the middle, dividing and thus belittling still further the little lawn, should wind off to the side most convenient, and the entrance gate be placed near one corner of the lot. If the convenience of the family demands it, an entrance may be made near each front corner of the lot, with winding walks to reach the front and rear entrances of the house. A slight curvature to the walks will add to their beauty without hurting their convenience.

3. *Fences* can scarcely be made other than stiff, straight, formal things; and they should, therefore, be as inconspicuous as possible. They may suggest protection, but they also suggest limitation and confinement, and their use is always a damage to the ornamental effect of grounds. The front fence may be simple and plain, and the stiff, straight line may be relieved by a clump of rose or other bushes growing partly through it at one or two points. The division fences between adjacent lots might easily be dispensed with entirely, and the apparent spaciousness of both lots be increased thereby; but if the fence must be had, let it be low, and covered with shrubbery; or better, let it be an evergreen hedge with some of the trees permitted to grow up, while the others are trimmed down.

4. *Ornamental objects*, on so small a lot, and in so close proximity to so artificial a thing as a house, should be beautiful rather than picturesque. The most ornamental object which can be had under such conditions is the lawn itself, and care should be taken to leave it as spacious as possible. All unnecessary division of it by paths or trees must be avoided. If the paths be carried towards the sides as proposed, and the trees be gathered in clumps at the corners, and near the front and sides, an open and sheltered stretch of green may be had of great beauty.

The trees on such a lot should be of the smaller and more beautiful sorts—conical evergreens, the mountain ash, the cherry, and dwarf pear, unless nature has already provided some towering oaks or elms under which the cottage may seem as if nestling for shelter.

A vase filled with flowers, a piece or two of statuary, with one or two rustic seats, may be added, and even a small arbor at one side is allowable, but every object should be of the smaller size that by comparison the space itself may seem of greater extent.

But avoid all little artificial mounds imitating hills and mountains. A bit of rock work, as far as practicable from the house, half covered with ferns and trailing plants, or a small terraced mound, supporting successive banks of flowers, may be allowed; but to mimic the Alps on a ten-rod patch is worse than child's play.

5. Concealment of every offensive feature will complete the picture. Trellises, or screens made of evergreens or shrubbery, may be used to shut out from view the wood-yard and outhouses, and even a blank or unpleasant aspect of the house may be half hidden by some climbing vine, or a bush skillfully placed.

How much more attractive all this than the little, bare, box-like cottages, squat close behind the front fence, with a stiff, straight walk from gate to door, dividing the little domain into two ; and the two inevitable evergreens planted one each side of the walk, and close to the door steps, looking like a pair of monstrous green goggles on the face. The small ground thus split and loaded seems smaller than it really is. Remove the two evergreens from the center to the sides of the lot, and then the eye in turning from one to the other, would take unconscious measurements of the intermediate space, and make the ground seem even more extended than it really is.

THE SUBURBAN VILLA AND FARMER'S GROUNDS.

The suburban villa with four or five acres may be regarded as representing what the farmer's house lot, embracing his gardens, orchards, yards, and barn inclosures may contain. In discussing this branch of landscape gardening, I shall, therefore, bring into view all the principles of the art required by the common farmer.

I will suppose the house already built, and will not discuss its architecture. I will suppose the site already chosen, and not attempt to discuss this choice, except to deprecate the folly of the farmer who, having hundred of acres, plants his house close by a dusty highway, with a total neglect of the many commanding, convenient and healthful situations which he has at command, near the center of his farm.

To make the discussion at once more interesting and instructive, I will illustrate my points by this plan of a villa, which lies not far from here, and embraces between four and five acres.

[The speaker hung before his audience a large drawing of the grounds he wished to describe. As we have failed to procure an engraved copy, the remainder of the lecture has been reduced to a brief statement of the several points discussed.]

Every place proposed to be ornamented must be studied by itself, and the plans must be specially adapted to the character and capacities of the situation. No one plan will fit two places, but the principles must remain the same.

1. *The approach* must be carefully studied and so contrived, if possible, that the first glimpse you gain of the house and grounds may be a pleasant one. In the place here pictured, the house presented to one approaching by the main street, an expanse of blank wall far from beautiful. To hide this from the eyes of visitors, till a point in the road should be reached where a pleasanter view burst on the sight, several trees were planted which, when seen together, should make a group hiding the obnoxious feature.

2. *The entrance and drives.* The entrance was determined by the convenience of the ground. The house stands near the south line of the lot, and fronts east. It is one hundred feet from the street, and the north half of the lot slopes rapidly towards a little stream on the northern border. The neighboring city lies in view to the northwest and north. From the main entrance the drive runs by an easy curve around a piece of rock work and a clump of trees past the front door, and thence around near the side door, and so on to the front of the barn. A second entrance from a side street allows the heavier teaming to be done without injury to the front road. Straight lines are avoided, and yet no curve is made without an apparent reason. Walks lead to a small gate at the southeast corner, and to various points of the grounds, but only where required.

3. *Interior Fences.* The low ground on the north being needed for a meadow and sometime pasture, a division fence was needed; but a fence would obstruct the vision, detract from the spacious appearance, and present an unsightly object. A fence at best is an offense in landscape. Its straight lines, and suggestions of limitation and confinement are opposed to all the free spirit of natural scenery. To avoid this, a terrace is thrown up along the declivity, leaving a depression at its base; and this, with the aid of a wire or slat along the top, furnishes a sufficient protection.

A fence around the barn yard is hidden by raspberry bushes and other shrubbery.

4. *Orchards and Fruit Plantations.* An attempt is made to unite the tasteful and the useful—a condition indispensable if we would introduce ornamental culture on the farms of the country. To facilitate this, cherries and dwarf pears are chosen for planting the front grounds. The cherry trees are thrown into groups, intermingled with evergreen groups. This gives the cherry trees some shelter, while it adds to the beauty of the grounds. The pear trees are planted in the hexagonal order, with a red cedar at the center of each hexagon. A hedge of evergreens shuts the pear orchard in from the street. The small apple orchard, occupying one of the back quarters of the grounds, is also planted in the hexagonal order, and is completely surrounded

by an evergreen belt. The standard pears are thrown into picturesque groups with evergreens. The small fruit plantations occupy ornamented plots, and need only a little more than the ordinary care to keep them in a condition fitting them for the double service of profit and ornament.

5. *Ornamentation*, aside from utility, is scarcely attempted. A simple but somewhat ornamental grape arbor stands on the terrace before mentioned, with seats on the inside, and a circular flower bed in the center of the large, open area within. Three or four other flower beds are cut in the lawn, at different points, but not so as to disturb the effect of the large, open lawn itself. A marshy place in the low grounds is excavated to form a little lakelet, fed mostly by springs, and some ornamental willows and other trees overhang it, while a small rustic bridge crosses the stream to the small spot of ground beyond. The ornamentation, as it leaves the vicinity of the buildings, may grow more rude and picturesque in character. Near the house regularity, symmetry and beauty are requisite. An old stump, half-hidden in wild flowers, is in perfect keeping near this bit of lake, but it would suggest untidiness and rudeness if near the front piazza of the house.

The chief ornaments of landscape are found, of course, in tree growths. And to arrange these in pleasing and picturesque groups is the most difficult part of landscape art. Solitary trees if either very beautiful or very picturesque, and especially, if of grand proportions, are often admissible in an open field designed for culture, or in some space too confined to admit a group. But a group of trees with a fine outline, showing bold lights and shadowy retreats, and especially with a sky-line wavy and graceful without too sharp or startling inequalities of height, attracts all eyes and provokes delightful study of the hundred intricacies of form and color which it presents. In general the group must be made of trees approaching the same form. A round-headed and a conical tree do not agree well together. Trees in rows are in keeping at the side of some long and stately avenue, like those of Versailles, especially if a magnificent palace lies at the end of the vista; but a modest farm house standing at the end of such an avenue suggests a poor captive of some Patagonian giants, about to run the gauntlet. And the sky-piercing rows of Lombardy poplars with which the Dutch line their roads, are about as picturesque and attractive as a line of grenadiers, or flamingoes.

6. *Concealments.* The great law of ornamentation is to multiply and magnify beauties, and to disguise or conceal defects; or, in other words, to present to the eye only pleasing objects and scenes. I have already stated how a poor aspect of the house was hidden from the approach. By a similar arrangement of trees, and groups of shrubbery, the barn yard and kitchen garden are kept partly concealed. The stiff rows of the grapery and the orchard are also seen only in glimpses through shelter-belts. And the formal lines of the exterior fence and hedges are largely relieved by clumps of trees and bushes thrown against them at several points. The rigid mathematical outline is thus broken up, and the eye, breaking over the boundary lines, weaves into the landscape the scenery without, as well as that within the grounds. This leads me finally to consider,

7. *The Outlook.* There are usually objects and points of interest in the distant landscape which it is desirable to retain a view of, as also unpleasant scenes which one would exclude from view. Both of those ends may be attained by a well studied arrangement of the trees. Standing on your front porch, or at some chief point of view, select the distant scenery which you wish to retain in sight. Then send a man to stick tall stakes at the points where you need trees to hide undesirable aspects, and objects, and to leave in sight those you have chosen; make suitable allowance for the future growth of your trees and then plant accordingly. In the place represented the churches and public buildings of the city were seen to be striking objects, and the trees showed openings through which these might be seen.

Some minor principles and rules were also illustrated, but these are the main ones to be observed in the ornamentation of grounds. It will be seen that all this does not necessarily involve a large expenditure of time or money. It only requires, as its chief condition, a skillful planting of trees. The care of walks, drives and lawns will cost some labor, but it is a labor which will pay.

Let us hope the day is not distant when rural life in our country, shall be relieved of some of its harsher features, and made more attractive by some attention to the beauty of our rural homes. It has too long been the reproach of America, that with the finest country and most fertile soil in the world, our farming districts still wear an aspect so barren of all beauty and so cheerless looking, and so repulsive. "America has no gardens," said lately a generous English horticulturist, who dwelt with full praise on all our great advantages, and who fully praised our great eastern parks as equal to anything of the kind in Europe. Let us wipe off the stain, and plant henceforward for home, and for beauty and comfort as well as for the market and the pocket.

DISCUSSION.

WARDER—There is little left to be said, except to confirm the doctor's good judgment and taste. I was especially pleased to hear him say, avoid fences. I would do it, not only in the towns, but in the country, and particularly in cemeteries. They can all be avoided, as suggested by the lecturer. I have seen this exemplified with success. I saw it done at Wilmington. An old Quaker gentleman dedicated a street on the condition of the abolition of fences. It is so to some extent at Rochester, New York. There are gateways leading from one street to another.

As to art ornamentation of grounds, we must be careful. New Englanders sigh for rock on these black prairies, but artificial rock work is only beautiful when hidden with plants. At Central Park there are native rocks, and it is endurable, but there is some child's play there. We don't want artificial lakes, nor artificial waterfalls! [great applause]. West side Park, at Chicago, has a mole hill in it ten feet high. Statues are obtrusive. They may do at Sans Souci, but not in this country.

Curved walks are easily made, and it is easy to make mistakes in them. Perhaps the curves shown us might have been made a little straighter, but the obstacles are brought in well.

Grouping trees is very difficult. The best cherries by the way would make an incongruous group—the Early May and Black Tartarian, for instance.

Flagg—I find it necessary, in planting trees about the house, to guard against getting them too near for health. A small tree, as it grows becomes worse and worse, if planted near the house, and ultimately may result in a good deal of dampness, and possible disease. In our climate, I presume the sun should have free access to the dwelling.

Dr. Gregory—I have known cases of typhoid fever resulting from an excess of shade.

Warder—I assent to the doctrine of no trees in immediate proximity to the house generally, but occasionally we may require a single tree to hide a defect in the house, etc. I would plant rapid growing trees to hide the blank wall in Dr. Gregory's dwelling, such as silver poplar, or I would put on an Ampelopsis or Virginia Creeper.

Francks, of Champaign—I would give up the curve line on small lots.

Warder—I think Mr Francks is about right as to straight walks in such cases. You can still have the gate at one corner of the lot.

Parks, of Tolono—I differ with the lecturer in thinking that white (with green blinds), is the most appropriate color for a house. I would paint a brick house red, with the stripes as white as possible. I can confirm what has been said of the bad effects of too much shade. I don't want big trees about a small house. I like the sugar maple the best as an ornamental tree.

Flagg—In a trip to the east, going rapidly through the country by rail, I had an opportunity of comparing a great variety of styles of painting houses. I found the most pleasing to my own taste, to be a light, (not white color), for the body of the house, and several shades darker of the same color for the cornices, window trimmings, blinds, porches, etc.. I acted on the hint, and painted my own house, as recommended by Vaux in his work on rural architecture. The body of the house lightest; the cornices, window trimmings, etc., some shades darker; the solid parts of the blinds a shade darker, and the slats of the blinds a shade darker still. I found this quite satisfactory. I have found the following receipts of Wheeler, in his Homes for the People, both very good:

Cream color, No. 1: Yellow ochre, five pounds; burnt umber, one-half pound; Indian red, one-fourth pound; chrome yellow, No. 1, one-half pound; white lead 100 pounds.

No. 2: Yellow ochre, two pounds; Vandyke brown, one-fourth pound; Indian red, one-fourth pound; chrome yellow, No. 1, one-half pound; white lead 100 pounds.

Use either of these for the body of the house, and darken them with burnt umbre for the projections, and I think you will have satisfactory results. There is a tendency to reverse the natural order, and paint the body of the house dark, and the trimmings light, but this makes a very dreary looking exterior. I see also a tendency to violent contrasts, such as making the trimmings very dark, which gives a flashy and gaudy appearance. Both of these faults are to be deprecated.

It seems to me that in tree planting, we should, so far as practicable, put the larger trees behind the house, as a back ground, against which the house may be seen.

WARDER—I would agree that generally large trees look best behind the dwelling, but at Princeton, New Jersey, are some very fine oaks in front of the old stone mansions, that produce a fine effect. Oaks, by the way, are very fine trees for ornamental use, as we may see where they have been preserved, as at Rockford and Cleveland.

Adjourned.

FRIDAY MORNING Jan. 14—9 A. M.

RURAL ECONOMY.

In the absence of the gentleman expected to lecture upon this subject, it was thrown open to discussion, after the reading of the following definitions and analysis of the topic, arranged by Prof. Bliss and the Secretary:

DEFINITIONS.

Rural Economy, according to Worcester, is the general management of territorial property.

Hamen, a German, defines it as the whole of the rules which must be followed in order to derive the highest possible benefit from the estate; or the proper application of all the doctrines of agricultural science of tillage, and of animal economy, in the management of our estates, so as to obtain in the production the best returns.

Goeritz, another German writer, says: "Rural economy differs from agriculture proper, in this, that while the latter is occupied chiefly with the special culture necessary for plants and animals, the former treats of the general management of the farm or estate. It might be said that one deals with the external, the other with the internal affairs of the estate. It is the office of rural economy to take into consideration the general and special organization of the domain, its various resources, its capabilities, and its revenue; it teaches us to estimate correctly the relation and the influence which the various branches that make up an agricultural enterprise, have upon the whole, as well as the various relations which may exist between the agricultural and other industries of a country.

The following are some of the topics which may be embraced under the discussion of this subject:

I. Choice of a farm.
  1. Capital that one has to invest—Means.
    a. in real estate.
    b. in working capital.
  2. Kind of farming preferred—taste.
  3. Capabilities of soil and climate.
  4. Markets accessible.

II. Arrangement and sub-division of farm:
  1. Rotation of crops.
  2, Position of farm buildings.
  3. Farm buildings.
  4. Fencing, hedging and shelter belts.
  5. Drainage.

III. General management.
  1. Labor, animals and implements.
  2. Manures.
  3. Ratio of working capital.
  4. Utilization of waste.
  5. Marketing.

IV. Farm industries:
  1. Dairying.
  2. Cider, wine and vinegar.
  3. Canning fruits; drying fruits.
  4. Sugars and syrups.
  5. Starch making.
  6. Broom making, etc.

Dr. Gregory—I would call attention to the importance of choosing a healthful part of the farm for the dwelling, and that if practicable, in a central position, so as to make all parts of the farm more accessible.

Prof. Bliss—I would call attention to the relation between fixed and working capital. How much money should one invest in real estate? how much in improving and stocking it?

Scott—There is much capital wasted in purchasing too much land, without capital to work it. A man should have a considerable amount of capital to commence farming.

Bogardus—Small farmers do not have much chance in such case. What can young men without capital do?

Whitney—They might bargain for a farm, and postpone the payment, or run in debt in one sense. Young men can afford to do it. They have a reserve capital of brain, nerves and muscle.

Dr. Gregory—We had fifty students of agriculture last term, and will have fifteen to twenty more this, and hope to increase the number by interesting the young men in agriculture, and I do not wish them to think that there is any special disadvantage in the pursuit of agriculture. To run in debt for a thing we consume is bad; but when one runs in debt for a farm, he runs no danger of defrauding anybody. I have advised teachers and others, for this reason, to invest in real estate, even if it were only a house and lot.

I would not advise the young men here to go to common day labor when they get through. There are plenty of men who would be glad to lease to them, or hire them as general managers. A gentleman told me that he knew a dozen places where a young man could get $1,000 or more a year in such a position. But an ignorant or unskillful young man would not answer.

The young man who wants to be a merchant finds the same difficulty of want of capital, and the chances of failure are much greater in trade, nine out of ten fail in business. In Boston it was said, only two or three per cent. succeeded. In Detroit I found hardly any of the old business houses left at the end of ten years.

Many young men have their own way to make; and I know of no better path than that of the farmer.

Prof. Bliss—I would call attention to the next head of the topic, and ask: Shall we adopt special or mixed farming: or mixed farming in general with one special crop? Shall we adopt one line of policy and stick to it or vary from year to year? If we we adopt a fixed policy, had it better be a certain rotation, or what?

WRIGHT, of Champaign—I have never lived on a farm, but I am farming a quarter section by proxy, and may perhaps speak upon this topic. The object should be to ascertain how to adapt means to ends—how much stock, for instance, is needed for a given farm. It is not a question of whether a man is poor or rich. I put three hands and three teams on a quarter section. I put, say forty acres, in meadow or pasture, twenty in wheat, eighty in corn, ten in rye, and some, perhaps, in broom corn. The question is whether we can make it pay. I believe in thorough plowing and deep cultivation. I allow $2,000 for the whole expense of the year and the stock; or $12 50 per acre. I believe in buying the best hogs you can—Berkshires are the best up to twenty months old—and we want all kinds of live stock, cattle hogs, cows, &c.

[PROF. LOW—"Landed Property and the Economy of Estates" estimates about $38 per acre as the proper amount wherewith to stock a British farm with implements, live stock, seeds, manures, labor, maintenance of horses and burdens for one year on a five hundred acre farm. John J. Thomas—Rural Affairs, vol. 2., estimates $20 per acre on a farm of one hundred acres, as sufficient for domestic animals, implements, seeds, food and labor.—Secretary.]

MICHENER, of Homer—I was born on a farm and raised there, and my observation is that no specific rule can be laid down. The market is an important consideration. Near a railroad one might with propriety sell grain.

I practice a rotation of crops; I never take more than four or five crops of grain without going back to grass. Nevertheless, we can keep up our soil much more than is generally supposed. When I came to this country I bought a place with a big pile of manure on it. The owner talked of prosecuting his last tenant for not moving it. The ground was very rich, producing as high as eighty bushels of corn to the acre; yet, I found that manure would add a third to the crop. Still I believe the soil would alone make a good living for me all my life if I cared nothing for posterity.

WHEAT EPISODE.

As to rotation, there are difficulties here. It is not a good country for wheat. It freezes to death without freezing out, on account of our snowless winters. It kills worse after a warm spell. If stock nip the ends of the blades the wheat is killed. If frost kills the end of the blade the wheat is not killed. I have generally sowed broadcast and harrowed in. Some years in my neighborhood the drill has been of marked advantage. Some years not, but upon the whole the better. But we have generally abandoned wheat.

[In answer to queries]—I have put in wheat with double-shovel plow. We had an open February, the wheat started, and then the cold killed half the roots in the ground.

I would drill wheat if I sowed much. I only recommend a small crop put in in the best manner.

I manure highly. Scatter coarse manure in fall on fall wheat, and in spring on spring wheat, putting it on the surface, unless very well rotted. There is a great tendency to rust with manure, but it insures earlier ripening. [Mr. Fangenroth's experience in discussion upon wheat last year is opposed to this.—Secretary.] I lost a great many crops when I first came by deep plowing. There was the heaviest loss where I thought I had prepared the ground the best. There was too much air in the ground, and some difference between the surface soil and that a few inches deep.

Geo. S. Rice—The only protection from plowing in wheat is between the furrows—on top of them it will die. Drilling, if you can keep the drill furrows open, is a great benefit; but if there is much wet weather in the fall the furrows are obliterated. An Englishman, in Madison county, furrowed out his ground before sowing, so that each furrow half covered the last. Then he sowed the wheat and harrowed the ground *with* the plowing. It looked level after harrowing, but after the first rain quite irregular.

Clark—I had a fallow ground plowed twenty-five years ago with a two horse plow, and then the wheat plowed in with a shovel-plow. It produced the best wheat I ever had—thirty bushels of red chaff wheat to the acre.

Jewell—Planting wheat deep is of little value; but in smooth land it will freeze out, while it succeeds in rough. Deeply planted wheat comes up small, and must form a second series of roots when it gets to the surface. I would plant wheat an inch, corn an inch and a half deep; sometimes more, sometimes less. Rotation has very little chance here. Our soil is not adapted to it. We need, also, more fences. One has no benefit of grass lands, etc., unless he has each field fenced. But our soil will endure more than others.

[In answer to question]—I would never ridge up corn. I work it deep at first, and shallow as it gets larger. I would plow about five or six inches deep for corn. Long plowing makes a hard crust that must be broken up.

PLOWING.

WHITNEY—Plowing a little deeper one year and shallower the next, will prevent this packing.

EATON, of Homer—I found in ground eight years farmed an increase of one-third in a crop of corn on double plowed land, over that on land once plowed.

SCOTT—Plowing is the foundation of success. Deep plowing for corn I think the best. If you make permanent lands four rods wide and keep making the dead furrows deeper, you get drainage and better soil.

[In answer to question]—Plowing in fall for corn is no advantage, unless you re-plow in the spring, on account of the weeds starting earlier. For small grains it is good. But the two plowings are very good for corn.

Adjourned.

FRIDAY AFTERNOON—2 O'CLOCK.

Judge J. O. CUNNINGHAM, of Urbana, delivered an address on

THE LAWS OF HIGHWAYS AND INCLOSURES.

The caterer to the pleasures of the table seeks how he may provide that material which while it furnishes nutriment for the muscular man, shall also afford pleasure to the palate of the consumer. How I shall, in dealing with a subject at once so unpoetic and arbitrary, as the details of the laws of our State concerning *Inclosures* and *Highways*, succeed in accomplishing the latter, however much truth there may be in my remarks, is, I presume, as much of a problem to the hearer as to the speaker. Not that *fences* have no poetry in them, or that *roads* are destitute of interest to the seeker after pleasure—for a fence, if a good one, whilst it is of itself, or should be to the animal, a *stern reality*—may be a "thing of beauty; and, if a protection to the treasured products of the soil, is a "joy forever," what more beautiful, or poetic, if you please, than the waving lines of the noble Osage, an exotic, yet thriving and useful, as if to the manor born, now so gently, yet forcibly, establishing their lines across and over our State; or if we look to the old *worm* fence of our fathers, now almost unknown in our State, devious yet straight, "ten rails high and staked and ridered," there is something comforting in it, so suggestive of the promised dominion of man over the beasts of the field. And as for roads, if we except those of Illinois for nine months in the year—certainly the year Anno Domini 1869—nothing is more interesting or poetic. Whether we consider an Illinois road, fraught with untold dangers to the venturous navigator, or the road denominated by the best authority the "narrow road," highways have to us many things of interest, which may be studied with profit.

Sir William Blackstone, in his introduction to his lectures—now denominated Commentaries—on the laws of England, says: "I think it an undeniable position, that a competent knowledge of the laws of that society in which we live, is the proper accomplishment of every gentleman and scholar, an highly useful, I had almost said essential, part of liberal and polite education." And if this be true of the general laws of the State, applicable alike to all citizens, then certainly we may spend a half hour, with profit, in contemplating the law of our State appertaining to Highways and Inclosures, institutions, for such we may with propriety term them, which occupy such important relations to the industrial and commercial classes, although we may all our lives have considered such things dry, and only to be handled by eminent judges and paid barristers.

HIGHWAYS.

Highways, or more commonly *roads* or *streets*, embrace every description of public thoroughfare, where the public have the right of travel, whether in the rural districts or in incorporated towns, where certain of the prerogatives of government have, for wise purposes, been given to municipalities. It will at once be seen that it is now neither desirable nor practicable to ask this assembly of farmers, and farmers' sons, to go with me into an investigation of the laws governing the creation, improvement and operation of the streets of the cities and towns of our State. If we succeed in giving a passing notice to the country roads, we shall, perhaps, not only consume the time and patience of the hearers, but meet their expectations also.

The right of *eminent domain*, or, in other and more words, the right to take the private property of the citizen, either personal or real, for public purposes, is an indispensable requisite of sovereignty, whether that sovereignty reside, as with us, in the people, or in a crowned head. A party purchasing a tract of land in the country, or a lot in the city, if that land or lot be vacant, or covered with the most expensive buildings, takes his title subject to the right of the governing power to use any portion, demanded by the public necessities, for public roads; always *provided*, the public first pay such owner for his damages occasioned by such public appropriation. Roads owe their existence, often to public necessity; to special legislative enactment, by which those more important roads crossing our State or connecting important towns, called *State roads*, are created; to the operation of general laws, by which our local roads, called *County roads*, are created; or to *prescription*, that is, the occupation by the public as a road for the period of twenty years, to which many of the roads around, and through the groves, in the earlier settled portions of our State, owe their existence. Roads may also be established by voluntary dedication by the owners. One who lays out a town plat marks upon certain portions of his plat the designation of streets and alleys; so a farmer may open a road through his farm, or upon its margin, and by his acts and declarations dedicate the same to public uses as a highway, which will afterwards estop him from denying the use.

The constitution of Illinois provides that no freeman shall be disseized of his freehold or deprived of his property, but by the judgment of his peers or the law of the land, and not then without just compensation being made to him. As the State does not own lands always where roads are needed, and as in such cases it becomes necessary for the State to assert its right of eminent domain, and seize private property for public uses, it is necessary in order to vest the public with the right to use and enjoy such property, that the law of the land should give that right by special enactment; or that, in the opinion of a commission, properly appointed under the general law, which commission may be denominated the peers of the freeholder, such property is necessary for public use. Having obtained such special enactment or such verdict of a commission, and compensation having been ascertained by a like course of law or by agreement, and paid to the owner, or waived by him, as he does in signing a petition for a new road, the public may use and enjoy such road for ever. The damages awarded the owner must first be paid to him, before the public or its officers have a right to open the road. [43 *Ill.* 86.]

The statutes of our State, pointing out the manner of condemning private property for roads, and of maintaining them when established, suited to counties under township organization and to counties not under township organization, are altogether too voluminous to be detailed here, and may be found and read by the hearer at his leisure, by reference to Chapters 93 and 103 of Gross's Statutes. In counties under township organization, each township represented by its Commissioners of Highways, acts for itself in the establishment of highways within its boundaries. Roads upon town lines are established by the joint action of the boards of the towns interested, and are by the same boards, when established, divided into two or more road districts for the purpose of maintenance and improvement, and an equal amount allotted to each town. In counties not having adopted township organization, the establishment of roads, as well as their maintenance, is under the supervision of the County Court, composed of the County Judge and two associates, sitting for the transaction of county business. The work of improving and maintaining roads, when established, is, in organized townships, under the supervision of officers denominated Overseers of Highways, under the general superintendence of the Commissioners of such town. The Commissioners may assess and cause to be collected an *ad valorem* tax upon all real and personal property in their town, not exceeding 40 cents on the $100 for road purposes, and a *per capita* tax of not less than one nor more than two days labor upon each able bodied and able minded male over 21 years of age, denominated a *poll tax*. These helps are found all too small to make good roads over our very loose soil, and good roads in Illinois, especially upon the grand prairie, may be looked upon as very distant in point of time, unless, perhaps, in the realization of female suffrage, we shall likewise realize *female road labor*, as a necessary concomitant, when the muscles of the strong-minded shall prove as useful upon our roads as their tongues and pens now are in awakening the world of mankind to a sense of the deep wrongs we have so long heaped upon our dear wives and sweethearts, in denying to them the privilege of bearing with us the burdens of state. We may comfort ourselves with the assurance that the roads of the future Arcadia will be not only worked by gentle hands, but they will be good.

DRAINING ROADS.

The law of 1867—Gross's Statutes, page 676—provides that whenever any public road or highway shall pass over low ground, and it shall be necessary to drain the same in order to render it dry and passable, and the road cannot readily or conveniently be drained without digging a ditch or ditches over or across adjacent lands, it shall be lawful for the officers of the road to enter upon such lands and construct such ditch or ditches as may be necessary. Compensation to the owner for the damages in this case is also provided. It is also legal for the road officers to enter upon unimproved land near roads, and take therefrom gravel, stone or timber necessary in the improvement of roads—compensation being likewise provided for. Here the State again asserts its right of eminent domain, in taking from the citizen his property for public purposes.

VACATION OR ABANDONMENT OF ROADS.

The power which makes can, under similar forms, vacate or relocate a road, but always on petition of citizens. A road laid out and paid for under the forms of law, if not opened its entire length within five years from such location, will be deemed to be vacated. [34 *Illinois*, *page* 320.] So, an abandonment by the public of a legal highway for another line of travel, is a vacation of the first line. A vacation for any cause restores the original owner to all his rights in the soil.

TITLE TO ROADS.

The location and opening of a road over private grounds, although the owner is paid all the damages he claims or a commission may allow, does not operate to divest him of the title to such lands, but the fee remains in the owner, subject only to the public easement, over the same. It has been held that the owner of the *fee* might recover in an action against a party who went upon the road and injured the land by cutting turf or digging the same, although the land was then in the exclusive control of the public. This rule might prevail as to the country roads of this State, but not as to the streets and alleys of towns and cities, where it has been held the title to the streets and alleys in *fee simple* is vested in the public. [11 *Ill.* 554—13 *Ill.* 50.]

OBSTRUCTION OF HIGHWAYS.

As there is invested in the State the power of establishing and improving highways, so is there power to prevent and punish their obstruction by parties claiming the right to use them for agricultural or other purposes, for horse racing, or those who from venal motives obstruct or injure them. Indictment by the grand jury, fine and imprisonment, according to the nature of the offense, is provided in our criminal code.

LAW OF THE ROAD.

The law of the road, sec. 1, chap. 93, provides that "when persons traveling with carriages shall meet upon any turnpike road or public highway, the persons so meeting shall turn their carriages to the right of the center of the road, so as to permit each carriage to pass without interruption," under a penalty of $5 for every neglect or offense. This requirement is positive and unequivocal, making no exceptions in favor of loads of wood or brick; nor in favor of stupid and unmannerly drivers; nor in favor of persons driving two horses and a stout lumber wagon; nor does it make any exceptions against persons driving only one horse and a gossamer like vehicle; yet how often has ill manners and stupidity, backed up by mule muscle and a two-horse wagon served to assert the law of might against right, causing the weaker party to retreat to the ditch or see his cherished turn-out wrecked and himself in the hands of the coroner, the subject of a fatal accident. Attached to the above law is a provision that the penalty shall not be recovered "unless some injury to person or property" result from the appropriation of the road by the offending party. In the name of the oppressed minority, whose occasional airings on the public highways are constantly disturbed by visions of death and destruction; and in the name of fancy horses and pleasure carriages, which are loyal institutions, and are specifically taxed to pay the national debt, I protest against this latter clause of the law, discriminating in favor of ill-manners and stupidity, and giving no rights to the weak minority unless they first suffer themselves to be smashed into a mass of splinters, broken harness and lacerated human flesh. What is the use of a law which has attached to it a clause requiring the injured party to present himself before the court with a wheel torn off, his arm in a sling, or his head plastered up before it will hear his complaints? The knowledge that an offender is punished by a just law is very grateful to the wounded feelings of an injured party, when coming to him during this life; but the knowledge that, after your *post mortem* examination, and the verdict of an impartial coroner's jury upon your dead corpse has been formally rendered, the brutal offender will be required to pay $5 for the indulgence in the luxury of sending your mangled and bleeding body into the ditch, beneath the objects you prized most highly in life, there to be laughed at by the drivers of mule teams and stout wagons, is most horrible. If our legislators have any feelings, or any of them drive light buggies, they will certainly repeal this latter most obnoxious clause, and allow the injured party, while yet in life, to know that his claim to equal rights with his fellows before the law have been vindicated to the extent of $5 worth. If redress does not come speedily, then in future canvasses for legislators, the questions upon the hustings will not be of the candidate's qualifications as statesman, but the absorbing question will be, "Does he own and operate a respectable turn-out?"

PRIVATE ROADS.

The 24th section of the chapter of our statutes, entitled *Roads*, provides that any person desiring to have a cart road laid out from his dwelling or farm to any public road, or from one public road to another, where the line of such cart-way or private road would lead across the lands of another, he may have such a road accorded to him, not exceeding in width 30 feet, by petitioning the Commissioners of Highways, as for a public road; when, upon the necessity of such road being found for the convenience of the petitioner, and upon the payment by him of the damages, such petitioner, his heirs and assigns, shall have the right to use such road for road purposes forever. It will be noticed in comparing this proceeding with the taking of private property for public roads, there is this difference: one authorizes the taking of the property of the citizen for the *private* purposes of another citizen, while the other authorizes the taking of private property for *public* purposes. For the latter there is, as before seen, warrant in the Constitution; for the former, none. Our Supreme Court, in a recent case (39 *Ill.*, 110) involving this question, decided this provision of the statute unconstitutional and void. I only mention this case here to warn you that if you purchase land back from a public highway, or are now so unfortunate as to have another's land between yourself and the public road, you need not waste your time and money in vain attempts, under this statute, to secure a passage to a public highway. Unless a public road is demanded for public purposes, the only coustitutional and possible plan is to purchase your road from your neighbor.

So much for the law of Highways. Fences are either inside, or those dividing one's inclosure into convenient fields, for farm purposes, or outside those constructed or grown on the outer boundary of one's possession, abutting upon the commons and highways or upon the land of another. As every man is permitted to enjoy his own property as he pleases, so that he does not interfere with the rights of others in like enjoyments, the existence or non-existence of inside fences raise no questions of law, and need not be considered by us, but not so with outside fences and division fences. As each in its turn affects the owner of the land inclosed or protected by it, in his relations to the outside world, so in the economy of human governments, have each become the subjects of much legislation and often of judicial adjudication. To prevent confusion, the two latter classes will, in these remarks, be considered each by itself.

OUTSIDE OR BOUNDARY FENCES.

At the common law of England, which our forefathers brought with them, and so far as applicable transplanted in this country, and which, unless repealed by legislative enactments, lies below and behind all statute law, an *ideal fence* surrounds every man's land; and to cross his line, although unmarked by fence or ditch, is, in the expressive language of that law, "breaking into his inclosure," and consequently a trespass, giving a right of action; but in our later, and more utilitarian days, these *ideal* fences have been compelled to give way to stern realities. As a consequence of the common law, and until its place was taken by the statutes requiring fences, all stock must, at the peril of the owners, be kept up or carefully herded; for whatever damage to crops, whether protected or not, followed their running at large, their owners were liable to answer for. The first statutory law applicable to our State, was passed by the territorial Legislature of the territory of Indiana as early as 1807, when Illinois formed a part of that territory. These laws were followed by the enactments of 1819, and 1835, which, with subsequent legislation upon other features of the same subject, have been incorporated in, and form a part of chap. 51, of Gross's Statutes, now embracing all of the statutory law on the subject of fences, except that pertaining to railroads, in force in Illinois. One section of one of these old acts, provides that if any animal shall break into an inclosure, the fence being good and sufficient, the owner of such animal shall for the first offense be liable for all damages caused thereby to the owner or occupier, and for the second offense double the damages committed. Another section provides that the condition of the fence at the time of the trespass complained of, may be given in evidence at the trial. These provisions are still the law of the State, and have been the subject of judicial explanation in the Supreme Court. In the case of *Seeley vs. Peters*, a case taken up from the county of Peoria, in the year 1848, and reported on page 130 of 5th Gilman, Judge Trumbull rendering the opinion of the court, it is decided under these statutes that the common law requiring the owner of stock to keep them upon his own land, has never been in force in Illinois; that in order to maintain an action for trespass of cattle upon one's inclosure, the owner must have it surrounded by a good and sufficient fence, and that there is no general law in Illinois prohibiting cattle from running at large. This case was contested by able counsel, and the opposite doctrine strongly contended for. A portion of the court dissented from the opinion rendered by Judge Trumbull, yet the opinion thus rendered has since been frequently re-affirmed by the Supreme Court, although often attacked by the best legal minds in the State, and may now, under the present legislation, be considered as settled. If the people are not satisfied with it, as certainly many are not, they must, through their constituted representatives, change it by statutory enactment. What constitutes a "good and sufficient" fence, is a question of fact for the jury to decide in each case for itself. What would be a good and sufficient fence to protect a crop from the incursions of hogs and sheep, might not be for cattle and horses, and *vice versa*.

In 1819 an act was passed regulating inclosures, the first section of which provides "that all fields and grounds kept for inclosure, shall be well inclosed with a fence composed of sufficient posts and rails, posts and pailings, palisades, or rails alone, laid up in the manner called a worm fence, which posts shall be deep set, and strongly fastened in the earth; and all fences composed of posts and rails, posts and pailings, or palisades shall be at least five feet in height; and all fences composed of rails, in manner which is commonly denominated a worm fence, shall be at least five feet six inches in height, the uppermost rail of each and every part thereof supported by strong stakes, strongly set and fastened in the earth, so as to compose what is commonly called staking and ridering, otherwise the uppermost rail of every panel of such worm fence shall be braced with two strong rails, poles or stakes, locking each corner or angle thereof." This portion of the fence law was repealed in 1835, since which time there has been no legal definition of a fence—it is only required to be *good and sufficient.*

TOWNSHIP ORGANIZATION.

The law above referred to is the general law of the State, but is still subject to such exceptions as have been created by special statutes, to which reference will briefly be made. The statute commonly known as our township organization law, not in force in any county in the State until adopted by a vote of the people of such county, and which by a like vote may be repealed, provides, that when any county may have adopted the system of township organization, any town in such county may by a majority vote of the eelctors, at any annual town meeting, establish and maintain pounds at convenient places in the town, and restrain and prohibit the running at large of stock, and to authorize the impounding and sale of such as are found running at large. It also authorizes in like manner the enactment of regulations for determining the sufficiency of fences in such towns, to determine what shall be a lawful fence, and to provide penalties against persons for a violation of any law of such town, not exceeding in amount $10. Under this authority each town may by itself enact a code of by-laws prohibiting entirely the running at large of all stock, or certain classes of stock, thus throwing upon the owner of the stock the onus of caring for growing crops, and not only making such owner liable for the damage his stock may cause, but subjecting him to penalties. Our Supreme Court, in one case, [43 *Ill.* 450,] quite recently decided that such enactments by the electors of a town, in effect restores the common law in such town, and leaves the land owner at liberty to fence his land or not as he pleases; or in other words, raises around every farm or lot in such town an *ideal fence* to cross, which is to *break into* an inclosure, subjecting the owner of stock so breaking in to the payment of all damages. The forms to be observed in the enactment of the by-laws of a town are simple, but must be strictly and literally complied with, else the by-laws will not be held to be in force by the courts. The omission of any material thing in their enactment vitiates the whole. The town clerk is required to advertise the enactment within 20 days after its adoption by posting in three publie places in the town copies of the same, and if the town meeting so direct, publish a copy in some newspaper of the town or county.

The Legislature has further provided in relation to outside fences, that except in villages, that temporary fences may be set six feet in the highway and remain there for five years, to enable the owner to grow in the meantime a live fence.

COMMON FIELDS.

The necessities of our people, owing to the scarcity of material for fences, has caused some legislation to meet these exigencies. By the statutes of 1819, still in force, it was provided that the owners of adjoining lands might, for the purpose of common protection from stock, and for other purposes therein named, form themselves into a *quasi* republic, for the maintenance of a common field, surrounded by one fence, which shall inclose all their farms. Under the powers given by this statute, the neighbors thus confederated together might elect a chairman, clerk, and treasurer, who should be sworn and perform their offices during a tenure to be agreed upon by them. These little communities may levy and collect taxes for the maintenance of fences, gates, and bridges, and for other purposes, and perform many other powers incident to government in their spheres. These combinations, however, as to all the rest of the world, are under the same obligations as individuals to surround their little domain by *good and sufficient* fences if they would protect themselves from the marauders of the common, or have redress from the courts for damage done. So far as I know now, there has never been an association formed in the State in accordance with the plan contemplated in the statute referred to, although there may have been such; certainly its provisions are so unique and so seldom resorted to, that further notice may with propriety be dispensed with. There are frequent occurrences of common fields among neighbors without the forms of law, which justly claim a little attention at our hands. Where two or more persons owning lands adjoining each other for prudential reasons mutually beneficial to each agree to and do inclose the same in one field, dispensing for a time with a partition fence, the law raises for the protection of each mutual obligations, to violate which subjects the offender to an action for damages. Neither party may depasture his lands thus inclosed, except the animals be herded, for if they escape from his lands upon those of his neighbor in the same inclosure, and commit damage, the owner is liable. Likewise neither party may remove his fence from the outside of his lands, without laying himself liable for any damages that may accrue, except he first give the other party due notice of his intention to so remove the fence. In such case each party must, at his own peril, see that his neighbor's fence is good and sufficient, as well as his own, for it has been decided (45 *Ill.*, 76) that if cattle break through any portion of the fence surrounding such common field and commit depredations, although upon the lands of an owner upon the opposite side, whose fence is good and sufficient, he cannot complain of the trespass. It therefore behooves those about entering into such an arrangement to be sure that their partners will look well to the common interest, and perform his part by keeping a good and sufficient fence on his portion of the boundary.

PARTITION FENCES.

We now come to notice by far the most important, to the farmer, portion of our subject—that of partition or division fences—those which divide the field of one owner from another. As questions arising out of boundary lines between nationalities, although often but an imaginary line, have cost the world some of its bloodiest wars, so lines and line fences between farmers, although often but a few feet or a few rods in length, have been the subject of much legislation and many hotly contested law suits. If men could gratify their ambition by owning all the land that joins them, or be bounded on all sides by commons or public highways, community would at once rid itself of much litigation, and the necessity for those long, narrow lanes which we sometimes see stretching their ugly lengths between two men who ought, for common interest and common credit, to be friends, but who these "*devil's lanes*" inform all passers-by are deadly enemies, too proud to acknowledge an error, and to resentful to grant a pardon, if asked for. Therefore, while farms must join there must be lines, which our mathematicians inform us are the continuation of a point, having neither breadth nor thickness—only length; but while this ideal fence will in all cases answer for the owners, it is unknown and unrecognized by their stock, and must be marked by some tangible, physical reality, whose language is, "thus far shalt thou come, but no further; and here shall thy proud waves be stayed." As between the owners of adjoining lands, our Supreme Court have decided (39 *Ill.*, 186) that the common law is in force, and that whether there is a partition fence or not, the owner of stock shall not permit them to stray across the line which divides his inclosed farm from that of his neighbors—or in other words, that it is as much the business of one as of the other party to division fences to keep them in repair. Our statute, however, has taken the matter in hand and made numerous provisions, which must be regarded as wholesome and proper in regard to partition fences. It is enacted that when any neighbors shall improve any land adjacent to each other, or when any person shall inclose any land adjoining another already inclosed, so that any part of the first person's fence becomes the partition fence between them, in both these cases the charge of such fence shall be equally borne by both parties; that where two or more persons shall have lands adjoining, each of them shall make and maintain a just proportion of the division fence, except the owner or owners of either tract choose to allow such land to lie open; that should the owner of uninclosed land adjoining inclosed land, inclose his land, upon the inclosure of his neighbor, using any portion of the fence of his neighbor as a partition fence, he at once, by such act, becomes the debtor of the owner of the fence to the extent of the then value of his proportion of the fence so used as a line fence, which amount, if refused, may be sued for and recovered in the appropriate action; or he may immediately build his proportion of the fence. If disputes arise between the owners of adjoining land as to the value of fence to be paid for, or the amount to be built by either party, the law provides that such disputes may be adjusted by the fence viewers of the town. The Assessor and Commissioners of Highways in townships in counties which have adopted Township Organization, are *ex officio* fence viewers in such towns; and in counties which have not adopted Township Organization, the justices of the peace fill that office. Happily for lawyers and bailiffs, but most unhappily for clients and suitors, the friendly offices of fence viewers are not often called into requisition to settle little differences which often arise between neighbors, who too often despise this unpretentious style of settling their differences, and appeal to the more pretentious and potential courts, and as a consequence come off, plaintiff and defendant both, beaten. The scripture injunction to "agree with thine adversary quickly," may be well heeded in all such, and in many larger controversies. The law further provides that when such fence viewers adjudge any fence to be insufficient, they shall give the owner or owners notice to repair the same, and upon the failure or refusal of either of them to repair or pay for the same within four weeks after notice given, the person aggrieved by such failure may repair such fence and recover from the persons so in default the cost of the same, together with all damages caused by such default. A party having once joined with his neighbors in the erection and maintenance of a division fence, and desiring no longer to be bound by the obligations imposed, or not desiring longer to keep up his inclosure, may remove his share of the fence, or the entire fence, if it be his, at any time between the 1st day of December in any year, and the 1st day of April following, providing he has given the owner of the adjoining inclosure 60 days' previous notice in writing; but not otherwise, without laying himself liable to pay such neighbor such damages as he may sustain by consequent trespasses, or otherwise.

The stated periods also for such mistakes as are constantly happening from imperfectly understanding the exact location of lines. Persons frequently set their fences on their neighbors' lands under mistaken notions, in which case, after the expiration of one year from the discovery of such mistake they may go upon the land upon which such fence has by mistake been put, and without unnecessary damage remove to their own land or the true line the materials of such fence.

The limits of this lecture will not permit us to go into the investigation of that large field embracing the laws governing the fencing of the great lines of railroads crossing our State. As they represent the public and are demanded by the great interests of trade and commerce, the interests of the stock-raiser have been somewhat more abridged than in his intercourse with natural persons.

CONCLUSION.

I have thus briefly given what I understand to be the laws of our State applicable to the fence, without expressing an opinion of what they ought to be and should be to produce the greatest good to the greatest number. I believe the law governing division fences is, so far as it goes, eminently equitable and just; but I believe the law governing outside fences, as interpreted by the Supreme Court of our State, as eminently unfair, unjust and made in the interest of the few graziers and stock-dealers to the almost infinite oppression of small farmers and fruit growers. As has already been suggested, the common law fences were held to be intended to keep cattle inside the owner's land, and he was compelled so to keep them. By an early statute the common law of England so far as applicable and of a general nature was adopted as the law of this State. Our Legislature has never in so many words enacted that all stock might run at large, but in the decision first referred to, *Seeley vs. Peters*, decided in 1848, and reported on page 130 of 5th Gilman, the Supreme Court, by the issues there presented for decision, was called upon to determine how far the common law, requiring stock to be kept up, was applicable to this State. Judge Trumbull said: "However well adapted the rule of the common law may be to a densely populated country like England, it is surely but ill adapted to a new country like ours. * * * It cannot be supposed that when the early settlers of this country located upon the borders of our extensive prairies, that they brought with them and adopted as applicable to their condition a rule of law, requiring each one to fence his cattle; that they designed the millions of fertile acres stretched out before them to go ungrazed, except as each purchaser from government was able to inclose his part with a fence." The reason here given, with others, prevailed in the decision of the Court, and the consequence is that it costs more money to-day to keep the cattle of stock owners out of the lands of their neighbors than all the cattle of the State are worth. A further result is that before the poor man can enjoy the single forty-acre lot he has by dint of industry acquired, he must, by hook or crook, surround it by a *good and sufficient fence* to protect his crops from the incursion of his rich neighbor's herds. It costs as much to fence a farm as a farm is worth at $10 an acre; yet, Judge Trumbull and the majority of the Court, in considering the applicability of the common law to our State, ignored all this; and saw only the "million of acres" of grass to be grazed. Those who will take the trouble to read the dissenting opinion of Judge Caton in the same case, will, I think, find his much the best reasoning, and much the most humane conclusion. This piece of judicial legislation has prevailed for many years, and is accepted by the Courts, not so much for its justice, as because it is a precedent; and it is impossible to tell how many poor men it has made poorer, or how many rich men it has made richer. During my practice in the Courts my heart has many times been pained to see poor men who appealed to those Courts for redress for the wrongs suffered by the entire destruction of their crops by the herds of their rich neighbors, turned away and denied a hearing or reparation of their wrongs, because they were unable to show a good and sufficient fence. Judge Trumbull, in rendering the above decision, said: "However well adapted the common law might be to a densely populated country like England, it is surely but ill-adapted in a new country like ours." If that was good reasoning in 1848 it is good in 1870. Twenty-two years have since then elapsed, and our State has in many parts become "densely populated," and in no part is to be seen the seductive "millions of acres" of grass which then dazzled the judicial vision; then if we have any Judge Trumbull's upon the bench now, who base their decisions upon such verdant physical reasons, they should lose no time in reversing a decision which has at once such poor foundations in either law or justice. And if they do not, the people should lose no time in speaking through their representatives, as the people of Ohio and other States have spoken, in such a manner as shall be heard, not only by the Courts and stock-raisers, but by poor men who have always had to keep so large a portion of their capital invested in unproductive and fast decaying fences. It is too late to remedy the wrongs already suffered, but not too late to prevent the many in store for the future, under the present system. I know of my own knowledge that a law re-enacting the common law, would long since have been upon our statute books but for the influence of capital.

The discussion upon the topics embraced in the lecture, being mainly confined to asking the Judge questions that he had already anticipated in his lecture, is not reported.

FRIDAY EVENING—7 o'clock.

JOHN M. VANOSDEL, of Chicago, one of the Board of Trustees of the University, delivered a lecture upon

RURAL ARCHITECTURE.

Mr. Chairman, Ladies and Gentlemen:

You have been favored during the week with a series of lectures from highly educated and gifted orators, and you have a right to expect that the best has been reserved for the last. This being my first attempt in this line, I shall claim your indulgence, should you find my diction fall short of your expectation.

Professional architects are not necessarily orators; and to illustrate architecture orally is something like an attempt to describe painting or sculpture without a picture or a model. Architects generally confine themselves to designs for public buildings, city architecture, or mansions for the rich, while the farmer has been left to become his own architect. Our libraries contain many and costly volumes on the subject of architecture; yet I find but few of them devoted to the subject of Rural Architecture. Loudon's Cottage, Farm and Villa Architecture, Downing's and Allen's Rural Architecture, Woodward's Country Homes, and Cleaveland and Backus' Village and Farm Cottages are exceptions, being specially devoted to Landscape Gardening and Rural Architecture. I have drawn liberally upon them, and have not attempted to paraphrase their writings, as I find their arguments and suggestions clothed in language superior to any I may have at my command.

Loudon says: "Teach the young what architectural beauty is, and they will admire it; show them how it may be produced in their dwellings, and they will desire to possess it. The leading principle of architecture as a useful art, is fitness for the end in view; as an art of design, expression of the end in view; and as an art of taste, expression of some particular style of architecture. The fitness of a design for the end in view, comprehends not only the fitness of the size, shape, number, relative position, and other particulars of the interior division of a building for the uses for which they are intended, but the fitness of the materials and construction with reference to the strength and durability which may be required, and the fitness of the expenditure for the means at the command of the builder. In like manner the principle for the expression of purpose or end in view, applies not only to unity of expression as a whole, but to the separate expression of all the different parts of a building for the purposes for which they are intended.

"So also the expression of architectural style applies not only to the building taken as a whole, which must be in the same style throughout, but to all its component parts, which must belong to that style and exhibit its characteristics. A cottage or a barn, which are recognized to be such at the first glance, are so far perfect as to the expression of purpose; but they may also be specimens of Grecian, Italian, or Gothic architecture, in which case, to the expression of purpose, is added the expression of style. As fitness and the expression of purpose are principles applicable to all buildings, so fitness, the expression of purpose, and the expression of architectural style, comprehend all the beauties of which buildings are susceptible.

"The expression of purpose for which every building is erected is, the first and most essential, beauty; and should be obvious from its architecture, independent of any particular style. As in literary composition, no beauty of language can ever compensate for poverty of sense; so in architectural composition, no beauty of style can ever compensate for the want of expression of purpose. Therefore, the foundation of all true and permanent beauty in architecture is utility; yet it is by no means advisable to neglect the study of style; it should be made to co-operate with and heighten the expression of purpose, because there are many persons who can admire the beauty of style by whom the more simple and universal beauty of expression of purpose would neither be relished nor understood. All architecture may be reduced essentially to three kinds; first, where the openings are covered with horizontal lintels; second, where they are covered with curved arches; and third, where the arches are pointed. Now, provided a system founded on any one of these three principles be developed in a uniform, harmonious and consistent manner with reference to strength, durability and fitness for the end in view, and to the general laws which govern all composition of lines and forms, will constitute architectural style."

Compositions having the openings covered horizontally, partake of the Grecian style; those with circular arched openings, of the Roman; the pointed arch, exclusively Gothic. All indentations, or spaces to be covered, should bear the impress of the style adopted; for instance, the spaces between the columns of a Grecian portico must be covered with horizontal beams or blocks; similar spaces in the Roman will have the circular arch; and in the Gothic, the pointed arch.

Roofs of Grecian buildings are required to have less pitch than in any other style of architecture, and should never exceed 20 degrees of inclination; this would be too flat for either slate or shingles, and necessitate the use of metal or composition.

Roofs of Gothic structures require an inclination of not less than 45 degrees, and are sometimes elevated to 65, making the roof a prominent feature in

Gothic buildings. The Roman roof proper is a section of a sphere, a dome, and is applicable only to public buildings.

The modern Italian roof has the flat pitch of the Grecian; the surface should be ribbed or corrugated, to imitate tiles. "The only styles at present in common use for domestic architecture are modifications of Grecian, Roman and Gothic. The modern Italian, a mixture of the Greek and Roman. The Castellated, the Tudor, the Elizabethan, and the rural Gothic or old English styles, are all variations of Gothic architecture."

Grecian or classic architecture, known as the five orders, as exhibited in the Ancient Temples, have their proportions so perfect that all modern attempts at improving them have entirely failed; and when we consider that fitness and the expression of purpose are the two leading principles in rural architecture, the Temple, when applied to the purposes of domestic life, is at variance with these established rules.

The comforts of a country residence require verandahs, porches, wings of different sizes, and other little accommodations expressive of purpose; and, therefore, when properly arranged, add to the beauty of rural architecture. An equal sided building affords the greatest amount of room practicable to a given circumscribing wall; for instance, a building 30 feet square will contain 900 feet area, with 120 feet of wall; whereas a building 20 x 40 feet will have but 800 feet area, with same length of wall. Therefore, the square form is the most economical of all forms of building. Wings and projecting parts, while they add to the beauty of the building in breaking up the monotony of the simple form, are costly methods of obtaining the amount of accommodation required. The expression of the square, unbroken form, is simply protection against the inclement weather. Add the verandah or piazza, and you have the expression of protection from the heat of the sun. A promenade, in the open air, a place to resort in the cool of the evening without exposure to the falling dew. The bay-window is expressive of comfort to the inmates of the house. Henry Ward Beecher calls them "little chambers of light, into which a group may gather, and be indoors and out of doors at the same time; where, in storms or in winter, we may have full access to the elements without chill, wet or exposure; these are the glory of a dwelling."

The front door, or principal entrance, should always be protected by a porch or portico. The expression of purpose in this is to protect the visitors while in waiting at the door, and to prevent storms from entering the house when the door is opened. In all designs for buildings on the equal sided plan, avoid having the gables spanning the entire front or side of the building; construct the hip roof, forming the eaves on all sides; to mark the front, construct a gable having half the width of the front for its span. If the form of the building is a parallelogram, let the ends be carried up in gables, and place smaller gables in the centre of each side wall; for roofs of wings or other projecting parts, never use the lean-to or single pitched roof; in covering piazzas, porches or other projecting parts, return the eaves to the building, so as to avoid the half gable.

Downing recommends the Italian style as the most beautiful mode for domestic purposes. He says: "It is a style which has evidently grown up under the eyes of the painters of more modern Italy, as it is admirably adapted to harmonize with general nature, and produce a pleasing and picturesque effect in fine landscapes, retaining more or less of the columns, arches, and other details of the Roman style; it has intrinsically a bold irregularity, and strong contrast of light and shadow, which give it a peculiarly striking and painter-like effect."

So many appliances of comfort and enjoyment, suited to a warm climate appear in villas of this style, that it has a peculiarly elegant and refined appearance. Among these are the arcades, forming sheltered promenades and beautiful balconies projecting from single windows, or from connected rows of windows, which are charming places to enjoy the cool breeze, as they admit of fanciful canopies or awnings to shelter one from the sun.

The windows are bold and well marked in outline, being either round-arched at the top, or finished with a heavy architrave. All these balconies, arcades, etc., are sources of real pleasure. Our warm seasons of the year are quite equal in elevation of temperature to the summers of the South of Europe. The Italian chimney tops, (unlike the Grecian), are always openly shown and rendered ornamental. The irregularity in the masses of the edifice, and shape of the roof, renders the sky outline of a building in this style extremely picturesque. A villa, however small, in Italian style, may have an elegant and expressive character without interfering with convenient internal arrangements, while at the same time, this style has the very great merit of allowing additions to be made in almost any direction without injuring the effect of the original structure. Such is the variety of sizes and forms which the different parts of an Italian villa may take, in perfect accordance with architectural propriety, that the original edifice frequently gains in beauty by additions of this description. There are many houses erected every year by persons of moderate fortune, who would be pleased to make additions at some subsequent period, if it could be done without injuring the effect or beauty of the main building; in consideration of this fact alone, the Italian is superior to the Grecian style for rural residences. The Castellated Gothic may harmonize with a rude, rocky, hilly, irregular surface of country, and is expressive of repulsion and seclusion; we associate the style with feudalism and the haughty Barons of the past.

The Tudor, and Elizabethan, require highly picturesque surroundings, and are used with best effect in large mansions, expressive of affluence and retiracy from active occupations.

"The English Cottage, or Rural Gothic, admits of the greatest possible variety of accommodation and convenience in internal arrangement; the high pointed gables are not only applied at the two ends of the main building, but terminate every wing or projection of any size that joins to the principal body of the house. The widely projecting roof, sheltering the walls, the gables ornamented with fancifully carved verge board, and finial ornaments, the porch, the gabled windows, the chimney shafts, and the ornamented gables being the essential features of this style, it is evident that this mode of building is highly expressive of purpose for country residences of almost every description and size. In the simple form of the cottage the whole may be constructed of wood very cheaply, and in the more elaborate villa of stone or brick as may be preferred." Downing highly recommends this style "as being rich in picturesque beauty, and harmonious with the surrounding forms of vegetation."

"It may be asked why the farmer, or small property holder, should conform to given rules or modes, in the style and arrangement of his dwelling or outbuildings? It is for the same reason that he requires symmetry, excellence of form, or style, in his horses, his cattle, or other farm stock, household furniture, or personal dress. It is an arrangement of artificial objects in harmony with natural objects, that costs but little in the attainment, and when attained is a source of gratification.

"In the diversified features of our country in climate, soil, surface, and position, no one style of rural architecture is properly adapted to the whole. The Swiss Chalet may hang in the mountain pass; the pointed gothic may shoot up among the evergreens of the rugged hillside; the Italian villa, with its overlooking campanile, may command the wooded slope, or the open plain; or the quaint and shadowy style of the old English mansion, embosomed in its vines and shrubbery, may nestle in the quiet, shaded valley, all suited to their respective positions, and each in harmony with the natural features by which it is surrounded. Nor does the effect which such structures give to the landscape, in an ornamental point of view, require that they be more imposing than the necessities of the occasion demand. True economy demands a structure sufficiently spacious to accommodate its occupants in the best manner, so far as convenience and comfort are concerned in a dwelling."

He who builds at all, if it be anything beyond a rude or temporary shelter, may as easily and cheaply build in accordance with correct rules of architecture, as against such rules, and it no more requires an extravagance in cost or a wasteful occupation of room to produce a required effect in a house of humble pretensions, than in one of profuse accommodations. The attempt at magnificence is often a failure, apparent always at a glance, and condemns at sight the judgment and taste of the builder.

The study of architecture should not be restricted to the male sex. A celebrated architectural writer, when advocating the study of architecture by women, says: "It is not in order that they may be able to draw columns, for that is merely the means, not the end of the pursuit, that we would suggest the propriety of ladies applying themselves to what has hitherto never been included within the circle of female acquirements; but that they may thereby cultivate their taste, and ground it on something less baseless and shifting than mere feminine likings and dislikings. And when we consider how wide is the province, how influential the authority which the sex are apt to claim in such matters, how much in all that regards ornamental furniture, and interior embellishments, depends on the refined or trivial tastes of our fairer halves, it must be acknowledged that to initiate them into such studies would not be an act of perfect disinterestedness. Independently of its subsequent advantages, the study of the grammar of architecture, or, in other words, the elementary practice of architectural drawing, would be highly beneficial to the youthful pupils, inasmuch as it affords an immediate application of the simpler principles of geometry, as it forms the hand to correctness, the eye to scrupulous examination of forms, and consequently implants habits of careful deliberation and attention, as well as the seeds of taste.

"The improvement which within the last fifty years has taken place in landscape gardening is, in a great measure, owing to the more general adoption of the art of sketching landscapes from nature as a branch of female education. If the study of landscape drawing by ladies has led to the improvement of landscape gardening, why should not the study of architectural drawing, on their part, lead to the improvement of domestic architecture? Lawyers may inform an architect of the requirements in the arrangement of a court house; merchants the accommodation required in a store; but I have found in my experience as an architect, that the majority of ladies are better qualified than the majority of men, to suggest the fitness and arrangement of a dwelling house, and their taste in matters of interior decoration and exterior finish is most reliable. The first impression which we ought to receive from seeing a dwelling house at a distance, is that it is such. On a nearer view, the parts and finishing of the exterior ought to convey to us some ideas of the taste of the occupant; unity of style should pervade both the exterior and the interior. As we enter the porch, these ideas ought to be confirmed by the continuations of the same general style of taste, enhanced in degree because nearer the eye, and increased till it culminates in the parlor. Every apartment in a house has, or ought to have, its particular use. Therefore, every apartment, on being entered, ought to display a marked character of style with reference to its finishing and furnishing. Whenever any doubt is left in the mind of the spectator as to the use of an apartment into which he enters, something in that apartment must as certainly be wrong, as when the exterior of a building conveys a false idea of its use, and a human dwelling is mistaken for a stable or a meeting house."

For the location of a dwelling house on a farm, no definite rules can be given. The general practice of locating them near the road or public highway, whether the farm extends on either side of the road or not, is a questionable practice. There may be much better building sites near the center of the farm, where the location of the house and necessary out-buildings would give easy access to the surrounding fields.

The lane or private road leading from the highway to the house would become a line of beauty in the hands of a landscape gardener. The site selected for the house should be dry, and slightly declining, if possible, on every side. The house should front, or partially front, the roads by which it is approached. "If a site can be found commanding a prospect of singular beauty, all other things being equal, the dwelling should embrace it. If a stream, or a sheet of water in repose, present itself, it should, if possible, be enjoyed. If the shade and protection of a grove be near, its benefits should be included. Finally, any object in itself desirable, and not embarrassing to the main purposes of the dwelling and its appendages, should be included and appropriated, so as to combine all that is desirable, both in beauty and effect, as well as in utility, to make up a perfect whole in the family residence."

Cellars are indispensable to the full convenience of the farm house, and when properly constructed, add to the comfort and healthfulness of the premises. The floor of the cellar need seldom be over three or four feet below the natural surface of the ground. The earth removed should be graded off, around the building, forming a terrace, or platform, two or three feet high. The terrace may be bounded by a wall of mason work, or sloping bank of thirty or forty degrees, covered with turf. The objection to the turf slope is its liability to get out of order, in which case it has a bad effect on the mind of a visitor approaching the premises.

Cellars should always have floors of concrete cement, water lime, sand and gravel, in such proportions as to insure a firm and stone like pavement over the entire area. In the construction of the cellar walls (which should be of stone work laid in cement or other mortar), the footing or base course should be laid so as to project six inches beyond the outside face of the wall. It is said that the ledge thus formed will prevent rats from burrowing under the walls, as their skill in engineering does not include passing around such obstructions.

Cellars should be thoroughly ventilated. At least one flue in the arrangement of the chimneys of the superstructure should be extended down, and open into the cellar. Chimneys should always be located between the rooms, if practicable, in preference to placing them in the exterior walls. The advantages are: first, the chimney tops, instead of passing through the roof at the eaves, or lowest part, are brought out at the ridge of the roof, or near it, avoiding the necessity of tall, unsightly tops, and the great care necessary to prevent the roof from leaking around them; secondly, the warmth of the interior chimney is diffused in the dwelling, and the draft will be stronger than it would be if one side of the flue were exposed to the cold air.

Dining rooms and kitchens in city houses are often arranged in the basement, having the floor below the surface of the ground. They are universally disliked, but are a necessary evil, that should only be endured in crowded cities.

The wood house should be plaeed so as to be of easy access from the kitchen. Cellars should never be used for the storage of wood, as the ants, and other insects contained in the wood, would soon find their way to every part of the house.

The water closets should be arranged under the covering of the wood house, aad carefully ventilated. Waste water from the kitchen and laundry should never be allowed to flow over the surface of the ground near the dwelling, but should be conducted in underground drains to a cess-pool, or to the manure pit at the barn.

The principal outbuilding on a farm is the barn, and some farmers pay more attention to the construction of this building, for the comfort of their horses and cattle, than they do to the one containing their wives and children—which is all right, so far as the horses and cattle are concerned. The size and arrangement of the barn will be regulated by the extent of the farm, and should be of sufficient capacity to properly receive its stock and products. It should be placed at a convenient distance from the dwelling, but never in such close proximity as to overshadow it by its huge proportions, or to annoy the inmates by inhaling its odors. The land should decline from north to south. If a basement is obtained, a portion may be used for cattle stalls, sheep folds, etc.; other parts for vegetable cellars. On large farms, wings should extend from the main building at each end toward the south, forming with the main building three sides of a hollow square, the south or fourth side left open to the pasture. These wings may be cattle sheds, or buildings of two stories, having the lofts for the storage of farm implements.

The stable for horses should be on the principal floor; a passage should be left at the head of the stalls, well lighted and ventilated; the floor made water-tight, and the water conducted from the stalls to a cistern in the basement.

The balloon frame is recommended not only for the construction of dwelling houses, but also for the largest barns, except that in barns it will be necessary to construct a frame work of timber to support the purlins of the roof and beams of the bays. All other parts constructed on the balloon frame principle will be stronger and more durable than by the old method of framing.

Good water and a plenty of it, is of prime necessity to the farm house and cattle yard. For the first, prepare a filtering cistern and use the rain water; or if a spring or brook is near, use the hydraulic ram. For the cattle yard a wind-wheel attached to a well pump, in many places, will accomplish the desired object.

On the subject of color, which should be given to farm buildings, much has been said and written. Downing ridicules our white houses with their green blinds, and in our eagerness to remedy this glaring defect, we have gone to the other extreme, the darkest shades of drab relieved or intensified by deeper shades of brown, make some of our houses appear as if draped in mourning. A medium should be obtained between these two extremes. Some light neutral tint, or drab color, fawn, lavender, or light russet, relieved by a deep shade on the cornices and trimmings generally. The contrast should not be too violent between the color of the body of the house and its trimmings and adornments.

It has been said that the color of the farm house should harmonize with the colorings of its surroundings. If the white house and green blinds harmonize with the verdure of spring and summer, what effect has the same colors contrasted with the russet of autumn, or the whitened landscape of winter? We should have a compromise in the fixed color of the building, to harmonize as far as possible the changing colors of its surroundings. If white harmonizes with the snow-clad landscape of winter, then a house painted bright green would harmonize with the vendure of summer. The varied hues of an autumn landscape harmonizes with the neutral tints suggested, and such tints are more appropriate to summer and winter than a green or white house. A house painted green would appear ridiculous. A white house may, for the reason given, be made a subject for ridicule.

Architecture, viewed as an art of taste, or practically considered, is so important and comprehensive, that volumes would be requisite to do it justice. I have endeavored to bring to your notice the leading principles, and have (tediously, perhaps,) given you my views of construction in detail. The principles set forth will apply to school houses, churches, or other public buildings. Fitness, purpose and style are words easily remembered, and may be reduced to the single thought, utility.

DISCUSSION.

FLAGG—What style of architecture is most appropriate to our Illinois prairies?

VAN OSDEL—I think Rural Gothic or Italian appropriate to our landscape. A plain landscape requires a plain house. Hills and valleys and pointed trees may excuse the Pointed Gothic. The objection to Gothic is that you must have the bed rooms in the roof. A two-story Gothic does not appear well, so we have a half story. I should prefer a very subdued Gothic, if any, on the prairies, but like the Italian better.

WHITNEY—How about the French or Mansard roof?

VAN OSDEL—It is applied generally to buildings in the Italian style. It is very fashionable.

WARDER—How would it look in the country?

VAN OSDEL—If a little broken, it would look very well.

WHITNEY—Which is the French or Mansard roof?

VAN OSDEL—The concave roof is an American invention. The French roofs are generally straight.

GREGORY—I have amused myself planning houses a good deal, especially of the octagon form. Our ideas of beauty are largely associated. A house in itself would hardly be regarded as beautiful. I never knew but one that would stop me to look at it: that was a church in the Grecian style, without steeple, and depending on color and form alone for its beauty. But a house is more interesting than a landscape. It attracts. I have analyzed my own feelings, and believe it is the associated idea of comfort, convenience, etc.

I like a verandah across the front of a house exceedingly. My heart warms towards the men who build them. Broad eaves are also attractive, and add to the expression of a house. The most expressive to me are the old Dutch houses on the Hudson, with

THE ORGANIC MATTER OF SOILS.

The subject that has been assigned to me is Agricultural Chemistry; but this is a very comprehensive theme. It includes many questions, either of which would require a long essay to discuss it properly. I have found it necessary, therefore, to confine my remarks to one of the many subjects in this wide field, and beg to call your attention to the origin, composition and properties of the vegetable matter of soils.

The limited time hitherto enjoyed for making mechanical and chemical examinations of soils in this State will prevent so thorough a discussion of the subject as is desirable; nevertheless a beginning can be made, and a more thorough investigation be left for the time when further experiment in the laboratory and the field shall have taught us far more than we now know of what it is possible to learn in this field of research.

One of the most noticeable features of soils generally, and particularly of soils in certain parts of this State, and of neighboring ones, is their dark color and the great depth to which it extends, often four or five feet, and sometimes more, though on the average, perhaps, about a foot. This is due in general to the decay of different forms of vegetable and animal life, that have flourished on the earth's surface; but in the soils of the Western States, partly also to the charred remains of plants produced by the frequent burning over of the prairies. It constitutes generally from one to two per cent. of a well dried soil, seldom more than five or six, but sometimes, as in peaty soils, it rises to sixty or seventy per cent. A soil from Livingston county, this State, gave between ten and eleven per cent., while one from Union county gave little more than one-fourth of that quantity. The small per cent. of organic matter in soils generally, notwithstanding they may have borne a luxuriant vegetation hundreds and thousands of years, teaches that it does not increase much, except in certain localities; and were it not for yearly accessions, it would soon cease to exist, and our soils would revert to their primitive state. Under certain circumstances, however, the waste of organic matter would go on with extreme slowness, and its entire destruction and removal from the soil would be prolonged almost indefinitely. A heavy clayey soil, retentive of water, and in whose pores air circulates with difficulty, if at all, would withstand the decomposition of its organic matter much longer than a porous sandy soil. Such clayey soils are often seen on the prairie, and as might be expected, they are rich in organic matter, because their nature is unfavorable to decomposition. In addition to their clayey nature, soils are often low and marshy, a condition suited to rapid growth, but slow decay, and consequently to an accumulation of vegetable matter. This is often increased by other portions, swept, during rains, from the higher to these lower parts of the prairie. In all such cases, unless the conditions of decay could be made more favorable by drainage or other means, the entire dissipation of organic matter would require a very long time.

The comparatively great depth to which it extends suggests at once the great length of time during which these prairies must have been covered with a luxuriant vegetation, and peopled by animals of an earlier geological age, the remains of which have often been deposited and preserved together. Within little more than a year two huge skeletons of an extinct species (the mastodon probably) have been found in this State, some three or four feet beneath the surface, one in Vermilion county, and the other in DuPage county. The depth of these skeletons indicates a gradual accumulation of organic and other matter in the places where they were found. Quite recently another is said to have been found in JoDaviess county, at a greater depth beneath the surface.

It is well to have a clear conception of the origin of humus or vegetable mold (for we shall use these terms synonymously) and of its relation to vegetable growth, for there can be no doubt that the fertility of a soil is due in a large measure to this substance. The conditions of decay are mainly three, heat, moisture and free oxygen. The absence of either of these in the proper degree would render the others for the most part inoperative. It is well known, for instance, that vegetable or animal matter cannot decay when frozen, however much oxygen and moisture may be present. Nor can decay be induced in the absence of moisture, though aided by a tropical temperature and an abundance of oxygen. Perfectly dry wood may be kept thousands of years with but little if any appreciable change. The same is true of thoroughly dried animal matter. Nor can decay be induced by moisture at ordinary temperature, without free oxygen. Of this we have an example in the preservation of canned fruits, the secret of which consists mainly in excluding atmospheric oxygen from the fruit in the can. Fruit has been thus preserved many years without loss of its original freshness and flavor, and it is difficult to say how long it might not be preserved with the same result. Sometimes by geological changes the surface of a country becomes depressed and covered with deposits many feet in thickness, to the almost entire exclusion of air from the former soil. Under such circumstances the organic matter remains with little change for a great length of time. Of late, while sinking a coal shaft at Urbana, a layer was struck some eighty feet below the surface, rich in compact peat-like matter intermixed with shells, showing that it had once been the surface soil, and, probably, a marsh. Organic matter under such conditions cannot decay. It may become more dense under pressure and assume in time the nature of coal, evolving, it may be, more or less carburetted hydrogen, but decay, in the proper sense of the term, requires the combined action of all the above mentioned agents; and when vegetable organisms without life, whether in the form of foliage, branches or trunks of trees, or of grasses, rushes, etc., are exposed to such action, they absorb oxygen, evolve carbonic acid and water, and pass gradually into a dark carbonaceous mass, which has been called by different names, having reference partly to different stages of decomposition, and partly to the different substances eliminated from it, but which, under the continued action of these agents, is, in the end, wholly resolved into water, carbonic acid, ammonia and the inorganic salts found, more or less, in all plants—in a word, into the so-called final products of the decay of all animal and vegetable bodies.

The intimate relation of humus to heat, moisture and free oxygen is shown from the fact that the quantity of it in a soil is usually in the inverse ratio of the activity of these agents. In a very warm and humid atmosphere, like that of the tropics, decomposition goes on so rapidly as to prevent any considerable accumulation of humus. The destruction of organic matter is as rapid as its growth. For this reason we seldom, if ever, find peat within the tropics, except on the sides of mountains, where the temperature is low. Neither Brazil, nor the low, swampy country of the LaPlata, furnishes peat; but further south, where the temperature is lower, at about the 45 deg. of latitude, and further still, as in Terra del Fuego and the Falkland Islands, it is found in abundance, The same is true north of the equator. Peat is rarely found in the valleys of the south of France and Spain; but further north, in England, Ireland and Holland, it occurs in immense quantities. Often within the limits of a single country or State, the different climatic conditions are indicated in the variable quantity of vegetable matter contained in soils. Soils in the northern and southern parts of France differ in their quantity of organic matter. Even in our own State we should expect, on general principles, to find soils (in other respects similarly conditioned) in the northern part somewhat richer in organic matter than those in the southern. It has already been stated that a soil in Livingston county contains nearly four times as much organic matter as one in Union county. But since vegetable matter varies from local as well as from general causes, one cannot draw general conclusions from a few experiments. When, however, the soils of the State shall have been thoroughly studied in reference to this question, we shall be surprised if they do not conform to the general law.

But is this vegetable matter of any value as a constituent of the soil in the growth of crops? Most assuredly it is. Both in its composition and physical properties it is admirably suited, in proper quantity and with proper treatment, to increase the fertility of soils.

In the first place it contains the elements necessary for the growth of plants; and what is peculiarly advantageous, is, that it is in such a condition as to become available gradually as the wants of plants shall require. Were all the organic matter of the soil to be converted at once into available plant food, then plants would have an abundance at one stage of their growth, but might be scantily supplied at a later and not less important period of their development. Besides the conversion of this vegetable matter into food takes place mostly in the warm season, at just the time when wanted by plants, while in the cold season it remains locked up and not liable to waste. This is one of those beautiful arrangements in the economy of nature, where means are not only adapted to ends, but carefully husbanded until needed.

If we examine this organic matter in its different stages of decomposition, we find not only carbon, oxygen, hydrogen and nitrogen, but also more or less of the alkalies, potash and soda, and of the alkaline earths, lime and magnesia, together with iron, phosphoric and silicic acids—substances which constitute the substantial part of the food of plants. Now the relative quantities of some of these elements vary somewhat in the progress of decay, the per cent. of carbon and nitrogen generally increasing in proportion to that of oxygen and hydrogen; that is, in decay, the oxygen and hydrogen escape more rapidly than the carbon and nitrogen. Moreover, from experiments made on soils in different parts of Europe, the interesting result has been obtained, that the weight of nitrogen to that of carbon in the humus of some soils is as 1 to 5; in others, as 1 to 9, 1 to 12, and sometimes as 1 to 22. The northern soils indicate a larger proportion of carbon to nitrogen than the southern ones. In some of the soils of Scotland, for instance, we find the ratio of nitrogen to carbon as 1 to 15, 1 to 20, and 1 to 22; while in those of Southern Germany it is as 1 to 5. The influence of climate is apparent in these numbers. The cool temperature of Scotland is less favorable to decay than the warmer one of Southern Germany. But the most remarkable fact indicated by these numbers is the enormous quantity of nitrogen in soils. From the per cent. of humus in a soil, and the proportion of nitrogen in the humus, it is easy to calculate the quantity of nitrogen in an acre of soil to a depth, for instance, of six inches. This quantity has been found to vary in the soils of Southern Germany from near 1800 to 9000 pounds. From Bretschneider's experiments made to ascertain the different quantities of ammonia, nitric acid and nitrogen at different periods of the growth of plants, it appears that an acre of his soil, a foot in depth, never contained less than two tons of nitrogen, and often considerably more, in consequence of additions from the atmosphere, to be spoken of hereafter. If those soils, not remarkably rich, perhaps, in humus, contain so much nitrogen, what stores of it must lie treasured up in these deep dark soils of the prairie, capable of being appropriated by the farmer to the use of his crops.

That the relative amount of carbon to that of oxygen and hydrogen should increase in decay, accords perfectly with what takes place in ordinary combustion. When wood or soft coal is burned, the hydrogen, for the most part, burns first, producing flame, and leaving the unconsumed carbon in the form of coals or coke. In the dark humus of our soils, we have the coals of the slower process of combustion, called decay. This, by oxydation going on in all parts of the soil penetrated by air and roots, becomes a constant source of carbonic acid, for the use of plants.

That the relative quantity of nitrogen, however, should increase in decay, is certainly unexpected, because of all compounds, those containing nitrogen are usually most easily decomposed, the nitrogen sometimes combining with hydrogen to form ammonia, and sometimes with oxygen and hydrogen to form nitric acid. According to the experiments of Berthollet and Saussure, a decaying body surrounded by air never emits free nitrogen. If it be a well established fact, then, that the per cent. of nitrogen in humus is greater than in the living plant, the inference is, that, relatively, nitrogen in decay escapes more slowly than the other elements. In what particular combination it exists, it may be difficult to say. Probably it forms a part of several different compounds evolved in the successive stages of decay, during which more or less of it, according to the varying conditions, is converted into ammonia or nitric acid.

A peculiar property of the nitrogen of vegetable mold is its inertness. In consequence of this property, it is not food for plants, so that, however rich a soil may be in such nitrogen, the crop can derive no benefit from it, so long as it is in this indifferent condition. This seems at first an objectionable feature; but it may not necessarily be so. The ends of agriculture may be, perhaps, as well, or even better, subserved by a difficult and gradual, than by an easy and sudden conversion of so important an element as inert nitrogen into an assimilable condition. The conversion of unassimilable to assimilable nitrogen is going on slowly and constantly during the season of growth in the imperceptible wearing away of vegetable matter under the favoring influences of heat, moisture and alkaline matter in the soil, so that the inertness of nitrogen, by furnishing a gradual, yet ample, instead of a sudden and superabundant supply of nitrogen to the crops, may be a desirable rather than an undesirable property. Were the nitrogen not inert, it might be so rapidly converted into ammonia and nitric acid as to prove objectionable, either from excess of nutritious matter formed or from its waste. Even with inert nitrogen, it is possible cases may sometimes occur, where, under circumstances peculiarly favorable to conversion, too much nutriment is furnished, either for the want, or for the good of plants. Soils saturated with nitrates may, perhaps, be an example.

Besides, should this inert nitrogen fail to be converted in sufficient quantity for the wants of his crop, as is often the case from unfavorable conditions of climate and soil, the farmer can, by mechanical and chemical means, hasten the process of decay. By keeping his soil loose for the air to circulate in, and especially by adding some chemical agent to facilitate decay, he may draw from this storehouse of nitrogen an ample supply for an abundant harvest.

And here experiment comes to our aid. If we take a small quantity of almost any dark soil, mix it with some fixed alkali or alkaline carbonate and ignite it, we obtain ammonia; that is, we convert the inert, unassimilable nitrogen of the soil into plant food. If we take another portion of the same soil and digest it a little while with water, then filter and concentrate the filtrate, we obtain a liquid which gives a distinctly alkaline reaction. Now, these experiments teach us what is probably taking place in all our soils in summer. We have the nitrogen and the fixed alkali, and therefore the materials for the formation of ammonia. They teach us, moreover, what to do in case the process goes on too sluggishly. If the alkali of the soil be insufficient for the work, a little more should be added. This is done when the farmer limes his soil, or spreads wood ashes over it. He not only furnishes food of a certain kind to his plants, but also the means of converting the elements of his humus into other and equally necessary kinds of plant-food. The same effect is produced by burning stalks and stubble on the field. Here the ashes serve the double purpose of food for the future crop, and of converting the inert nitrogen of the soil into ammonia. In so far as the stubble is only charred, it becomes, for the most part, worthless for both these purposes. But this practice of burning stubble on the field, although advantageous in several respects, tends, when long continued, to injure the soil. It constantly diminishes the vegetable matter without making any provision for its replacement, and the end of such practice would be, unless muck or some other vegetable manure be added, the impoverishment of the soil, just as a man, who spends every year more than his income, would become in the end, bankrupt. It would be far better for the soil in both its nutritive and physical properties, to plow in the stalks and stubble, especially if green, than to let them dry and then burn them; for in this way the nitrogen, as well as the inorganic elements, is returned to the soil, making its productive power, in some cases, almost equal to what it was before the crop. From an acre of broom-corn of average yield, it is estimated that only some six hundred pounds are taken for market. Now, if the green stalks, constituting the great bulk of the crop, be plowed in at once after harvest, they would benefit the soil far more than if allowed to dry and then be burned, that is, unless the soil already contains an excess of vegetable matter, as the raw prairie usually does. In such case the burning of the stalks and stubble may not be injurious, but even beneficial for a term of years. When, however, the quantity of vegetable mold has been sufficiently reduced for the purposes of vigorous vegetation, a farther reduction of it by the ashes of the plants which should be used to replenish it, would be injudicious, and the intelligent farmer must judge, from the condition of his soil, what treatment is required for each particular case.

The frequent burning over of the prairie, in its wild state, has undoubtedly prevented so great an accumulation of vegetable matter as would otherwise have been the case, and if the process had been oftener repeated, the quantity would have been still less, especially, if instead of a thick, compact sward, and a soil almost impermeable to air, decay had been aided by the porous and permeable nature of our cultivated soils. Then the frequent top-dressing of ashes would have been far more efficacious, not only in preventing accumulation, but also of destroying that already in the soil. The effect of burning what grows on a soil is seen in countries abounding in forests, like Sweden, Northern Russia, and certain parts of our own country, where the wood is burned and the ashes spread on the land. For several years the soil produces abundantly, but after that shows signs of exhaustion, and requires renovation by manure or fallow. In such cases the soil contains little, if any, vegetable matter. There are no two, three or four tons of nitrogen associated with other kinds of plant-food on every acre for the use of vegetation.

In addition to the ammonia derived from the nitrogen of vegetable mold, a small quantity is known to fall with rain, snow and dew. The experiments of Lawes and Bretschneider show that about nine pounds annually fall in this way on an acre. This ammonia probably has its origin partly in organic bodies decaying on the soil. Whether any of it proceeds from the nitrogen of the soil, is difficult to say. Vegetable mold and clay are so excellent absorbents of ammonia that it is difficult to see how, at ordinary temperatures, it could escape from a soil rich in these substances. It would seem as if a small quantity of atmospheric ammonia should be absorbed by the soil, rather than that any should escape from it into the atmosphere. With the varying intensity of cold and heat, it is possible not only that ammonia is sometimes absorbed, but also given off at other times by the soil into the atmosphere.

A few experiments may not be uninstructive here. A raw, black soil from the University farm, containing after being dried four hours at 145 degrees centigrade, 9.5 per cent. of water, and 18.13 per cent. of organic and other volatile matter, gave off during ignition a current of ammonia distinctly perceptible by test paper and smell ten or fifteen minutes. Yet, when this soil was treated with caustic lime, no ammonia could be detected with certainty by smell, or by test paper exposed ten or fifteen minutes; but when exposed twenty-four hours in a closed vessel, the test paper became blue, and some dilute hydrochloric acid placed above the mixture of soil and lime in the closed vessel, gave, after exposure the same length of time, when evaporated, chrystals of sal ammoniac, showing that although the tests as ordinarily applied fail to detect ammonia, still a very small quantity is given off. A raw, air-dried soil, from Livingston county, containing 3¼ per cent. of water, and 10.17 per cent. of organic and volatile matter, also gave, on ignition, a quantity of ammonia easily detected by the smell. So also one from Union county, containing only 1.55 per cent. of water, and 2.84 per cent. of organic and volatile matter, gave, on ignition, although not quite so much, still a very perceptible quantity of ammonia. Now it is certain that some of this ammonia existed already formed in the soil. If the whole of it existed already formed, then these soils, rich in organic matter, are also very rich in ammonia, and should be, as they really are, very fertile; but a part of the ammonia may have been formed during ignition from the inert nitrogen of the humus, by the small quantity of free alkaline carbonate in the soil, and how much is due to one cause and how much to the other has not yet been determined. These results seem to justify the conclusion that although under favorable conditions ammonia may escape from the soil, still the amount so escaping is extremely small.

A far more abundant source of atmospheric ammonia is evaporation. Experiment teaches when pure air is conducted over moist soil, free from ammonia, that some of the nitrogen of the air combines with the water and forms ammonium nitrite. The temperature at which the experiment was made varied between 10 and 52 deg. centigrade, or 50 and 125 deg. Fahrenheit. It would appear then, that in the warm weather of summer, when evaporation goes on rapidly, the conditions are favorable for the production of this compound.

But the nitrogen of vegetable matter not only gives rise in decay to ammonia, but also to nitric acid, and within the last few years the opinion has gained strength that this is the main source of nitrogen to plants, chiefly because the fertility of soils is greatly increased by an alkaline nitrate. It is well known that in soils containing animal and vegetable matter, nitre is often formed. In some countries the circumstances are peculiarly favorable for iis production, and it accumulates in so large a quantity in the soil as to become an article of commerce. The formation of nitre, or nitrification, goes on most rapidly during the heat of summer, and when moisture is abundant. The process is very obscure. In the first place, an immense quantity of nitrogen exists in every soil rich in humus. Now, this nitrogen, at a moderate temperature, and with sufficient moisture and in contact with an alkali, gives rise during decay to ammonia. At a higher temperature, with moisture, free access of air and an alkali, some of this nitrogen may be oxydized to nitric acid. It is possible, as many believe, that the nitrogen of the humus is first converted into ammonia, and that the nitrogen of this ammonia is then oxydized to nitric acid. In this case ammonia is only an intermediate link in the series of transformations between the nitrogen of the humus and nitric acid. The general results of Bretschneider's experiments, already referred to, seem to harmonize with this view; for according to them, relatively much ammonia and little nitric acid were found in his soil in early spring, but as the temperature of the season increased the nitric acid increased, while the ammonia diminished; a fact indicating that the increase of temperature was more favorable to the formation of nitric acid than of ammonia, unless, indeed, ammonia was first formed and then oxydized to water and nitric acid, which is by no means improbable.

But this explanation, although it may be true in part, does not express the whole truth, for the above experiments teach that during summer the total quantity of nitrogen in a soil increases, particularly when crops are growing. This increase of nitrogen can come only from the atmosphere, and suggests that there must be some other way of forming nitric acid than that of oxydizing the nitrogen of the humus, or that of ammonia.

The latest view on this subject is that ozone may be concerned in nitrification Under certain circumstances it is well known that oxygen becomes endued with remarkably active properties. It had long been noticed that air, in places where lightning had struck, had a peculiar smell; also that the air near an electrical machine in active operation was similarly affected, but it was not until 1840, that the oxygen set free in the decomposition of water by the galvanic current was observed to have the same smell. From this it was inferred that oxygen itself was the cause of the smell, in consequence of some change which it had undergone. Further investigations seem to teach that this modification of the properties of oxygen results from the decomposition of common, or inactive oxygen, into two kinds of oxygen, which from their different properties, have received the names ozone and antozone; and it appears that these modified forms of oxygen are evolved not only by electricity, but more or less in many, if not all ordinary processes of oxydation and deoxydation, so that there is always more or less ozone and antozone in the air, already formed, or in process of formation, particularly in the soil, where in warm weather, decay of organic matter is supposed to be accompanied by the evolution of these agents. It may easily be conceived that ozone evolved in the organic matter, in immediate contact with the inert nitrogen, would be in the best possible condition for combining with such nitrogen, or with the nitrogen of ammonia, or even with the nitrogen of the air in the pores of the soil. In this way it is possible that some nitrogen in all these different conditions may be converted to nitric acid; and in so far as the nitrogen of the air is oxydized to nitric acid, it is easy to see that the total quantity of nitrogen in the soil at a given time must be increased. It is not easy to detect ozone in a soil, because from its energetic nature, it combines as soon as formed with the carbon, hydrogen and nitrogen of the soil, and thus disappears, and the rate at which this process goes on depends on the varying conditions of temperature, moisture, and nature of soil. Organic and alkaline matter are essential to nitrification, and a soil rich in these substances has in so far the conditions for producing nitrates, and we may add, for producing harvests. Such a soil in the warm moist air of the tropics would produce nitrates in abundance, in the frigid zones none at all, and in the temperate zones more or less, according to the variable amounts of heat and moisture suited to induce and carry on the process.

One of the relations then of humus to the growth of crops is plain. It furnishes them with nitrogen, which is essential to their healthy development. This is supplied in part as ammonia, and in part, and probably by far the greater part, as nitric acid, at least in warm latitudes suited to its production. A small quantity of nitric acid, as well as of ammonia, falls with rain and snow, about three pounds to the acre annually; and according to the experiments of Lawes and Bretschneider, the total quantity of nitrogen which annually falls with rain, snow, and dew, does not exceed on the average nine pounds to the acre, while the quantity of nitrogen in a crop of thirty bushels of wheat and its straw, is five times that amount. It is evident then, that the crop must get a large part of its nitrogen from some other source than the ammonia and nitric acid which fall in rain from the atmosphere. This source is the organic matter of the soil. If a soil contain no organic matter, it will in general be more or less barren, that is, it will be deficient, not only in other kinds of plant food, but particularly in nitrogen, and to increase its productiveness nitrogen should be added either in the form of organic matter, ammoniacal salts, or nitrates.

That the humus of the soil sustains an intimate relation to the plant in the way of furnishing it with nitrogen, is illustrated by the sugar beet. This vegetable is particularly rich in nitre, at least when grown in certain soils, in certain latitudes, often so much so as to render it difficult and expensive to separate it from the sugar. But a short time since we saw at the beet sugar factory at Chatsworth, in this State, crusts of sugar covered with a net work of nitre crystals, and were informed by the able superintendent, Mr. Weferling, that in all his experience of twenty years in the sugar factories of Germany, he had never seen sugar so rich in nitre before. A specimen of third grade sugar, from the same establishment, was analyzed in the University laboratory, and gave 13½ per cent. of nitre. This, of course, has to be separated from the sugar before it is fit for market, and I need not say that the separation is very thoroughly effected, although at considerable expense, and sugar of excellent quality finally obtained.

These facts are exceedingly interesting and instructive. In the first place, they teach us that the conditions of the soil are very favorable for the production of nitre, too much so for the economical production of sugar. It is very probable that the syrups at Fon du Lac, Wisconsin, contain less nitre than those at Chatsworth. This would be expected from the lower temperature there, even though the soil be exactly similar to that at Chatsworth. Soils in the southern part of this State, less rich in organic matter than those of Chatsworth, would also give syrups less rich in nitre; and the soil at Chatsworth, although now so rich in organic and saline matters as to render the production of sugar expensive, will be greatly improved by a few years cultivation. As soon as the excess of organic matter has been removed, and the soil thoroughly subdued, it will doubtless prove excellently adapted to beet culture, and satisfy all reasonable expectations by its returns.

In the next place the nitre in the sugar must have existed in the beet. But how came it there? Only one of two suppositions can account for it. Either it must have been absorbed from the soil by the beet, or it must have been formed in the beet from elements which had entered it in some other form th an nitre. The former is the view generally entertained on this subject not only because in decay nitre is formed, and is ready at hand for absorption by the roots, but also because nitrates added to unfruitful soils often greatly increase the vigor of vegetation; an effect which is most directly and naturally accounted for by supposing that the nitrate, or at least the nitric acid becomes food for the plants.

Still there are some who think it possible that the nitric acid is formed in the plant, that is, in the pores of the leaves. By the decomposition of the carbonic acid in the leaf it is thought that ozone is formed, and that this energetic ozone coming into contact with the nitrogen of the air in the pores of the leaf combines with it and converts it into nitric acid, which is absorbed within the plant. It is scarcely necessary to add, that if this is the way in which the nitrogen of plants is assimilated, the nitrogen of the soil may have nothing whatever to do with the nutrition of plants. Possibly there may be cases where plants have the power of assimilating some nitrogen directly from the atmosphere. At least one cannot positively say there are none. But that all, or the chief part of the nitrogen of plants is assimilated in this way is, to say the least, extremely improbable.

Other kinds of food furnished also by the organic matter of the soil are potash, soda, lime, magnesia, iron, and manganese; and here two thoughts are naturally suggested. First, for an unknown length of time a gradual transfer of the above materials has been going on from all the lower parts of the soil, and subsoil penetrated by roots, to the plants on the soil. These, as they perished, have added their annual installment of these elements to the upper layer of the soil, and thus there has accumulated a supply sufficient for a luxuriant vegetation. The soil is so rich in these elements that abundant crops of grain can be removed annually from the soil for a long time without any perceptible diminution of its fertility. This is well illustrated by the reports of the farmers of this State in 1857, concerning the fertility of prairie soils. It will be remembered that then, from an analysis of a soil from the western part of this State, an invidious comparison was instituted by the State Geologist of Kentucky, between the soils of this State and those of Kentucky. To prevent any injurious effect of such comparison, the testimony of Illinois farmers was sought with respect to the capability of their soils, and in almost every instance the testimony was that continuous cropping fifteen, twenty, and even thirty years, without manuring, produced scarcely any diminution of fertility. This is probably as favorable a statement as could properly be made with respect to the undiminished fertility of soils under constant cropping for a large number of years; but the fact of the great fertility of soils is clearly brought out and cannot be doubted. The fact is common to almost all virgin soils, and is attributable to the same cause, the accumulation of plant food in that part of the soil where it becomes most available to cultivated plants.

Another thought is, that humus, as well as clay, with which humus is often intimately associated, is of a peculiarly retentive nature. It has a species of affinity for many compounds required by plants as food, and, therefore, retains them with so much force that they are not removed by rains, or only partially. An exception should be made in favor of nitrates, which are easily soluble, and can be removed for the most part from the soil by washing, but the general nature of humus is to absorb and retain those substances that plants feed on. Phosphoric and silicic acids are also important constituents of plant food, and are contained in greater or smaller quantity in the humus of soils.

Then too the physical properties imparted to soils by humus, are quite as important, perhaps, as those derived from its capacity of furnishing food. The consistency of soils, especially those made up very largely of finely comminuted matter, like that of prairie soils, their power of retaining water, their tendency to contract and become hard while drying, their power of absorbing moisture from the atmosphere, their heat depending not only on the gradual combustion of the humus, but also on its power of absorbing heat from the sun's rays, and finally, their power of absorbing and retaining for the use of the plant various kinds of plant food, like ammonia. All these properties are largely dependent on the variable quantity of humus in soils, properties whose value it is difficult to over estimate in their relation to the productive power, that is, the agricultural value of soils.

In closing, we will only say, that whatever value humus may have as a constituent of soils, the soils of the prairie possess that value in a preeminent degree, and to derive the greatest benefit which it is suited to impart requires a careful study of its constitution and properties.

DISCUSSION.

FREEMAN, of South Pass—The Livingston county and Union county soils, mentioned by Prof. Stuart, are extreme cases. One was probably low, wet prairie; the other, forty years under the plow, and well drained. We have a hard pan here, which is not good when turned up. If thrown upon the surface, will its exposure alone make it fertile? It involves a practical question we want to get at.

Prof. Stuart—Hard pan is not so well adapted to the growth of plants as soil containing nitrogen or humus; but it will gain ammonia and nitric acid from the atmosphere, become pulverized, and better adapted mechanically. If soil were all hard pan, you would have no crop the first year, and the organic matter would increase year by year. There are said to be soils without organic matter, that produce well, but not many, I think.

Honton, of Centralia—I suppose, by working down gradually, we can get our soil deepened and good without manure.

Stuart—We should want to know, first, the chemical constituents of the subsoil. It would take several years to do it.

Dr. Gregory—If there is nitrogen in the subsoil, could not fertility be brought out?

Stuart—There is probably no nitre here.

Riley, of St. Louis—Would not mere exposure be sufficient, as in the sand ridges north, that produce corn well?

Stuart—Probably inorganic soils take in humus by cultivation. It is very possible that ammonia goes to the soil itself; but it may also come from the soil, being given off at high temperatures and absorbed at low. A great amount of ammonia is given out by heat.

Adjourned.

Tuesday Afternoon—2 o'clock.

H. C. Freeman, of the State Geological Survey, gave some account of the soils of Southern Illinois, illustrated by a section of the soils from the Ohio and Mississippi railroad to Cairo, of which the following is an imperfect abstract:

I was only lately informed that I was expected to address you, and I have been absent from this part of the State for the past six months, engaged in another avocation. I have not had time to prepare careful statements, and my remarks may not be very well ordered.

I will give my personal observations, and practical and easily understood remarks, considering the geography and topography of the country first, and then the disposition of the soils.

We have the Mississippi on the west, the Ohio on the south, and the Wabash on the east. The general tendency of these is southwest. The slope of the surface is more southward, but still southwest. Taking the whole

State, and drawing a section line from north to south, we find it shows a descending plain from Wisconsin to Cairo, and it would so appear on a true scale. In the south part of the State, however, there is one great interruption to this gradual descent. This is the Grand Chain, extending from the Grand Tower, on the Mississippi, to Shawneetown, on the Ohio, or from the Ozark range of Missouri to the Cumberland chain of Tennessee.

Last year I delivered a lecture on the soils of the State in general, showing the drift and its original formation as qualifying soils. That lecture properly preceded this. I will now say, in general, that the soils of Northern Illinois are coarser in texture than ours. In the north, you find heavy beds of gravel and sand. As you go south, you find sands; and still farther south no sands, but fine clays. These last form the soils of Southern Illinois. They cannot be definitely limited, except where the surface is washed.

Nearly all our Illinois soils are drifts. This general statement applies to the prairie and adjacent timber land; but the bluffs are different.

It is difficult to see where the northern limit of Southern Illinois begins; but I will speak of the general peculiarities of its soils, commencing at the Ohio and Mississippi railway. From that point, excepting one great interruption, there is nearly a regular descent. As far down as Dongola, we find an unequal distribution of two soils, and over a portion of that area, called the basin of Egypt, we find six soils. North and south of it we have the two lower soils of the basin. Southward, as I have said, these go to Dongola. South of that is a soil of more recent origin.

A soil, I may remark, has been elaborately defined as the superficial covering of the earth, in which plants grow, of a dark color, etc., but this does not fit. A good deal of good soil is not dark, as mulatto soil, ash-colored soil, etc. In one case, also, the lower soil is more productive than the upper.

Taking up the soils marked on the diagram: No. 6, or the bottom soil, is the hard pan you were talking of this morning, and the next, No. 5, is the surface soil of this region, varying in thickness, in different places, from one to twenty feet. Where washed away in some places it exposes No. 5, and the latter becomes indurated, especially where it is wet. No. 5 is the first covering of rocks. I have traced it from Neoga to Dongola. No. 5 not only runs over No. 6, but continues over the top of the Grand Chain, being fifteen feet thick on the highest hills. Nos. 1, 2, 3 and 4 do not any of them go above a given level north of the Grand Chain, and below that are all washed away, gravel put on, and loess on top of that.

Here is a section of the six sorts, taken from the north part of Franklin county:

No. 1. A black loam, with a little clay, 6 to 10 inches thick.

No. 2. Whitish clay, with a little loam—the surface soil of nearly all our southern prairies—3 to 15 inches.

No. 3. A chocolate and ochre colored joint clay, 12 to 16 inches.

No. 4. A white, almost pipe-clay, sometimes containing small nodules of iron, 12 to 18 inches.

No. 5. A yellowish clay drift, the clay proper of Central and Southern Illinois.

No. 6. White clay—your scalds—the upper part full of little pebbles of oxyd of iron, and sometimes with drift boulders.

The difference between No. 5 and the top of the Grand Chain is, that the latter is levigated, being deposited in nearly still water, and has humus from the tree growth. Up here, it becomes materially different, from different agencies.

At points where Nos. 5 and 6 both disappear, you come to the loess, which is more recent, and would correspond with one of the other numbers, perhaps No. 3.

Going south of Dongola, you come into the alluvium of the river bottoms, divisible into two—first and second bottoms. The second bottoms are of a coarser material.

Besides these, there is, commencing near Thebes and running to the Ohio river, an older soil than any, three or four miles wide, and silicious in its character.

These various classes of soils sometimes blend—as many as four of them at once on the verge—and it is necessary to be careful and discriminate the facts. In taking samples for analysis, you may get everything.

Swales sometimes make a great difference in adjacent soils, as may be seen in Williamson and Jackson counties, where No. 3 is thus brought to the surface. Last July, during a great drouth, I observed a part of a field of corn in one of these swales to be making a magnificent growth, whilst the rest of the field was badly damaged.

Another variation has been made by denudation. In the water shed, adjacent to the Big Muddy and Saline rivers, there has been extensive denudation of the fine-grained sandstone of the coal measures. In the fine silicious soil, in No. 5, we have the result of trituration; but in denudation we find mounds remaining of the old coal measures, that have chiefly been swept away. The only soil remaining is a result of the disintegration of coal shales and sandstones. Frankfort, Illinois, is built on one of these mounds. At their base you find the regular stratification again.

Loess, which I suspect No. 3 to be, I suppose originated on the Upper Missouri river. It is found south as far as Vicksburg and Grand Gulf, on the river, and more inland still farther south. It is deposited as far as the water level goes. It went across Southern Illinois, north of the Grand Chain, through the basin of Egypt.

These soils may be distinguished by their vegetation. No. 2 is post-oak flats. We often distinguish it in going from the edge of a prairie to its centre. It effervesces with a salt that cattle seek. Complaints of drouth and wet on this might be obviated, perhaps, by deep plowing. Over this white clay soil corn should be got in early; but the soil is then too wet, so that cultivators are in a tight place, unless the rains are continuous. The same is true of No. 5, on the Grand Chain, except that the wet is but little in the way. But the loess at Villa Ridge permits you to plant corn the first of July and get a good crop. The locality is about sixty feet above the bottoms, has a deep soil, with a good deal of phosphorous in it, and a warm, humid air from the rivers—a remarkable combination of advantages.

I have thus gone over the ground in a general way; and will now be glad to answer any questions.

DISCUSSION.

Dr. WARDER, of Cincinnati—The hills at South Pass have a flinty, stony material. Where does it come from?

FREEMAN—I presume it is due to the fact that the ridge is divided into the Makanda and the South Pass ridge. The soil of the latter rests on the mill-stone grit; of the former on the coal measures proper. It is between two anticlinal axes of mill-stone grit and coal measures. There are also 400 feet of chertz south of Cobden. Bald Knob is mainly chertz.

WARDER—How about segregation in soils?

FREEMAN—I think it is a chemical process. In arenaceous clay the iron nodules are near the surface. I suppose the origin to be deposition from the sea that covered the territory, and that segregation took place afterwards.

MAHAN, of Centralia—What soil have we at Centralia?

FREEMAN—It is a silicious clay loam, and like our soil on the ridge.

MAHAN—It is difficult, you say, to tell where Southern Illinois soil begins. I think it is quite marked between Neoga and Mattoon; and so over at Pana.

FREEMAN—We can't draw a line precisely. We used to think that boulders terminated at Pana; but we find them at Cobden ridge. The hard pan of this region is the same as the "scalds." No. 6 belongs to the early part of the drift; but the erosive action took place prior to it. It may be seen close by Cobden Station, which is 300 feet below the top of the ridge. They have there dug through this No. 6, and you find it clear to the top of the hills. On top of this again, in Williamson county, we find gravel and boulders, mixed with No. 5, as well as granite, feld spar, quartz and sand stone. The gravel is not a clean one, and lies rather at the bottom of No. 5. The boulders are limestone.

PROF. STUART—A boulder was found in the neighborhood of Chatsworth, that was estimated to weigh fifty tons. It was found in digging post-holes and was supposed to be a quarry—but gave out suddenly.

FREEMAN—Boulders could not be brought from any great distance. A few miles south of any anticlinal axis one will find a large amount of drift shorn off from the elevation. They decrease in size as you go southward. When the stone is a large mass, you can often determine its age from the fossils. Loda and its neighborhood are sandy. The sand came from the region just north. The quick-sand bed at Champaign is probably the same thing that is at the surface at Loda.

MAHAN—Has the upheaval been made since the top soils were deposited?

FREEMAN—No, sir. As to the conditions here, the blue clay seems to reach here from the north.

MAHAN—Below No. 6 here, we pass through gravel mixed with blue clay. In the east part of the town water is soft. On the fair ground we find yellow clay, and the water is hard.

HONTON—There is lime in all the wells I have examined here.

FREEMAN—The general character of water in the basin is saline. It is the cause of fever in the region. Mr. Pullen's well is chalybeate and slightly saline.

Mr. COOPER, of the *Centralia Sentinel*, after deprecating the apparent tendency of some to undervalue the Centralia soils, read the following table of borings, made by the Illinois Central railway, between April 11, 1855, and November 27, 1856, at this place:

	Thickness of vein.		Total depth.	
Blue clay, with yellow sand	20	6	20	6
Sandstone	1	10	22	4
Blue slate, light color	10		32	4
Blue slate, dark color	55	8	88	
Bituminous shade		8	88	8
Hard blue clay mixed with gravel	3	6	92	2
Blue slate	25	6	107	8
Soapstone	91	4	209	
Limestone		7	216	
Bituminous coal		6	222	
Soapstone		12	234	
Lime rock		6	240	
Soapstone	93	6	333	6
Bituminous shale	2		335	6
Coal	3		338	6
Limestone	20		358	6
Soapstone	151		509	6
Sandstone	25		534	6

Black slate	6	6	541	
Soapstone	65		606	
Ironstone, very hard	3		609	6
Soapstone	247	6	857	

MAHAN—Does No. 3 occur over much space?

FREEMAN—Yes; over the Big Muddy region. There is not much near the railroad.

STUART—What is the inclination of Cobden ridge?

FREEMAN—It is different on the two sides. The northern ridge has the longest slope. The southern ridge has a vertical exposure on its south side of from 50 to 80 feet in height. The north corresponds with the rock formation beneath it, and descends 400 feet in five miles. We find a deep soil, 20 feet deep at my house, and where there is humus and timber it protects it from washing, which takes place in the old fields, but not where the ground is in its natural condition.

FLAGG—I would like to know the best way of managing the "scalds." I suppose those found in the northeast part of Madison and in Macoupin counties are identical with No. 6.

FREEMAN—Manuring and draining would make them all right. I will read what Mr. Engelmann says of them in the third volume of the State Geological Survey on Clinton county: "Everything which tends to loosen the sub-soil will improve it and make it fertile, because it is not necessarily a poor soil and defective in the ingredients which are essential to the healthful development of plants. Sub-soiling alone will not help much, unless deep stirring is continually repeated, because the soil would be packed close by every heavy shower. The most effectual remedy would probably consist in under draining, whereby the air would gain continual access to the soil."

WHEAT EPISODE.

Dr. GREGORY—What is the influence of burning stubbles and fields? I am told that in Greene county the best wheat growers burn their fields, and that millers can detect the wheat thus grown.

CROSBY, of Centralia—A Mr. Renfro below here has been in the habit of burning straw to get his best crop.

STUART—Theory and practice have established the truth of my statement. It is evident theoretically that adding ashes would tend to hasten the decay of organic matter; but also that organic matter in time would be thus exhausted. Where wood is burned the soil is fertile for a few years. After that it shows a diminished fertility. It is a benefit, however, so far as it makes the constituents of the soil more available. Heated clay, treated with acid, gives up more plant food.

HESTER—The burning of straw is better for the first year, but not for the second or the next.

LEONARD—Experience shows that scripture is right—that the ground should not be burned.

SHONTS—I think the first crop after burnt stubble is the best. I burnt mine—my brother did not. The next year you could tell the division between us to a line, and I had 5 to 10 bushels per acre the best corn. The next year there was no difference.

RUSSELL, of Sandoval—A solid bed is the best for wheat. Is not the cause of the ground being better, simply its being more compacted?

GREGORY—This corresponds to the Greene county experience.

HONTON—Why, then, in the first settlement of the State, when the soil was loose, were the crops better?

FREEMAN—Clover was used in Pennsylvania to precede wheat, and I think it could be done here. I would plow under clover the second year.

STUART—I think the process an excellent one. It is followed in Genesee county, New York. Clover strikes its roots deep and brings up material.

COOPER—A friend of mine at Jonesboro bought a worn out old field adjoining him, sowed it to clover, took off one crop, plowed under the next, and raised 25 bushels of white wheat to the acre.

FREEMAN—In the prairie soil south of here, over the soil No. 3, clover will strike through the top soil to No. 3 and ameliorate the upper.

GREGORY—Judge Lawrence, of Boone county, said he manured one strip of ground with straw, another with barn-yard litter, and a third with rotted manure. There was the best crop where the straw was put, next after the barn-yard litter, and the poorest from the rotted manure.

FLAGG—No one has answered the hard question of my friend Honton, and I will attempt it. Crops were good when the country was new, partly from the fresh fertility of the soil, and partly, perhaps, more from the absence of insects and diseases. But it remains a fact that a loose soil and a compacted soil are both commended and successful in wheat culture. I suppose that wheat *grows* best in the loose soil, but *endures* the winter cold and is less "thrown out" in a compact soil, in which there are less air and water spaces.

Dr. Gregory—In England I saw the steam drag at work on very stiff soil, and so thin that the rock often came within a foot of the surface. It grew 34 bushels of wheat to the acre. Superphosphates were sprinkled over it with a water-cart. In the south of England, General Heman told me, he averaged 72 (?) bushels to the acre.

Adjourned.

Tuesday Evening—7 o'clock.

C. V. Riley, State Entomologist of Missouri, gave a talk upon Noxious Insects. He stated that, owing to a press of other work, he had been obliged to come without preparation, but that he presumed a rambling talk would be more interesting than a for mal address. He then began something as follows:

I will give a little sketch of Entomology, to start upon. There are seven orders:

1. Beetles or shelly-winged insects, called Coleoptera, distinguished by their hard, shelly wing case, entirely covering them. The Lady Bird is an example.

2. Four-winged Flies, or Hymenoptera, having four glassy wings, divided by nerves into panes.

3. Orthoptera, or straight-winged insects, with large hind legs. Cockroaches and crickets belong to this order.

4. Neuroptera, or nerve-winged insects, such as the large Dragon Flies or Devil's Darning Needles.

All the above are masticating or biting insects, with jaws.

5. Butterflies, or moths. Their wings appear powdered, but are scaled. Their scientific name is Lepidoptera.

6. Two-winged Flies, or Diptera, such as flies and musquitoes.

7. True Bugs, with half shelly wings.

These last three are sucking insects. All insects are contained in these seven orders. Although invented by the fathers of Entomology, it has not been much improved upon. We have injurious insects in all these orders.

One of the characteristics of insects is to go through various metamorphoses. The Beetles, Hymenoptera, Lepidoptera, Diptera—all go through complete transformation. Orthoptera and Hemiptera go through two transformations. Some insects go into the ground to effect their transformations; some from the water to its surface; some into the filth of stables, and so on.

The importance of the study many cannot appreciate. Few conceive the amount of loss from these tiny foes. America is the land of insects. We have more than any other country on the globe. Whilst in Europe a loss of 20 to 25 per cent. from their ravages is large, it rises here as high as 50 per cent. Yet it is a singular fact that most of our injurious insects are imported. The same is true of weeds; and they seem to displace and destroy the allied native species. There are two causes for the rapid increase of these imported insects. First, this continent is the oldest and its flora and fauna are more old-fashioned, and not adapted to endure the "struggle for life" against the more completely developed new comers. In the second place, the parasites of the imported insects do not come along with them so generally as could be desired. At any rate, the fact remains; and I wish to impress upon you the importance of guarding against the imported insects. Only two weeks ago, I received a new European weevil—one of the worst—from A. S. Fuller. Their parasites do not accompany them, because they are livelier and escape. Some of our native parasites attack them, but there has been no importation of parasites made.

Insects are spreading to us, such as the Rape Butterfly, Colorado Potato Beetle, Grain Bruchus, Harlequin Butterfly, etc. Many could easily have been prevented, but were not.

I am now ready to answer any questions. I have here a few of the more injurious insects—the Apple Tree Borers, round and flat headed, the hickory, locust, cotton-wood and other borers, the Blister Beetle, Colorado Potato Beetle, Apple Worm, etc.

DISCUSSION.

DR. WARDER—Does the bark louse spread by the feet of birds?

RILEY—I think they would so spread, but that their spreading in this way is overrated. They can only be moved about two days in a year at a time, when there are not many birds yet here.

QUERY—I found a green insect on a current leaf.

RILEY—It is the currant leaf louse, easily killed by soap suds.

QUERY—Do insects come in cycles?

RILEY—With some it is so; with others not. There are no stated periods. The Hessian Fly has vanished in the east, but I think it is from better cultivation.

QUERY—Which are our friends?

RILEY—They are mostly Hymenoptera, or clear-winged flies, such as Ichneuman flies. These friends are apt to be crushed first, because they are bold. Calosoma Calidum is one—a closely allied species feeds on the Colorado Potato Bug. The Tiger Beetle is another. As a rule, the black and brilliant bugs are predacious.

QUERY—What of Chinch Bug?

RILEY—It is native here, and does not spread in Europe. The common quail and the lady bird, and several of its own order, prey on the Chinch Bug. The Horse Mantes is very ferocious. I think it must do much good for fruit-growers. I have heard your strawberries here were hurt by a grub.

BRUNTON—The grub that has done damage here is the May Beetle. But there is another—a small black bug—that has been mischievous.

RILEY—It injures plants by suction. It was more abundant than usual last year.

Is there any trouble here from the apple tree borer? I will send round its two parents. Its attacks may be prevented by four laths put around the young tree, or by soft soap applied early in May. The flat-headed borer is confined to the upper sun-scalded or otherwise injured parts of the tree. It is prevented, also, by soap. I would examine the apple orchard every fall to be safe. Soap will not keep out the peach borer. The moth don't seem to care much for it. Mounding the trees I presume is a good plan. No insect that I know of preys upon this borer. It lays its eggs in June, and perfects in one year.

The curculio is said to have been less injurious the past year, at this place, than heretofore. The canker worm is found here a little. In the southern part of this State, a gentleman thought to stop the curculio by putting a bandage of wool around each tree. So the city fathers of Baltimore had troughs made to put around trees to stop another insect that could fly. But the true canker worm can be prevented by bandages, and might have been prevented from coming here. The female is wingless, and so it spreads very slowly. They are easily killed. Scrape off the eggs and burn them. Troughs can be made around the trees. They must be tight, and kept on all the time of the insects. But bandages kept smeared with refuse sorghum are the best. Fall plowing is beneficial, at least in Southern Illinois. The chrysalis is in the ground all summer and late in the fall. Exposure by plowing lets other birds and insects to them.

QUICK, of Irvington—The leaf roller is bad here in some places. How would you get rid of them?

RILEY—It is the rascal Leaf Crumpler. The perfect insect is a little gray moth. Go in winter and hand pick all the folded leaves. That is the best remedy. The Tussock moth can also be caught now.

QUERY—I find a white aphis on evergreens, especially on white pine. How are they best killed?

RILEY—There is a scale insect on the leaf and a woolly bark louse on evergreens. Mr. Dunlap says syringing with soap and water kills them. I would put tobacco in it. The scale insect may be killed by knocking off and burning the dead leaves.

The apple curculio does not attack the peach that I know of. It is abundant on the wild crab apple. It has a shorter proboscis and four humps instead of two. The plum curculio makes its mark and lays its egg. This insect bores into the fruit, goes to the ground, and then comes out. The only way to destroy them is to jar the trees and catch them. In Vineland, Dr. Trimble informs me that united action destroyed nearly all the insects. The best time is early in the morning. It is necessary to be united and act together. I don't think they fly more than two or three miles. The wild plum is a source of curculio supply, and it occurs in hickories in the hulls. It was seen here in the west in one locality at least 25 years before any trees were planted. The wild plum is a good place to catch them, and a row of plums a good thing to gather them on.

The codling moth is easily managed, as they have proved by having fair fruit in Vineland this year. Catch them in the cocoon under the bark of the trees or other sheltered place. Hay bands are good for them to gather under. So are rags or cloths put about the trees, or in the forks of the trees. It is single brooded in Europe, but is supposed to be two-brooded here. Pick up the fallen apples or have hogs or sheep do it. They appear about May 1, or earlier, and lay eggs in the calyx of the young apple. The worm is about three weeks maturing, and there are several generations in a year. The apples gathered will send out the perfect insects. Kill these as the most dangerous.

Distinguish between insects, so as to not kill your friends. Harris' Insects Injurious to Vegetation is a good book. The American Entomologist is desirable.

The sparrow has been introduced as a remedy. In England it is the commonest bird, and is looked upon as a nuisance, rather than a benefit. It is doing no good to the fruit or grain-grower.

It may be good for the city, but bad for the country. It multiplies beyond endurance.

WARDER—*Datana ministra*, or hand-maid moth, is one of our most troublesome insects. It comes about the 4th of July. It is not found on the pear, but is on the apple, walnut and hickory. It feeds in groups on the same leaves. I have found 200 of the young worms on one leaf. At this age they are easily destroyed, but wait till they shed their coats and get bigger, and they are less agreeable to deal with. As they get older they go to younger leaves. I find them almost always, and think there may be more than one brood of them. [See Dr. Warder's work on apples for a description of this insect, which does not figure in all the books. *Secretary.*]

The oyster shell bark louse I have not found doing well south of 40°. They were gone at Champaign this year, though we found them last. Harris' bark louse don't hurt my trees much. Soap suds kills it.

RILEY—I found the oyster shell bark louse at Alton, and saw it from Huggins', in Macoupin county, but it don't thrive well there. I have urged our fruit men in Northern Missouri to look out for it. I saw a great number of the hand-maid moth on walnuts, at Belleville, last year. They had completely stripped the trees. On taking some home, I found them nearly all affected with a parasite, as many as six to an insect.

HONTON—The grasshoppers here this year seem affected by something like eggs upon them.

RILEY—Mites, probably.

Adjourned.

WEDNESDAY MORNING, *January* 26—9 A. M.

PROF. EDWARD SNYDER, of the Industrial University, delivered a lecture on

AGRICULTURAL BOOK-KEEPING.

I may be permitted to introduce my discourse with the remark that I hardly can be expected to make my subject—the dry and matter-of-fact subject of book-keeping—as interesting and attractive as most other subjects might be made. But a useful art it is; so much everybody must admit, and more perhaps, than any other people in the world, the American needs a certain skill and proficiency in keeping records and in making out accounts.

The easy credit system which prevails among all classes of our business men imperatively demands the keeping of strict accounts on both sides. There is a possibility for every one to be intrusted with public funds, and in consequence being placed under the necessity of rendering accounts systematically and intelligibly. Moreover, I venture to assert that no practical man, whether in business or private, can possibly feel comfortable without recording in some way his financial transactions; without from time to time taking a retrospective view of a year's income and expense, and thereby shaping the budget of his expenditures for the year to come, or increasing his efforts and energy towards the balancing of his wants and his earnings. For it is a comfort, even approaching luxury, to know as often as we possibly can the exact state of our business or affairs, whatever they may be, whether our books foot millions or hundreds of dollars; they tell us the faithful tale of the past, and with their aid we may shape the future. Even within the narrow limits of a household, what satisfaction may not be derived from the keeping of a faithful account of expenditures; how much valuable information can be obtained from a perusal of that financial family history. It certainly aids us to correctly estimate our wants, and would be an ever ready answer for that doleful question of the time, asked a thousand times without an answer: "I should like to know where my money goes?" It is not our earnings nor our expenses, taken separately, that tend to make us rich or poor, but the balancing of the two. I mean to say, that if I earn $600 a year and live on $200, I am three times as well off as the man who earns $2,000, and spends it, for I earn the competence of two more years over and above the other.

In family as well as in political economy, money—that is the means of satisfying our wants—is the price of our life-work and toil; and well might we advise everybody to carefully control its use, and account to himself for it, as exactly as we do in business, for, as the poet says: "It is hard to get, and hard to hold." This will be fully true of every position and station in life; but the desirability to keep accounts for our own information and guidance becomes a positive necessity, whenever our business is also the business of other people. No business man can ever think of being without as correct and minute a business record as he can afford, or as his business demands.

This brings us back to a few definitions, which will be necessary to introduce the subject of Book-keeping in general. Book-keeping, we are told by the best authorities, is a systematic record of business transactions.

I invite your attention to the word systematic, which characterizes the definition.

If we keep a diary of a journey or of our sayings and doings, we also keep a record; but every fact we inscribe there will remain as it is put down, an isolated affair; in other words, we do not expect to draw a line below the last of the month or the year, and give the exact amount of our joys and sorrows, wishes and hopes, and disappointments. We do not expect to ever make that use of a diary. It is different with books for business purposes. We have there a distinct end in view, and, after a certain time, we expect our books to show us in an intelligent manner and condensed figures the complete state of our business, as compared with a given statement of a former date.

As to the forms for keeping accounts, there have been offered to the agricultural public a great variety of them. Almost every book on book-keeping that makes its appearance contains a farm or agricultural set. As a rule, they are pronounced impractical by practical farmers; and though some of these judgments are pronounced, on superficial inspection, still, in general, we must admit that they are so by their very nature—to-wit, as frames or models to go by. The truth of the matter is, that the tendency to make them serve as general models for all, and thus generalizing and dropping all peculiar features of a distinct line of business, makes them less plain to all; and further, we opine, it is sheer impossibility, nothing more nor less, to shape, invent or frame a model set of books, which would conform itself fully to all the requirements which are implied in the diversity of agricultural pursuits in general—the specialties and extent of the business—size of farms, herds, orchards—the importance given to the work of keeping books, and the time allotted to it.

I will refer my hearers to the works of W. C. Cochran of Detroit, J. Mayhew, Bryant & Stratton, C. W. Munson, and others. Each of these systems is complete in itself, though perhaps in their model form they might not meet the wants of many; yet each of them can be applied to the most diversified branches of agricultural industry, if well understood and correctly applied.

Before we enter upon a farther description of Farm Books, I desire to say a few words about an opinion which in some way has tended to prejudice public mind against book-keeping, expressed very often in the phrase, "there is too much work about it." Of course, there is some work in writing up a financial history, but it lies entirely with him who keeps the record to decide how much he can afford to do at it; and, secondly, the question is not whether there is much or little work about it, but whether the work put on to it will pay. Sometimes I thought that there exists an opinion that, in order to keep books at all satisfactorily and successfully, there are required nice desks, books with gilt letters, several hues of ink, infinity of pigeon-holes, etc., etc., and the more style and display there, the more accomplished will be the results issuing from that desk. We are inclined to believe that this mistake has found its way into many counting-houses of our commercial world, and we almost suspect that it has crept even into the offices of our public administration. The farmer must be particularly warned against all stylish forms. He ought never to undertake more of a record than he can do easily, and abstain from all complicated forms; they are sure to breed confusion, and leave him dissatisfied with the result of his work. The simplest forms are always the best. Even those who are versed in the science of accounts, and have time to devote, abstain from complicated form; so much more farmers, who have but a very limited time to give to it.

I have already mentioned that it is impossible to give a model form of books for all. I will add, now, what seems to be the natural consequence of the above statement, that you will hardly ever find two sets of books exactly alike. Men will eagerly carry their individual notions into every kind of work they are doing, and try to improve (as they think) on anything and everything existing. There may be perhaps such a thing as a model house, theoretically—best thing for everybody—but, practically, never two men built alike. It is so with the records of business houses, banks, etc., whose similarity of business would be thought to produce similarity of forms; and probably in every other line of recording and writing. I will therefore give you the general outlines of three forms of Farm Books which I have met with in practice, and I believe that all I ever saw theoretically recommended could be also classed under these three headings. The first, simplest form would comprise those farm sets found in the text books of Bryant & Stratton, Packard, Comer, Fulton, Eastman, etc. They are in form very much resembling the common double or single entry books of the merchant, are easily understood, and adaptable to all diversities of business. They would require the keeping of a Day-Book, at once to be used as a Journal, a Cash Book, and a Ledger. [Practical illustration of the desirable forms and management of these books given.] These systems are susceptible of being reduced to the very simplest forms, and therefore much recommended to persons limited in time.

In regard to the Day-Book, I would state that in my opinion the farmer needs for reference and comparison not only a record of dollars and cents, but also the history of every day's work and doings; nay, more than that, he ought to jot down all his observations, the weather, and every other remarkable and even interesting event or observation, for future reference and inspection.

It seems to me that the history of a farm kept in that way would be a source of infinite information and advantage to the owner; it would excite and encourage observations—comparisons between the year's crops, work, seasons, etc., would naturally follow—and finally attention to agricultural reports from abroad, and a live interest in all agricultural matters would be the natural consequence of such a course. We could predict nothing but excellent results if a great many farm records would be kept and compared annually.

As a general rule, we could not advise farmers to close their books oftener than once a year, but would emphasize the necessity of taking as correct and full an inventory as possible at the start, and at every closing of books.

As a representative of the second system, I would refer my hearers to the text-book on agricultural book-keeping, by C. W. Cochran, considerably more complicated than the former, but very judiciously and correctly arranged. Its chief characteristic is the recording of the cost of cultivation against the proceeds of the produce in detail. It necessitates the keeping of accounts with the different fields not only, but also with all the different sources of income or expenditure; labor of teams and men must be valued, and at certain intervals of time, say every week, carried to the different accounts, where it was applied. Discrimination between improvements and running work and expenses must be introduced, and accounts kept with implements, fences, teams, labor, cattle, produce, fields, dairy, buildings, household expense, etc. [Follow practical illustrations of time-table and other forms.]

There is perhaps not much more work in this system than in the one described previously, but it certainly requires more attention, more minute discriminations, and perhaps considerable skill and experience ; but I consider it nevertheless a practical set, susceptible of considerable simplification, and when faithfully kept, certainly as full and correct a record as any one could wish for.

The third form that I intend to mention, is only adapted to the management of large estates. It consists in rather a small library, if carried on on a large scale—that is to say, separate books are kept for the different sub-divisions of the manipulations on the farm or estate. Labor is, for instance, entered in a record by itself; the payments of hands, boarding, etc., and also the actual amount of labor done are balanced; the work planned and arranged for months beforehand, etc. So with the Team Book, which is debited with the cost of animals and harness, fodder, attendance, shoeing, etc., and credited, individually or generally, with the work.

In the Field Books the different sub-divisions of land have separate records —and through consecutive years the manner and kind, as well as cost of cultivation—the kind, amount and proceeds of crops are carefully entered, showing thus complete histories of the fields. And so with herd books, orchard and dairy records, forests and buildings, etc.

For the purpose of condensing the results shown in the different books, a General Journal must be kept. Cash Book, Ledger, Bill Book, Letter Book, etc., will be necessary auxiliaries in this system.

It will require the full time and attention of one or more men to attend to the duties of book-keeping of such a concern, but it is done, and consequently likely pays. The Farmer's Record, by Mr. W. C. Munson, published by Blackmer & Lyon, Chicago, is somewhat on this plan, though on a very small scale, being adapted to the wants of our farmers.

In closing my address, I may be allowed to remark that since a farmer must be a business man, and a good one, too, if ever he intends to meet with success in his calling, we cannot too highly recommend for this purpose the keeping of correct books. They inevitably tend to make a man a close calculator, and bring about that foresighted, balanced way in business transactions, which is a necessary requirement for success. Plowing and harrowing won't make a farmer. There is headwork on a farm to do, in order to make it pay ; there are close calculations to be made between cost and produce ; the work is to be planned for time and beforehand ; the crops must be adjusted to the demands of the market; that market must be watched; and we are sure that an intelligent record of the past must very much aid the farmer in judging and keeping on the best road to success.

DISCUSSION.

MURTFELDT, of St. Louis—It is a great source of comfort to know just where you are financially, but not one man in ten of our Illinois farmers does know. It is impossible to succeed is this way. If money comes freely it goes freely, and I would impress the idea that some account, even so little as an annual inventory, should be kept. First keep a daily record and journal in the simplest form. Chas. H. Rosenstiel, of Freeport, does this. An inventory is like an account of stock, it gives the working capital, or stock in trade. Mr. Sullivant formerly kept an account with every horse and mule even. He had system enough. How well he succeeded I do not know, but he claimed to have made an acre of corn with seven-eighths of a day's labor. Book-keeping sets us thinking as to cost of production compared with price of produce.

COOPER—I agree with the speakers that we want a simple system of book-keeping for farmers—a system proportionate to the amount of business. Systematic book-keeping is part of the regular business of the merchant, and it will do for the large farmer, but the small farmer, who spends the day in toil, and returns home tired at night, wants something different. He should keep a book of some kind, but we can't get him to keep an elaborate system of books. A simple cash book will answer, and will show a great deal. Then let him get a ledger, if he likes, and keep an account with the whole farm.

DR. HONTON—It is easy to theorize on book-keeping but a little different to keep up the books. Some years ago my better-half assumed the responsibility of keeping a complete farm record, and kept it for two years. We find we are constantly referring back to it. But it is perhaps better for some men not to know where they are; if they did they might get discouraged, whereas they persevere and finally get through.

SNYDER—Many expenses we get ashamed of simply by putting them down. Household expenses cost strangely little. The incidental expenses are twice as much.

Some curious facts some times appear from keeping systematic accounts. Mr. Eaton, of Broadlands, found that the chief expense of hay making was the hauling.

Adjourned.

THURSDAY AFTERNOON, 2 o'clock.

Owing to the sickness of J. S. Taylor, Dr. Honton, of Centralia, opened the discussion on

SUPPLY AND DEMAND FOR FRUITS.

This subject is one affecting our pockets, and embraces the nature of supply, sources and means of marketing, the culture, harvesting, and value of products, etc.

It is hardly ever possible, I think, to succeed with one thing, and we ought to have a variety. We have here strawberries, peaches, apples, and pears, and other fruits grow equally luxuriant. We have a fine soil. Others have the advantage of a better drainage. Except for mismanagement we could have fruits with great ease. It is difficult, however, to make the supply too great. Our fruits come in at different periods. Villa Ridge is three weeks ahead of us, and we find the difference of ripening to be about 12 days to every 100 miles of latitude.

The country is supplied, as yet, only along the existing railroad lines, and perhaps to a distance of twelve miles from them. Peaches conflict more than strawberries; and here, again, I would urge the raising of more than one sort of fruit. We had a glut year before last, but by sending to other parts of the State the glut was relieved. Some years ago a man was reported to have made $2,000, to $3,000 a year off a few acres of strawberries, the result was a great many twenty acre patches. We got off owing to big crops, etc., without any serious loss. In Vineland some of the early settlers seemed in danger of making fortunes, but there they have now settled down to business.

As the most marked case of glut, I will mention the crops of 1867, which were the best we ever had in the whole south part of the State. In 1868, of 10,000 packages received in one day in Chicago, one-third was consumed in the city. As prices grow lower consumption rapidly increases, and as fast as intelligence and culture spread, the consumption of fruit will increase. 1,200, or 1,300, twenty-four quart cases of strawberries might be consumed in Chicago of late. I eat three pounds of fruit a day myself, and have a friend who says he eats five pounds of grapes. Twelve years ago, I am told that a gardener who took sixty-five quarts of strawberries into Chicago could not sell them all, and had to take home ten quarts. Now he sells 4,000 to 5,000 a day. At Peoria, in 1862, I saw from thirty to sixty quarts a day sold with difficulty, now 500 don't supply the morning markets.

Apples should be used in even more forms than they are now. I find in many families that fruits are not enough used.

Railroads should be compelled to carry fruits at same rates as other produce. We have to pay $1 20 per 100 for fruit to Chicago, when we should not pay more than double what we do for wheat, or 40 cents, we pay 94 cents on the fruit train. We have tried to secure other outlets, but in the end have not succeeded so well. There was an engagement last year in Chicago for forty-eight hours. Commission merchants shipped outside and thus relieved themselves. We ought to have here a Board of Trade, and be able to know the prices of previous day every day at different points.

DISCUSSION.

WAKEMAN—At Milwaukee, in time of the glut at Chicago, strawberries were 28 to 31 cents in Milwaukee, and 4 to 5 in Chicago.

WOOD, of South Pass—I have been only five years in the business. I find that all the producers crowd into a promising market, and get in each other's way. We ought to organize from here to Villa Ridge, and have concert of action. I advocated sending a man to the various points, but did not succeed in having it done. Last year Mr. Earle was sent east to effect arrangements to ship strawberries that way. He did the best he knew, and perhaps the best possible; a Michigan Central car was given us, and taken through to Detroit with a passenger train at the price of freight. The first car, which was not full, went through in good time, and paid. The next car, which was full, broke down this side of Champaign. In the next, ice was tried, placed in a pan at the top. Another car load did not connect. I think mischief was done intentionally.

Certain places never get berries from abrord. At our first meeting we voted to canvass the territory, ascertain how much Milwaukee wants, for instance, and send a whole car, but we found only 4,700 quarts of strawberries were shipped to Milwaukee, June 1st. We wanted a car to go up the main line, but on the 28th May only 2,900 quarts were sent, yet the gross shipments of strawberries from Cobden alone, were:

In 1867	8,152	bushels.
In 1868	5,816	"
In 1869	17,774	"

Centralia shipped in 1869, 6,361 bushels. (10,300, says Mr. Cooper.)

In view of these facts, we voted to send out a man to canvass, and have him confine himself to a certain region, and see if we cannot keep, say one-half of the berries we ship, out of Chicago. We ship direct to these places, save twelve hours or more, and get five cents more a quart.

We find trouble from the berries brought in by the "natives" a distance of twelve miles, all bruised, badly picked, the crates made badly, and in such a condition as to hurt the sale of good fruit. We find it difficult to get daily accounts of sales.

Brown, of Villa Ridge—I have been much pleased with Dr. Honton's remarks, especially his advising to grow several kinds of fruits. I think apples, especially late apples, one of the safest fruits to raise, and I think they will be one of the most profitable. I notice a steady increase in the price of fruit, first because more people are using it, and secondly from the extension of our railways, and the means of distributing it. Pears pay well, and are growing in demand just like apples. They are not now appreciated in small towns. An organization was attempted three or four years ago to ship to six men in Chicago. It failed. Mr. Woods' plan may do. I think we can work out something. Put up good fruit in good order; yet in case of bad and good fruit there has been such a thing as averaging of sales. That was done, and is done even to-day.

Cooper—One means of increasing the demand is the establishment of canning houses.

Brunton—I think it in bad taste to say anything against the Illinois Central. Its fruit train did not pay all last year. They did all we could expect of them. The best place to sell is in the home market; the next outlet is the large commercial centres. We can't agree to ship long distances, our raspberries spoiled over night here.

Honton—According to the prices charged, an engine with only two cars of fruit, running from South Pass to Chicago would make over $100.

Wood—Fifty-three tons were sent in one day from our station last year.

Gale—I think the rates were reasonable last year.

Mahan—Not much has been said as to the probable increase in planting. Planting will increase vastly from the new railroads. The one from Springfield through Edgewood will strike one of our best fruit regions. There are large orchards at Olney, and south of there they will go in heavily. The Belleville and South Eastern railway will also let in a good deal. I think that the demand will not increase as fast as the supply.

Adjourned.

THURSDAY EVENING—7 P. M.

Judge A. M. BROWN, of Villa Ridge, one of the Trustees of the University, read a lecture on

PEAR CULTURE.

Mr. President, Ladies and Gentlemen :

Our Secretary has assigned me a subject upon which, I fear, I shall be able to throw a very feeble light. It is a subject, however, of great interest to all growers of fruit, and what I am about to say, though of little value in itself, may serve to draw out from others of larger experience and more extended observation, something that shall redeem my own deficiency.

During the past twenty years, pear culture has received a wonderful impetus. Hundreds of thousands of trees have been planted in all parts of the country—the nurseries have been taxed to their utmost to supply the demand, and yet, this noble fruit is still a luxury, attainable by the wealthy only, even in our most favored markets. In the less important markets, it is rarely exposed for sale, and it may be asserted that, of the whole population of the United States, not one man in twenty has ever eaten a first-rate pear. The inference from these statements must be that pear growing has not been generally successful. Indeed, it is doubtful whether one-half the trees planted during the past twenty years are now alive, and, in the west especially, an old pear tree is such a rarity that we look upon it with a kind of reverence. Knowing, then, as we do, that the pear, under favorable conditions, is one of the most vigorous, thrifty, productive and long-lived of all our fruit-bearing trees, it follows that either our soil or climate, or both, are unsuited to it, or that planters have been unfortunate in their selection of varieties; or, else, that we have failed to understand and apply the kind of culture that is required to secure it against those fatal diseases to which it is subject.

In planting an orchard, the first thing to be considered is the nature of the soil in which the trees are to grow, for though the pear adapts itself to a wide range of climate and a great variety of soils, thriving alike in the sands of New Jersey, the deep alluvium of our own western river bottoms, and the clay hills of the river bluffs, it is yet somewhat capricious, living and bearing fruit in some localities, to a good old age, while in others, it persists in perishing by disease in its early youth. While we cannot assert absolutely what soil is best for the pear, we may safely say that it must be measurably fertile, and especially that it must be deep, with a sub-soil permeable by its deep-feeding roots and incapable of holding stagnant water. No soil can be good for the pear which is underlaid by an impervious sub-soil. The roots in their effort to obey the law of their nature, which is to extend downward to a great depth, will penetrate to the sub-soil, and will find in the stagnant water held there the conditions of disease and certain death. Nor is a soil suitable for the pear, however dry it may be, in which there is an undue proportion of humus, for the tendency of this is to produce a succulent, sappy and late growth, which always invites disease. I should say, therefore, that the best soil for the pear is one originally deep, well drained and rich, in which the rank vegetable mold has been, to a considerable extent, exhausted by previous cultivation.

PREPARATION OF THE GROUND.

No doubt it would be an advantage, in most soils, to trench the ground to the depth of three feet or more, but, as not one man in a hundred can or will incur the expense of this, it would be useless to recommend it. In many localities under-draining may be essential, but it is beginning to be doubted whether under-draining is practicable in orchards without the trouble and expense of once in two or three years taking up the tiles to free them from the masses of roots that penetrate into and clog them. In soils naturally well suited to the pear the only preparation necessary is deep plowing, the deeper the better. For soils underlaid by a tenacious sub-soil, it seems to me, that the best preparation, aside from thorough under-draining, would consist in deeply plowing the land into ridges, upon which the trees should be set, thus giving the greatest depth possible for the roots to penetrate, and furnishing surface drainage by which superfluous water could escape.

SELECTION OF TREES.

I prefer trees not more than two years old from the bud or graft, and consider yearlings generally the best. At this age you are much more likely to get roots entire, or nearly so. The pear tree sends its roots so deep into the earth that by the time it is three years old the fibrous roots are beyond the reach of the nursery-man's spade, and you get, not roots, but mere naked clubs a foot or more in length. A tree thus mutilated requires about two years to repair the damage done before it can begin to grow. The young tree, with its system of roots perfect, or nearly so, grows at once, and will generally overtake and excel in size and vigor its larger and older neighbor. Another reason for ordering young trees is, that the chance is better for getting them well grown and thrifty, to say nothing of diminished cost.

TIME FOR PLANTING.

Pears may be planted, when the ground is in good condition, at any time from the fall of the leaves in autumn to the beginning of growth in the spring. In fall or winter planting, however, great care must be taken to heap the earth up around the stems to prevent the loosening of the roots in the ground by the winds or their upheaval by frosts—dangers to which the pear is peculiarly liable from its usual want of numerous small roots.

DISTANCE BETWEEN TREES.

There is considerable diversity of opinion amongst orchardists as to the proper distances between trees in pear orchards, but the tendency is very strongly toward much closer planting than was formerly practiced. If we knew that our trees would live to reach the age of twenty years or more, and desired to provide for them while young all the room they would require in their mature age, twenty-five or thirty feet apart would be none too much. But, knowing, as we do, their liability to perish by disease long before they would require so much space, and knowing, also, that if all should survive they will bear fruit many years before they would cover the ground, it seems much the wiser plan to plant close, say four trees where otherwise there would be but one. For standard trees fifteen feet, or twelve by fifteen, for some varieties, would seem to me very suitable distances. If they live long enough to crowd each other, a part can be taken out, for before this will occur they will have paid for themselves many times over. If the plan of root-pruning, of which I shall speak, should be adopted and persisted in, these distances should be still further diminished.

CULTIVATION.

All agree, so far as I know, that all orchards should be well cultivated while they are young, but it is the practice of many to cease cultivation as soon as the trees have reached a bearing age, and sow the ground in grass. So distinguished a horticulturist as Mr. Mahan, maintains that sod, if kept mowed close, and the cut grass left on the ground, operates as a mulch, not equal to a mulch of straw or leaves, but still superior as a promoter of growth, to cultivation. It seems to me that it must be a very peculiar soil in which such a result would be produced. If the object were to check a too rampant growth, and thus promote fruitfulness, or prevent a tendency to disease, we might look upon the practice as a wise one; but the difficulty with trees that have once come into bearing, is, that they are apt to cease wood-growth almost entirely. Pears, and particularly those varieties that are protfitable and most generally planted, tend to over-fruitfulness. They cover themselves with fruit spurs and blossom buds to such an extent, that they cease to form new wood unless stimulated by manure or cultivation. If the trees require cultivation to make them grow while they are young and producing no fruit, surely they must require it still more when their energies are most severely taxed—when they are required, in one and the same season, to perfect a crop of fruit, prepare blossom buds for the succeeding year, and extend their growth of wood. If they fail in either of these it will be in the latter, and the result will be small and meagre foliage, with an excess of small and worthless fruit; and this process goes on from year to year, until the trees cease to be of any value. I regard a moderate annual growth of new wood as essential to the permanent health of all fruit trees, and I know of no way to secure it, when there are annual crops of fruit, except by the stimulus of cultivation, assisted when necessary by a judicious thinning of the fruit, or, what is still better, of the fruit buds. I regard the recommendation to sow grass in orchards of any kind as pernicious to the last degree, and insist upon thorough cultivation, especially in the early part of each season, as essential to permanent health and productiveness.

DIFFICULTIES OF PEAR-GROWING.

But, after all, the want of success in pear-growing has not been the result of a neglect of proper culture so much as of other and entirely different causes. The first of these to which I shall call your attention, has been the disposition to plant too many varieties. The novice in pear culture looks through the catalogues of the nursery-man, or the descriptions in Downing or Barry, and the desire seizes him to plant a few, at least, of every kind that he finds well spoken of. He makes up his list, and he is fortunate if he is able to close it with less than thirty to fifty varieties. At the end of ten years, he will find that ninety per cent. of the fruit he has gathered has come from not more than five or six varieties. He will find, also, that many kinds have disappeared from the orchard, and the places that knew them know them no more, and he *may* wish that several other sorts had followed their example. In one of his beautiful and instructive rural essays, Mr. A. J. Downing gives an account of a pleasant dream that visited him as he swooned himself to sleep in a hammock stretched in his garden on a warm summer evening. Pomona, goddess of fruits, and Flora, goddess of flowers, called upon him and entered into conversation with him. Part of what Pomona said to him is so appropriate to the point under consideration that I cannot, long as it is, forbear quoting it:

"Pomona," says the narrative, "opened the discourse by a few graceful remarks, touching the gratification it gave them that the moderns, down to the present generation, had piously recognized her guardian rights and those of her sister Flora, even while those of many of the other Olympians, such as Jupiter, Pau, Vulcan, and the like, were nearly forgotten. The wonderful fondness for flowers and fruits, growing up in the western world, had, she declared, not escaped her eye, and it received her warmest approbation. She said something that we do not quite remember, in the style of that good old phrase of 'making the wilderness blossom like the rose,' and declared that Flora intended to festoon every cottage in America with double Michigan roses, Wistarias and sweet scented vines. For her own part, she said her people were busy enough in their invisible superintendence of the orchard planting now going on at such a gigantic rate in America, especially in the western States. Such was the fever, in some of those districts, to get large plantations of fruit, that she could not, for the life of her, induce men to pause long enough to select their ground or the proper sorts of fruit to be planted. As a last resort, to keep them a little in check, she was obliged against her better feelings, to allow the blight to cut off part of an orchard now and then. Otherwise the whole country would be filled up with poor miserable odds and ends from Europe—Buerris and Bergamots, with more sound in their French names than flavor under their skins."

These last words, we confess, startled us so much that we opened our eyes rather widely, and called upon the name of Dr. Van Mons, the great Belgian, spoke of the gratitude of the pomological world, etc. To our surprise, Pomona declared that she had her doubts about the Belgian professor—she said he was a very crotchety man, and although he had devoted his life to her service, yet he had such strange whims and caprices about *improving* fruits by a regular system of degeneration, or running them out, that she could make nothing of him. "Depend upon it," she said, "many of his sorts are worthless—most of them have sickly constitutions, and," she added, with some emphasis, snapping her fingers as she spoke, "I would not give one sound, healthy, seedling pear, springing up under natural culture, in your American soil, for all that Dr. Van Mons ever raised." (We beg our readers to understand that these were Pomona's words, not ours.) She gave us, after this, very special charge to impress it upon her devotees in the United States, not to be too much smitten with the love of new names and great collections. It gave her more satisfaction to see the orchard and fruit room of one of her liege subjects teeming with the abundance of the few sorts of real golden merit, than to see whole acres of new varieties that have no other merit than novelty. She said, too, that "it was amazing how this passion for collecting fruits—a genuine monomania—grew upon a poor mortal when he was once attacked by it; so that, indeed, if he could not add, every season, at least fifty new sorts from the Continent, with some such outlandish names (which she said she would never recognize,) as *Buerre bleu d'ete nouveau de Scrowsiwowsy*, etc., he would positively hang himself in a fit of the blues."

Most planters of orchards have been affected with this monomania to a greater or less extent, and it has had its legitimate results in meagre crops and sickly and dying trees.

Another principal cause of the failures in pear growing is the pear tree blight—a disease about which much has been said and written, and for which many causes have been assigned and many remedies proposed. The diagnosis of the disease given by Mr. Downing in his "Fruits and Fruit Trees of America," has been generally received as correct and complete, but recently a new theory has been started, ascribing the malady to the attacks of *fungi*. Mr. Downing says: "To explain the nature of this disease, we must first premise that, in every tree, there are two currents of sap carried on: 1st, the upward current of sap which rises through the outer wood, (or *alburnum*) to be digested by the leaves; 2d, the downward current, which descends through the inner bark, (or *liber*) forming a deposit of new wood on its passage down.

"Now, let us suppose, anterior to a blight season, a very sudden and early winter, succeeding a damp and warm autumn. The summer having been dry, the growth of trees was completed early; but this excess of dampness in autumn, forces the trees into a vigorous second growth, which continues late. While the sap vessels are still filled with thin fluids, a sharp and sudden freezing takes place, or is, perhaps, repeated several times, followed in the day time, by bright sun. The descending current of sap becomes thick and clammy, so as to descend with difficulty; it chokes up the sap-vessels, freezes and thaws again, loses its vitality, and becomes dark and discolored, and, in some cases, so poisonous as to destroy the leaves of other trees when applied to them. Here, along the inner bark, it lodges, and remains in a thick, sticky state, all winter. If it happens to flow down, till it meets with any obstruction, and remains in any quantity, it freezes again beneath the bark, ruptures and destroys the sap-vessels, and the bark and some of the wood beneath it shrivels and dies."

It is not necessary to quote what is said further as to the outward manifestations of the disease in the bark and foliage. You are all, probably, familiar with them. What I have quoted embraces, very briefly and concisely, an explanation of the manner in which the disease has its origin. It leaves out of view, however, the action of fungoid growths which, as recent investigations show, are present in the further progress of the malady. Probably there would be no blight if our trees could always go into the winter with perfectly ripened wood, and probably, if there were no fungus they would, usually, recover from the effect of the freezing of the sap. The peach tree may freeze until the sap is as black as ink, and yet live and flourish—nature, under cover of the strong, protecting bark, depositing layers of new healthy wood over the diseased surface of the *alburnum.* But the bark of the cultivated pear is exceedingly delicate, its vessels easily ruptured. Now, suppose the conditions indicated in the extract I have quoted. A rupture of the bark, however minute, occurs, through which the disorganized sap oozes out. Upon this the ever present sporules of those "scavengers of nature," the cryptogams, fasten, vegetate and multiply, spreading and pushing their way from the diseased into the healthy tissue, until the affected branch is girdled and destroyed; or, if the trunk is the point of attack, the tree itself dies outright.

Now, if the disease originates as we have supposed, the remedy, or rather the preventive indicated, is such a course of treatment as will secure perfectly ripened wood and prevent an autumnal growth. As we cannot control the seasons, we must so manage as to adapt the trees to their vicissitudes. To accomplish this, different methods have been recommended and practiced. We are told to apply lime and ashes, well worked into the soil, as tending to produce short jointed, well matured wood; and the advice is no doubt good, but we have seen abundance of blight in the most highly calcareous soils. Others say, cultivate so as to keep your trees growing to so late a period that there will be just time enough for the wood to ripen before cold weather; but, practically, this cannot be done with any great degree of certainty. Uncovering the roots, whenever we observe a tendency to late growth, is also advised, and finally, root-pruning. This last has been recommended, as a final resort, by Downing, Field and others; but so far as I know, the first to insist upon and practice it systematically, was our distinguished State Horticulturist, Dr. Hull. In a region where whole orchards have perished with blight, he has found it a complete protection; and, in our rich western soils and changeable climate, it is probably the only sure preventive. The philosophy upon which the practice is founded is sound. A root pruned tree will make no vernal growth in the fall. It will have enough to do to repair damages below ground without attempting anything above beyond its proper duty of ripening its fruit and making its normal growth of wood.

The usual objection to the plan is the labor and expense of digging trenches three feet deep around any large number of trees and repeating the process as often as once in every two years. This objection may probably be partly obviated by the use of sharp cutters drawn by horses, but if it can not, it is better to incur the expense of hand labor than to have no pears. The day of successful fruit growing without labor has gone by in this country forever. Another objection to the general adoption of the practice occurs to me, to-wit: that root-pruning implies the necessity of the very highest culture—it implies judicious top-pruning as well, and careful thinning of the fruit buds; in a word, it implies a degree of care in the management of the trees that very few men will be willing to give them. Trees root-pruned every two years and otherwise left to take care of themselves, would very soon fruit themselves to death. Our orchards, instead of presenting an array of wide-spreading thrifty trees, would show us rows of miserable, stunted monkeys, their heads mere thickets of fruit spurs. For those who are not disposed to adopt this thorough system of management, there are certain palliatives that may be resorted to, in addition to those I have before noticed, such as cutting out and burning diseased branches, or shaving off the bark wherever the shriveled spots appear, or, as the last resort, digging up the tree and planting another, of a healthier sort, in its place.

Leaf-blight is another disease to which some varieties of pears are subject. It consists in a premature dropping of the foliage, very often, while the fruit is still upon the trees and unripe. It is not fatal in itself, but often leads to the form of blight we have already discussed. Trees thus early denuded of their leaves almost always, unless the autumn is very dry, begin to grow again in the latter part of the season, and consequently enter the winter with their sap vessels gorged with unelaborated, crude sap. The proximate cause of the malady is fungoid growths upon the leaves, but there is doubtless some remote cause in the condition of the trees themselves. Probably, as it attacks certain varieties only, whilst others are wholly exempt, it depends upon some constitutional taint. Possibly it is a modification of the other form of blight, the vitiated sap entering the circulation and inviting the attack of fungi in the leaf instead of the bark. The best treatment of the disease that I can think of is to reject entirely all varieties known to be subject to it. Fortunately, we can do very well without them, however much we might like to retain such noble fruits as the Flemish Beauty, Buerre Diel and the Louise Bonne de Jersey.

DWARFS.

Perhaps I should not close without a few words in relation to dwarf trees. According to my own experience, they possess but a single advantage, that of producing fruit at an early age. They are not, as has been often claimed, less subject to blight than trees on the pear stock. In my own orchard, much the largest proportion of trees that have been affected by this disease were wholly on quince roots. For orchards the dwarfs are objectionable. They require high culture to make them permanently productive, and as it is necessary to prevent their being prostrated by the winds, to train them with low heads, this cannot be given with the plow. For the garden, where there is room for but few trees, they are desirable. They grow rapidly and come to a bearing size as well as a bearing age much earlier than standards, and when properly trained and otherwise well managed, nothing can be more beautiful and satisfactory.

In shallow soils, not well suited to the pear on its own roots, quince-rooted trees may be often made to succeed. The quince, unlike the pear, keeps its roots near the surface, and may live and thrive in situations that might prove fatal to the latter.

Dwarf trees often change to standards after they have come into bearing, by sending out roots above the junction with the quince, thus giving the cultivator the benefit of early fruitfulness and also the permanence of the pear root. This result can be artificially produced by removing the earth and by an upward cut with a sharp knife, forming a lip, in the pear wood, whenever a root is desired. This lip should be kept open by the insertion of a piece of glass or some other substance, and the earth replaced and firmly pressed down. I have seen the happiest result from this rooting from the pear, in trees that had almost ceased to grow on the quince, and especially in a row of Bartletts, which seemed exhausted, as is generally the case with this variety, by their first crop, but which are now as thrifty and vigorous as trees need to be.

Mr. President: Pear culture in the west is yet in its infancy. Let us hope that, with a few years more of experience and close observation, we may be able to understand it more perfectly—that we may learn the varieties that are adapted to our several localities, and have the courage to weed out and reject all others.

DISCUSSION.

MITCHELL, of Centralia—When should bark be cut for blight?

BROWN—Whenever you see it.

COOPER—When would you "lip" the dwarf trees to get them upon their own roots?

BROWN—In spring, or even as late as midsummer.

REEDER, of Centralia—Several years ago I put out dwarf trees on a side hill, near Cincinnati. On the hill side below were stones laid up; the earth filled up against these about the tree trunks, and they became good standards.

HELM—What are the five best sorts?

BROWN—Bloodgood, Bartlett, Howell (coming very near with the Bartlett), Seckel and Duchess d'Angouleme, which is the only pear I would plant as a dwarf.

LAWRENCE—I don't know much about it. Buffum is a good pear, but not profitable. I had the Seckel 2½ inches in diameter during the past year, but I don't expect to keep it up. Bloodgood comes three or four weeks before the Bartlett (gathered from 4th to 7th July, at Centralia), Duchess d'Angouleme does not vary much from year to year. It is never very good.

Pullen—Do you prune much?

Brown—Very little.

Pullen—Root pruning three feet deep is impracticable here. The branch roots do not go to that depth, I think.

Brown—Cutting off all the side roots is sufficient, even if only eighteen inches deep.

Cooper—Root pruning is done partly to prevent late growth. Would not early cultivation do?

Brown—It might the past season; but it is only occasionally that we have such an one. The trees generally go to rest early from drouth, and are started again by warmth aud moisture.

Honton—What would you think of keeping up cultivation?

Brown—I knew a gentleman in Kentucky to do so, with good success.

Cooper—I should think cultivation might answer; and then mulch.

Brown—I would not advise root-pruning, unless necessary. I shall this year root-prune some varieties that are liable to blight.

Wilgus, of Richview—What is the remedy for leaf-blight.

Brown—I do not know. Hull and Hyde, of Alton, have tried root-pruning with success. The cost with Hyde is ten cents a tree.

Eldridge, of Centralia—I have had some experience with dwarf and standard trees of eight or ten years of age. It is not more than two feet down to all the roots. I can root-prune thirty a day. The trees a year ago last fall showed symptoms of blight. I root-pruned them, and they are all right the past year. I don't root-prune when the leaves are on. I pruned about one hundred trees; dug trenches to get at the roots.

Flagg—Dr. Hull's theory of root-pruning, which I am desired to restate, is this: He observed the fact that trees that ripened their wood early like the Seckel, did not blight, and that those that made late growths, like the Madeleine, were most liable to blight. Hence he inferred that if the late growing trees could be forced to rest, they would not blight, and undertook to do so by root-pruning. He opens a trench around the tree, leaving the lateral roots, say two feet long for a tree four inches in diameter, and goes as deep as the lateral roots are found. Thus far he has found it a preventive; and Mr. Hyde, Dr. Haskell, and others, of Alton, who have tried it, speak very favorably of it. Mr. Hyde says it checked blight that was actually in progress. Dr. Hull also claims that root-pruning induces fruitfulness, which would be a natural result, and insures larger and finer colored fruit.

BROWN—What is the experience of pear growers with trees in grass, as to its preventing leaf-blight?

PULLEN—I have had a few trees in sod for five or six years. I cultivated and manured them at first, and they blighted. I cut cff the blighted parts. I quit cultivating them, and have had no blight, and regular and good fruit ever since.

FLETCHER, of Centralia—I have a dozen dwarf tress in grass, doing well.

Adjourned.

THURSDAY MORNING Jan. 26—9 o'clock.

PROF. S. W. SHATTUCK, of the University, repeated his lecture on Drainage, already given, which was followed by this

DISCUSSION.

HULL, of Alton—In visiting orchards at St. Josephs, Michigan, I found them cleaning out their drains laid among the trees. The roots would get through spaces not thicker than a knife-blade. The drains were laid from two and a half to four feet deep, and had been down but a few years. The soil is generally sand, with water not far from the surface.

FLAGG—How would it be in this soil at Centralia?

HULL—I am of the opinion that men were there, that the roots were hunting, and *would* hunt air chambers.

PERRINE, of Centralia—My orchard is very thrifty, and I think there is no doubt of the utility of drainage here. In my orchard, where the main drain was laid in low ground, I find the ground this morning in good condition to plow. The hard pan is more porous than I expected to find it.

PULLEN—Is the hard pan hard to get through?

PERRINE—It was very hard digging in spring—hard and dry. I did not use any pick, but the common ditching spade, six inches wide, and sixteen long in the blade. I put the hard pan back on the tile. One main has been laid three years. I am troubled somewhat by the soil washing alongside of the drain. I have to go along and fill up at such places. I prefer to level by the water in the ditch; we do so in Indiana. I have tried the level, but don't like it; I prefer to have the ditches dug their full length, and then level them myself and lay the tile. I see no special advantage of the round over the sole tile. I would not use the small tile. In Indiana they use nothing less than the three inch; it is more easily laid.

WILGUS—I have had a little experience under Mr. Perrine's teaching. The hard pan is at different depths at Richview. If we could lay our drains above it, it would be better. But it is at different depths, and undulating. It is a serious work to get through it. I have found the surface saturated, and the hard pan below it dry. I have had to use the pick sometimes. The hard pan is from two to six inches in depth. Below it the clay is soft. I think this may be the origin of Mr. Perrine's trouble with washing. I find winter affects the hard pan a good deal, if we throw it on the surface. I think it will improve by drainage, year by year. I have laid drains twenty-four feet apart through my pear orchard (planted 12x12), in the alternate rows. The water disappears from the surface immediately over the drains, and a day later between. The tiles have been laid two years, and the orchard is ten years old.

BRUNTON—There are places here where we have six or seven feet of hard pan, and there is hardly a farm but has it five feet thick somewhere. I have no faith in the practicability of profitable drainage. Drains along branches are good. There is a deeper soil there. But to show how impervious the hard pan is, I have a table of earth in my cellar, with a hole scooped in the top with a three-inch margin. If I fill it full of water it won't leak out in three weeks. [Laughter and applause.]

HULL—I am surprised to hear the gentleman say that at Kirkwood, over in Missouri, the subsoil is so hard that they make cisterns without bricking them up; but drainage makes it all right. E. R. Mason, of Webster, has one of the finest vineyards in Missouri on such ground under-drained.

COOPER—I am surprised to hear such terrible accounts of the soil here. I have no apprehensions from my own observation or experience. I spent five years here visiting farmers for the Illinois Central Railway company, and ascertained a good deal about their successes and failures. Farmers fail and succeed like other men. Where a farmer has succeeded, he got up early and worked hard. Men have got rich here by farming, in eight years, by main strength and awkwardness, without tile drains. I have planted my own trees, and had no trouble. I believe they are handsome trees. I dug a cellar and put the hard pan and clay right about the house. In the spring I found it materially changed. I did not have surface soil enough to cover all of it, but I graded and sodded it, and the grass has grown well. The difficulty here is drouth, and I think a proper surface cultivation remedies that. I think drains on top of the hard pan will not accomplish what we want. I am encouraged by Mr. Perrine's experience.

Brunton—I did some draining in Indiana in 1834, with slabs, at the depth of twenty-two inches, and got good land. There are six acres of my land that we plowed and subsoiled twenty inches deep, with two teams, of four yokes each, of oxen. One mound of hard pan, near the creek, we managed to break a foot deep. I never could get into it more than an inch since.

Adjourned.

Thursday Afternoon—2 o'clock.

C. W. Murtfeldt, Secretary of the Missouri Board of Agriculture, repeated his lecture on "Dairying," which the ladies of Centralia turned out in force to hear. The discussion which followed was unimportant.

Adjourned.

Thursday Evening—7 o'clock.

Dr. E. S. Hull, of Alton, State Horticulturist, talked upon Pruning, commencing, however, with some remarks on the Curculio.

Formerly, and for many years, the curculio gave me no trouble. When they began to do so, and I commenced jarring trees, I at first caught them with no difficulty in a few runs. Now I find it necessary to run the machine for a long period, and then often without entire success. I was puzzled to know where so many curculios came from. I supposed it might be from the accumulated leaves and rubbish in the woods, and burnt them over, but without success. I found, finally, that they seemed to come in upon me when the wind blew from my orchard over neighboring orchards, where the curculio was not caught. They seemed to scent their way. Hence, when they were abundant, and the temperature was high in the middle of the day, they would come in and do their mischief, and could not be caught before they did it. Here you will soon be in the same condition. You are in the condition to not have a sound peach the coming year. There have been but few curculios the past year, but they were good for at least fifty cuts each; and many of the grubs have escaped, as they come out, I believe, in the night time. To remedy this, the curculio must be caught. Low-headed trees must be made higher. I have raised the heads of four-year old trees by pruning. The curculio catcher will answer a very good purpose, as long as your orchard is isolated; but where there are adjoining orchards, they will come in on you. This necessitates combined action on the part of neighboring fruit-growers. Yet at South Pass we found not more than twenty-five out of one hundred and fifty fruit-growers willing to combine, although combined action would destroy the insects in four or five days. They are on the trees ten or fifteen days before they lay their eggs, and are generally caught the first time. They do not fly until the thermometer is above 70 degrees.

Over in Missouri, on the Iron Mountain railroad, last year, the peaches were nearly all destroyed, although it was supposed that thirty commission houses would be needed to dispose of them.

[In answer to questions.]

I think a cuculio catcher can be made to run to a trunk fifteen inches high.

I think Missouri may have been supplied by curculios from Du Quoin, or other points over here.

I think the plum curculio *may* breed in the hickory.

The plum curculio don't like the wild plums much. I would out the wild plum trees down, if troublesome.

PRUNING.

When you plant a tree, cut off the limbs up to where you want to form the head, and above that point leave them, or spur-prune them. Pinoh the side branches that put out from the trunk at eight or ten inches. Cut them back in the fall to one bud. Pinch back the growth from this bud the second year, and give the same treatment in the third. This is to develop the trunk. Then cut these side branches close back to the trunk, and thereafter keep it clean. I have thus the *lowest* headed trees in Illinois. The limbs grow *down* from the lower branches. The common low-headed trees do not shade the trunk much, but by having the limbs come out horizontally, they do. I have not paid so much attention to this as I should; but my later trees are all right. They do not split down.

To Make Trees Productive.—No fruit buds are made until the elongation is stopped. Then the fruit buds are formed in the axils of the leaves. If the growth is late, no fruit buds are formed. If many small limbs are together, the buds are starved, to supply the ends of the shoots.

I don't want more than a peach to a twig, nor more than forty-eight peaches to a box. Allowing six boxes to a tree, this makes two hundred and eighty-eight peaches to a tree. Now, to prune off and reduce to this number would cause an immense wood-growth. Hence I root-prune, by means of a plow with a sharp coulter.

Root-pruning obviates the extreme length of naked roots, which is a heavy tax upon the strength of the tree. It can be done any time after the fall of the leaf. You don't have to go deep with the peach. Year before last I did not get deep enough, and my peaches rotted.

Dr. Winans and others have been experimenting at St. Josephs, to see if this root-pruning cannot all be done by horse-power, and with good prospects of success.

Root pruning makes fair fruit. It is the way to compete with California.

As to the pear and cherry, I disbud, to thin the fruit. I let the pear shoots grow six inches.

We must cultivate well, say in May, when the weeds grow; in June, before the fruit hangs heavy, and in the fall.

I would root-prune the apple once in about five years. The pear I would root-prune early and severely.

Dr. Winans found root-pruning the Delaware grape made two vines bear as much as eighteen not so pruned. I hope it may remedy blight, mildew and rot. Dr. Winans is trying it largely.

HONTON—I think we may over-prune. I think diseases of the vine may result from that and from over propagation. We must catch the curculio. My orchard is low-headed.

Mr. COOPER offered the following resolution, which was unanimously adopted:

Resolved, That we have been highly entertained and instructed by the interesting course of lectures which have just closed; and we herewith tender our thanks to the State Industrial University, and to the lecturers who have entertained us on behalf of the University. And, believing such a course of lectures, given annually, will be productive of great good, we hope they will be continued.

Adjourned *sine die*.

ROCKFORD COURSE.

The third course of Industrial University Lectures was held at the Anchor Mission Hall, in the city of Rockford, commencing February 21st, 1870, in the evening.

Judge C. I. HORSMAN was chosen President of the Convention, and E. H. GRIGGS, of the Rockford Register, its Secretary.

The Hon. ANSON S. MILLER delivered the following introductory address:

Assembled as we are this evening for opening the Agricultural discussions instituted by the Illinois Industrial University at Rockford, for Northern Illinois, we may well congratulate ourselves on the presence of the Regent and officers of the institution, and other distinguished advocates of scientific husbandry from various parts of the State. We have the great pleasure of welcoming them, one and all, to this young city, known for its horticultural adornments and its extensive manufactures of industrial implements, amounting to millions of dollars annually.

Illinois has the honor of originating the first movement in Congress for a law donating to all the States of the Union public lands for the endowment of Industrial Universities.

Our Legislature, in 1853, unanimously requested this through the Senators and Representatives of Illinois, and in 1862 the desired law was passed by Congress, and duly approved by President Lincoln. Under this law providing for Agricultural Colleges the State of Illinois received land scrip for 480,000 acres of the National domain.

The Illinois Industrial University was incorporated by an act of the Legislature approved Feb. 28th, 1867, and was subsequently located at Champaign, and in addition to the grant of United States lands was further enriched by the donation of Champaign county, in real estate and bonds, valued at over $406,000. Such is the *endowment*.

The main *purpose* of the University, as expressed in the law of Congress, is "THE LIBERAL AND PRACTICAL EDUCATION OF THE INDUSTRIAL CLASSES, IN the several pursuits and professions in life."

In order to do this effectually, the statute of incorporation requires the University "to teach in the most thorough manner such branches of learning as are related to agriculture and the mechanic arts, and military tactics, without excluding other scientific and classical studies."

These words, recited from the laws, are happily and forcibly expressive of the *purpose* for which the University was founded; and to accomplish this, studies have been judiciously arranged, exercises in the various departments appointed, and lectures provided for the students, the institution having been opened for their reception in March, 1868.

And it gives me pleasure here to say, that the University is now operating alike creditably to its faculty and board of trustees, and honorably to the great and rising State of which it is already a distinguished ornament.

The establishment of institutions of learning for the promotion of the useful arts, and the elevation and happiness of the industrial classes, marks our age as a new and noble era in the progress of society to a higher civilization. Hitherto the advantages of these institutions have been almost exclusively confined on the votaries of science and literature, the candidates for professional life, and the favorites of wealth and fashion, while the great body of the producers, they who fed and clothed the world, cultivated its fields, built its cities, sustained its commerce by sea and land, invented and constructed its machinery, and tasked the elements with human labors, have been neglected and overlooked in the measures for collegiate instruction.

Throughout our country and the civilized world, there is an upward and onward movement for the thorough education of those preparing for the various departments of useful business. Our own State is awake and active in this cause of improvement, the union of Science and Industry, the grand purpose for which the University was founded.

The speaker then urged the importance of this union of science and industry in all the useful arts, and illustrated his subject by references to Chemistry, Geology, Botany, and Vegetable Physiology, as applicable to the soil, the atmosphere, and the growth of plants. The elementary snbstances and constituents of the earth, air, and their agency in agricultural products, were carefully considered by the speaker, who affirmed that husbandry held more important relations with the natural sciences than any other industrial calling. In comparing the properties of the soil, the substances, organic and inorganic, with those of the atmosphere, the oxygen, nitrogen, hydrogen, and carbon, he thought the agency of the latter not inferior to the former in the production of flowers and fruits. Even intelligent people little understand the influence of the chemical forces of the air on vegetation. They wondered how beautiful flowers and luscious fruits could be grown from *dirt;* the lovely violet, the perfumed hyacinth, the painted tulip, the delicate lilly, and the fragrant rose; or the delicious strawberry, the rich pine apple, the juicy melon, the pulpy grape, the golden orange, the tempting apple, the melting pear, and the blushing peach; all these were much indebted to the sweet influences of the atmosphere, for their charming qualities; all the elements of the ethereal ocean, and the rains, the dews, and the sunlight contributed bountifully to their perfection. Plants like animals, it must be remembered, were living organizations, and required suitable food for their growth and development. This they obtained from the soil and air through *chemical action,* stimulated by light, and heat and moisture. The earth seemed to be a vast laboratory, the art of culture a *chemical* one, and the intelligent farmer the chemist, whose science enabled him to augment the powers of nature. The cultivation of the soil, the operations of the dairy, and the feeding of animals, were all dependent for their success on chemical principles.

He said the animal, vegetable, and mineral kingdoms held relations intimate and wonderful, and that these could not be well understood but through the medium of science, which he defined to be philosophical knowledge. Elementary truth founded on well arranged and established principles, on which results could be predicated with certainty. He said that *knowledge* was not necessarily *science*, neither were facts principles. Agriculture was progressing towards a science, but as yet had more facts and observations than well settled scientific principles. He spoke at some length of the hindrances and helps, and hopes of agriculture, and said that past progress gave ample assurance of future advancement. Science enlightening industry, would lead to agricultural abundance and social eminence.

Washington, who preferred the plow to the sceptre, and sheathed his sword in a sheaf of the harvest, said in his message to Congress, that an agricultural establishment by the government would prove "*a very cheap instrument of immense national benefit.*"

The old notion that a farmer needs no education is exploded. If a young man was to be qualified for the pulpit, the bar, or the profession of medicine, he must first receive a good, *general* education, and then a *special* one, while the young farmer had been neglected in both; a degredation which had caused many a farmer's son to leave his home for a business which would secure him a higher intellectual education. Increasing educational facilities he hoped would make such a course unnecessary.

Farmers should send their sons to the University, where with suitable studies, experimental farms, model gardens, and thousand acre grounds, they might learn to unite science and industry, and enjoy the best opportunities for improvement.

The remainder of the evening was occupied by Dr. Gregory with his lecture on ornamentation of grounds.

Among the persons present and participating in discussions were the following:

G. B. Alverson, Rockford; John Andrews, Rockford; Elmer Baldwin, Farm Ridge; Asa Baley, Beaconwood; E. W. Blaisdell, Jr., Rockford; John Cahoon, Belvidere; O. S. Cahoon, Belvidere; Samuel Church, Selden M. Church, O. J. Cummings, Sherman Cummings, Saml. Cunningham, Edward Dorr, Wm. Durno, John Fitch, Charles Fletcher, Rockford; D. W. Gates, Belvidere; E. H. Griggs, Jas. Hinckley, E. Hobart, G. O. Holmes, C. I. Horsman, H. P. Kimball, Rockford; J. G. Knapp, Madison, Wis.; J. J. Lake, Rockford; L. W. Lawrence, Belvidere; Dudley Lyford, Roscoe; A. Martin, Maurice Martin, M. Martin, Reuben Martin, J. B. Miles, A. S. Miller, G. C. Miller, Rockford;

A. F. Moss, Belvidere; A. H. H. Perkins, Spooner Ruggles, J. W. Selden, J. S. Shearman, R. Shepherd, Horatio Stone, Levi Tallu, Rockford; L. Teeple, Belvidere; A. H. Vanwic, John Webb, John Wilcox, Rockford; G. W. Wilcox, Chicago; F. E. Willoughby, S. E. Withers, J. S. Wood, Rockford.

TUESDAY MORNING, *February* 22—9 o'clock.

Mr. SHAW, the morning lecturer, not having yet arrived, Mr. O. B. GALUSHA, of Morris, Secretary of the State Horticultural Society, was called upon to open a discussion upon the soils of Northern Illinois, in reference to horticulture, which he proceeded to do as follows:

For horticulture, soils should contain a moderate amount of humus and be well underdrained. Clay loam is about the best. Some think a predomination of clay the best; but from this I dissent. There is considerable variation of soil in Northern Illinois; but generally we have here all the needful ingredients for tree growth. Generally, here, we have clay above limestone rock—a soil particularly adapted to apples, pears and small fruits.

KNAPP, of Wisconsin—I am inclined to disagree with the gentleman who has just spoken. I never saw a quince in Wisconsin, and I believe our soils are naturally lacking in some ingredients. Every tree requires certain mineral constituents. Humus and soluble carbon are not sufficient. Salt, potash and phosphorus must be present. Have we got these? Up yonder (pointing to the map) is Lake Superior, in granitic rock. On the north of it, the mountains are 2000 feet high. On the west, or Wisconsin side, nearly as high. That country has been the longest out of water of any yet discovered. The elements have worked upon it the longest. Still south is the Wisconsin river, up which, and passing south of Madison, is the Pottsdam sandstone, 700 to 1500 feet thick, composed of the debris of the granite quartz, feldspar and mica. Feldspar has as much potash as ashes, and decomposes readily. The water took it up and carried it off. Then the glacial period came and washed down over this country. There is a boundary, as of a lake, lined with boulders, running along the Wisconsin river and west of Madison, and southward into the counties of Winnebago and McHenry. I think from this long exposure, potash may be deficient. We want wood fires, and the ashes from them. We want the duty off of salt and to use that. We need to save bones and apply them.

I spent four years in New Mexico, where an efflorescence of salt whitens the ground when it is dry. The grapes on that soil were very fine, and I conclude we want salt for grapes. Quince growers say we want salt for quinces.

I know some discredit has been thrown on the necessity of chemical constituents. Experiments have been made to show that wheat, etc., could be grown without silica. But they did not prove it could be grown profitably.

To make good apples, look at the soil, and then apply what is needed. Clay has a good deal of potash. It needs to be applied to sandy soils. Phosphates are needed for all. We find them where there are remains of fossil fishes, etc.

There was plenty of potash in our soils when they were first plowed. Now there is a deficiency. The burning of straw has been a great mischief in Wisconsin, and I suppose here. You ship your grain, and its phosphorus to the east. You rob your soil and send it by car loads to Chicago. It would be better to feed it to the hogs even.

Bones should be gathered up on the farm. Put two inches of fresh ashes in the bottom of a hogshead or box, then a layer of bones, then another of ashes, and so on. Wet the mass, particularly with chamber lye, and keep it just wet enough not to leach, and do not let it freeze, and keep it in this condition six months. Then mix it, put in a little copperas and perhaps pyrites; dry it with plaster and sow it on your ground.

Quinces on the Rio Grande are good to eat—better than the Pennock. Have seen the trees five to fifteen feet high, about as large around as my arm, and thirty or forty years old. The pear grows finely along side of it, and as nice as those from California. The apple is free from defects where it has water enough.

Galusha—I want testimony as to causes of failure of the pear in the north.

Shearman, of Rockford—I demur to the allegation. I never saw finer pears than I have seen grown in some instances in Northern Illinois, on the clay formation, among broken rock, etc. When the winters are not more than 15° or 16° below zero, I believe they ought to do well. They can endure even 30° below zero. There have been many failures in frtiit growing, but where the varieties have been hardy ones, we have had success both here and in Wisconsin.

KNAPP—I do not wish to be misunderstood. Mr. Shearman would plant on clay. That is what I would do. But it won't do on sand where the black oak dwindles to a shrub fifteen feet high. Along the lake shore and along Lake Winnebago, where the clay is, we can grow good pears.

EDWARDS—I have had twenty-four years experience in Bureau county. The clay knolls are the best with us for pears. The winter of 1855-'6 killed a large number of varieties with me. I gave them up, but afterwards found that varieties that did escape, and had protection from being amongst evergreens, succeeded as well as apples. I have been thus encouraged to plant a good many. Evergreens operate to prevent the full effect of sudden and severe changes. Trees among evergreens escape in blossoming time, when outside they do not. Evergreens protect apples from blowing off as much as they otherwise would, and we can cultivate tender varieties, such as the Rambo, among evergreens.

GALUSHA—One great difficulty is the extremes of heat and cold, and needs study. Fungoid growths are scavengers, and not evils *per se*, but we must avoid the conditions of fungoid growth.

WELDON, of Rockford—Cannot climatic changes be partly protected against by deeper planting in good soil? I find it so.

KIMBALL, of Rockford—After the cold winter of 1855-'6, in digging a cellar, I buried some pear trees six feet deep. One or two of the trees grew up, and have never blighted since.

HORSMAN—I set out about the first pears in this county (in the oak barrens). They grew well and bore well for many years, but finally blighted. I have since got dwarf trees, but they bear a crop or two and then die.

PENFIELD—My trees have disappeared a good deal in the same way.

KNAPP—We seldom find the Quercus coccinea, or black oak, over 50 years old. One year, as in 1867, it makes a good growth. The next it dies. The same cause that kills it, kills the pear tree. In the park at Madison it shed its leaves in October, and died the following summer after a partial development.

GALUSHA—Does Judge Knapp think blight arises from that cause?

KNAPP—I think that starvation is a partial cause. Protection by mulch has succeeded in some cases. Water was wanted.

FITCH, of Rockford—Mulching I have found very good. I planted 30 years ago Rhode Island Greening, Baldwin, etc. Got fine apples, but short-lived trees. Small grain is one of the worst things in an orchard. A young tree will not thrive well after an old one. [But, in Madison county, I have about 300 apple trees planted after trees that had stood 40 years, growing well. Large holes were dug, and the limbs of the old tree burnt in the hole. *Secretary.*] Grass hurts an orchard in my experience.

PROF. STUART—I was surprised to find a large quantity of manganese in the ash of oak leaves, also of lime. The ash of apple tree leaves had no manganese, but a large amount of lime and potash, and probably of soda. I am inclined to think that potash, soda, phosphorus and silicic acid are necessary ingredients. We want all the ingredients, and also moisture and heat. These organic elements are wanted. We must be careful in our conclusions. There are conditions and causes not well understood, just as there are in Texas fever and hog cholera.

MOSS, of Belvidere—I believe in mulching, whether with the plow, cultivator, leaves or straw. The first is best in wet seasons, the latter in dry. The drier the season, the more and deeper the sun draws. In 1858 and 1859 we had excessive drouths. I expected good crops in 1860, and we had them, because the sun had drawn deeper into the earth and drawn up nutriment. The trees about my residence were planted from the brush after 1836. They are now thirty years old, and ten inches through. The last five or six years they have begun to die. They die in June and July. I suppose it is because they came from old roots.

DR. GREGORY—I think a borer may have been at work.

FLAGG—Drouth has been said to be useful simply as effecting underdrainage, particularly for the following season.

KNAPP—I think a good deal of the theory of the sun drawing up salts. In New Mexico, after rain falls, efflorescence took place on the surface, and went up the spires of grass.

STUART—Were there crystals on the leaves?

KNAPP—On the whole plant. Cattle in that region refused salt.

Adjourned.

TUESDAY AFTERNOON—2 P. M.

PROF. STUART repeated his lecture on the chemical constituents of soils, after which JAS. SHAW, of Mt. Carroll, delivered an address on the Soils of Northern Illinois. As it was in substance nearly the same as delivered by Mr. Shaw before the State Horticultural Society, the latter, which was revised by Mr. Shaw, is mainly inserted here.

THE SOILS OF NORTHERN ILLINOIS.

I propose to occupy your attention a short time in discussing the soils of Northern Illinois, and the dynamical forces which have originated, transported, and mingled these soils, clays, and superincumbent masses covering the bed rocks.

I shall speak of that part of our State lying north of the old Silurian Beach, which crosses the State from a point near Hampton, on the Mississippi river, and passes eastward a few miles south of this place, bending up a little north of Morris, and thence passing on to the eastern line of the State, south of Chicago. The land north of this Silurian Beach was comparatively elevated table land at the time the coal deposits of the great coal basin lying south of this old beach were in process of formation. And there is evidence that over this comparatively elevated table land a great denudation has taken place. Some great force has worn off and swept away, from Southern Wisconsin and Northern Illinois, a large amount of material, which has been deposited over the face of the country south and west of that elevated region. It is estimated by Prof. Whitney, and other good geological authorities, that at least three hundred feet has been denuded and carried away in the region of the Illinois and Wisconsin mounds. These mounds—Scales Mound, the Blue Mounds, Terrapin Ridge, and the various elevated and island-like elevations left over the general level surface of that part of the State north of this old Silurian Beach—are monuments left standing when the rest of the formation was swept away. Any one with thoughtful mind, who stands upon their tops and looks over the surrounding country, or who examines the regular succession of outcrops up their sloping sides, cannot resist the conclusion that the general level of the whole country surrounding once corresponded with these highest points. As in reading a book we at once miss the pages which are torn out, so in examining these mounds, we at once miss whole leaves and parts of leaves in the Great Stone Book, which have been removed by the forces of which I shall presently speak. The Galena Limestone, the Cincinnati Group, and the Niagara Limestone, are the leaves, whose fragments yet remain to attest a time when each one of them in regular succession spread over the region now under discussion.

Against this Silurian Beach of which I have spoken, the coal measures are shingled, as it were, or deposited. At the place where we are now assembled, the old St. Peters sandstone shines like sugary masses along the river banks, and is elevated in fantastic shapes at Deer Park and Starved Rock, a little to the northeast; but at LaSalle, a few miles southwest, coal pits are sunk for hundreds of feet, and the black treasure of the earth found in the greatest abundance. At Sublette the Galena limestone is the bed rock nearest the surface; but at Princeton, towards the south and west, an artesian well, five hundred feet deep, still exhibits coal measure deposits. This shows that this old Silurian Beach, in the carboniferous ages of the world, presented the appearance of a somewhat abrupt range of hills across that part of the State.

Over that part of the country north of this Beach, the bed rocks are covered with superficial deposits from ten to fifty or one hundred feet in thickness, composed of clays, sands, loams, gravels, drift materials, and prairie soils of later growths. If this superincumbent mass should all be removed, leaving the naked bed rocks, the general face of the country as to levelness of appearance, would not vary much from the present state of things.

In classifying soils, we find several well marked varieties. The alluvial deposits of the river bottoms are latest in formation, and deserve a brief notice. In examining river deposits, the first thing worthy of consideration is the *flood bed.* Here the action of the river is that of currents, or flowing water. Where the current runs strong, sand will be thrown up in tow heads and sand banks and sand islands; in still places a fine black mud will be deposited; and this force will exert a sifting and assorting influence, and form mud flats and banks, and deposits of pure sand. The next action of the river will be over its *flood plain,* or that part of its bed covered only by the high water of the spring inundations. This is usually a low bottom, covered at the flood of the river with water, and producing a heavy crop of sour prairie grass later in the season. Over this the water usually rises and falls without much current action, and a yearly Nile-like detritus, or fine mud, is precipitated. The soil thus formed is fat, deep and sour, and is unfit for agricultural and horticultural purposes, until it has been built up beyond the influence of the river floods, and sweetened by the sun and atmospheric influences. Then it becomes a soil of inexhaustible richness and productiveness.

Stepping backwards in geological time, we next come to the old river terraces, which are simply the ancient flood-beds and flood-plains of these same rivers, at a time when they rolled an infinitely larger volume of water to the sea. Over these are the sandy soils and the rich, flat bottom lands, Nile-like in their inexhaustible productiveness. The Mississippi river, Rock river towards its mouth, and many of the smaller interior streams present these well known river phenomena, and make a notice of these alluvial deposits and this fluviatile action necessary in speaking of the soils of the State.

Receding backward in geological time, we come to the bluff formations, the oldest deposits in the Quaternary system. This is called the Loess, or Bluff formation. It is not extensively developed in Northern Illinois, but is present in most of the bluffs which skirt our streams. Deep rooting trees and vines find in it a congenial soil, and the best soil conditions of growth. Some of these Loess or partly Loess formations in our part of the State would be the best fruit and wine producing districts in the world if kindly Italian skies and genial atmospheric conditions smiled on the tops of the trees and vines. When the Mississippi and the Illinois rivers were lake-like in their expanses, and the waves beat up against their bluff shores, throwing up silt, oozy detritus, and frothy marls and sand, this bluff formation was deposited and accumulated It is composed of light cream colored clays, greenish marls, muddy sands and various combinations and mixtures of these; and, as already intimated it affords the best soil conditions in the State, or in the world, for the growth of the vine and all kinds of fruit trees. Even in our chilling and unfavorable climate, fruit and grapes of fine appearance and good quality are beginning to be produced in considerable abundance. At Galena, Morrison, Mount Carrol, and Sterling, I have seen small vineyards purple with their great crops of generous fruit, and orchards laden with the finest of our hardier apples; while the strawberry, raspberry, gooseberry, cherry, and other kindred fruits are raised in the greatest abundance, and of good quality.

Next to the Loess in succession are the regular soils and clayey deposits which cover the uplands or general prairie level of the country. And inasmuch as these are originally derived from the decomposition of the rocks, it will be well to call attention to the character of the bed rocks in this part of the State. If the dirt mantle covering these rocks, in that part of the State now under consideration, was all stripped off, the rocks then exposed would be found to belong to the Galena Limestone, Cincinnati Shales, and Niagara Limestone, coming to the surface in irregularly shaped patches. Now, the soil or earth mantle covering these rocks, notwithstanding the tremendous mixing to which they were subjected by the drift forces, to be spoken of hereafter, partake somewhat of the nature of the deposits lying immediately beneath it, and were in part derived from their decomposition. The evidences of this are strikingly manifest. The Galena Limestone and Niagara Limestone, although separated by an intervening formation, are strikingly alike in lithological character. Both are a coarse-grained, cream-colored and reddish magnesian limestone. When they decompose a rather coarse-grained soil is the resultant. In many places, if we dig from the surface to these rocks, we find a coarse, reddish, hard pan, or crumbly clay, resembling closely these rocks. As we sink into this clay we find pieces of "float" mineral and bits of the rock itself, the latter lying evidently *in situ*, unworn by water, and appearing like pieces of the original rocky mass, which was harder and had resisted the surrounding decay and rotting away of the rocky ledges. On the other hand, portions of the country underlaid by the Cincinnati Shales are covered by a close-grained, finely-comminuted, greenish, creamy-colored subsoil, closely resembling in texture and lithological character the shales from which it has evidently been derived. But these resemblances of the earthly mantle to the rocks lying under them are only found in certain localities in and around the "lead basin;" and only to that extent is the "lead basin" a "driftless region."

But the "Lead Basin" is not a "driftless region." In many places around it and through it evidences of true northern drift are found. Boulders are not rare in these places; float or drift copper is frequently found; drift clay exists, regularly stratified, and old river terraces may be traced, and modified drift and gravel is not rare. The lead region seems to have been only partially invaded by the drift forces, and these forces seem to have acted in a modified form. The heavy denuding forces spoken of already acted before the drift period. Then came on the drift conditions and the glaciation of the continent, during which the transportation of clays and soils and a universal mingling and mixing of the surface materials of the earth took place, modified in the lead region in the manner just noticed.

Soils and clays and sands in the first place are derived from the decomposition of the rocky formations at and near the earth's surface. The silent processes of nature to-day, as in past geological ages—if I may be allowed to use the language used in my address some time ago before the Northern Illinois Horticultural Society—are grinding rocks into soils and re-cementing and hardening soils into rocks. There was a time when the surface of the earth was covered with rocks, and rocks only, but atmospherical and chemical agencies, the solvent power of water, dews, and dampness, and aqueous forces kept in constant action processes of slow decay, and soils were gradually formed and carried as sediments into ancient seas. We all know the old adages about the constant dropping which wears holes in the stones; and the files of time, which wear and make no noise; but few realize how important a part these peaceful agencies have played in the creation of the present order of things. The frost and the rain, the dissolving power of water and the mighty power of freezing and cold, and other like agencies and energies of nature are all powerful to bring about the mightiest results. The "tooth of time," gnawing away age after age, will nibble into clay and sand, the solidest rocky ledges. If undisturbed by mechanical forces, the superficial clays, loams, sands, subsoils, and soils covering the underlying rocky masses would be nothing but the residuum left after the removal by percolation of water of the more soluble portions of the decomposed rocks. The soil would then be *in situ*. Regions of country underlaid by sandstone would be covered with a sandy soil; limestone districts would be covered with a soil with a limestone base, and the geologists could tell at a glance from the appearance of the soil what rocks lay beneath it, and *vice versa*.

But certain forces of nature transposed, mixed and mingled into one mass the materials derived from widely separated sources. The first of these forces are the same silent, peaceful agencies which we see operating round us in our daily walks over the earth's surface. There is a struggle going on all the time in our fields, in our streets, and everywhere, building up and tearing down, construction and destruction, an ever balanced antagonism. Gentle rains and earth-born torrents, little trickling rills and strong streams are tearing down the soils from the hill-sides and bearing it away to the lower levels. The small water-plowed trench of to-day next year becomes a chasm, and ages hence a hollow, and the transported materials have been built up in alluvial deposits, or are the fillings in in the bottom of some stream. Alternate freezing and thawing helps along the varying struggle, and God's great plowshare, the frost, runs annually through the surface, mellowing the whole.

These familiar, always acting, somewhat silent agencies, in time produce great results. They mix the soil, they transport it to some extent, but they never carry it long distances from its place of origin, nor do they carry the heavy masses of the drift materials for hundreds of miles away from their parent ledges. Other and mightier forces did this, and while doing it, they ground the stones into clays, and the clays into impalpable powder, as the wheat kernels are ground into superfine flour between the upper and nether mill stone. They were the mills of the gods, which ground exceedingly slow, but ground exceedingly small.

There was some tremendous force, which tore the boulders from their parent outcrops in the distant Lake Superior regions, and drifted them on their journey to the South; which grooved and planed the surface of the solid rocks, and strewed for hundreds of miles in its track beds of clay and sand and gravel, and mingled, mixed, transported and reformed the soils to such an extent as to well nigh destroy their separate characteristics and origins over large portions of Northern Illinois, and greatly increase the difficulty of their proper classification. This force, whether floes and bergs of ice, loaded with stones, gravel, and detrital matter, and borne along by winds and currents, or strong, earth-born water torrents, moving along and wearing the abraded materials, or the slow procession of the all-powerful, crawling glacier—whatever it was, it moved like a vast army of shovelers, multiplied millions of tons of the loose materials denuded and worn down from the rocks of the north, and piled them like a thick earth mantle over the coal basins to the south and west.

Of that great force I propose now to speak. In order to understand what I shall say, it will be necessary to refer to the well-known action of ice and snow in the glaciers of the Polar world. I have already shown that the struggle of the rain drop to get back to its mother, the sea, produces the silent, peaceful agencies and energies of nature, of which I have briefly spoken. I propose now to show that the struggle of the snow-flake to get back to its mother, the same sea, produced those mighty drift forces whose results are so evident around us.

Agassiz, Tyndall, Forbes, and other trustworthy scientific travelers, have made us familiar with the action of the ice forces as they now exist in the Alpine glaciers. Away up in the mountain basins of the Alps snows accumulate in vast fields and in great thickness. When the mass becomes heavy and thick, pressure changes the bottom of the mass into a plastic, porous sort of ice. This basin is the *Mer de Glace*, or sea of ice. Inasmuch as snow is being constantly added to it, the volume and thickness of this sea of ice would soon become so great as to produce serious consequences if some safety valve was not found to afford vent to the pent up mass. The lower part takes upon itself a slow, almost imperceptible, motion, and soon fills the descending valleys with a stream or river of ice. As snow is added at the top, it sinks down to the bottom, and when it becomes ice, is drawn off, as rivers run out of lakes. This ice river flows slow, but is subject to all the laws of flowing water. It widens, it contracts, it deepens where the flow is slowest, and its motion increases where the mass passes over rapids. As it crawls down in its slow, irresistible motion, dirt bands are formed along its margins, stones and great masses of rock roll down upon it, the bottom and sides of the channel are grooved, planed and striated by the mighty power of the grinding, rubbing ice, and all the material accumulated is carried eventually to the lower end of the glacier, and there dumped off in terminal mouraines and huge piles of gravel, boulders and other drift materials. In the case of the Alps, the glaciers melt when they reach the plain and before they find the sea, and glacier-born torrents begin where the ice ends, and the materials borne thither by the ice are further moved and assorted by the muddy, rushing waters which take their place. The struggle of the snow-flake has ended, and the struggle of the rain-drop now begins. Both are trying to get back to their mother, the sea. It is true the ice river flows infinitely slow, but in comparison with the river of water it moves infinitely strong. The Mississippi, if it were a glacier instead of a water river, could bear upon its back boulders and whole ledges of stone as readily as it now floats a feather or a saw log. What it lacked in motion, it would make up in the slow, irresistible and mighty force of its all grinding, all consuming procession. Such is a glacier in the Alps, and these glaciers are kneading certain parts of Italy over now as in past time they kneaded North America.

Over the new Wrangells Land and in Greenland the same forces of the ice are in active operation, only to a much greater extent. All upland Greenland is one vast *mer de glace*. But the Greenland glaciers, instead of melting in intermediate sunny valleys, push down into the sea itself, and after crawling along its bottom in the indenting bays and fiords, keep breaking off great masses, which float away in the deep blue waters until they are caught by wind currents and gulf streams, to be borne by them as ice bergs and ice floes, whither the drift of the ocean carries them. And thus they float, until warmer seas cause them to melt in sunnier climes, and the floor of the ocean is strewn with their adhering dirt and stones. Certain iceberg paths in the sea already are accumulating at the bottom of the water fields of boulders and huge windrows and beds of gravel and dirt. Baffin's Bay, Hudson's Bay, and other northern seas and bays thus become nests of icebergs, and these icebergs, before reaching the water, were glaciers, and these glaciers, at their origin, were the Arctic snows of Greenland. Thus Greenland, like all other polar and circumpolar lands, is shipping her boulders and her gravel to the bottom of distant oceans, and these, at some time in the future eternities of God, will become the face of continents.

And now you will indulge me a moment to paint a fancy sketch of that scene in that world of savage desolation, home of the glacier, and realm of enduring frost! We will take our stand on some headland of Spitzbergen, or on some flame colored granite ledge amidst the wild desolations of some Arctic waste of snow and ice. Before us is the deep indenting fiords of some pulsating bay, throbbing responsive to the tides of the ocean. Around us are the crawling glaciers creeping down from the ice seas above. As the ends become submerged and break off, the deep fiord, nest of the icebergs, becomes filled with the slow moving bergs. Some are wallowing in the blue waters like huge Leviathans; some impinge upon each other with the resounding crash of parks of artillery, but the most of them shoot up their tall pinnacles into the thin, cold air, presenting the similitudes of ice forests, or the more beautiful and artistic forms of domes and minarets, and beetling pinnacles of a now departed mediæval architecture. The midnight arctic sun hangs in the heavens like a ball of fire, and his golden rays, playing upon these icy masses, lights them up with flame, and emerald and blue, until the whole watery realm glows with amethystine tints and opalescent hues, and the refracted and reflected glory of a thousand rainbows plays around and among and over the scene. Imagination may well revel in a glory like this, and the Beautiful Land, with its flaming city, seen in glimpses by the pilgrim Bunyan over among the Delectable Mountains, comes softly to the mind like the shadow of a dream. Oh! we may dream of our castles in the air, and build beautiful as we will, but Nature furnishes grander scenes than any the imagination can picture, and there is no beauty or sublimity like that in the great Land of Silence round the Poles.

But we will come down from the "misty mountain tops" to the prairies of Illinois. Starting with the boulders in the neighborhood of Lake Superior, we trace them south and west to the Missouri river. These crystalline sandstones, flame colored granites and black-trap rocks, can be traced back to their parent ledges about the starting point. As we advance away from the parent ledges, the boulders become smaller, and the drift materials towards the Missouri river are only gravels and drift clays. On seeing these curious water-worn stones strewn over the face of the country, the most ordinary mind at once concludes that they did not grow there, but were brought there from some other place. They are "nigger heads," "lost rocks," wanderers away from where they originally existed. They are entirely unlike any rocks outcropping round them, and it is no great task to trace back the track over which they came. The world was lately excited over the Cardiff Giant, but men went to work and soon traced it back thousands of miles to its original bed in the gypsum quarries of Fort Dodge. In the same way they trace the boulders back towards Lake Superior and Greenland, and could find the origin of each one if a few thousand dollars or a large humbug was involved.

In some parts of Iowa these loose stones, from the size of a man's fist to that of a shock of wheat, lie so thickly strown over the ground and accumulate round the margin of the lakes to such an extent, that in the one case parties might walk over them, stepping on the boulders alone; and in the other, they have given rise to the superstition or belief in walled lakes. In looking over a field of these boulders once upon a time, my companion, who was somewhat irreverent, exclaimed, that it seemed to him as if the devil, when he sifted the soils down out of his great sifter, had emptied with a jerk the accumulated stones over this particular field. If he had named the Creator, instead of his satanic majesty, I would have thought the comparison a good one.

Now, I believe the ice cap which covers Greenland at the present time once extended down into the middle regions of North America. Agassiz, some years ago, demonstrated to the satisfaction of the scientific world, that a great ice cap did cover the drift regions of the American continent. The carboniferous summer slowly ended, and the glacial winter as slowly came on. An entire change of the flora and fauna of these parts of the earth took place. Glaciers covered our land in every favorable locality. Seas of ice accumulated in the basins. Stones were torn away from the outcropping ledges; ledges were ground into sand and clay; motion took place in various directions; but the general movement was towards the south and west. As the climate again grew warmer, the ice cap slowly melted, commencing at the south and melting the ice towards the north. Basins became filled with water, and lakes and seas existed, into which glacial born currents of muddy water poured, and in which ice bergs and ice floes floated, as wind or currents drove them. And we thus have the compound forces of the glacier, the ice berg, and the water torrent in vigorous operation. These causes, added to and coming after the peaceful agencies and influences, spoken of in the early part of these remarks, explain all that we see, while examining the drift formations, with which our Illinois rocks are covered. The peaceful causes which worked before the drift have also worked since the drift period, and produced some of the later phenomena observable.

In this way our soils are formed; in this way they are mingled and mixed; and in this way they are carried on long journeys over the earth's surface. In this way they are pulverized, ground up, kneaded. In this way their volume is greatly increased; and they are sweetened up and changed from their sour conditions during the carboniferous ages, and made fit for grains, grasses, hard wood, trees and man—the crowning and noblest work of all. These are the forces which shoveled and carried such a grand deposit, and spread it over our noble State. And here where we stand, almost in the very garden of the State, I cannot refrain from a local allusion or two. Look around you, you people of Ottawa, and see how you are blessed in all things heart could desire. Rich in agricultural and horticultural resources; the St. Peters sandstone crumbling from your hills like unworked mines of melting, crystalline sugar; the black treasures of the earth almost under your feet; a stream ready to toil and make your city alive with the hum of wheels and the bustle of manufactures—all these, and more, have blessed your lot over that of ordinary men. Only in our own unrivalled valley of Rock river has nature been alike kindly in her manifold gifts. *Our* prairies there are so beautiful, and *our* soil is so rich, that we believe some lucky farmer, in sight of the glancing waters of our unrivaled stream, will some day find the remains of the old stump of the old tree of knowledge, as he delves in his rich fields.

Man acts on nature, and nature in turn acts on man; and it is no wonder our State has robbed the Old Dominion of her standing boast, and now arrogates to herself the proud title of "the mother of Presidents," as she has already so pre-eminently become the mother of noble men!

But pardon this digression, and I will add a closing remark about our soils.

Their various kinds of qualities I do not intend now to describe, except to say that while there is a general similarity in the whole mass, the details differ infinitely, and make a minute classification difficult. We have soils that are light, heavy, warm or cold, wet or dry, compact or porous, fine or coarse, hungry, leachy, loamy, sour, sweet, clayey, sandy, limey, marley, and various combinations of these, which the agricultural chemist alone can determine. Silica, or the earth of flints; allumina, lime, magnesia, potash, and various salts and metaloid compounds unite in various combinations to make up these soils. The humus, which gives the richness and blackness of color, is chiefly derived from the successive growths and decays of grasses and other vegetation.

The question as to what soils will produce and mature good and constant crops of fruit, depends not only upon the nature of the soils themselves, but also upon climatic and atmospheric influences, and the nature and property of the sub-soils. There is much more in these influences than any one might at first imagine. Vegetable chemists and the best vegetable physiology demonstrate that the most of the tree and plant, directly or indirectly, is derived from the atmosphere, and not from the soil at all. Soils, of course, are important, but they are not all-important.

In speaking of the drift and drift forces, I have constantly used the word "soils." Strictly speaking, this use of the word is inaccurate. The great glacial and drift forces apply to the sub-soils, and underlying masses of clay, sands and gravels. Soils, accurately speaking, are the surface deposits, covering these masses. These surface soils are formed somewhat differently from those underlying drift materials above referred to. And this brings us to speak of the origin of the prairies. I will not discuss these at length, but simply give a few of the theories concerning their formation.

Lesquereaux believes they a slow growth from ancient peaty marshes. Winchell believes them to be of lacustrine origin, that is, that they are the bottoms of lake-like bodies of water, not yet having time to be covered with forest growths. Foster believes them chiefly owing to atmospheric and meteorological influences. Some believe them owing to ancient Indian annual burnings. Judge Caton has still another theory. All of these gentlemen argue their respective theories with ability; and in this conflict it is hard to tell who is right. The probability is that each of them apply to certain localities, and explain all the phenomena of those localities.

TUESDAY EVENING, 7 o'clock.

Judge J. G. Knapp, of Madison, Wisconsin, delivered a lecture on

TREE PLANTING.

We are told that immediately after the creation of man, he was placed in a garden, where grew every tree pleasing to the eye, and bearing fruit grateful to his taste. From that day to this, a tree has been ranked among the loveliest and most useful of created objects. Childhood entwines the love of a tree in its heart, as it gambols and sports in the shade. Youth is equally gratified, whether it seeks the shade to study nature or books, or to breathe the words of love beneath the tangled boughs, where only one can hear. Trees are not forgotten by the man when the fires of youth no longer burn in his bosom, but now their leaves protect him from the heat of the summer sun, and the cool atmosphere beneath them refresh him for his toils, or the same trees shield him from the cold blasts of winter winds. In old age, when the head is whitened as by the frost, memory runs back to trees known in former days. The gambols are played over, the studies, the loves are lived again, and the old man sighs for the shade of those old trees, greener in memory, than in the month of June. The birds are there; all our playmates, not even the dog is gone from that dream. The days when we went nutting, or botanizing, when we filled the basket with the rich apple, the luscious pear, the melting peach, and the nectared plum, are fresh before our minds, as of yore. We delight to adorn the spot where we expect to rest from our labors, with these best gifts of heaven to man. And finally, we ask to lie beneath those shades till the great day of days shall come. We would as soon be beneath the blue waters of the ocean as be buried on the bleak hill, where sun, and wind, and storms battle, in a grave where no tree sheds its soft shade.

Tree raising is more economical than corn raising, so far as profits in dollars and cents are concerned; but I must leave that to others, or for another occasion, and now content myself with the assertion that TREE RAISING IN THE NORTHWEST IS A NECESSITY.

1st. Because of our location in the grand divisions of North America as regards vegetation.

2d. Because timber trees can afford our only protection from the inclemency of the climatical influences that affect this region.

3d. Because thick timber belts afford a defense against the spread of noxious insects and fungal growths.

4th. Because thick timber belts, and especially evergreens, are the best protection against the attacks and spread of malarious diseases, and consequently they render a country healthful.

Each of these heads contain sufficient matter to occupy all the time you can allow me, and therefore I can but touch here and there upon some of their prominent points.

The North American continent may be divided into five grand regions, according to their vegetable growths. These are the regions of the *mosses and Saxafrayes*, of the *dense woods*, of *alternate woods and prairies*, of the *prairie or grassy*, and the *arid or desert region*. The vegetable productions of these regions, modified in part by soil, are mainly dependent upon the peculiar climate possessed by each. When the true boundaries of these regions shall be well understood, men will be enabled to define not only the vegetable forms of each, but also to understand and speak intelligently of many of the peculiarities of their several climates.

The region of mosses extends from near the 60th parallel to the Arctic ocean, and is sometimes designated as the "Barren Grounds." But its barrenness is due to want of heat, rather than to want of proper soil, or moisture in the atmosphere; in fact, it has an atmosphere of great moisture, when its temperature is considered. This region embraces and lies near the points of greatest cold in the northern hemisphere, and a small addition to its elevation would place the whole surface in the region of perpetual snow. Its vegetations are mostly cryptograms, that make a rapid growth during the short summers of almost constant sunshine. A few grasses, ranunculuses, and crucifers, are found in favored spots of the extreme north, and a few creeping willows, junipers and yews in the south in more favored locations. All this region is beyond the limits of the United States, and only the winds that blow from it, always cold and disagreeable, can affect us.

The region of dense woods lies south of the mossy region, and along the Atlantic to the Gulf of Mexico, covering the valleys of the St. Lawrence and its tributaries, Nova Scotia, New Brunswick, and the islands of the coast. The States east of Lake Michigan, the Wabash and Mississippi rivers lie in it. It stretches across the continent from the shore of Lake Michigan, by way of Lake Superior, the Lake of the Woods, and the valley of the Saskatchawin over the great mountain ranges into Alaska. In Oregon it makes south to the Columbia river. It is nearly broken off between the heads of the Mississippi and the Red river, owing to some peculiarities of the climate in that location. In the northwest, the boundaries of the woody region may be defined by a line drawn from the *debouchure* of the White river into the Missouri, southeasterly to the mouths of the Crow Wing and the St. Croix; thence to Lake Winnebago, and Racine. South of Lake Michigan the boundary is just west of the Wabash, near the State line as far south as Vincennes, where by a deep southern sweep it strikes the Mississippi a little north of the Grand Tower range of hills. It then extends up that river to the Missouri, which it follows just north of its valley to Fort Leavenworth; after which it bears off to the south near the western boundary of Missouri and Arkansas to the Sabine in Texas, and thence to the Gulf of Mexico.

In this region is found a vegetation more varied than in any other portion of the temperate zones. To merely enumerate the varieties and species found here would require pages, without giving instruction, except to the botanist. This is the region of delicate foliages, where great moisture in the atmosphere supports plants that consume half their weight of water each twenty-four hours. Here we have learned our lessons in arbor culture and fruit raising.

The region of woods and prairies lies south and west of the dense woods, having its western boundary nearly along the Missouri river, including but a narrow strip along the east side of Nebraska and Kansas; thence southwesterly by the foot hills of the *Llaua Estacada* on the Trinidad, thence westerly by San Antonio to the Rio Grande. It then skirts the coast below the mountain ranges to Vera Cruz. Nearly all of Minnesota, Wisconsin, and Illinois and Missouri lie in this region, the balance being in the dense wood, All of Iowa is in it. Dakota, Nebraska, Kansas, the Indian territory, and Texas, are divided between this and the grassy region. The vegetations of this region, though mainly composed of the same varieties as are found in the regions abutting upon it, not unfrequently happen to be of peculiar forms, and a very marked character exists, particularly in the woody texture of the plants. It will be seen that the greatest breadth of the alternate region is in Northern Illinois and Southern Wisconsin, as on that line is the greatest eastern bend of this region.

The prairie or grassy region lies west of the alternate region, and east of the Rocky Mountains. It has its greatest east and west axis near the 41st parallel, and its north and south from the great bend of the Missouri to near Austin, in Texas; stretching over eighteen degrees of latitude and as many of longitude, and covering over a million of square miles. The grasses hold dominion of this region. A few trees, chiefly elms, ashes, box elder, cottonwood and walnuts are found along the water courses of the eastern portion; but they are all stunted and starved by drouths, where they are not submerged with water. They seldom rear their heads much above the banks of the streams. Farther towards the centre of the region, all trees yield to the climatic influences, except the cottonwood; and even this succumbs for a distance of 200 miles along the Platte, Arkansas, and Canadian rivers. Many peculiar forms of vegetation exist, but I cannot even notice them, except to say that they show in a remarkable degree the effects of climate upon vegetable life in the pointed and spined forms, and poreless cuticles.

The arid, or desert region, lies west of the grassy, with which it is often intermingled and blended, thus affording no distinct boundary. It is a vast region interspersed and cut by the ranges of the Rocky Mountains, Sierra Madre, San Juan and other chains east of the Sierra Nevadas, and embraces the Territories of Wyoming, Montana, Utah, Colorado, New Mexico and Arizona, and the State of Nevada. Moisture condenses on the mountain peaks and ranges, and so gives rise to the streams that flowing from them into the valleys and plains, are there often lost in the parched sands and soils, or are evaporated under the scorching rays of the sun. This region can scarcely be called desert, though it be arid. The nearest approach to a desert are plains at a great distance from mountains, or in the beds of ancient lakes, where salt so impregnates the soil that vegetable life cannot exist, without water sufficient to dissolve and dilute the salt. The mountain ranges and peaks rise out of a vast plain elevated between 6,000 and 7,500 feet above sea level, to the height of from 19,000 to 20,000 feet. On these ranges the moisture condenses, and under its influence the foot hills partake of the nature of the alternate region, producing grasses and trees, principally the conifers and poplars. Frosts occur nearly every night in summer, and thus preclude the possibility of raising tender plants among these mountains.

The western slope of California, by reason of the great rain fall during winter, belongs to the grassy region, rather than to the arid, or mountain. This winter rain answers to the former and the latter rains of Judea, and produces grass and the small grains.

Too little rain, (only from two to three inches), falls in both the prairie and arid regions to produce crops or trees without irrigation ; from which I infer that the area of timber will never be greatly extended in those regions, however much they may be in the alternate region.

None of the lines dividing these regions from each other are well defined, owing to local causes. One region shoots into another, forming promontories, bays, and islands. The mosses crowd out the conifers and amentals on the high lands north of Lake Superior, on the fog wrapped islands in the Gulf of St. Lawrence and Newfoundland, and on the summits of the mountains of the eastern States. In the alternate region, in Minnesota, the woods intrude nearly across the State north of the Minnesota river. Several intrusions of woods are found in Wisconsin. The great bend, resembling the Gulf of Mexico, in Missouri, is especially prominent, and the deep indentation of the alternate region in Illinois, reminds one of the peninsula of Florida. Have these any connection? I think they have. The timber of the alternate region is generally found along the river beds and on the northern slopes of the hills, as if in such places there was a better supply of moisture. Islands of timber are found in Wisconsin and Illinois, but which, as I have not time to enumerate, you can call some of them to mind.

The prairie grasses occupy the higher and driest ridges and plains ; thence they have made intrusions into the woods wherever favorable surfaces and soils have presented, or where dry currents of air have had full sweep. Thinking, as I do, that the prairies may be accounted for on the theory of a lack of sufficient rain fall, and in that rain fall occurring in the summer months, when it cannot penetrate into the ground below the effects of the sun and dry atmosphere, I can, by it, readily account for the *oases* of prairies in Southern Michigan and Indiana, and for their oak openings, and even for the "blue grass region" of Kentucky. The climate of those regions, when first seen by white men, assimulated to that of the alternate regions ; and the removal of the forests farther east is fast carrying the same climate into New England. May we not say it is already there? If the clearing away the trees permits the climate that has caused the prairies to advance where they were not, we may also reason that the planting of trees, and especially the planting them in thick belts, will arrest the progress of this destructive climate, and even change it where it once existed, as it did in the States of Illinois, Iowa and Wisconsin.

This region of alternate woods and prairie has a climate which, to the settlers who have resided here the longest, is incomprehensible, and to those not residents, utterly unknown. Such extremes of heat and cold, of wet and dry, of winds and calms, of changes from year to year, month to month, day to day, can be found in no other country of the same extent. Men more ignorant of this climate than are the residents, attempt to write and talk about it, to give rules for the government of the cultivators of our soils, and for the fruits grown here, which rules, however proper they may be when applied in regions possessed of other climates, are, when applied to this region, not only useless, but absolutely injurious and pernicious. These rules are laid down as applicable to all places, as unbending as are statute enactments. Hence it happens that agricultural and horticultural books, magazines, and papers written by men whose knowledge and study has been confined to the woody regions of the earth, where there is a surplus of moisture, and a thin, cold, damp soil, with thick surroundings of trees, yet with the same annual temperature as in the northwest, are here of little or no practical value to the common reader, however valuable they may be in the region to which they are adapted. To determine where such writings are applicable, and where not; where they may be profitably followed, and where they would be pernicious, the reader must look beyond the book, magazine or paper in hand, to the climate and soil for information, and have wisdom enough to judge of the applicability of the rules laid down.

The immigrants of the northwest entered it with the same ideas that now prevail in the east, and we have acted upon the same rules we there learned, and which are there still taught, and we are only just discovering, or it may be we have not even yet discovered, the causes of our failures. We have read the writings of celebrated men; we have followed the rules given by the sages of agriculture; we have ditched land already parched, and trenched soils deeper by feet than the soils about which these savans have written are by inches; we have ridged our corn lands to carry off surplus water where water was deficient, and our crops have dried up and perished; we have reared our trees in nurseries according to rule, and planted, hoed and tended them by the book; but the rain has been withheld, the moisture of the atmosphere has not condensed in dews; clouds have not shaded the sun; hot winds have come, and the leaves have withered and the trees perished, or if, by chance, they survived the extremes of summer, the severity of winter has killed them. These instructors have told us that we are in the same mean annual temperature as is New York, New England, Great Britain, France, Holland and Germany, but they have not told us that our summers are much hotter and our winters colder; that in the one season we have the climate of Palestine, and in the other of Northern Russia. They tell us because New York, New England, Britain, France and Germany can produce pears, peaches, plums and apples, therefore, the same fruits must also grow in the northwest, if the rules of planting and tending be followed. Men heed them, and the experiment is tried over and over. Money and time are lavishly expended by men in trying what others have tried and failed in, because Prof. ———, who appends a dozen or so initials to his name, indicative of credit marks for knowledge, has advised them to do so, simply upon the one condition of our annual temperature. The remedy for failures, and there is a remedy, lies in studying the conditions of the laws that govern climate and vegetable existence, and in following the laws thus discovered, rather than in violating those laws, by following rules announced by men ignorant of the conditions of the climate of this region. In the one case success will crown our labor, in the other failure.

We all desire to grow the fruits of other regions. Those of the tropics we cannot have unless they are quick growing annuals, that care nothing for the colds of winter, because at that period they are hidden from its effects in seeds. But when we desire to rear trees that last from year to year, we must study their organism, and the conditions under which they can survive. Here nature tells us that plants are limited by condition of climate. In Europe their boundaries are byiosothemis, because the rain fall and moisture are very equable. In North America they are ranged by temperature, and also by degrees of moisture and distributions of rain fall. Some trees reach their maximum of excellence on the Atlantic slope, and scarcely appear on the eastern rim of the Mississippi basin. Forms characteristic of the eastern rim are unknown, or but feebly represented where the prairies commence, and entirely disappear as the grassy plains are reached. On the other hand, forms not known in the woods, are found but sparsely in the alternate region, reach their full development in the grassy plains, to be again displaced by plants of the arid region. So marked is this character of vegetation in North America, that if a man who has carefully studied the forms along a given line of annual temperature, say that of 45 deg., might be placed in any place along that line, and from the vegetation alone, he would know his longitude within a single degree.

As the flora of the different regions have a marked character, so the woody texture of the plants of the same variety is marked in the different regions. Trees in the alternate region, and especially those growing in the "oak openings," which indicate the transition from the arborescent to the grassy region, are examples of this position. Such trees are dwarfed, gnarled and sickly. The extremities of their limbs are often dead, while the main body is covered with foliage, thus showing that their existence is passed in a desperate struggle for life. When the trunks are felled and examined, they are found more or less decayed; in all cases the wood is hard, brittle, and indicates that the tree has suffered from want of moisture and shade. The old timber of the region, as is well known, is almost valueless for the manufacture of articles where lightness and strength are required. We are happy to know that a marked improvement is seen in the young trees growing in thick groves in this respect. These last show what may be done by thicker planting of trees towards changing the climate. They show further that if we would rear fruit trees in the northwest, we must surround them with timber belts, so as to moisten the atmosphere, and must plant the trees so thick that the ground shall be shaded, even if one-half the trees be cut away at an early day. It is better to plant four trees and get one good one than to plant one tree and have that dry up and die. But the extra trees may be plums, or peaches, or dwarfed apples, and as such are short-lived, and bear when small, they will pay for the ground they occupy, and we may less feel their loss when obliged to cut them away.

We can not increase the amount of rain fall in this region, but we can husband what we have, and make it feed our trees and plants. Trees growing in thick masses can do this; and when the masses assume the form of belts, and fields, and orchards, they impart the climatic conditions under them to the fields and crops.

Trees have a power to conduct heat, by which they facilitate its passage from the air to the ground in summer, and from the ground to the air in winter. Trees also, like animals, have a specific heat of their own, which aids in equalizing the temperature of the surrounding air. Trees when in full foliage are always cooler than the surrounding atmosphere, and the latter is therefore cooled by them, and more readily parts with moisture, causing heavier dews near the trees, than at great distances from them. Trees by their shade prevent radiation of heat from the ground and consequent evaporation. Trees produce coolness in the air during the great heat of the day, by the great evaporation of moisture from their leaves, which will be indicated by the thermometer, even though we may not perceive it when standing or working in the sunshine near them. This effect is manifest if we pass beneath their shade. Trees, by adding moisture to the atmosphere, prevent summer frosts, as a moist atmosphere is not as easily heated, or cooled, as a dry one. Trees of an ordinary growth evaporate from the surface of their leaves about ten inches of water, and this evaporation goes on whether it be rainy or dry weather. [To understand this point, suppose the tree covers a space of 20 feet square, or 400 square feet, then the evaporation from such a tree is 400 superficial feet, and ten inches deep, solid water drawn from the ground by the tree and discharged into the atmosphere]. One-third of our annual rain falls is thus required to furnish trees with their needed supply of water. These points would again lead me beyond my limits, and I must pass them without elucidation, with their opposite effects produced by the destruction of the forests.

Trees protect the soil from forming sand dunes, where the winds can tear up a sandy formation. They also save the soil from rushing into the beds of rivers, and the ocean. Degradation of the soil commences at first by rain currents running over the soil where the roots of trees are wanting and the sod is broken. At first a new thread of a channel is seen, that increases in size with each successive shower, or melting of the snow; the fine particles of the earth are taken away; the channel widens, and becomes the trunk of other channels. The mere thread of water becomes a torrent, and bears before it earth, gravel, stones, and makes a frightful, impassable gully. Trees, therefore, are required on all these steep hill sides to protect the soil, where it is light. The importance of this constant absorption of the soil will be realized by a reference to the deep and broad valleys every where excavated in the land in the northwest, where the materials that once filled them now fill the deltas of our large rivers. Whole States owe their existence as dry land to the earthy matter carried down the rivers from higher regions, including among its particles the richest soil of the uplands. The quantity of sand the rivers of the northwest have carried may be seen not only at the mouth of the Mississippi, but also in the flats formed in the broad valleys, which have all the appearance of having once been large lakes, whose beds are now filled with floating sand and mud. The amount carried down the Chippewa, after filling its own lakes, has checked the current of the Mississippi, and raising an embankment across that stream, has formed the lakes

Pepin and St. Croix. The sand and mud carried by the Black river, and its companions the La Crosse and Trempleau, has filled a lake twenty miles or more in length and five in breadth, and the broad flats for miles up those streams. The Wisconsin has filled lake beds whose extent would astound those not conversant with the valleys of that stream. One of these above the Dalles must have been fifty miles in length and twenty-five in width, with long bays reaching up the Lemonoir and Yellow rivers. And another was one hundred and fifty miles long, and at some places ten wide, along a portion of which the Milwaukee and St. Paul railroad is now laid. The Missouri, after filling its own channel for one thousand miles, has filled the " American bottom," and aided, and is still aiding, to fill the swamps and deltas of the Mississippi.

If we were to trace the course of the winds that reach us, we should find that our hot winds in summer that dry our atmosphere, that kill the leaves like a hard frost, that shrink the grains in the wheat and destroy our fruits and tender plants, come to us from the southwest. So, if we trace the track of the tornadoes that almost yearly sweep across the center of this alternate region, carrying dismay, if not destruction and death, to our people, we shall find them intimately connected with, if they do not have their origin in, the trade winds of the tropics, and reach us after passing over the mountains to the southwest, where they have been wrung dry of all moisture, and where they have been heated as in a furnace over the arid plains they have passed in their great rounds of travel. They come down on us here greedy of moisture, and instead of giving life, their presence is death. And we shall also find that the cold winds of winter, not less destructive, come to us in this region as they come no where else. These we can trace across the same vast plain, to another whirl around the axis of greatest cold, and electro-magnetic attraction, on the 80th parallel and the 100th meridian—a wind no less destructive than that of the heated summers that has passed over no body of open water, to raise its temperature since it left the point whose annual temperature is 50 deg. below zero, and where often 60 deg. below is reached. That wind comes to us also from the west.

Such are the winds we have to provide against. Against these we can raise no barrier equal to belts of tall trees, and especially the tall white pines and the Norway spruces. Who, on the open prairie, exposed to the full blast of these winds, would not welcome the friendly shelter of even the deciduous trees? We can not stay the wind currents, but we can raise them above our heads, and so secure ourselves, our stock and crops from much of their ill effects. We can pursue our avocations in comparative ease and comfort, though we know the fierce winds rage above the tree-tops, for we may hear them shriek like demons, or wild beasts turned from their prey.

A thick belt of trees with its cross-belts to ward off side winds, will protect eleven times the height of the trees. Apply this principle to the orchard, or field, you were to protect; and a belt of evergreens, sixty feet high, which, if of pines or spruces, may be reached in thirty years, and you have six hundred and sixty feet protected. The back set of the wind made by the next belt will add to this, so that a ten-acre lot will be entirely protected by such belts, and the wind will not descend into it at all. The advantages that must arise from such protection are many. I can but name a few. It would prevent the snow from drifting to the destruction of winter wheat. It would prevent the rapid evaporation of the snow and other moisture, from the passage of the current of dry air. It would protect the ground from freezing to the same depth as in other fields exposed to the full effects of the winds; and thus permit the winter moisture to percolate into the ground for the summer use of the crops. It would permit many tender fruits and ornamental trees to be grown where they could not be grown without protection. It would add to the beauty of the home, and increase the comfort of the man and his animals, that were surrounded by it. It would increase his crops. I have seen a calculation, and believe it true, that eight acres surrounded by a thick belt of trees, will produce more than ten acres not so surrounded. The northwest does not lack sunshine and heat. Its lack is moisture, and something to break the winds.

Such belts of trees as I have spoken of, would often lift even the destructive tornadoes from the ground, and always retard and break much of their force; as a water-spout is broken by the passage of a cannon shot through it, or of a vessel across its path, even when the vessel is foundered by the current of air that makes the spout.

Such belts of trees would, in a great measure, give the supply of timber which would in a few years—fewer than most of us imagine—be required for the supply of our farms, villages and cities, for building materials and other uses. Because we have hitherto had timber for these uses, we are apt to think that we shall always have it. This imagination is far from the truth. The extensive pine forests of Michigan and Wisconsin will be cut away within the next generation. I once made a calculation based upon the amount of lumber received in Chicago in 1868-'69, where I took as a basis the following points:

The amount received at Chicago, 1,069,851,336 feet. The annual average increase of the import for ten years, 115,620,148 feet. The other parts of the lakes and rivers only consuming the same amount as Chicago, and that a single pine tree will make 1,200 feet, and found it took 1,783,886 trees to make the lumber cut in the woods, with an annual increase of 96,350 trees. I then supposed there were left in those States 5,000 square miles, on each of which were twelve thousand eight hundred trees, or twenty standard trees to the acre. Then without any increase in the future consumption, the trees would all be cut in twenty-eight years; but if the annual increase continued, they would all be cut in twenty-four years. If this calculation be correct, the question of "HOW LONG WILL THE PINE FORESTS LAST?" becomes a serious one. It involves the question of where the timber to build with is to come from. Trees planted this spring would not be large enough for saw-logs before 1920. To say nothing of the value of trees suitable for sawing at that period, is not the necessity of planting trees *now* apparent?"

It is not unknown to us all that many countries are fearfully wasted by the depredations of insects; also that the most devastating of these insects are such as are seldom seen on the wing during the period of their ravages. Thus the locust and grass-hopper have, from time immemorial, devoured the vegetation of some countries on the eastern continent. The ravages of these insects have furnished the theme for the illustrations of the poet and orator in the east, when describing the wrath of God against the sins of the people; and they are still looked upon by the superstitious as sent by Him in judgment. The prophet Joel says, "they, (the locusts), are a nation, strong and without number, whose teeth are the teeth of a lion, and he hath the cheek teeth of a great lion. He hath laid my vine waste, and barked my fig tree. * * A fire devoureth before them, and behind them a flame burneth; the land is as the garden of Eden before them, and behind them a desolate wilderness; yea, and nothing shall escape them."

The grass-hoppers on the dry plains, between the Missouri river and the Pacific ocean, are no less destructive to such few crops as the industry and perseverance of man forces from the dry grounds by means of the irrigating streams flowing from the mountain ranges, than are the locusts of Arabia. Against the march of the immense hosts, the farmer sometimes opposes with success his broad watering ditch, filled to the brim with the flowing streams, wherin countless myriads find a watery grave. But woe betide the man whose crops have no such guardian ditches! Over such a plantation the march of the devastating army is as rapid, as destructive, as the armies described by the prophet. We may well rejoice that the Missouri and Mississippi interpose their broad channels in advance of such armies, and act as guardian angels to our corn and wheat fields. After their days of ravaging and feasting are past, mounted on strong wings, rising above the broad streams and the tree tops, they seek a new place where they may deposit their future brood of devourers; by which means they appear in other places in other years.

Hear Marsh on the remedy: "The insects most injurious to rural industry do not multiply in, or near the woods. The locust which ravages the east with its voracious armies, is bred in vast open plains, which admit the whole heat of the sun to hasten the hatching of the eggs, gather no moisture to destroy them, and harbor no birds to feed upon the larvæ. It is only since the felling of the forests of Asia Minor and Cyrene, that the locust has become so fearfully destructive in those countries; and the grass-hopper which now threatens to become almost as great a pest to the agriculture of some North American soils, breeds in seriously injurious numbers only where a wide extent of surface is bare of woods."

The chinch bug of the prairies was lately as much dreaded by those who knew their ravages as a beast; but these can never traverse a belt of thick woods seven or eight rods in width, to devastate an adjoining field. The cool damp soil, and shade of such a belt present an impassable barrier to their march, the same as to the grass-hopper. Another devouring pest has appeared among us whose origin seems to be traced to the dry western plains—the ten-striped potato bug—whose ravages are to-day more dreaded than the rot.

Other forms of devouring insects now swarming on those arid grounds, may multiply upon us as we cut away our guardian trees, and thus drive off our forest-loving birds, which feed upon the insects whenever they make their appearance among us. The increase of trees, by plantations, will increase the number of friendly birds, as we shall thereby furnish them with homes in which to rear their young, and they will pay for the care by destroying the devastating insects.

If these positions be true; if the open plains breed these myriads of devouring insects, and if forests and birds arrest their march, the law of protection is plain; and he "passes on and is punished" who does not heed the voice of nature. He who raises the barrier, does an act worthy of his country, and he who cuts it down commits a crime against his race.

"Another important advantage," says I. T. Thomas, "has been occasionally afforded by the shelter of wood-lands. It is well known that rust in wheat is commonly most prevalent on low and mucky lands; yet at other times, and in its most virulent form, it seems borne on the wind, and often destroys thousands of acres on all kinds of soil in one sweeping blight. An instance of this sort occurred in Northern Indiana in 1840. Early and late sown, on compact and spongy soil, on hill and dale, cleared land and prairie, were all alike affected. In every instance, however, where the crop was sheltered by wood land it was least injured. An extensive farmer of Ontario county, New York, informed me, some years ago, that out of two hundred acres of promising wheat which he then had growing, all was completely destroyed except *those portions sheltered by woods*; the total loss being four or five thousand dollars, most of which he believed would have been saved had his land been protected by timber belts. There are farmers, not a few in the Northwest, who can call to mind instances of similar destruction of their wheat crop, by a sudden spread of this destructive fungus, known as "rust," over their wheat fields and who have seen all their promising hopes of large crops at once blasted. Where they expected thousands of bushels of wheat, they found only worthless straw, which they have been obliged to remove from the ground by the aid of fire.

I do not hesitate in saying that crops of good winter wheat may be grown on lands in this State where now it will almost invariably winter kill, and where spring wheat is destroyed by rust, if the fields were belted in with thick set timber trees, so as to protect the ground from the cold winds of winter and the hot winds of summer, And I know that without such protection the attempt to grow fruit must be a failure in all our open prairie region. I would have one-fifth of all the land planted in timber belts, at once, as a matter of necessity for the State.

But, Mr. President, I must hurry on to the last point I have proposed. Thick timber belts, and especially evergreens, are the best protection against the attacks and spread of malarious diseases.

Trees purify the air we breathe, by absorbing the carbonic acid gas, which, when existing in sufficient quantity, is destructive to animal life, and by emitting, at least during sunshine, oxygen gas. They are supposed also to destroy that unknown something which we call miasm in the air, and thus prevent sickness. The evergreens—pines in particular—are known to impart to the atmosphere that peculiar gas known as ozone, which is not only the best disinfecting agent, but is also the best tonic that can be inhaled into human lungs. To this property, I think, may be attributed the invigorating atmosphere of the pine woods, and not to any balsamic odor of the trees. The turpentine gatherers are proverbially healthy, and malarious diseases never attack persons in the Southern States, or on the West India Islands, who live in the pine woods.

Lancisi cites a number of facts showing the advantages of belts of trees, in protecting against the effects of malaria, and the dangers resulting from their removal. He calls attention to the fact that in former times there existed, on the south side of Rome, a thick forest. It extended from Frascati and Albano to the Tiber, and protected the southern portion of the city, and the neighboring district, from the baneful influence of the effluvia of the Pontine marshes. This rampart has since been removed, and the country has become proverbial for its unhealthiness. The ancient Phœnecians, Egyptians, Greeks and Romans possessed ancient woods and groves consecrated to their gods, in which those people often assembled for worship and pleasure. The great advantage of those groves to the cities and towns in whose neighborhood they were, arose from their guarding the people against the diffusion of malarious poisons that floated in the air. They planted trees along the rivers and in the marshes, to guard against malaria; and Cicero recounts the law that enforced the practice. In order to insure their protection, these trees were solemnly dedicated to, and placed under the protection of some divinity; and the consuls were made responsible for the enforcement of the laws in relation to them. How different was their practice from ours, that lays bare the swamps and marshes, and cuts down the trees that would stand as sentinels of health along the banks of the rivers and streams, and interpose between our dwellings and the malaria engendering marsh!

Baptist Dowar, in his work on the means of restoring and insuring salubrity to the Roman States, recommends planting pines and other trees between Rome and the Pontine marshes, to intercept the miasma wafted from them by the southwest winds towards the city. At Belitu, as also at Campo Salmo, the destruction of belts of woods was followed by the prevalence of malignant fevers.

Dr. Lewis, in his Medical History of Alabama, says: "W. P. E. had negro quarters situated on the first prairie, elevated above the low lands of a small creek, the fourth of a mile from the houses. The belt of low ground was frequently overflowed, causing water to remain in holes over its entire breadth, on the subsidence of the stream; but it was well shaded by the dense foliage, the plantation lying on the prairie in the rear of the cabins. In the winter of 1842 and 1843, the trees between the houses and creek were cleared away, and though, up to that time, some eight or ten years, the negroes living in the quarters had enjoyed uninterrupted health, a case of fever scarcely occurring, yet during the summer of 1843, the first after the forest had been cleared away, fever prevailed among the negroes with great violence, continning until frost. The negro quarters were afterwards removed to the opposite side of the creek, about the same distance from it, but with an intervening growth of timber, and no fever has occurred on the place since."

Mr. Bartlett says: "Whole families have resided near the Pontine marshes and by the intervention of shrubs and trees have escaped for years the noxious effects of the mephitic vapors which these putrid waters engender." Dr. Hossack states that a family in New Jersey was attacked with fever in consequence of cutting down a wood that separated them from a morass in the neighborhood. Before the operation they had been healthy.

During the late war of the rebellion, much of the sickness of the army of the Potomac in the summer, autumn, and winter of 1861, while encamped near Washington, was the result of the cutting down and destruction of the trees for purposes of defense, as a military necessity, and for the use of the troops. The same thing was also noticed in Louisiana, where troops had been encamped for some time, and many trees were cut down. This was strikingly illustrated at Port Hudson, where, for purposes of defense, the rebels cut down nearly all the timber adjoining the outer fortifications. It became necessary, in several places, for our troops to cut down more trees, and in a very short time the effect was quite marked in the increase of sickness in the regiments camped upon, or near this ground.

These instances might be enlarged. Most hygeists recommend leaving a wood, if possible, between marshy grounds and a house, or an encampment. The conifers are the best for that purpose, because such trees are the thickest, and because of the peculiar gas or odor they emit. It is now settled as a physical fact, that trees do destroy malaria. A few instances may be allowed me.

Pliny, and some others of the ancients, supposed that trees absorbed the exhalations arising from insalubrious places; and that the beneficial effects obtained from woods were to be accounted for in that way, rather than from the obstacles they offer to the diffusion of those exhalations. This opinion has, to a certain extent, received the sanction of Theunerville, Copland, and other modern writers; and its correctness is undoubtedly true, as shown by the result of experiments made long ago, and repeated more recently to ascertain the truth.

Dr. Lewis, of Mobile, says: "It is the received opinion that live vegetation protects the human system from the deleterious effects of malaria; and it appears that experiments made by scientific men have satisfactorily explained the mutual dependence of animals and vegetables upon each other for support."

Mr. Carsiere states, that the leaves of plants and trees, and all green vegetations that cover our soil, are all inexhaustible sources of oxygen, which is so important a principle to sustain life and to preserve health as to be indispensable. Hence, to cover the fields, the edges of marshes, and the whole extent of the soil with an abundant vegetation, is equal to placing on the surface of unhealthy regions a reparative application of the greatest price. Trees, therefore, must have a large share in the amelioration of the country, in consequence of the quantity of leaves they furnish. The belief that the use of trees affords an important protection against the malarious influences, is very general among the Italians, best qualified by intelligence and professional experience to judge upon the subject. The commissioners appointed to report on the measures to be adopted for the improvement of the Tuscan Maumne, advised the planting of trees in such directions as to obstruct the currents of air from malarious localities, and thus intercept a great proportion of the pernicions exhalations.

Lieut. Maury believes that a free use of sunflowers, planted between the Washington Observatory and the marshy banks of the Potomac, has saved the inmates of that establishment from the attacks of intermittent fevers to which they have been formerly liable. The proverbial salubrity of the pine and live-oak woods in the Southern States, is known and recognized by all who have been acquainted with them. Growing vegetables consume carbon and set free oxygen, and thus perform a part in the economy of nature the reverse of animals. By that means the air, which would otherwise become contaminated, becomes purified, and always fitted for the use of men.

In some portions of this State, contiguous to the lake, a cold, damp wind comes from the lake, very injurious to persons of weak lungs. No barrier can be interposed to the advance of such a wind equal to thick belts of our tall evergreens. It seems to me, from every view I can give to this subject, that no other kind of cultivation of the soil is so imperiously demanded as is the planting of trees to preserve the health of the people, where it is now reckoned healthy, and to render those places salubrious that are now malarious.

Did time permit, I could show that no other crop would be as profitable to the grower as crops of trees, and especially timber trees, such as pines, cedars and larches for buildings and fences, walnuts, butternuts, oaks, ashes, hickories, cherries, and birches for manufactories, walnuts, chestnuts, butternuts, and hickories for their nuts; and all these, and other trees, for timber and wood. I could show how much of our land should be planted with trees to make the balance of the country produce to its greatest extent, and to supply the demand for timber and fuel. I might classify our timber trees, showing which are best for growing, and which are not worth the space they would occupy. But you cannot give me the time, and I must stop, as at the very threshold.

I have told you that the era of the pine forests may be readily cast, any of your school boys may cast it. Other trees cannot be grown before those we now have will be cut down and gone. To-day the pine forests are more valuable than the gold mines of Colorado. To-morrow they will be cut down and worked up. To-morrow comes a famine of lumber in the northwest. The taxable property of these States will then lose a large per centage of its value, the manufactures of lumber must cease with its use in buildings. To-morrow, unless we fortify against its approaches, will come another and severer wind than any that now reaches us, unrestrained in its course from the cold north. That to-morrow will be a sad day for the people. But come it surely will, unless the people of to-day take efficient steps to renew, preserve or plant forests and tree protections. The pine forests of the north when once removed will not be reproduced on the same lands. They are now growing on lands generally nearly level, and free from stones, interspersed by grassy meadows easily drained, and rich in vegetable deposits ; and the same spirit of immediate gain that strips off the timber now, will then convert these lands into grazing and grain fields, and so prevent their ever being again covered with trees, even if we could suppose that pines would grow there except by artificial means. Fire and domestic animals will aid man with his ax in the destruction. The openings will let in the sunshine. The hot winds will come unrestrained and dry up the waters. The rain and dews will cease. The moist atmosphere will be driven off, and those timber lands will become prairies, subject to all their vicissitudes, but without their deep rich soil.

Statisticians have cast the period of the existence of the coal beds of Europe. The period of the coal beds of America may also be cast, and when cast will be found shorter than men could wish. The use of coal as fuel is of modern date. It cannot renew itself, and therefore may be exhausted. Its years are numbered. The years of man are limited by the era of the earth's adaptability to support him; and for his future we must look beyond this and a few coming centuries. To-day coal heats our furnaces and drives our machinery, heats our houses, and supplies us with light as well as fuel. Take away the supply of coal and the factories and workshops will be still as the grave. The locomotives will rust in the shed, and the rail be buried in weeds. The streets of our cities will be dark, and our houses uninhabitable; our rivers will not be disturbed by the paddle-wheel, and our lake voyages be prolonged to uncertain dates. The past will again lengthen its periods and prolong its dates. A thousand special arts and manufactures, one by one, then in a crowd will fly the empty soil. The prices of freights will increase, and of products decrease in the hands of the producer. Wages for labor will diminish, and poverty cast its dark mantle over the land. One necessity of life now easily obtained through cheap transportation must leave us, to be followed by the departure of others more important. Our people must fail with the means of subsistence it is the law of nature, inexorable in its requirements, fatal in its execution.

Gloomy as such a picture may be, it is but what the Northwest must become, unless the fostering care of the people and of government be extended to our forest trees. These alone can save the people of these States to their soil. Cut away the forests, denude the surface of trees, and plant no more, and the years are not distant, when the agriculture that now produces the millions of bushels of grain, will cease; grain growing, with its attendants, fatted hogs, and beeves, and sheep, its dairy products and fine wools, will be replaced by pasturage and stock raising; and lean kine will eat up the fat ones that now feed at our cribs of corn. When the trees are gone, the cold already too severe for the winter wheat, will become too severe for spring crops. The winds that now dry up the rough, coarse and spiny vegetations of the plains, will then wither and parch the plantations of the husbandman in the States of Iowa, Minnesota, Wisconsin and Illinois. The States farther west having succumbed beforehand. Then there will be too little feed to keep the fifty inhabitants on each square mile warm during winter, and to dress their food during summer. Civilized, refined men and women must give place to oxen and sheep. Public parks and private gardens, State buildings and churches, school houses and manufactories, stores and depots, will be converted into sheep-pens, cattle-stalls, and hay-barns; or their wood works will go to feed the temporary flame kindled to warm the half-savage men that remain on the soil, or wander after their flocks in quest of food for themselves and their herds over its surface. The small farm with its neat house, orchard, and garden, its fields of yellow grain and tall corn, the home of the happy family, will become part of a cattle range; for cattle alone can retain a foothold, until that other and little more distant day shall come, when the winds and drouths will reduce these plains to the condition of Asia Minor, and Toorkastam, or to our own plains on the west of the Wisconsin river. Trees alone can save this region from such a fate, for they will live and increase as long as man shall live on the face of the earth.

Let me not be misunderstood, when I have spoken of the disastrous climate to which this alternate region is subjected by nature, as if I had expressed the opinion that to man the climate was insalubrious. Sufficient observations upon our climate, and its effects upon the human system, to determine what will be the ultimate effect upon that system, and how it will operate upon man's civilization and intelligence, have not been yet noted to determine those effects. I, however, believe we here possess the two elements that go to make up a great people, in a greater degree than they are possessed by any other country in the civilized world—the bracing effects of a cool and dry atmosphere for human health, and the warmth and moisture sufficient for the growth of the best agricultural products, upon the richest and most easily tilled soil in the world. Poisonous malaria is seldom engendered by our water courses or wet lands. We are not subject to the deceitful but fatal effects of phthisipneumonia begotten by the cold, damp atmosphere of other regions. A cool, dry air, so indispensable to the highest development of man, is here remarkably combined with a warm atmosphere of sufficient moisture to produce a large growth of the most valuable vegetables. Our climate is not unlike the climate of that region, from whence came the Caucasian race of men —the foremost of the human family. Here that climate will be again bred in the bone and settled in the marrow. Here the family will take a new start in the race of life and conquest. These facts tell of a glorious future, a coming civilization, a human development in body and mind, such as the older States and countries, whence we trace our last departure, can never reach. Let each one remember that we owe this rich inheritance to the Giver of all Good, and man has no right to despoil it. Let us, also, remember that he who plants a tree, does it not alone for posterity, as is commonly supposed, but for himself also. Let the people, under wise legislation, and the guidance of personal knowledge, train and care for posterity, as the Creator has provided for them, by the surroundings of this region; let all learn and obey the laws of climate, improved, as an enlightened intelligence can improve it, and nothing better in climatic conditions can be enjoyed, or desired, to place Northwestern States in the true position they should occupy—first, for health, wealth, and happiness of their people. Then will Illinois hold the highest place in that proud pre-eminence.

DISCUSSION.

EDWARDS—This is the great physical question of the northwest. I remember that when a boy in Western New York, that farms were advertised with a note of the acres *cleared;* now the acres of *woodland* are given. In 1841 I helped to clear land in Ohio for cultivation. To-day the timber would be worth more than all the crops ever grown on the land. It is said timber is on the increase in Illinois; but it is not so—it is diminishing. We should plant for protection. I know thirteen acres of timothy protected on two sides by a fifteen feet Osage orange hedge, and on the other two by planted timber. It has produced three and a half tons per acre. Thinning out closely planted groves will pay the expenses of the plantation. Nut bearing trees should be planted where they are to remain. White Pine and Larch are the best trees. Pine should be planted with other trees to protect its leaders, which are apt to suffer when the tree is young. The pine is one of our best trees, and well adapted to our prairie soils. More than half of our prairie weeds are of a resinous character.

GALUSHA—I can't refuse to talk upon this subject; but it is late. I heartily approve of all that has been said in the paper. I have fought on this line sixteen years already. I think we should draw up resolutions expressive of the sense of this convention on the subject, and I move that a committee of three, of which Mr. Edwards shall be chairman, be appointed for that purpose.

SHAW—The dollar and cent argument has not been sufficiently pushed. I have observed in the last two years that a neighbor, having a house and lots worth $2500, made them, by tree planting, etc., to sell for $4500. He sold six kegs of paint, fifty evergreens and a few little bushes, for $2000.

EDWARDS—One-third of the available timber on the Pacific slope is already destroyed. It is already difficult here, I am told, to get black walnut enough for the use of our cabinet makers. The Commercial Bureau, of Chicago, gives a statement of a prospect of the speedy extermination of pine timber.

GALUSHA—The area and amount of pine timber in the north is greatly overrated.

KING, of Rockford—In 1846 I spent several months in Europe. I found them planting trees in England; everybody had copses of all sorts planted on the hill slopes. There was no law obligating them to do so; there are laws against destroying forests.

KNAPP—I have known black walnut trees seventeen years old that were a foot in diameter.

Mr. Galusha's motion was adopted, and Samuel Edwards, O. B. Galusha and A. S. Miller were appointed the committee.

Adjourned.

WEDNESDAY, *February* 23—9 o'clock.

The subject of Timber Planting was resumed.

MOSS—Judge Knapp said trees would not increase the rain fall. I have always understood they would.

GALUSHA—I am glad this point has been taken up. Rains are regulated by fixed laws. Man may modify—I think he may—the distribution of rain. In summer electrical attraction will have its effect. Lightning rods will bring showers, and probably trees.

BALDWIN, of Farm Ridge—The opinion has been prevalent that the quantity of rain could be increased by trees. This is controverted [by a French writer quoted] by Mr. Reynolds in his report of the Paris Exposition. I think the reasons there given are not satisfactory; and that tree planting will have the effect to increase the rain fall.

[The authorities seem to bear out the statement of Judge Knapp that forests do not increase rain fall, but husband it, and prevent its speedy evaporation. Loomis' Meteorology, p. 157-8; Blodget's Climatology of the United States, p. 482, etc., and 405; Marsh's Man and Nature, p 178. But the position of M. Tisserand, as quoted by Mr. Reynolds, is much in advance of Judge Knapp, and is perhaps partly untenable. See vol. 7, Transactions Illinois State Agricultural Society, p. 704—Secretary.]

The committee appointed to report upon tree planting, submitted the following resolutions, which were adopted:

WHEREAS, At the present ratio of consumption, the pineries, from which we obtain our supplies of lumber, will be exhausted in about 20 years, and in the meantime, prices of all variety of lumber must appreciate in an adverse ratio to this reduction, and

WHEREAS, Since it requires many years for the growth of trees to supply this indispensable commodity, it is imperatively demanded of the present generation to commence at once the planting and culture of trees on a scale commensurate with the prospective want, and

WHEREAS, The history of the old nations and countries of Europe has clearly proved that no country can continue productive and healthful, when robbed of its forests of timber; therefore, it is

Resolved, That we, farmers upon the prairies of Illinois, recognize the duty incumbent upon us to set an example of timber planting, and do hereby pledge ourselves to plant from year to year, as circumstances will admit, such trees and tree-seeds as are adapted to our several localities.

Resolved, That this convention respectfully suggest to our constitutional convention in session at Springfield, the necessity of inserting a clause in the constitution, making it obligatory upon our Legislature to enact laws for the encouragement of timber culture.

Resolved, That we respectfully request the editors of newspapers and agricultural journals in the State, to publish these preambles and resolutions.

S. EDWARDS,
O. B. GALUSHA,
A. S. MILLER.

MOSS—I am committed in favor of the object of tree planting, but think we ought not to incumber the convention with this matter, but refer it to the Legislature.

FLAGG—That seems to me more appropriate; besides it seems very uncertain at present whether the constitution will be adopted.

EDWARDS—I would be like the good old darkey; if the Lord said to jump through a stone wall I would jump *at* it, and leave the result to God. I am not over sanguine as to the result, but I would give line upon line and precept upon precept.

CHURCH, of Rockford—I have attended these meetings, and been interested. No matters have been up upon which I knew enough to say anything; but any reflecting man can appreciate the danger of getting out of timber. Statesmanship should consider it. Our people look too much to present profits and not enough to the future. I do not exactly concur in the resolutions. Constitutions should rather instruct what not to do. Instructions don't avail much, as we saw in our last constitution. If the money spent in the last Legislature in ring-legislation had been put into tree planting, it would have given a great impulse to the matter. Agricultural education is not sufficiently appreciated, although nominally approved. A philosophy of agriculture will bring about a change.

The resolutions having been adopted—

FLAGG—I move the committee be continued, and instructed to present a draft of a bill on this subject to the Legislature.

KNAPP—I drafted bills on this subject for Wisconsin, and got them passed, but there has been no acceptance of their provisions by the tree planters. Statute laws must be backed up by a strong public sentiment.

GALUSHA—I am sorry they have such an ignorant set of farmers in Wisconsin. We have better legislators from among the farmers than they seem to have in Wisconsin.

KNAPP—Our Horticultural Society wanted $1000 to expend in Wisconsin and got twenty votes. More than two-thirds of the Legislature were lawyers.

MCCARTHY, of Rockford—I am rather opposed to the resolution relating to the constitutional convention; but am in favor of the pending resolutions. I am not entirely a believer in the climatic advantages of trees, but there are reasons enough, useful and aesthetic, for planting them.

The resolution was carried, and W. C. Flagg added to the committee.

O. B. GALUSHA, of Morris, Secretary of the Illinois Horticultural Society, and one of the Trustees of the University, read a paper on

THE FENCE LAW.

All laws enacted or promulgated by civilized and Christian nations, are intended for the protection of each individual citizen, in his person and property.

Owing, however, to the weakness and short-sightedness of law-makers, as well as the cunning and wickedness of law breakers, the best and wisest laws often fail to accomplish these results.

It also oftentimes occurs that laws which were, at the time of their enactment, just or practicable, afterwards become oppressive or unequal, from the change effected by increase of population, advances in civilization, or progress in science and modes of conducting the industrial arts.

Among this class of enactments we place nearly all statutory regulations in our own State, relating to fences and inclosures. Common law, which is or should be the basis of local or State laws, provides for the protection of owners in their possesion of all species of property, including growing crops, from injury or damage by any other person, or by animals in possession of others, excepting, of course, such privileges of right of way, etc., as are necessary for the public good.

This principle of law commends itself to the common sense of every man of sound mind, and, while it has been entirely ignored in the constitutional convention and legislatures of this State, yet it was deemed expedient by our earlier law makers to suspend its application and enact laws which virtually compel every cultivator of the soil to protect his crops, while growing upon his own land, from depredation by his neighbor's domestic animals; and these enactments have been reiterated with slight variations, from time to time.

Such is the practical state of affairs, which I propose, in this paper, to consider, and which I trust this convention will seriously consider, with a view to suggest to the constitutional convention, now in session, such provisions in our organic law as shall bring all future legislation upon this subject, into harmony with this just principle of common law.

In discussing this subject, we will not stop to consider either the expediency or folly of a departure from the common law principle in the early history of our State, but will look at the practical application of our existing laws, and see wherein they are unequal and oppressive.

I. Laws relating to highways:

As has been stated, the common law does *not* provide for free commoners, or for animals to go unrestrained in the highways or upon unoccupied lands, but *does* provide that damages done by domestic animals may be recovered in actions for trespass, whether the property (crops) injured or destroyed was protected by fence or not. The Supreme Court of Illinois has several times decided that this provisian was [is] not in force in this State as regards outside fences [i. e. fences along the highways.]

These decisions, together with the statutory regulations based upon them, amount to free license to pasture the highways, and consequently involve an immense expense in fencing against free commoners.

That we may fully comprehend the vast amount of the cost of highway fences in the State, we will make a few estimates based upon the supposition of laying out highways along the section lines throughout the State, which all will admit will not amount, in the aggregate, to more miles of highways than will ultimately be required. This plan will give us 221,620 miles of highway fences.

The cost of these at $1 25 per rod, or $400 per mile, will be $88,648,000. We will admit the convenience (at present) of having *fenced* highways along the township lines (or an equivalent amount) for the purpose of driving herds and flocks to and from market, etc. Supposing these to be established, the cost of fencing them—at the rate above named—would be $15,774,400.

This amount deducted from the total cost, as above, leaves $73,873,600 as the cost of building, throughout the State, highway fences, over and above those needed for convenience in moving herds and flocks from place to place.

Estimating that these fences require to be renewed once in twelve years, or that repairs are equivalent in cost, to such renewal; or, when hedges are maintained, that their care will amount to $1 25 per rod in twelve years, we find the *annual* cost of maintaining these unnecessary fences to be $6,072,800, or *nearly a million dollars more than our entire State debt.* We thus see that while we are groaning under, and complaining of, "the burden of taxation," we are annually expending on these almost superfluous "outside fences" more than double the amout of our State taxes.

It is indeed a convenience to have the leading thoroughfares fenced, as above stated, yet it would be (and is) obviously unjust to burden the owners of lands, along the lines of such thoroughfares, with the *entire expense* of maintaining the requisite fences. Why should not *these*, as well as the highways themselves, be constructed and kept in repair, partially at least, at public expense.

Were all persons, who rear cattle, to practice the most economical mode of training them, viz: teaching them while young to lead, and occasionally renewing the lessons afterward, such fenced thoroughfares might well be dispensed with, as they are in eastern countries.

Cattle are naturally more docile and tractable than horses, yet while horses in droves are always led, it seems that the idea of accustoming *cattle* to the halter and driving them in a similar way, seems hardly to have been thought of. I think that it would be proved upon trial that the average expense of training them to lead would not exceed fifty cents each, per year, while the practice of thus keeping them tractable would save a vast amount of trouble and expense in stabling, leading upon cars, taking to slaughter houses, etc. It seems unnecessary to add that fenced roads are not needed in driving flocks of sheep, as it is well known that they are usually disinclined to leave a beaten track, in traveling, and are easily kept in place by well trained dogs. Let any farmer upon the prairies of Illinois, who doubts the utility of this proposition to provide for the restraining of domestic animals, sit down and make careful estimates, from data, in his own township, and he cannot fail to arrive at the conclusion that such a plan would save to the people of the State, annually, a sum equal, *at least*, to half the aggregate amount of their taxes.

When our present laws were framed the State was sparsely populated, and every householder had access to wide ranges of open prairie, where his domestic animals could roam and feed, free of cost, upon herbage, which would otherwise be destroyed by frost or devoured by flames. This state of things has forever passed away in the greater portion of the State, and we are called upon to examine our present circumstances and regulate our laws in conformity with them.

In the more thickly settled portions of the State, and where farms are worth fifty dollars or upwards per acre, the most intelligent farmers are convinced that true economy in animal husbandry points to the practice of "soiling" instead of pasturing their cattle—as in this way double the number can be fed from a given number of acres; and this practice will, if intelligently pursued, result in enriching the land. Whereas, by prevailing ones, manures are wasted and farms impoverished. The fence law is called "the poor man's law," and the highways are called "the poor man's pasture;" yet a careful observation of the practical operations of the law, at the present time, will show the fallacy of these pleas. Let us see how it affects the interests of this class of persons. The poor man emigrating to our State and seeking a home upon its fertile prairies, finds a forty acre lot which suits him, and which his little means will enable him to buy, and build upon it a dwelling sufficient for the present comfort of his family; but this land is in a sparsely settled region, far from timber, and from water communication, hence fencing material is high. He finds, on estimating the cost of the three hundred and twenty rods of fence requisite to inclose it and protect his crops from the ravages of the rich man's herds, which are allowed to roam at large, that the expense will be, at least, $400. He has not the means to meet this (to him) enormous expense, and he passes on far beyond the Mississippi, seeking upon the government lands a homestead which the laws prevented him from securing in our own State. In this way hundreds of emigrants are annually prevented from settling upon our prairies. Let us remove these obnoxious laws, and soon our unoccupied prairies will swarm with industrious people, and become covered with golden grain, enriching the honest tillers of the soil, and yielding valuable revenue to the State.

It is well known that the laws of this State were chiefly copied from those of New York, yet that State has found her fence laws imperfect. A few years since an attempt was made to reform those laws, and there, as here now, the proposal was met with the cry that "to enforce the common law rule would be oppressive to the poor man." "The highways and commons were the poor man's pastures, and he must be allowed to use them for this purpose, or be deprived of the privilege of keeping his one or two cows, which were necessary for the support of his family." Yet the majority favored the measure, and the reform was consummated.

The result proves that the reform was truly in the interest of the poorer classes. Now the one or two cows of the poor man find a quiet pasture in good feed, on a neighbor's farm; whereas they formerly roamed along the overstocked highways, oftentimes causing a long and weary walk to the owner after his hard day's work, in the shop or field, is done. It is generally conceded that the increase in the value of the milk from the same cows, since the law was reformed is more than equal to the cost of their pasturage; and we are assured that, were a proposition now made to return to the old custom, this class of persons would vote, almost to a man, against it.

II. Laws relating to Division Fences:

These, in brief, provide that persons whose inclosed lands adjoin, shall each construct half the division whenever either shall occupy his land, and notify the other to build half the fence. Thus, if A. owns an inclosure adjoining B's land (which may be in commons) whenever B. uses his land for tillage, or incloses the same, A. can compel him to build one-half the division fences. It matters not if A. uses his land entirely for pasturage, while B. keeps no animals in pasture, but devotes his farm to growing crops of grain, which requires no fences to keep them at home. Still the law empowers A. to seize upon and sell the products of the soil or other personal effects of his neighbor, sufficient to cover half the expenses of erecting and maintaining the division fences.

To illustrate the practical operation of this law, and show the power it vests in one person to oppress another, allow me to mention two instances (out of many) which have come under my observation:

Mr. A. was a farmer who had a part of his land in timothy, which he yearly cut for seed. The land being extremely rich, there was a luxuriant aftergrowth of grass, and as he owned horses and cattle, he wished to avail himself of this feed during the fall and winter. The land adjoining this was owned by Mr. B., and there was no division fence. Mr. B. was a good, simple-minded man, who had been so unfortunate as to have fallen into the toils of a sharper, who had extorted a mortgage upon his farm without rendering him an equivalent; and at the time referred to he was working hard in raising crops to lift the mortgage and secure the possession of a home for himself, his wife and little ones. Mr. A. saw that if he was to enforce *the law* upon his neighbor, and *compel* him to put up eighty rods of "lawful fence" at this time of his extremity, it would prove the last blow which would effect his financial ruin, sending him and his little family adrift without home or shelter for a night. Seeing this, he saw also that were he *to be as oppressive as the law allowed him to be*, he would be equally guilty before God with the villain who had driven poor Mr. B. to this extremity. A. erected the necessary fence, and B. succeeded in keeping his home. It is needless to add that, since that time, A. has used his influence toward the abolition of a law which thus places the poor and the unfortunate at the mercy of their more prosperous neighbors.

The other instance is that in which a widow with a family of children, had possession of an eighty-acre farm, left them by the deceased husband and father. This was a prairie farm, far from market and far from timber, and consequently fencing upon it was very expensive. She rented out this farm, and with the rent, and by practicing industry and economy, was enabled to keep her family together and her children in school. The owner of an adjoining farm wished to make a division fence, but as the widow was utterly unable to build her portion of it, he proceeded according to law to put up the fence, and then proceeded further according to law, to threaten her with prosecution unless she paid over to him in cash the value of one half the fence. For a long time her life was embittered by this frequently repeated threat, when, through sacrifice of personal comfort, and the assistance of kind friends, she was enabled to accede to the cruel demand.

This "law-abiding" farmer was thus enabled to increase his wealth through legalized robbery of the widow and orphans. Let us hope that such law-abiding oppressors are rare, and trust that the principles of humanity will prevail, even where humane laws are wanting.

The principle of common law to which we have referred, has been repeatedly recognized, by the supreme courts of other States, as paramount to conflicting local laws or customs; and, since it commends itself to our best judgment, should it not be made the basis of statutory law (upon this subject) in our own State? Can any good reason be shown why I shall be forced to protect myself from the depredations of my neighbor's cow or horse? If my neighbor chooses to allow his animals to roam over his fields and harvest their own food, he should be at liberty to do so, provided they are kept upon his own premises. But is it right that I, who believe I can confine and "soil" my cattle to better advantage than to follow my neighbor's practice, should, in addition to caring for my own animals, be compelled to build a portion of the fence which my neighbor wishes to use in restraining his stock? Surely, a law requiring this from me is unjust. An "act" compelling me to erect a tight fence, eight feet high, around my sheep fold and pasture, to protect my flock from destruction by my neighbor's dogs, would be equally just, in principle, yet how would such a law look upon our statute book? Why, every one would say that legislators enacting it were either fools or madmen. The principle involved is that of legislating for the benefit of one class of property at the expense of another class. In the supposed case it would be a wild and unreasonable legislation for dogs versus sheep, while the law under consideration is an unjust discrimination in favor of cattle and against cereal crops—it is legalizing extortion from the grain grower for the benefit of the cattle raiser.

There is one other important consideration which needs no argument to elucidate it, but which will be appreciated as soon as named, viz: That the great changes in our prairie climate which are needed to render the labor of the agriculturist more uniformly remunerative, and also to beautify the prairies, making homes upon them more pleasant and attractive, can only be brought about by the extensive planting of trees, which we all know it is impracticable to plant, especially along the highways, while cattle are allowed to go unrestrained.

Mr. President, and Gentlemen of the Convention: I present to you the following preambles and resolutions, embodying the leading considerations which I have brought before you, and move their adoption:

WHEREAS, The Common Law principle that every lawful owner of property is entitled to protection, by law, in the possession of the same, is founded in justice and equity; and,

WHEREAS, The statutes of this State—which require owners of real estate to protect the same, and the crops growing thereon, from depredations by domestic animals belonging to others—are manifestly unjust and oppressive, and at variance with common law; and,

WHEREAS, Many persons with small capital, who seek to procure homes upon our prairies, are prevented from doing so by their inability to erect protective fences; and,

WHEREAS, One of the greatest needs for the promotion of successful agriculture and horticulture, upon the prairies of the west, is the presence of lines of trees and groves—to check the fierce winds, ameliorate the atmosphere, and induce more frequent showers in summer—which trees it is impracticable to plant while cattle are allowed to run at large to destroy them; therefore,

Resolved, That all the laws of the State of Illinois, relating to fences, should either be abolished, or made to harmonize with the principles of common law—making all owners of animals responsible for the damage done by them.

Resolved, That a committee of three be chosen by the convention, to immediately memorialize the Constitutional Convention of this State, now in session, upon this subject.

DISCUSSION.

BALDWIN—No argument is needed in behalf of the resolutions. They are plainly right. In early times, it was well enough to let cattle run at large; but now it is different. It is unjust that a man should be compelled to take care of his neighbor's stock.

JUDGE MILLER—This is a difficult question. We shall not live, probably, to see no fences; but we do want to see the common law principle in force in Illinois. In a leading case, from the adjoining county of Ogle, two of our supreme judges said the common law did not apply in this case, whilst Judge Caton dissented. I wish the organic law might be amended, in this respect. Fences are mainly abolished in Europe, and soiling adopted. It may be the most profitable here.

JUDGE KNAPP—(After inquiring and learning the state of the Illinois law)—Such a law was overruled in New York and Wisconsin. I am surprised it should be so decided in this State. I think the constitution of the United States would protect one.

MOSS—I am very glad to hear the views presented. I coincide, in the main, heartily. Local legislation may help us, but is annoying, on account of the different by-laws in adjoining townships.

EDWARDS—The fences cost more than all the buildings of the State. It is a great waste of timber.

RUBBLES—I would not like to have this matter embodied in the constitution, for fear it would defeat it. It might be submitted as a separate article.

BALDWIN—In the south part of the State it might prove a strong objection to the constitution.

SHEARMAN—I approve of the common law principle, and think the resolutions should prevail.

FITCH—I have suffered exceedingly from the present condition of things. The law is unjust.

DORR—We do not protect animals as we should. This law would make people tie up animals, and they would be neglected.

FITCH—I think they would be better taken care of, and our woodlands, when cleared, would grow up again as they can not now, when the ground is fed by live stock.

JUDGE MILLER—The effect of reverting to the common law will be simply to make each one take care of his own.

An invitation from Prof. J. H. BLODGETT, Principal of the West Side schools, to visit the schools, under his charge, was received and accepted, with thanks; after which, the convention adjourned.

WEDNESDAY AFTERNOON—2 P. M.

WM. G. KING, Esq., of Rockford, read an address on some of the points of

DAIRYING.

It is not my intention at present to give you a full treatise on dairying, but simply to glance at the general features of this industry, and to point out some matters which require the attention of western farmers.

When we consider the improvement which has been established in the dairy industry of the northwest, the magnitude of this interest and the great importance it is fast gaining in the nation's industry—its product being now one of our leading exports—we can realize that we have an immense field for our labor and investigation.

THE IMPORTANCE OF DAIRY INDUSTRY.

We will glance, for a brief period, at the importance to the national prosperity of this branch of its industry. Commissioner Wells, in his last report to Congress, has placed us, and with us the whole commercial world, under obligations for his untiring industry and unflagging zeal in collecting statistics of the first importance to all persons engaged in active pursuits, both in this country and in all other countries doing business with us; and we are pleased to find that foreign statistical and scientific associations award to a United States Commissioner the well-deserved compliment that he has given to the world the most elaborate, the fullest, if not the best paper on national resources ever produced under the auspices of any nation in existence. We will review a few of the leading facts which bear upon dairy interests.

He tells us that the dairy products of the United States amounted, last year, to the amazing sum of four hundred millions of dollars, exceeding the cotton crop by about one hundred millions, being within fifty millions as large as the corn crop, and leading the wheat crop twenty-five millions of dollars. When we take into account the large amount of dairy products consumed on the farm, which are not calculated in the estimate, the product of the dairy must equal in value even the crop of corn, which is grown successfully both north and south, and has long been considered as our most important staple, while dairy products are confined to a comparatively small section of our territory. Ten years ago the amount of cheese made in all our States amounted to a little less than fourteen millions of dollars, and the amount of butter made then to less than thirty millions of dollars; the whole dairy product was then estimated at about forty-three millions, showing that during the last ten years we increased our dairy products in value more than three hundred and fifty millions of dollars, which would make an increase during the period, in per centage, of about 800; but it must be borne in mind that values have generally increased, both of manufactures and farm products. The articles produced in the dairies have increased in value as much (if not more,) than other farm products. If we allow an appreciation of one half in values, we still have an increase of fifty per cent. *per annum* in dairy products, which you will say is a very large growth, although we allow a large estimate for appreciations in prices, and perhaps more than sufficient.

Ten years ago, the total amount of cheese made in the State of New York, according to reports made to the authorities at Washington, was about thirty-five millions of pounds for that year. The market reports of the city of New York up to the first of January, 1870, and for and during the year 1869, show receipts in that city alone, of eighty millions of pounds, and this, after consumption at home had been taken out, and we may reasonably presume some millions of pounds were consumed at home, and in towns and villages all over the country, which never went to New York. From the statistics and the evidence we have, I think it fair to infer that the production of New York State alone, last year, was not less than one hundred millions of pounds, which brought more money than the whole cheese crop of the United States in the year 1860.

The number of pounds of butter made annually is not much less than the number of pounds of cheese, but the value of the former article is much greater than that of the latter. If you allow me to venture on an approximate estimate, I think it would be safe to say that in a dairy production of four hundred millions of dollars, we might put about two hundred and sixty millions to the credit of butter, and one hundred and forty millions to the credit of cheese. This is a goodly result, indeed, bringing rich rewards to the industrious—comfort, affluence and cultivation to the firesides of many worthy homes, and relieving from that severe toil, the anxieties of which, at an earlier day, were pressingly severe.

The statistics of the cheese manufacture in the northwest can be more accurately ascertained at the meetings of these associations than at any other place, or in any other way; but the making of butter being differently conducted, the article being made at home in farmers' houses, and sold in smaller quantities, and often in a more retail way, the statistics in detail are very difficult to collect; we can get at aggregates sold at wholesale, but we can not readily separate the productions of the several States and counties; also the home consumption of butter is very large, and our estimate of the whole make, even when made under the auspices of the agricultural bureau, may be below the truth. As a fact which may indicate something of the extent of the crop in the northwest, we find in the Chicago papers, at the close of 1869, a statement of the receipts and shipments to and from that city for the year; omitting, be it remembered, all transactions by express, we find the arrivals reported at a trifle over eight millions of pounds, and the shipments at five millions of pounds. As there is no report of the shipments from Chicago by express, we can not tell whether that city consumed the three millions of deficiency, but from what I have seen of the shipments taken to that city by express (which they do not report), I should think the estimate of receipts and shipments, as given in the market reports, much too small. From this brief review, we can get something of an adequate idea of the growth and magnitude of this interest.

Market Quotations are so arranged at our commercial centres as to puzzle the uninitiated, and to confuse even the best western dealers, but worse than this, they are unjust, and in the manner of quoting we ought to demand reform. The nomenclature of the market reports is so glaringly false and wrong, so far as it relates to western products, that it is a wonder that any intelligent dealer places any reliance in the reports. Why this is continued from day to day, and week to week, without a word of remonstrance from large dealers it is difficult to say, but I will venture to assert, that in our large markets it is well known that the scale laid down in reports is an arbitrary one, in most instances not indicating truly the relations of quality to value, or of value to quality, and that a scale much more intelligible could be established with advantage to both producers and dealers, and which would not discriminate against States, counties or localities, but quote any product according to its intrinsic merits.

In order to illustrate this subject further, I will call your attention to some quotations of the butter market of New York as it appeared on the 22d day of last month, in one of the best, most reliable, and most widely circulated of the New York market reports. If any of you have butter for sale, and if you will attentively read the market quotations, and can, at the end, tell in what class your butter belongs, and what you may expect to get for it, you certainly will perform a feat of great intelligence, for most men would be lost in the mazes of the fog. But I do not wish to convey the idea to you that in the quotations the relation of value to quality is in *all* cases ignored; some of them pretty clearly indicate it, but that they do an injustice to those who manufacture and those who deal in a really good article in the west is clear enough, and that a much better manner of reporting might be adopted. Let me present an example: one quotation reads, "State firkins, poor to good, 30@33c; that is, a poor State firkin is worth 30c per ℔., and a good one 33c. Further down on the list we find "Western firkins, good to prime, 22 to 28c;" a *good* Western firkin it seems brings 22c, while a poor New York firkin brings 30c. We find also Western firkins, poor to fair, 18 to 20c; a poor Western firkin brings 18c, and a poor New York brings 30c, according to this price current. We could go on and analyze the list and produce more samples of the same sort, but we have selected enough for our purpose.

It seems scarcely necessary to rehearse that which is self-evident, that butter if good is GOOD, if fair is FAIR, and if bad is BAD, whether made in New York or Illinois, and that such quality ought to have its market value, without regard to whose farm it was made on.

It may be said in justification of the present classifications that a poor New

York firkin of butter, is a better article than a good Illinois firkin, and that the scale is so arranged, that dealers understand GOOD Illinois to be a very indifferent article, and poor New York State to be a more desirable commodity. I think it quite likely there is some such design in the arrangement of the scale, but were we looking for an argument more cogent than any we have offered to prove our correctness, this, (which is the very one reporters would furnish us), is that which I should select, that is that the scale is so arranged as to deceive.

Another objection to quoting dairy products of the west by the State or section from whence they come, is the very important one that they are often wrong with regard to the average quality of the make in the different localities. If we are to have quotations by States, counties, etc., (which we protest against), the least we can expect is, that they show some measure of correctness. I noticed last summer that some of the weekly circulars issued in different eastern cities, quoted Illinois and Wisconsin butter at the bottom of the list—the poorest and the lowest priced. All the States west of us took a higher rank in this article, according to some few of the "wise menof the east." Now, *we* know that in the whole territory west of the great lakes, there is no richer country in fine, sweet grasses, and pure water, than the Rock River Valley. We also know that in this Rock River Valley, we have farmers from New York, New England, and from Europe who are pre-eminently that class of people noted for making good butter and cheese. We know, that enterprise, intelligence, and untiring industry, have been at work for years making improvements in, and developing this magnificent industry; that we have more butter packed in the dairies, and less stone packed than in any other dairy country west of Buffalo, and that our cooperage, to say the least, is as good as that of any western State. To-day, in the cities of Chicago, St. Louis, Memphis, New Orleans, and many other places, the sign "Rock River Butter" over the produce dealer's door, is constantly to be found, and is a valuable advertisement. That a large portion of our butter is poorly handled, and much of it poor when it is first made, we do not deny, but the facts I present I hope show the absurdity of sectional quotations.

I will further illustrate the point briefly by some of my own personal experience. I had a connection with a large butter and cheese house in St. Louis for some years. The house bought and sold butter from many of the dairying States of the Union, and on some occasions I remember when the house had bought New York State butter to supply its most fastidious customers, we have inspected the stock and selected out our choicest Rock River packages, putting them aside for those who were very difficult to please, and holding them a little higher than New York dairies. This, doubtless, will sound very trange to New York produce reporters, but yet it is nevertheless so. I would also remark here, that a factory of Illinois cheese sent to the same house during the fall of 1868, was held higher, and sold for more money than New York and Ohio factories purchased at the same time.

One of the causes influencing the present mode of quotations is, that when New York State dairymen do not like to accept ruling prices, (and being generally rich enough to hold for better ones), it is a great convenience to some dealers to be able to offer a good article to their customers at a much lower price than State butter, and also make returns to their western correspondents at the market quotations for western butter.

I am pleased to be able to say that many intelligent New York and Boston houses repudiate the scale classification and nomenclature of the reports, and I know of some who sell good western butter for a price much above the quotations, and often get for nice lots of Welsh tubs, or half firkins, the prices quoted for New York State. May we express a hope that the agricultural press of the Northwest will help us in our demand that our dairy products shall be quoted according to their intrinsic merits, and not by any arbitrary classification? I may have been prolix in my remarks on this matter of quotations, but if so, my excuse is, that I look upon it as an evil which ought to be corrected, and that in calling attention to it some good may be accomplished. In some countries in Europe the butter dealers quote the markets for first, second, third, etc., etc., or the article could be quoted something like the cotton market is, or say choice, good, good middling, middling, low middling, etc., etc., with some deviation with regard to style of package, which the market may demand at different times. But I will leave these suggestions with you and pass on to other matters.

The best manner of Making and Packing Butter for the Market.—Keeping in view the chief ideas of this hasty address, we still must not overlook the fact that a large amount of our western butter is carelessly made, and as carelessly prepared for market, and that this fact affords the opportunity to place *all* our dairy product in the same category. In some districts but little attention is paid to the subject. Dealers, as long as they can buy at a profit, are indifferent to quality and package, while farmers reason according to the requirement of the dealer, and consequently progress is very slow. On the contrary cheese making has fallen into more intelligent channels, and a powerful community of interests exist between those who produce milk and those who make it up into cheese; the butter interest being in fragmentary items needs that unity of action which the cheese interest (being united in larger bodies) secures; it is therefore important to that branch of dairying, that information on the requirements of the markets be easy of access and widely diffused.

The fact that the butter crop is so much larger than the cheese crop is a strong reason why such associations as ours should contribute to its development; besides, the wants of butter makers in the way of full information are really greater than those of cheese makers at the present day. Our cheese makers have established a reputation for a degree of excellence at home and abroad not yet reached by our butter makers. I will give a few concise

Rules to be Observed in Making Good Butter.—Everything a cow eats or drinks affects the flavor of the milk and butter; therefore cows should be kept in a clean pasture of timothy or "herd grass," and have pure, clean water to drink. Wild grasses, garlic, weeds, and leaves or stagnant water give bad flavor to butter.

The milk room should be cool and dry and the air should be pure; it should be kept cool and sweet, be well ventilated, and in a shady place or cool basement; no decaying vegetables or anything having an offensive odor should be allowed within it, and no manure heaps or hog yards should be near it.

Close watchfulness of the milk is required; if it stands too long it will make bad flavored butter, less of it, and it will require more labor to churn and work it; if milk pans are not kept well cleaned and aired, they will gather the acid and make bitter butter.

If possible the cream should be churned every morning, especially in warm weather.

Some of the best makers never wash their butter, others equally skillful, always do so. The chief object to be obtained is to cleanse the butter of the butter-milk; this is necessary to success. Good butter cannot be expected unless this is thoroughly done. After working the butter, it should be salted and set in a cool cellar, or suspended in a cold well, until the next morning, and then slightly re-worked from its surplus water and brine, and *immediately* packed in the vessel that it is to be used from, or taken to market and sold in. Butter should be worked and cleansed of butter-milk and salted in the cool part of the day, and with as little working as possible, and leave it *free from butter-milk and water*. Much butter is injured by working too much when soft.

When finished it becomes hard or set, every working over, or changing from one vessel to another, injures it, rendering it soft and pasty, breaking the grain, etc., and it will never again be as firm, or nice in flavor, and will not keep sweet as long.

It should be kept in a cool, sweet, dry cellar in a *brine-tight* white oak firkin or tub, which should be soaked in a strong brine for some days before filling it. Care should be taken at all times to keep it covered with a white cloth, with a layer of saturated salt on top of the cloth. A uniform coo temperature in a sweet, dry place is essential to keeping it sweet. Butte once exposed to too great degree of heat, will never be as hard again, or keep as well.

Stone jars are undesirable packages; on account of their weight, the heavy cost of freighting them, and their liability to be broken, shippers seldom buy them, but for family use they answer very well.

Care should be taken to select the best kind of salt. The taste is a good guide in salting, or about ½ to ¾ oz. to the ℔. of butter. Much is injured and nearly spoiled by putting in too much. Saltpetre and sugar, or any such kind of mixtures, are worse than useless—they are injurious.

In taking it to market, it should be done in the cool part of the day, if in warm weather, and at all times kept out of the sunshine, and if freighted in a railroad car, one well ventilated.

There is nothing connected with dairying more striking or more palpable than the fact that everything a cow eats or drinks affects the flavor of the milk and butter; if your cows are fed turnips, carrots, onions, cabbages, grass, hay, bran or corn meal, each takes with it a distinctive property to the milk, which is also found in a greater or less degree in the butter and cheese into which it is manufactured. The color of butter (well and properly made) depends more upon the feed given to the cow than upon all other causes together. It does not require an expert in testing butter to trace bad flavor to its original cause. Stagnant water asserts its presence by its unmistakable musty odor; all pungent vegetables proclaim their ascendency so that none can mistake their influence. The fine, sweet grasses impart that delicious fragrance which gives to your butter the highest value.

A cool, dry, well shaded and well ventilated milk room is also a matter of great importance. If you have fine cows, fine feed, and a close, musty or unclean atmosphere to keep your milk in, your investment is in vain. Get a suitable milk room built at once, and if you cannot do this, get rid of your dairy stock as quickly as possible, and go into some other business, for this one cannot possibly pay you. These conditions being right, I wish to call the earnest attention of the milk producers of the country to a most important consideration, that is, the cooling of the milk, exposing it to the atmosphere and expelling the animal odor as soon as possible after being drawn from the cow. This is especially necessary during the warm season, for if the milk be put away without cooling when the air is nearly at the temperature of the milk when drawn, decomposition will very soon commence, and of course bad and unwholesome butter and cheese are the result.

The pleasant fragrance of "new milk" has passed into an adage, and people inexperienced regard its odor as one of its good qualities, but it is not all pure. There is a subtile element—an animal odor which is deleterious and offensive, and if retained by the milk will impart its peculiarities to the dairy product. This odor, I regard, as the most potent cause of that disgusting flavor which we find in some cheese; it is also, in many cases, the original element which promotes rancidity in butter. The presence of this odor and its offensive properties can be readily tested. If your milk, taken fresh from the cow be put into a *close* vessel and allowed to remain a short time, on opening it a watery condensation of the effluvium will be found on the inside, of the most unpleasant odor, and very unfit to be taken into your butter and cheese. I hope it is obvious to all that cooling the milk and expelling the animal ordor is essential to excellency.

Various devices have been lately offered to effect the objects spoken of; those which expose every particle of the milk in a thin sheet to the action of the atmosphere being most effective. The cooler which will perform the work in the simplest manner, and at the same time can be easily and thoroughly cleansed, so that every portion of decomposed milk can be readily removed, is the one to supply the want. Wooden milk pails should never be used; tin pails can be easily obtained, and are much better for milk, also the paper pails with enamel inside are very good.

The item relating to the washing of butter has been questioned by high authority, and since I first published the above directions, I have had many letters upon the subject of washing butter, some persons advocating that butter should be washed in clear, pure cold water, and others taking the opposite, that the flavor was destroyed by washing, and it should never be resorted to. When I resided in Dutchess county, New York, I know that the farmers enjoying the highest reputation for fine butter ignored washing, but it must be taken into account that their butter was sold and consumed immediately after it was made. From my observation and experience, I conclude that butter for *immediate use*, if well worked and treated properly, has a higher flavor when *not* washed, but when packed for keeping any length of time, it ought to be well washed in pure, cold spring water. The high grades of rich, yellow Irish butter made for *export* are always washed, the lighter and more delicate Holstein, made for immediate consumption, and keeping poorly, is generally not washed.

The kind of cooperage used in packing butter for market is of the first importance, and this is overlooked in most western localities. One of the chief reasons why western butter is at a low standard in the markets abroad, is that the cooperage is so very poor. Many farmers and dealers do not generally patronize the best cooper, but the cheapest one. They reason that it makes no difference, as they generally give the package away, and the less it costs, the better for them. Now, this is a very great mistake, for intelligent dealers will pay for the same quality of butter in such cooperage as suits the market, an enhanced price much more than sufficient to compensate for the better and more costly packages. It is our interest to imitate the most favorite styles of eastern packages, and if possible to excel them in smoothness of finish and beauty of workmanship. We should never pursue the penny wise policy of buying the *cheapest.*

There is a prejudice in eastern markets against all butter in packages known as western, even though the article be quite good; the circumstance of the package is used to depreciate it. It is, therefore, obvious that in order to destroy this idea, we must pack in the cooperage popular in those markets. I would, therefore, advise the use of the New York "Welsh tub," the "half firkin" tub and the hundred pound "firkin;" the former should be made of white ash or white oak, the two latter of white oak only. The Welsh tub with flat hoops, the other two spoken of with round hoops—not mere straps with rough bark and large knots, but nice and smooth second growth hickory, with smooth, shiny bark, free from humps, each hoop a half pole, and all uniform in size and color, the wood to be free from sap, and of uniform color—everything neatly and well done. Get this kind of cooperage to pack your good butter in, if it costs five fold more than the comman kind, and you will do more to destroy the prejudice against our product than if we wrote volumes and still pursued our cheap and careless customs.

One of our greatest faults at the west in making butter is that we salt too much, and a large amount of western butter is cured with coarse salt. This fault has been pointed out very often with some good results, but it exists still to a great extent. A package of butter just rightly salted so as to be pleasant to the taste, will bring five cents per pound more in some markets than it would sell for if there had been only a quarter of an ounce more salt to each pound. The coarse salt of commerce is not pure; besides being hard to dissolve in butter, it continues to be gritty and unpleasant to the taste; it is not generally clean, nor does it amalgamate with the butter or cheese fully. I have heretofore recommended the Liverpool salt of Ashton's brand. I am glad to be able to say that we now have an American salt which I consider quite as good or better. The New York Factory and Excelsior brands analyze as well as the Ashton, and are finer ground.

There is no section where there is not room for improvement in the manufacture of this article, but especially here, where, as yet, the business is in its infancy, and facilities for doing it to advantage are not found on every farm. I wish I could impress upon the small dairyman of the northwest the great truth, that he who is engaged in the manufacture of poor butter or cheese, is in a very BAD business, and he who is producing a good article of either is pursuing the highest agricultural attainment.

I have often had reason to remark that the western farmers, who have good butter to sell, get on well without going in debt to the stores, and come out in the fall without having a debt to pay out of their corn and wheat crops; and those who do not make butter to sell through the summer, often contract a debt at that time which it is often difficult to meet.

The present and future prospects of the dairy interests of the west were spoken of in my address at Elgin. The satisfactory trade of the last year, I think, has fully borne out some of my predictions, and looming up in the future I think I see the fulfillment of others. When we reflect upon the greatness and importance of this interest—upon its rapid growth during the last ten years—the increasing population of the country—the new settlements springing up so rapidly in the west—the large mining interests, gradually increasing, and the wants of such a population for our dairy products—the favor with which our shipments have been received on the Pacific coast, and the ever active and improving energy of the men engaged in this branch of our national industry, who can doubt continued success? The household word of the American people, and especially of the western people, is "Excelsior," higher, onward. Values *may* change—markets for a time may afford small encouragement, but these are but ripples on the surface of the great stream which will continue to flow on to its destination, which is sure to be victory—success. Let us all give strong hearts and steady hands to the work we have, and prosperity will reign in all our borders.

DISCUSSION.

Mr. KING was asked what kind of a cooler he would prefer.

KING—The best cooler I have seen is a sheet of zinc, corrugated like a wash board, but with the ogees larger, and so arranged that whilst the milk runs down one side of the zinc, cold water runs down the other in fine streams.

LAWRENCE—Dairying is one of the leading interests, especially here, though good butter may be made a good deal farther south. It is important to remember that anything given the cows affects the taste of the milk. I have used the milk-cooler mentioned by

Mr. King. In the hot weather I use more water, in cool weather none at all. Milk set upon Sunday morning thus cooled, was good to skim Tuesday, and the butter as good as October butter, whilst that set without cooling soured by Sunday night. The interest in dairying will increase, and cheese to a certain extent will take the place of meat.

CURTIS—I would impress the idea that butter must be kept away, when made, from all offensive smells.

KING—A good butter maker once brought me some butter that was very offensive. I found on inquiry that he had shot a pole cat going into the cellar where the butter was kept. I put the butter in a dark corner of the cellar and kept it many months, and the odor disappeared.

LAWRENCE—There is cause for complaint against our Chicago dealers. They sell our best cheese in the New York factory boxes. The second rate is all Illinois factory, and the third rate is Illinois dairy.

SEARS—I think if gentlemen will make the best cheese it won't go into New York boxes. The locality has to take the general character of the product.

KING—All good butter should be recognized as such, wherever produced.

Adjourned.

WEDNESDAY EVENING—7 o'clock.

SAMUEL EDWARDS, of LaMoille, occupied a few minutes in a talk on

HANDLING EVERGREENS.

I have had a good many years' experience with evergreens. Growing them from seed in ordinary seasons on our prairies is rather difficult. A wet season, like the last, is better; but as a rule, those who are inexperienced had better buy their trees.

To grow evergreens, soil that is about one-third sand, with some mold, should be used. The seeds should be covered once or twice their diameter. They should be sown early to prevent their "damping off." This arises from excess of moisture in hot weather. We sow on dry sand to check it. Sow the seeds in beds four feet wide; about two pounds of the seeds of the European larch, or of the pines, to the square rod. Cover the young plants with leaves the first winter. Leave the plants two years in the beds before transplanting. Birds are fond of the seeds, and must be watched.

In getting trees from the forests, get them as quickly as possible, and put a shade of laths over them. Plant them closely in the bed; leave them in the bed generally two years, and then plant the rows two and a half feet apart, but the trees close together in the row.

We sowed our seeds last year at Green Bay. The atmosphere is not so dry there; the birds are the only trouble.

I prefer to plant evergreens when in a state of rest, but they can be moved in a moist day, until late in the season. In that case I would plant late in the evening, water heavily, and protect them the next day from the sun.

Trees for belts I plant ten feet apart in the row, and break the joints with the next row.

Red cedar has generally succeeded pretty well until three or four years ago. Hemlock is grown best in partial shade. The American Yew is fine in the shade. It is similar in leaf to the European and to the Hemlock. It is propagated readily from cuttings in the shade, late in May. The Norway Spruce will bear shearing well; as also the Arbor Vitæ.

[In answer to queries]—When the branches are too thick, taking out the alternate branches often does very well. It will answer to move seedlings that have not been transplanted if you are careful. I would just as soon have trees from the woods; but they must be carefully handled, and be small ones, not more than four to twelve inches in height. Red pine is difficult to handle. Austrian pine is attacked by a fungus. I find it here at Rockford. Siberian Arbor Vitæ does very well here. In the shade it roots readily from cuttings made with a part of the last year's wood left on.

ELMER BALDWIN, of Farm Ridge, chairman of the State Board of Charities, delivered an address on

RURAL ECONOMY.

The subject assigned me furnishes rich material for an extended course of lectures. The varied interests of the industrial classes—that great wealth-producing portion of mankind, the basis of individual and national wealth, growth and prosperity, the great patient, quiet class, which bears the world of business and activity on its shoulders—can be but briefly noticed; certainly not fully analyzed and discussed in a single essay.

I shall only attempt to seize on some salient points of the subject, and only discuss those in a discursive and disconnected manner. I shall briefly allude to the commercial, judicial, educational and social interests of the rural population; and, in doing so, shall not willingly draw invidious distinction between classes and pursuits, believing that society should form one harmonious whole; that the different occupations and callings, when necessary to the workings of society, should be mutual in aiding each other, and that no improper jealousy should mar the practical usefulness of each.

But, at the same time, I would not hesitate to pass any deserved censure, when the rights of one class are unnecessarily encroached upon or sacrificed to the aggrandizement of another.

The history of the world is but one continued effort toward aristocratic privilege, an effort of one or more classes to place the bit in the mouth of the other, and to ride *ad libitum*. Personal ambition, or desire to better one's condition, to reach a conspicuous position in society, is a most laudable and praiseworthy quality. It is the primary source of the world's wealth, and the main spring of the world's activity. But the right to achieve such superiority should be freely accorded to all others. When we rudely push back our fellows in the race, or place impediments in their path, we violate the law of comity, and do wrong to society and to ourselves.

The condition of the rural population through the long centuries of the past—their status as related to the governing and professional classes—has been one of acknowledged inferiority and tame submission to wrong.

Legalized aristocratic privilege, with the ignorance of the industrial and superior education and intelligence of other classes, were the principal agents in perpetuating that state of society.

Knowledge is power, and it is asking too much to require superior intelligence to forego the position that intelligence gives.

The ignorance and ready submission of the rural class to the behests of professional pride and dictation, was proverbial, and for centuries they scarcely revolted at the claim of their superiors, that the laborer should trust his property in the hands of his lawyer, his body in the care of the doctor, and his soul in charge of the priest. But a new era has dawned on this once down trodden class. A comprehensive economy and competing emulation has made them self-reliant, and taught them that beneath the rough exterior of the laborer there may dwell as pure virtue, as bright an intellect, as noble a soul as can exist beneath the trappings of aristocratic or professional pride; though unpolished the diamond is still there.

The equalizing influence of our free institutions and universal education has constantly tended to their elevation.

The recent national ratification of the principle of the equality of all men before the law, is a proud achievement of the age, a bright and rapid stride in the halting march of human progress, placing society on an elevated standpoint above the fogs of prejudice and aristocratic caste, around which the sunshine of truth shall ever play.

Under the fostering influence of this noble principle the rights of all classes are destined to a more perfect recognition, a more full appreciation, and many of the errors of the past are destined to disappear before its benign influence.

Yet it is hard for the leopard to change his spots, or the Ethiopian his skin! Habits of thinking indulged in for ages, customs sanctioned by generations of use, opinions almost as old as time, cannot be banished at once, or obliterated even by argument or reason, however absurd in character. The wearing influence of time aided by the general dissemination of intelligence can alone obliterate the accursed spot—the long standing claim of the inferiority of the rural class.

The boon of a common education is now conceded to be the right of all, but a higher education for the industrial classes is denounced by thousands, and even by professional educated men. It is said to be inappropriate, unnecessary, and that efforts in that direction will prove disgraceful failures; that endowments of such institutions will prove worse than a waste of the funds which should have been added to those of classical schools.

Such utterances should blister the lips of any intelligent person that utters them; they are opposed to the spirit and genius of the age. Such persons are groveling among the fogs of prejudice, far behind and unworthy the day in which they live.

The president of a classical college in a recent lecture on classical education, said his college was designed to educate and form leaders in society; an idea that smacks strongly of aristocratic rule. The industrial class with us are now too intelligent to longer yield to the demands of a privileged class, whether that class carry fetters for the slave or the claims of professional superiority. Our people have achieved a position in advance of all others who have preceded. No others have enjoyed such educational advantages, so cheap and general diffusion of literature and intelligence. This diffusion of knowledge and elevation of the masses is the growth of modern ideas, a development of modern philosophy, the legitimate outgrowth of that terse and comprehensive sentence, "Do unto others as you would that others should do unto you," an axiom that levels all distinction, that strikes the fetter from the slave and the rod from the hand of the oppressor, and will eventually wipe out that system of education that selects and trains a few for leaders and the masses for followers. That axiom will educate all the people, and all the leaders we need will be spontaneously developed.

I pass to notice some measures of economic policy which I regard as of vital importance to our industrial population. Whichever way we turn we find some trace of the feudal vassalage, exemplified by the world's history, attaching to the laborer, the result of law, custom or usage.

As agriculturists, we have drawn from a virgin soil, teeming with exuberant fertility, food for the hungry millions of the earth, and sent it along long lines of transport, seeking a market. A fertile soil, of easy cultivation and a scattered population, have enabled us to make this, to some extent, profitable; but a moment's reflection must convince any one that we are selling the realty of our farms; to use a homely comparison, "always taking out of the meal-tub and never putting in, must some time reach the bottom." Ever taking from the soil and returning nothing to it, but sending all the product to a foreign market, must, in the end, result in ruin.

It is a nice and plausible theory that we should buy our manufactured goods where we can buy the cheapest, and where we buy there will be the market for our produce; but this theory may have its drawbacks. If we have to pay transportation on our heavy agricultural products four thousand miles to the European market, to pay for the cheap goods, they may not prove very cheap in the end.

Men high in political position tell us that a wise political economy requires a reduction of the price of our products, so they will bear transportation to a foreign market; that then the commerce and trade will be brisk and profitable; that such reduction of price is a necessity for the continuance of the trade. And we are also told that policy is particularly applicable to the Northwestern States, and our farmers are appealed to as agriculturists, that they have no interest in manufactures except to pull them down, and then buy goods made by the cheap labor of Europe.

It seems to me a rather poor consolation to western farmers, that for the purpose of aiding the importing merchants of the eastern cities to drive a profitable trade, they must put down the price of their products till they will bear exportation at a profit, whatever that price may be. As a condition for sustaining this trade, the farmer must first reduce the price of his production, then pay transportation one-fourth of the distance round the globe, and transportation and charges on the goods received in exchange; and worse still, exhaust and ruin the soil by the destructive process of sending all their products for consumption in a foreign country.

It is the old system repeated; the interests of the rural population must be subservient to the trading interest.

The policy here recommended was pursued by the South Atlantic States, till the rich soil of Virginia and the Carolinas were turned out as hunting grounds for the fox and the wolf, and every people pursuing a similar policy has found a like result.

Such will be the story of the rich prairie soil if we continue as we have begun. Some future traveler will descant upon the profligate policy which changes the richest soil the world has seen into a barren waste. The soil must be fed or it will cease to yield its fruits.

Manures are made where the products are consumed, and if ours are consumed in England, English soil will grow fat at the expense of ours, as it has done to some extent already.

We need diversified labor, diversified pursuits. That people, whose industry is the most diversified, is the most independent, the most wealthy and prosperous. We need the mechanic and manufacturer alongside the farmer, aiding and building up each other, and any policy that puts off the day that consummates that object, is opposed to the true interest of the west. Such diversified industry is the normal requisite of a successful people. A purely agricultural people ever have been and ever will be, in the final result, poor. It requires no great exercise of intellectual acumen to discern the fact that the nearer the farmer and manufacturer are to each other, the more readily they can exchange their respective products, and the cheaper they will be to each. If they are thousands of miles separated, the cost of transportation must be added to the original cost, increasing the price that much, which is really just so much loss to the world. But it is said the carrying trade is commerce, and commerce is a national as well as a private interest. Exchange of production when necessary is beneficial, when not necessary it is not beneficial, but is really a loss; and if the producer and consumer were always near each other, extended commerce would be unnecessary.

If you separate the industries for the purpose of making commerce, you may as well haul your produce up the hill and down again in the track of Falstaff's troops, which performance is a very fair exemplification of the opposing policy.

Much of the foreign commerce of the country is detrimental rather than beneficial. It can hardly be profitable to ship heavy, bulky produce, making the circuit of the markets of the world, which, when finally sold, must be sold in competition with like products raised on the spot and paying no transportation. It fares no better for its long and costly carriage, but is generally of less value from its long journey on shipboard; thus they compete under circumstances decidedly disadvantageous. And much that is returned in payment for these hard earned products is the fashionable follies and froths of London and Parisian fashions, which, if sunk in mid ocean, would be no loss to the world.

It is a mockery of justice and an insult to common sense to guard with technicalities, to abstrusely mystify the question at issue; to allow it to be carried through all the courts, however small the amount, under the pretense of protecting the rights of parties until you protect them to death. To administer simple justice, in ordinary cases, needs no complicated forms, no learned disquisitions, no costly investigation; plain, common sense is the best guide and best referee.

If two individuals cannot settle their differences, let three fellows settle them, under prescribed forms, plain, simple and final. Having named some of the duties society owes the individual, let us inquire how they are met under existing institutions. If we could divest our minds of pre-conceived opinions; if we could place ourselves as pioneers at the formation of society, aiming to establish plain, simple and effective rules that should subserve the best interest of all, we could but regard the present complicated, expensive and laggard system of meting out justice, as more venerable from age than use, and as subserving the purposes of the legal profession better than that of the masses of the people.

No one denies the correctness of its principles embodied in the common law. Blackstone, Story, and the long list of able exponents of the abstract principles of right and justice, elucidate and define axioms as immutable and eternal as justice itself. But the machinery by which these axioms are applied, the forms and technicalities of the law, the long and vexatious delay, and the enormous expense, render the whole system partial, oppressive and powerless for good.

An amount of one or two hundred dollars had better be abandoned than contested in a court of record; and even a claim of five hundred or one thousand dollars will not pay expenses if it has to be rescued from the hands of a determined opponent. Our laws allow (very absurdly) contests for the smallest amounts to be carried through all the courts, as if it was the object to make business for bar and court, regardless of the cost, trouble and annoyance of the parties, jurors and witnesses; or to give the party with the longest purse the advantage. The cost of a session of our circuit courts is frequently many times the amount adjudicated. A contest for an amount of $20 frequently accumulates a bill of costs of one to two hundred dollars—exclusive of counsel fees.

There seems a disposition to disregard the interest of parties with witnesses, who are frequently compelled to dance attendance at the county seat during an entire session, only to find their case laid over for future action, or, if brought to trial, it is only after days or weeks of expensive waiting. Why should the interest and convenience of the court and bar be regarded as of more consequence than that of the whole people?

Those who have been forced to these acts of feudal fealty, whether as parties, jurors or witnesses, to leave home, family and business, and await the tardy action of the court, while its august dignity is engaged in adjudicating a $5 appeal from a justice's court, can appreciate my argument. But even this annoyance might be borne, if by it parties were sure of prompt redress for their wrongs; but here the proverbial, "law's delay," blasts the fond hopes of the expectant client.

The poor man has been wronged, and with abiding confidence appeals to that court he has ever been taught to reverence. Curtailing expense, abridging all the luxuries and many of the necessaries of his family, he collects the means to meet his expenses while he waits at the threshold in sight of the judicial ermine for the decree that shall give him his own. Days and weeks pass; his money is wasted and his heart sinks within him as he learns that, on motion of his rich opponent, his case is carried over to the next term. Still hopeful and conscious of the justness of his case, he robs his family of their comforts to save the means to again appeal to the courts of his country.

Again he waits, term after term, wasting the means his family needs, and when he finally recovers a judgment, after expending several times the amount, his richer opponent appeals to a higher and more expensive tribunal. Unable to pursue it farther, he seeks in bankruptcy a protection from the persecutions of the sheriff, and a chance to care for his family at home. This is no fancy sketch. It is the legitimate, and frequently the actual, result of the operation of the law in this boasted land of equal protection. It was the boast of some of the ancients that the rich and poor were alike protected by the judicial ermine. It is not so in this land of freedom. What chance has the poor and honest litigant in a contest with a rich scoundrel or soulless corporation, when the smallest amount can be carried through all the courts—appealed, remanded, new trials granted, and so on, through all the changes that a long purse can play on the complicated judicial machinery, until the costs consume an ordinary fortune, and none but the wealthy can stand the drain?

It makes no difference, practically, whether you deny a certain class a remedy for their wrongs by legal prohibition, or make your courts so expensive that they cannot meet the expense. In either case their wrongs must go unredressed. It is claimed that all this expensive machinery is necessary in order to a full understanding of the case, and a correct application of the law, and without it cases might fail to get a strictly legal decision. If this be so, still the result is not worth the cost. If, by carrying every case to the court of last resort, and the chief justice was endowed with omniscience and infinite intelligence, so that every decision should have all the infallibility ever ascribed to the edicts of the Pope, still the result would not pay. No amount of sophistry can convince any rational man that a judgment, however pure and well backed by legal lore, that gives him one hundred dollars at an expense of three hundred, is any protection against the wrong doer or any benefit to him.

The law poorly answers the purpose of redressing the wrongs of individuals, and if it was made to enrich the legal profession at the expense of the people, it could hardly have been more adroitly fashioned for that purpose. To the people it is but an *ignisfatuus*, that flatters but to deceive, that lures but to destroy. I will offer a few suggestions as to a remedy:

I would commence reform (as all reform must be gradual) by revising and extending the jurisdiction of the lower courts, making their action final, and thus stopping nine-tenths of the business now sent to the higher courts. This will relieve the industrial class from nearly all the participation in the expensive, vexatious and unnecessary attendance on the high courts.

I would establish a local court in each town, precinct, or ward, with jurisdiction over cases amounting to one thousand dollars. I would make it strictly a court of equity and allow no appeal from its decisions; guard its proceedings with all proper provisions for the protection of parties. Let all matters in dispute be promptly and cheaply adjudicated and forever settled. Let it be virtually an enforced arbitration, where all contests shall be settled in the embryo.

Such a court, divested of those technicalities, which only bewilder the courts and juries, will seldom do great injustice. A better jury can be found in each town than at the county seat, where professional jurors congregate. The parties and witnesses will be among their neighbors, where they are well known and properly appreciated. The merits of any case will be better understood where the occurrence takes place, and the cost will be trifling. What is recovered will be net gain, and not swallowed up in costs, as in the higher courts. But, better still, the decision will be prompt, decisive and final—no vexatious delay, no interminable litigation, eating up the substance and bankrupting the parties, and if the parties do not get full justice, there will not be enough left to pay for changing into a higher court, where every dollar recovered will cost from two to ten.

It may be objected that these courts and juries will not be learned in the law, and cannot nicely discriminate on all legal points. To this I will answer that they will know what is right, and justice is better than law. Neighbors and companions of the parties, they can, more fully than strangers, comprehend the case, and do to others as they would have and may expect others to do to them.

The settlement of all difficulties by such domestic courts will soon establish plain and simple rules of procedure. Text books, embracing terse, short and practical axioms, will soon be produced and become one of the important studies in our common and higher schools. The people will soon become educated to their position. When that time arrives the world will look back to the present system of judicial practice as the Protestant church looks back to the sale of indulgences by the Pope.

But another vital consideration is, that the rich and poor will be placed on terms of equality before the law. The trifling cost will not be a bar to any person seeking redress for his wrongs, while the rich man or corporation will have to abide the result without appeal; no dragging the poor opponent through the fatal labyrinth of interminable litigation, but both alike must submit to the decision of their peers. A glorious boon which will in the future, as it should have done in the past, save many a fortune, and many a happy home from desolation and ruin! And this will be accomplished at home—parties and jurors and witnesses will not be forced to leave their business and dance attendance at the county seat for weeks at each term of court—an expensive, vexatious and unbearable annoyance.

The Mormons of Utah have no litigations, but settle all differences by referring them to the brethren. The bishops, who are more judicial than priestly in their offices, summon a number of the brethren, who call the parties and witnesses before them, hear the case and decide it, which decision is final. Justice is said to be fairly administered, and to the satisfaction of all parties, and that without delay, and with little time and expense.

If all minor matters of dispute were thus settled with us, and there is no reason why they cannot be, it would save an immense amount of time, and vexation, and millions of expense. It would prevent long continued quarrels, and make men better citizens and neighbors.

I know of no good argument in favor of the present system of litigation, except it be to gratify the malicious spite of the parties toward each other, and the resulting benefit to the legal profession. The first, certainly, is not a weighty argument, and the second will do to place by the side of the first.

Although the proposed reform will lessen largely the business of the bar, yet I can hardly believe an honorable lawyer will object to it. They certainly ought not to wish men to quarrel, merely to give them employment, and to have unnecessary litigation merely for a fee. The courts and members of the bar will be elevated and dignified by the change. Only questions of grave importance will come before them, and they will have time for deliberation. It is true some of the members of the bar will be forced to follow other callings, and that change will probably be beneficial to the country.

That they will yield the point without a struggle can hardly be expected. The legal fraternity have occupied the royal road to social and political distinction and pecuniary success. They have made the law and administered the law, and have done both in the interest of that calling, and their fees have been enormous compared with the earnings of the laboring class. And yet, they are not to blame. It is asking too much of human nature to refuse a boon so valuable and so freely tendered. It is the fault of the industrial class. That class that does not respect themselves will not be respected. Those who do not claim their rights will find them monopolized by others. Life is a contest for position and privilege. As the "farmer pays for all," and constitutes a large majority of the body politic, if he can lessen the amount and cost of litigation; if he can simplify and cheapen the administration of justice, and by it reform society, even if by it he curtail some of the privileges heretofore unjustly enjoyed by the legal profession, still it is his right and duty to do it.

The claimed sanctity of judicial power and prestige, grown hoary and musty by ages of privilege and popular subserving, should very appropriately be scanned, criticised and reformed by the great mass of the people whose voice was not heard when that power was created, and scarcely heard during the long centuries, while it has grown venerable from age rather than usefulness.

The diffusion of intelligence among the rural masses, arousing them to a sense of their condition and relation to the professional and privileged classes, has made them the great agent in the world's progress and reform—the Archimedean lever that moves the world. It has already broken the fetters of political tyranny and ecclesiastical domination. And it now proposes to cheapen and reform the administration of justice. When aroused its power is irresistible, and, like a giant awakened from his slumbers, whatever it wills must be done.

I earnestly commend the subject to special attention, as a reform demanded by every consideration of humanity, justice, policy and economy.

The future physical and social well being of our people is a subject that may well elicit anxious inquiry. What is to be the effect of the general diffusion of knowledge, acquisition of wealth, the comforts, elegances, luxuries and refinements of modern society? Will indulgence in luxurious habits, as of old, sap the physical health, deprave the morals, and effeminate and destroy the race? Or, is it possible to combine hardy, vigorous health, simple manners, pure morality, and rigid industry and economy, with the intelligence, refinement and luxury of modern civilization?

All the ancient nations are said to have been ruined by wealth and luxury. Greece fell before the vigor of youthful Rome, and Rome in turn when enriched by her conquests and had become wealthy and effeminate, fell before the hardy hordes from the northern forests.

Some think they already see marks of deterioration and indication of a declining race in our own country. Statistics show that the native population of Massachusetts are decreasing—the deaths exceed the births by a considerable per centage. It is sad to witness the destruction, decline and exit of races or families of men.

No more touching epic is written in the history of humanity than that of the native Indian of our forests, falling before the vices and diseases of civilization. Radical violation of natural law is the cause of such decline and extinction. These facts call for serious thoughts.

We may well consider carefully the untried future before us. To meet the new conditions with which the advancing spirit of the age has endowed us, is an important question. If, in emerging from the ignorance of former ages, we forsake the frugal habits, the close economy and stern and noble virtue which were the former characteristics, and adopt the fashionable habits, luxuries, profligate expenditures, a looseness of morals which have ever been the bane of wealthy, aristocratic life, we shall not gain by the change.

The unhealthy condition surrounding the people of our cities and populous towns, with their improper habits, intemperance and profligacy, would in time exterminate them if they did not receive fresh accessions of healthy population from the country—and the country population are too prone to imitate their city cousins. Fashions, unhealthful, inconvenient and expensive, made purposely to show that the wearer cannot labor, and designed to make labor disreputable, are almost as prevalent in the country as the city. But fashion is inexorable, and few can resist the tyrant. I would that a yearly congress was held at Washington to agree upon fashion for the year; such as are simple, healthful, economical and adapted to plain republican institutions, and then cut loose from those derived from the courtezans of Paris—the offshoots of monarchy, unsuited to our condition and a disgrace and shame to our people.

There is a strong tendency with our young men to float off to the city, lured by a fancied gentility in which they can participate, and which they fear will not be found at home.

This is a great mistake. Nine-tenths of them fail in business, become intemperate or fall victims to other vices. "Man made the town, God made the country." Yet there are errors in our system of education, religious teaching and social customs, that tend to produce this result. Our country customs embrace too few literary exercises, and social recreations: too little amusements.

The religious world have generally made a very grave mistake in forbidding all exhilarating amusement; the youthful nature craves it as certainly as their food, and it is almost as necessary, and under equal restraint is no more sinful. Such prohibition drives the ardent youth to the town for that excitement denied at home; there he frequently meets and yields to temptations which prove his ruin and those who denied him pleasant, rational amusement at home are responsible for the result.

Make home pleasant and you soon will be attached to home. The lyceums, the social meetings, where the old and young meet together, mutually chastening and enlivening each other, are among the needed institutions in every neighborhood. Every neighborhood should have a hall expressly for social gatherings and cheerful, enlivening amusement. The agricultural, mechanical and laboring population require it more than any other. The ceaseless daily toil, repeated day by day, to eat, to sleep, to toil, without a cheerful sound or relaxation, is more than man can bear uninjured; such amusemnnt is the best protection against intemperance and other indulgences so prevalent, and which need the anathemas oftener hurled against acts comparatively harmless.

The indulgence in stimulants or narcotics of any kind, or in any amount, and which is so universal at the present time, cannot be too severely condemned. It leads directly, if not surely to intemperance; it perverts the taste, beclouds the mind, taints the breath, poisons the secretions, and degrades the man in his own estimation, if not in that of others. Would that our rural population would preserve their persons free from such contamination, that a tainted breath should not mingle with the sweet odor from the flowers and fruits they rear!

The agriculturist and horticulturist should in moral and physical purity rival the beauties of nature's brightest scenes.

Those scenes are purifying and refining in their influence, and should not be marred and disfigured by the impurity of the cultivator.

No pursuit is more quiet, more in unison with nature, and none where more true enjoyment can be found. It is exempt from the anxiety and perturbation of the merchant and speculator. The agriculturist never watches with throbbing brow and feverish anxiety the rise and fall of stocks, the failure or success of gambling ventures; but pursues the even tenor of his way assured that seed time and harvest will not fail him.

The more pure and virtuous the mind, the higher and more perfect the appreciation of nature's choicest beauties. The retired merchant, the millionaire, the denizen of city life who, through the year of anxious toil, while accumulating his wealth, has ever cast an anxious glance to the anticipated future when he should retire from the turmoil of business and the ceaseless cent. per cent. of daily anxiety, to breathe the free country air and revel in the pleasures of rural life. But, ah, too often when the coveted goal is reached, he finds, too late, that corroding care has palsied the feelings and perverted the taste! The keen appreciation of nature's sylvan beauties which shed such a halo of joy around his youth, comes not back to the dwarfed and cankered soul that has given a life-worship at the shrine of mammon.

Irrevocable fate has decreed that as a man lives so shall he die. The mind, that for a life time has feasted on the follies of fashion, and delights of the gourmand and epicure, and sat late at the wine cup, no nobler sentiment, no higher aspiration can awaken his sensibilities; he must feast on his former follies until the smallest infinitesimal spark of immortality seeks its future resting place.

But far different is the noble form, clear intellect, the delicate sensibilities of the hardy son of toil, who, in the words of the apostle, can present his body a pure and acceptable sacrifice, whose brain is not pickled in alcohol, lips cankerous from use of the filthy meerschaum, whose breath is not redolent of beer, alcohol, and loaded with effluvia from ulcerated lungs and diseased liver, but whose every faculty is preserved by strict temperance in the condition God gave them; whose breath is as pure as an infant's breathing on flowers, whose every taste and sensibility by appropriate use have been preserved in their pristine power and purity; gratifying every taste and passion to any extent that does not interfere with the demands and requirements of every other, he preserves his manhood intact.

Deriving his support and rewards of his labor direct from the hand of Providence, and living in close contact with the grandeur and beauty of nature's handiwork, seeing the imprint of divine intelligence on every leaf and breathing from every flower, he can but be devout.

Old age to such a man comes not with disease and pain, and with dwarfed and dying sensibilities, but his faculties become brighter and more highly appreciative as he approaches the immortal.

Were such the character and such the life lived by the rural population, our political economists would have no reason to speculate on the decline and extinction of the race. A higher and more glorious destiny would await them class legislation and class privilege would disappear before their intelligence, and a more perfect intellectual, physical and moral man would convert our country into a modern Eden.

DISCUSSION.

LAWRENCE—In many respects the west is ahead of the east; in others behind, and for one, in legal reform. Thirteen years ago it was proposed in our legislature, and only one man of all the lawyers there was willing to look into it. A man in this State cannot sue me for $120 wages before a justice of the peace. He must go into court and employ a lawyer.

BALDWIN—There have been propositions before the two last legislatures to extend the jurisdiction of a justice of the peace even as high as $500.

Adjourned.

THURSDAY MORNING, *February* 24—9 o'clock.

Messrs. Galusha, Moss and Church were appointed the committee under Mr. Galusha's resolutions.

PROF. SHATTUCK, of the Industrial University, repeated his lecture on Drainage, which was succeeded by the following discussion:

KNAPP—Thought drainage in Rock county, Wisconsin, and in the northern part of this county would be a damage. Would you drain in Kansas where the heat is 120° and the rain fall 25 inches?

SHATTUCK—I would drain in some cases to check evaporation. These are exceptional cases.

KNAPP—It will do to drain in a clay subsoil. It would not do here, nor north.

LAWRENCE—Every foot of the country here, except along the river, will be benefited by drainage. My farm is on rolling prairie, underlain by red clay. 1857 or 1858 was very wet and hot. Oats were killed dead, so that I did not have a pint on twenty acres—simply from lack of drainage. There is a good deal of land here and in Wisconsin that will pay for draining.

GALUSHA—I differ with the gentleman from Wisconsin in his believing that no considerable portion of this part of the State needs drainage. I mole-drained land on my old place in Kendall county, where the subsoil was so tenacious that we could talk forty rods through the drains. There is an impervious clay under the soil on the coal fields that must be drained.

Adjourned.

THURSDAY AFTERNOON—2 P. M.

Judge L. W. LAWRENCE, of Belvidere, one of the trustees of the University, read a paper on Manures. [Not received.]

DISCUSSION.

CAHOON—I spread dry straw four to six inches thick on a meadow just after cutting. It was a dry season, yet the meadow grew a foot of grass that fall, and seemed improved the next year.

FITCH—I manured from an early day with rotten straw and manure of cattle and sheep. I left my farm six years ago. The man who followed me got some great crops, but has not attended to manuring; and the farm is now failing. It is better and easier to keep up a farm. Don't raise grain entirely, or you will come to misery, as many of our farmers have done.

CHURCH—Is there any experience in applying straw in the spring?

CAHOON—I think it bad to put on straw before corn.

LAWRENCE—The straw must be turned under in the fall, or it won't rot. Then it both warms and underdrains the land

FITCH—It will *do* to plow in straw in the spring, but the corn looks poor until late in the season; then it grows better.

WILCOX—A neighbor of mine put straw on an exhausted field, and plowed it in the fall, and raised a good crop. He put 300 sheep on a field of fifty-three acres that had been seven years cropped, and was much exhausted, for three years, then plowed deeply, and raised the best crop of wheat in the neighborhood—800 bushels; weighing fifty-seven or fifty-eight pounds to the bushel. By using a large amount of straw a wagon load of manure can be made to a sheep annually.

CUNNINGHAM—My practice is to stack my straw well, and to keep cattle enough to work over the straw during the winter. I bed the cattle in the barn yard thoroughly with it two or three times a week; also with corn stalks. I keep the cows in the yard through the summer; draw out the manure thus made in the fall and plow it under—the depth is not material. I never could get manure enough. People say they can't afford to keep cattle. They can't afford to do without them. Clover is a good manure plowed under the second summer.

GATES—I have tried plowing in wheat straw dry. It is hard to do. I rotate my crops as follows: two years clover, then corn, wheat and barley, each one year, and then clover again. I pile my manure after corn planting, hollowing the heap so as to make it hold water. I spread it on clover and timothy meadow in the fall. I take off a crop of hay the next year, feed it off a little, and the next spring, as late as possible, so as to have as much growth to turn under as may be. I plow it seven inches deep and plant to corn. I cultivate shallow, not more than four or five inches deep, so as not to disturb the sod. The next crop is oats, cultivated in. The next fall I plow the land up and put on barley. The plowing up brings the clover to the surface, so that it re-seeds itself and the rotation begins again.

CAHOON, the younger—About unloading manure—it should be spread as it is hauled.

LAWRENCE—We lose by throwing in heaps in fields.

CAHOON—There is a great loss often from not properly cleaning up where the pile is.

LAWRENCE—You may take all the manure away and there is still trouble from over richness from the absorption that has taken place.

JUDGE MILLER—It is important in applying rotted manure to plough it under as soon as possible. Voelcker analyzed rotted manure, spread one year, and found it had lost 42 per cent. of its best constituents. The nitrogen had disappeared and nine-tenths of the ammonia were gone. If you allow manure to heat it is valueless. We have been stinting our lands and taken the marrow out of them. We should raise stock and make manure. I have observed that farmers who keep sheep keep up their farms, and think we should have a hundred sheep on every quarter section.

GALUSHA—In composting I have spread the manure evenly and thrown plaster of Paris on every layer, using about a peck to a load of fresh manure. I keep the heap level, and make it about three feet high. Rain will hardly go through that thickness. I have found this manure first-rate for all purposes. I spread it immediately before the plow, from the wagon, but I think the waste spoken of went into the ground, not into the air.

I have used Baugh's super-phosphate, by mixing a wagon load of hog manure with two-thirds of a barrel of super-phosphate and one bushel of plaster on the barn floor. I put this mixture on sweet corn, a coal shovel full to a hill, just as the corn was up. The corn was fully double in yield to that without manure.

Super-phosphate, with hen manure and plaster, on a still lighter piece of ground, gave very good results when applied to Lima beans. I have also applied lime, without benefit, owing, I think, to its being applied at the wrong time.

Liquid manure, from the leachings of stable manure, with three parts water to one of the leaching, I have found very good.

Calumet bone-dust I did not like. The Detroit dust was better.

CUNNINGHAM—I would not top dress grass land. It can be used to better advantage for something else. The sod itself is an immense amount of manure. Sod should be plowed when vegetation is growing rapidly, in June. I let sheep run on it, and let it lie until the next spring.

LAWRENCE—If sod is plowed in the spring and a crop put on it we generally lose the crop from the white grub. Plow in the fall and plant in the spring.

CUNNINGHAM—The grubs only work every three years.

GATES—Four years ago I turned over ten acres of clover, seven inches deep. There were plenty of the little white grubs in it. A neighbor turned over twelve acres, to a depth of two or three inches. When I planted and cultivated my sod I did not disturb the white grubs, but I found they were at work on the clover at the bottom. They did not injure my corn, whilst my neighbor lost all of his on the shallow plowed land by their attacks.

MOSS—I wish we knew how much we take from our fields annually. We get say 800 pounds of wheat, and 900 of straw. We get a good deal of this back through the atmosphere, but we need great care in husbanding manure to save ourselves. I have practiced hauling manures to the part of the farm nearest the stables, and endeavored to manure the back parts of the farm by grass, etc. I am doubtful about hauling manure from town.

GALUSHA—Manure costs me in town twenty-five cents a load.

I haul it three miles and a half. It costs about one dollar and twenty cents a load at my place.

LAWRENCE—There is a farm in my neighborhood, on the white oak barrens, that a German bought five years ago, when it was so impoverished that the last crop of oats on it had been so short that two-thirds of it ran under the mower. The German bought straw piles, paid a quarter of a dollar a lead for manure and made all he could on his own farm, now he gets as good crops as anybody. He ran in debt one thousand dollars to buy the place, he has paid the debt, supported a family of nine, and bought and paid for thirty-eight acres more. He has done it all with manure. It requires some pains to turn straw under. I plow as deep as I can. It is not in the way in planting or plowing. It will not last long as a manure.

GALUSHA—Straw is very good as a mulch for orchards. It may keep the trees longer lived. It is not worth five dollars a ton, or it would buy a better manure.

[According to Dr. Miles, oat straw as a fertilizer is worth about $2 28 per ton, wheat straw $1 72. Its chief value evidently is as a mechanical agent in loosening the soil.—*Secretary.*]

SHEARMAN—They pay $4 per ton for rye straw at the paper mill here, delivered and stacked. It may pay to haul in straw and take back manure. I haul manure from town and pile it up during the winter and spread in spring.

WILCOX, of Western Rural—In California they burn the straw after heading the wheat. The crop has run down from fifty to fifteen bushels to the acre.

MOSS—I would prefer to haul straw into the barn-yard, but where you stack in the field this is not practicable. It is better then to spread it in piles over the field and burn just before a rain.

WELDON—It will pay to haul manure three miles.

GATES—Which produces the best manure?

GALUSHA—I go for the barn-yard manures. The condition of the soil is very important in its effect on manures. Perfect pulverization gives the full benefit of atmospheric manures.

WILLOUGHBY—How would you manage cornstalks?

LAWRENCE—Turn them under by a hook on the beam of your plow.

WILLOUGHBY—How would you manage manure made by feeding cornstalks?

LAWRENCE—Let it rot till fall. Leached ashes help.

CAHOON, the younger—They will rot by harvest.

WILCOX—I feed shock corn and straw to sheep in yards. The sheep tear them apart pretty well. I put in hogs in the spring and they turn the mass over hunting for corn, and this disposes of the cornstalks.

LAWRENCE—I expect that ultimately cornstalks will be steamed and fed to stock.

GALUSHA—Meanwhile cut up cornstalks in the old way.

MR. GRIGGS, of the Rockford Register, offered the following resolutions, which were adopted:

Resolved, That the thanks of the members of this Institute are due, and are hereby tendered to the Trustees of the Illinois Industrial University, for their action in giving us the benefit of this free course of Industrial Lectures and discussions; to Hon. W. C. Flagg, Corresponding Secretary of the Board, for his attendance and efficient labors, which have done so much to secure its success and add to its interest, and to Dr. J. M. Gregory, Hon. A. S. Miller, Dr. J. Shaw, Prof. A. P. S. Stuart, Samuel Edwards, Esq., Judge L. W. Lawrence, Wm. G. King, Esq., Judge J. G. Knapp, Hon. Elmer Baldwin, Prof. S. W. Shattuck, and O. B Galusha, for their very able and instructive addresses, to which we have listened with great pleasure and profit.

Adjourned.

THURSDAY EVENING—7 P. M.

SHEEP-GROWING IN NORTHERN ILLINOIS.

JOHN FITCH, of Rockford, opened the discussion:

I bought coarse-wooled sheep originally, and graded them up to about one-half Spanish, which I consider about the best. I prefer dry lands. Sheep do not need water during the time of green feed, and they are less liable to foot rot on such lands. I have an airy shed. We only need to keep their backs dry. The lambs want more protection. It is best to sort into three lots in winter. I feed corn, about half a gill to a sheep, daily. They eat the blades and a good deal of the stalk. They used to eat the wild coarse hay well. Will pick up and save a great deal that cattle leave. Preventives will keep off disease. I would not keep them to a greater age than five years. Give sulphur with the salt for ticks, but not in wet weather.

LAWRENCE—I commenced with two sheep. At the end of twenty years, having bought four in that time, I found I had sold twelve hundred sheep, and averaged one hundred dollars a year for wool. Never but once did I sell as high as forty cents a pound. The lowest was in 1852, when I sold for twenty-three cents.

Every farmer should keep a limited number of sheep; but I don't think it will now pay to keep large flocks. It costs more now to carry them through the summer than to winter them. At the price wool is bringing it won't pay; and wool will come from Western Kansas. But every farm should have a limited number on it.

The Merino is the sheep in spite of long wools, because the Merino is the one most needed for clothing. We want cassimere wools; the long wools are only fit for combing. I am opposed to crossing the Merino and the Cotswold. They are too much unlike. I would raise the Southdown for mutton, although it is poor for wool. It has fine mutton, with the fat and lean well mixed. The long wools only make a second-class mutton.

Sheep are valuable to consume any coarse stuff there is around. They are good to clear out foul land. They are as healthy here as anywhere I have been. They have but little foot-rot, and that is easily cured. In New York, limestone soil is freest from foot-rot. My brother-in-law put quick-lime in his sheep-yard with good success. I had it in my own flock, in the wet season of 1866, when there was a good deal of mud in the yard. I changed the yard, picked out the lame sheep, pared their hoofs, plunged the hoofs in a strong solution of blue vitriol, put the sheep in a dry field, and cured them in ten days. A neighbor lost nearly all his sheep.

Scab is an itch, and easily cured. Take one pound of refuse tobacco to every five sheep afflicted, make a strong decoction, and dip the sheep in it. For every fourth sheep dipped, put in two table-spoonfuls of turpentine, which will float on the liquid, and get on the wool.

For the grub in the head, I have filled the hollow in the top of the skull with turpentine, with good success. I cured it in one case after the sheep had spasms, but it lost one of its eyes.

I use five pounds of sulphur for a hundred sheep each year, and mingle saltpetre with the salt. Two weeks of sulphur and salt will kill the ticks.

Sheep are liable to bloat, from fresh feed, especially from white clover. I give a table-spoonful of saltpetre. It is also good for cattle. If you can give the animal a quarter of a pound, and get it into his stomach before the gases explode, you have saved the animal.

Nothing that passes through a sheep ever sprouts.

We have scrofula among Merino sheep, sometimes. I have perhaps one case a year. They generally die.

Sheep want water just as other animals do. They drink oftener than other animals, and I am sure it contributes to their health. But they will live without water.

FITCH—I have kept them in a pasture where there was no water. I turned them into water, and few would drink.

LAWRENCE—True; but in a dry time they go to water. As to French Merinos, I would as soon keep a cow. They cost more to keep than the Cotswold, are tender, and their fleece is coarse. They are not the sheep for the North.

The best hay for sheep is clover properly cured. Next to this is fine upland prairie grass. Hungarian grass is good. Clover I cure in this way: I commence mowing about four o'clock P. M., and cut till dark; let it lie until next day after dinner; then turn over the heavy spots, rake it up and put it in small bunches. I let it lie a day or two, then shake it up and put it into the barn.

Corn is an excellent grain to produce wool, but is dangerous for breeding ewes. My brother fed his ewes plenty of corn. The lambs had silky hair, and legs as limber as a string. He lost most of his lambs. I feed half corn and half oats, and have no trouble.

MILLER—In 1864 I put my sheep on wheat stubble, and they appeared to tread out the chinch bug.

WILCOX—I have been much interested. I would have been fifty dollars better off if I had heard Judge Lawrence about the bloat three months ago. I have also found the lambs weak from the ewes eating corn.

I stack my grain in the field, and have tried to make the manure in the field, but the sheep won't stay out there. But I scatter straw in the yard in the morning, and they pick up a good deal; and will pack down and make manure of a good deal in this way. With one feed of hay a day they do well.

I thought I would get a larger class of sheep, and crossed with Leicester or Cotswold. I got large, fine looking lambs, now two crops of them. But I found this year that it does not work well. The yearlings decline in a flock of 300 or 400. I think they can't be kept in large flocks. I lost 25 out of 130 lambs. The grades do not shear as heavy as the three-quarters Spanish Merinos. Yearlings, sheared five and a-half pounds instead of six and a-half. A friend of mine has succeeded well in breeding Southdowns upon Merinos, and then upon Leicesters.

Cahoon, the younger—I think habit has a good deal to do with a sheep's wanting water. If they have been watered, they want water. So sheep not regularly yarded or housed do not come up well.

Alverson—Sheep need water in winter the most. They do not drink in summer except when the weather is dry.

The discussion finished, the following resolutions were unanimously adopted, after speeches of congratulation and kindly expressions of good will from Messrs. Galusha, Teeples, Moss, Lawrence, Miller, and others, and the convention adjourned *sine die*:

Resolved, That we regard the holding of free courses of lectures and discussions in various sections, under the auspices of our Industrial University, as important adjuncts to the usefulness of that institution, and most valuable sources of information for the agriculturists and horticulturists of the State, and trust that the success of the experiment may be such as to warrant their adoption as a permanent feature of the institution.

Resolved, That we, as practical farmers, are deeply interested in the agricultural development of the State of Illinois, and education of the people in the science of agriculture, and most cordially indorse the general management of the Illinois Industrial University, and pledge to it our cordial and earnest support, believing that the University is a necessity for the promotion and prosperity of industry in our State, and should be sustained by all good citizens.

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[174—184 having been used by a mistake of the printer to number two different sheets, the latter is referred to as 177 *b*.]

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