Wisconsin Farmers' Institutes : a hand-book of agriculture. Bulletin No. 6 1892

Wisconsin Farmers' Institutes
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CHARLES KENDALL ADAMS, LL. D.,

PRESIDENT OF THE UNIVERSITY OF WISCONSIN.

[From a picture painted in 1892 for Cornell University by J. Colin Forbes. R. C. A.]

WISCONSIN

FARMERS' INSTITUTES,

A Hand Book of Agriculture.

BULLETIN NO. 6,

1892.

"I say understandingly, that the young of our country, who will bring to Agriculture, the education and intelligence, the industry and perseverance essential to success in every other career, whether mercantile, industrial or professional, will, in the course of the next twenty years, attain a far greater degree of material well being, on the average, than awaits them in any other calling." *J. M. RUSK, Sec'y of Agriculture.*

Edited by W. H. MORRISON, Supt.

40,000 COPIES ISSUED.

MADISON, WISCONSIN.
DEMOCRAT PRINTING CO., PRINTERS AND STEREOTYPERS.

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HON. WM. P. BARTLETT,

President of Board of Regents University of Wisconsin:

SIR:—I have the honor herewith of presenting to you Bulletin No. 6, Wisconsin Farmers' Institute.

Respectfully yours,

W. H. MORRISON,

Superintendent.

MADISON, WIS., Nov. 7, 1892.

UNIVERSITY OF WISCONSIN.

AGRICULTURAL EXPERIMENT STATION.

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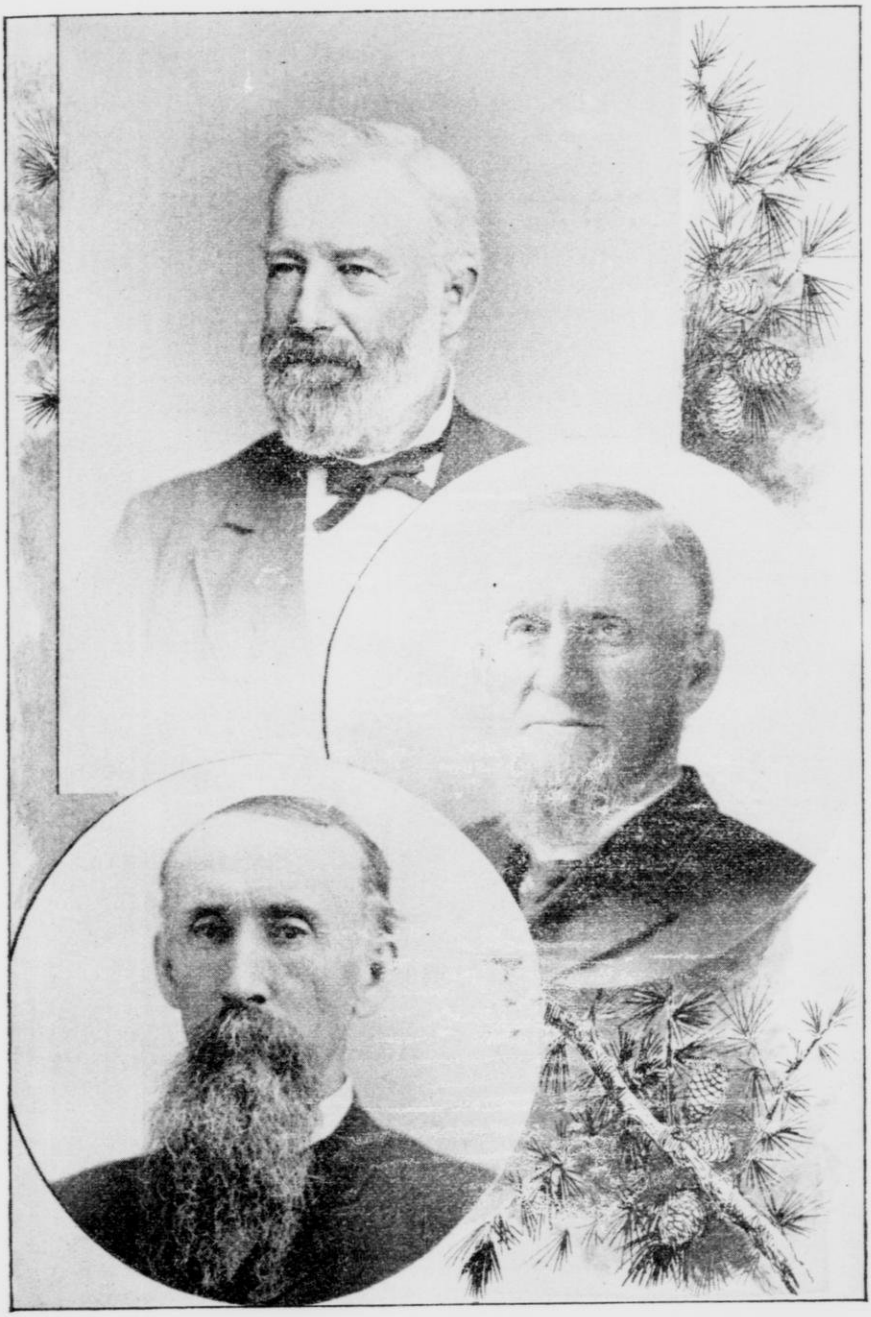
Office and Laboratories, in Agricultural Hall, University Grounds.
Experiment Farm, with buildings, joins the college grounds on the west.
Telephone connection.



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UNIVERSITY OF WISCONSIN.

COLLEGES.

College of Letters and Science,
College of Agriculture,
College of Mechanics and Engineering,
College of Law,
School of Pharmacy.

COURSES.

Long Agricultural Course,
Short Agricultural Course,
Mechanical Engineering Course,
Civil Engineering Course,
Mining and Metallurgical Engineering Courses,
Railroad Engineering Course,
Electrical Engineering Course,
Law Course,
Pharmacy Course,
Ancient Classical Course,
Modern Classical Course,
General Science Course,
English Course,
Civic-Historical Course, antecedent to Law and Journalism,
Special Science Course, antecedent to Medicine,
Special Courses for Normal School Graduates.

BRANCHES OF STUDY.

The University presents a very wide range of study, embracing one hundred and seventy-three subjects of study, known as sub courses. Something of the extent and variety of these may be indicated by the following synopsis: Eleven languages are taught, viz.: Greek, Latin, Sanscrit, Hebrew, German, Norse, French, Italian, Spanish, Anglo-Saxon and English. In Mathematics there are thirteen special courses. Under the Sciences there are a variety of courses in each of the following: Astronomy, Physics, Chemistry, Geology, Mineralogy, Zoology, Botany, Bacteriology. In History there are ten courses; in Civics, ten; in Economics, eight; in Mental Sciences there are eleven, embracing Psychology, Ethics, Aesthetics and Logic. There are six courses in Pedagogics and courses in Military Drill, Hygiene, Sanitation and Music.

In Mechanics and Engineering:—Elementary Mechanics, Mechanics of Material, Mechanics of Machinery, Theory of Construction, Thermondynamics, Elementary Surveying, Railroad and Topographic Surveying Geodesy, Sanitary, Hydraulic, Railroad, Electrical, Steam Engine, Hydraulic Motors, Hoisting Machinery, Theory and Construction of Locomotives, Railway Locomotives, Railway Location, Railway Equipment, Construction and Maintenance of Way, Railroad Field Work.

In Electricity: - Electrical Testing, Electrical Plants, Electrical Construction, and various forms of drawing are given; also shop work in wood, iron, brass, both hand work and machine work, machine designing, construction and testing machines.

In Agriculture:—Various courses are given in agriculture: Animal Husbandry, Farm Management, Agricultural Chemistry, Veterinary Sciences, Agricultural Physics, Horticulture and Economic Entomology, etc.

In Law:—Courses in Equity, Jurisprudence, Real Property, Constitutional Law, Wills, Contracts, Torts, Practice and Pleading, Law of Evidence, corporations, Domestic Relations, Admirality, Insurance, Estoppel, Partnership, Taxation, Criminal Laws, Common Carriers, Medical Jurisprudence, etc.

In Pharmacy: - Courses in Practical Pharmacy, Pharmaceutical Chemistry, Materia Medica, Pharmaceutical Botany, and Practical Laboratory Work.

General Facilities:—The faculty embraces upwards of seventy instructors. The laboratories are new, extensive and well equipped; embracing the Chemical, Physical, Metallurgical, Mineralogical, Geological, Zoological, Botonical, Civil and Mechanical Engineering, Agricultural and Pharmaceutical Laboratories. *Seminars* for advanced study in History, Language, Literature, Mathematics, and other branches are being developed.

The libraries accessible to students embrace that of the University, 26,000 volumes; of the State Historical Society, 146,000 volumes; of the State Law Department, 23,000 volumes; of the City, 11,000 volumes, besides special professional and technical libraries, making in all more than 200,000 volumes, thus affording very exceptional opportunities for reading and special research.

For further information send for a catalogue, or address the President or the head of the department concerning which information is desired.

FARM INSTITUTES FOR 1892-3.

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Dates, Programme, etc., furhished by applying to W. H. MORRISON, Supt., Madison, Wis.

FARM INSTITUTE WORKERS.

T. J VAN MATRE.
THOS. CONVEY.

GEO. MCKERROW.

C P. GOODRICH.
L H. ADAMS.

AGRICULTURAL INSTRUCTION

AT THE

University of Wisconsin.

An account of the advantages offered by our University to young men who wish to better equip themselves for the profession of farming.

The agricultural system at the University of Wisconsin is triune, the three factors being:

I. To develope agricultural science.

II. To educate youth in agricultural science and practice.

III. To spread agricultural knowledge throughout the whole farming community.

AGRICULTURAL HALL.

The first of these lines takes form in the Agricultural Experiment Station where investigation and experiments helpful to agriculture are constantly in progress. The reports and bulletins of the Experi-

ment Station, free to all farmers upon request, will give further information upon the work of this division.

The third line of effort is through the Farmer's Institute, the work of which is now well known, understood and highly appreciated by all progressive farmers within our commonweath. Persons unfamilliar with the Institute work will gain a good idea of this line of effort in the Farmer's Institute Bulletin which presents in condensed available form the best thought and effort of the Institute.

It is the second division of the system that we call especial attention at this time, viz., the education of youth in agricultural science and practice. In 1892 there were in attendance 152 students in the four courses here mentioned.

The courses in agriculture at the University are four in number described as follows:

THE GRADUATE COURSE IN AGRICULTURE.

The Graduate Course offers exceptional opportunities to college graduates for professional training and original investigation. The Experiment Station, the several laboratories in the Agricultural College, the Dairy School equipment and the farm are all brought into use. The special lines of study will be left largely to the selection of the student. Graduates of our own and other agricultural colleges and similar institutions will be entitled to the privileges of this course.

THE LONG COURSE IN AGRICULTURE.

The Long Course in Agriculture offers training in studies that are not only helpful in farm practice, but afford a liberal and scientific training. Besides strictly agricultural studies it embraces chemistry, physics, botany, zoology and geology together with one modern language. These constitute the foundation for special work of research in agricultural science. Many young men who intend to pursue farming as a vocation may well afford the time and means necessary to complete the Long Course in Agriculture. With the training it affords, they should not only be able to make a success of farming, but be in a position to enjoy its best features to the fullest extent and to become leaders of rural advancement. Information relative to the Graduate and Long Course is furnished in the university catalogue which will be sent on application.

THE SHORT COURSE IN AGRICULTURE.

The Short Course in Agriculture is designed to meet the wants of young men who are anxious to excell in their chosen vocation of farming, and who feel the need of more and better preparation before taking up their life work. The time which such persons can devote

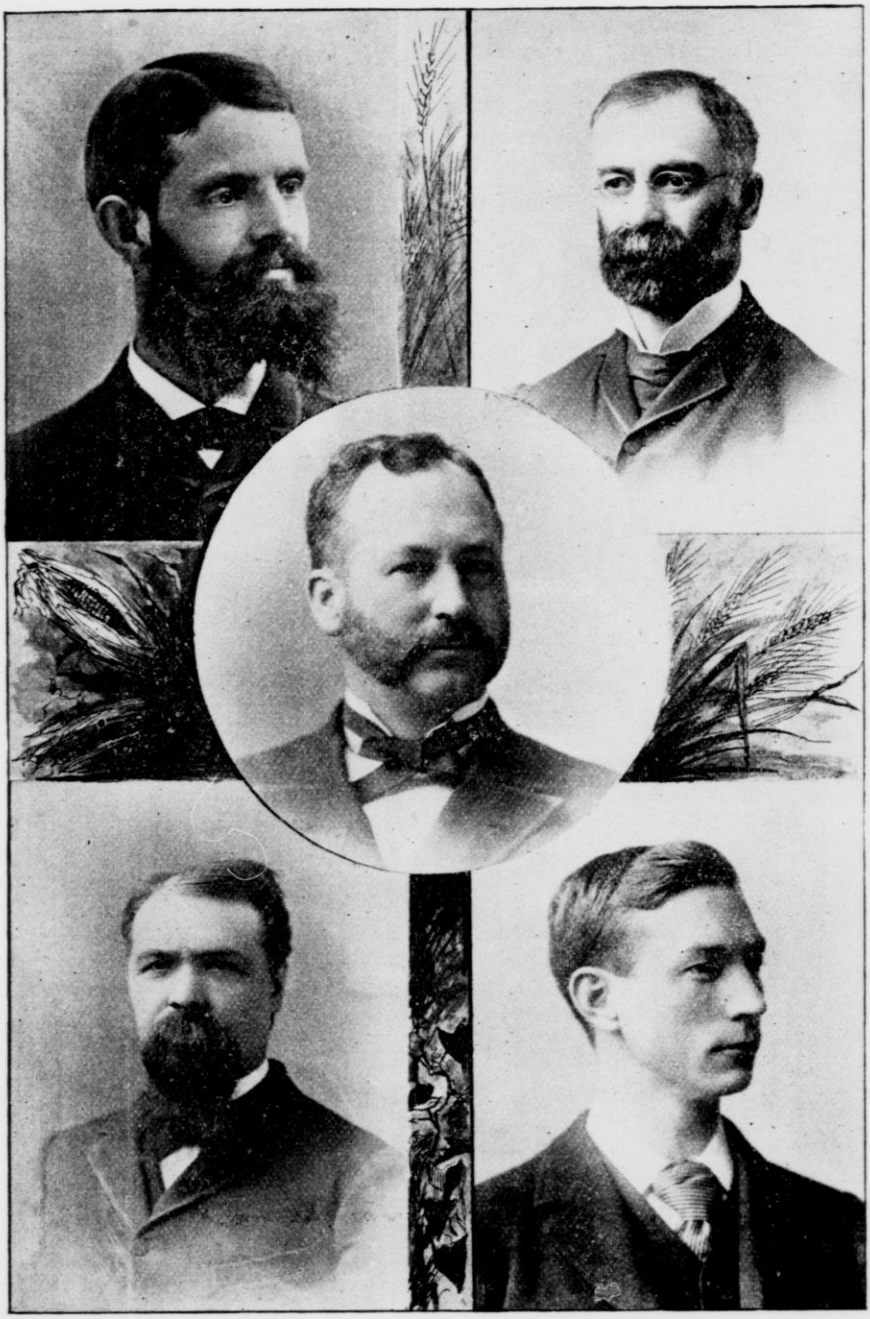
to study is often limited, and, for this reason, in the selection of topics and the arrangements of the studies, laboratory work etc., everything has been planned to give the largest amount of information and assistance possible without undue crowding. The subjects presented for study are those about which every young farmer should have definite and clear knowledge; in their treatment the topics are handled in such a way as to make the information helpful to the student in the highest pssible degree.

There is no longer any question concerning the value of advanced definite knowledge regarding agriculture to those who follow farming; education and training pay on the farm as they pay elsewhere in life. Seven years' experience with the Short Course in Agriculture has enabled us to gather information and apparatus, and to plan a course of study of such an intensely practical and helpful nature that we

HORTICULTURAL LABORATORY—STUDENTS GRAFTING.

believe the young farmer who looks over the subjects presented in this circular will not debate the question as to whether he can afford to take the course or not, but rather whether he can afford to miss it. The expenses are very small for the advantages offered and any young man with energy enough to pursue the studies can find the means of gaining the funds necessary to enable him to take the course. Our students are gathered in the winter when time can be spared from the farm. The money necessary to meet the expenses can be earned in a single summer by an ambitious young man.

The Short Course in Agriculture has now grown to such an extent that the student should attend two winters in order to complete it. The new student is at liberty to select from the list of studies in



PROFESSORS AGRICULTURAL COLLEGE.

E. S. GOFF.
F. H. KING.
W. A. HENRY.
S. M. BABCOCK.
J. A. CRAIG.

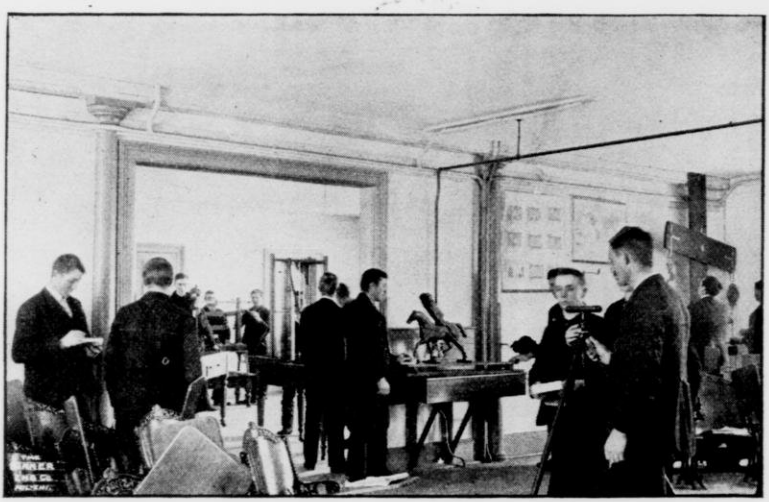
lectures, laboratory and shop practice, the equivalent of three recitations daily, leaving the remainder of the subjct to be pursued the second winter.

The following subjects are taught in this course:

FEEDS AND FEEDING.

PROF. W. A. HENRY.

The lectures will treat of the laws of nutrition; feeding standard, feeding for growth, fat, milk, etc. Each of the common feeding stuffs employed by our farmers will receive careful attention, and its properties and possibilities noted. The aim of the work is to aid the student in becoming an intelligent feeder of live-stock, utilizing each product at hand in the very best manner. The subcourse will consist of thirty lectures extending through the term.



PHYSICAL LABORATORY — STUDENTS USING SURVEYOR'S LEVEL, TESTING STRENGTH OF TIMBERS, ETC.

BREEDS AND BREEDING.

PROF. JOHN A. CRAIG.

These lectures will treat of the various breeds of our domestic animals, with descriptions and characteristics of each. The student will be prepared, as far as possible, not only to judge stock well for his own personal gain, but also that he may become an expert in the show ring where live-stock is gathered for exhibition and competiton.

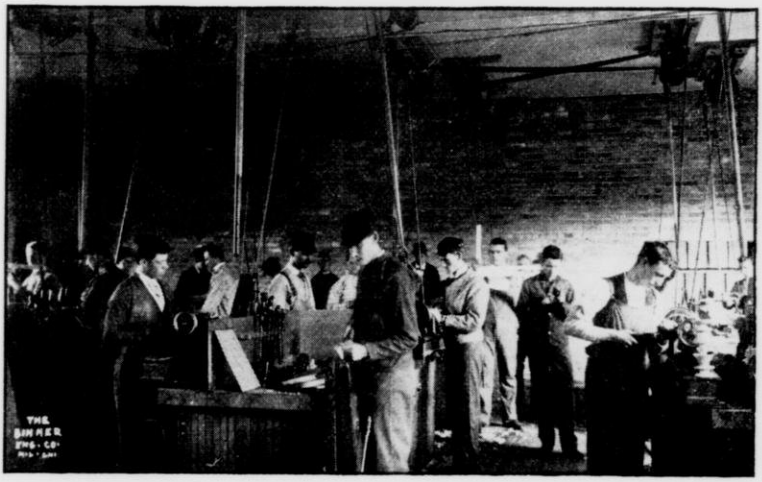
In the theory of breeding, the subjects of heredity, atavism, pre-

potency, variation, in-breeding, line breeding, etc., will be carefully discussed. The observing student should gain from this study facts of the highest importance the management of live-stock The sub-course embraces thirty lectures, beside a study of pedigrees extending through the term.

AGRICULTURAL CHEMISTRY.

DR. S. M. BABCOCK.

In this course there will be discussed such topics as the chemical elements contained in the soil, air, crops manures; the atmosphere as a source of plant food; soil—its formation and classification, the water and air it contains, as a source for plant food; the plant—how it grows, feeds, matures, and the animal food product it yields; manures—necessity for, kinds, value of stable manure affected by the food eaten; commercial fertilizers; rotation of crops; tillage; fermentation and decay. This course of instruction will be given by lectures and recitations three times per week.



MACHINE SHOP—STUDENTS AT THE CARPENTER'S BENCH AND TURNING LATHE.

AGRICULTURAL PHYSICS AND THE PHYSICAL FEATURES CLIMATE AND METOROLOGY OF WISCONSIN AND THE UNITED STATES.

PROF. F. H. KING.

The work in Agricultural physics will deal with relations of water to soil; movements of water in soil; purposes, methods and instru-

ments of tillage; soil temperatures and methods of modifying them; questions of drainage; water supply for stock and the kitchen, construction of farm buildings; ventilation and lighting of barns and dwellings; permanent and portable fences; farm moters. One lecture daily, with laboratory work additional.

HORTICULTURE AND ECONOMIC ENTOMOLOGY.

PROF. E. S. GOEF.

These lectures will embrace methods of propagation, planting, cultivation, pruning, marketing and preserving the fruit of our climate; instrucction in the growing of garden vegetables, the constrution and management of hot-beds, forcing-pits, etc.; the culture and adaptation of flower garden and greenhouse plants the principles of ornamental planting, and of laying out gardens and pleasure grounds and the formation and management of lawns; methods of seed growing; the principles of selection and the art of cross-fertilization with the view of improving varieties; also the principal injurious and benefitial insects of our climate, with the means of preventing insect ravages. One lecture daily; laboratory work additional.

JUDGING DRAUGHT HORSES — COMPETING FOR THE OGILVIE MEDAL.

PRACTICAL MECHANICS.

PROF. C. I. KING.

This course embraces work in the University Machine Shops covering bench work in wood, wood-turning and blacksmithing, and the

work is so planned and directed as to cover the fundamental principles of each. The student will be able when he gets through to turn a chisel-handle or neck-yoke and to iron a whiffletree or forge a pair of tongs. Requires two hours' time daily, in the shops at forge and bench.

FARM DAIRYING.

DR. S. M. BABCOCK AND MR. DEWITT GOODRICH.

Ten lectures on dairying will be given by Dr. Babcock. Laboratory instruction in the use of the Babcock test will be given by Mr. Goodrich, in the student's laboratory in Agricultural Hall. In Hiram Smith Hall, the new dairy school building, is a large room arranged for students pursuing farm dairying. In this room will be fund apparatus for practice with the deep setting of milk and centrifugal hand cream separating machines, including the DeLaval Horizontal Hand Separator, the DeLaval Vertical Hand Separators Nos. 2 and 3, and United States Cream Separators No. 5, making four styles of hand cream separators in all. Instruction will be given in the use of the milk test, coloring, salting, working and packing of butter. This course is intensely practical and most helpful to those who intend to follow private dairying in its most modern, advanced form. The instruction in practical dairy work will be under the charge of Mr. Goodrich.

VETERINARY SCIENCE.

C. A. WOODFORD, V. S.

In this course the needs of the stockman in the care and handling of farm animals will be constantly in mind. The aim will be to teach the pupils to locate and detect the more common ailments of our domestic animals, and give instruction in preventing and curing them. While the purpose of the course is to help young farmers it will prove of material value to those who later intend to enter a veterinary college. Animals treated by the lecturer in his local practice will be used for illustration. As aids to the work, the department has the skeleton of the horse and cow: the Auzoux life size, desectable model of the horse, containing three thousand named parts; Auzoux models of diseased parts, etc. One lecture or demonstration daily.

EQUIPMENT AND FACILITIES.

The University library, with 25,000 volumes, and the Madison City Library, numbering over 10,000 volumes, are open to students. The Agricultural Library numbers 3,000 bound volumes. It contains over 400 volumes of stud books herd books and flock registeries. Our reading room contains files of seventy-five of the leading agricultural papers of this country and Europe.

At the experiment station farm is a considerable number of registered animals of the various breeds. The student will make use of these and further have the help gained at different stock farms in the vicinity of Madison, where are some very fine specimens of the leading breeds of live stock. Visits to these farms with the instructor are frequent. In the Hiram Simth Hall is a large room devoted to instruction in private dairying. In the University machine shop the student has excellent facilities for carpenter work, wood turning and blacksmithing. In Agricultural Hall are three lecture rooms and three laboratories—chemical, physical and horticultural. One of the lecture rooms is provided with a stereoptican and electric light. By means of this we can throw upon the screen, during the lecture, pictures of representatives of the numerous breeds of live stock, and other objects of agricultural interest.

STUDENTS JUDGING A SHORTHORN COW WITH THE SCORE CARD.

THE MITCHELL SCHOLARSHIPS.

Through the thoughtful munificence of the Hon. John L. Mitchell of Milwaukee, there have been provided twenty scholarships, in the Short Course in Agriculture, of $100 each. These scholarships are placed one to a county, in the order of applicatoin from county school superintendents, graduates of the country district schools having preference. Fifty dollars of the schoolarships are paid during the first winter, and fifty during the second winter. By this arrangement twenty new scholarships are placed each year.

Persons desiring to compete for these scholarships should communicate with their county school superintendent, through whose recom-

mendations only the scholarships will be placed. It should be borne in mind that Mr. Mitchell's aim was to attract attention to the merits of our Short Course, and no really ambitious young man should give up taking the course if for any reason he is unable to secure the benefits of Mr. Mitchell's kindness.

THE OGILVIE MEDAL.

Mr. Robert Ogilvie of Madison, Wis., has provided that a gold medal be awarded annually to that member of the Short Course class who will prove in competitive trial his superior ability in judging the merits of improved live stock. This medal is of exquisite workmanship and valued at $75. Last year it was won by Mr. Arthur L. Hough, of Winchester, Wis., the awarding judges being Wm. Lysaght, of Monroe, J. H. S. Johnstone, of Madison and John M. True, of Baraboo. The next medal will be awarded near the close of the term, and all Short Course students are allowed to compete excepting last year's winner. After 1893, only second year Short Course students will be allowed to compete for this medal.

THE SHORT COURSE LITERARY SOCIETY.

The students of the Short Course each winter conduct a literary society which afford a means of mutual improvement and enables the members to become better acquainted with each other. The Short Course society meets weeky, with a varied programme, the leading features of which are a consideration of some of the important agricultural questions. The meetings are largely attended and have proved a source of much pleasure and great helpfulness.

REQUIREMENTS.

Students should be at least 16 years of age and have a commo school education. Experience has shown that young men of at least twenty years of age who have had practical knowledge of farming and have borne responsibility, do the best work with us and the best pleased with what they learn.

EXPENSES.

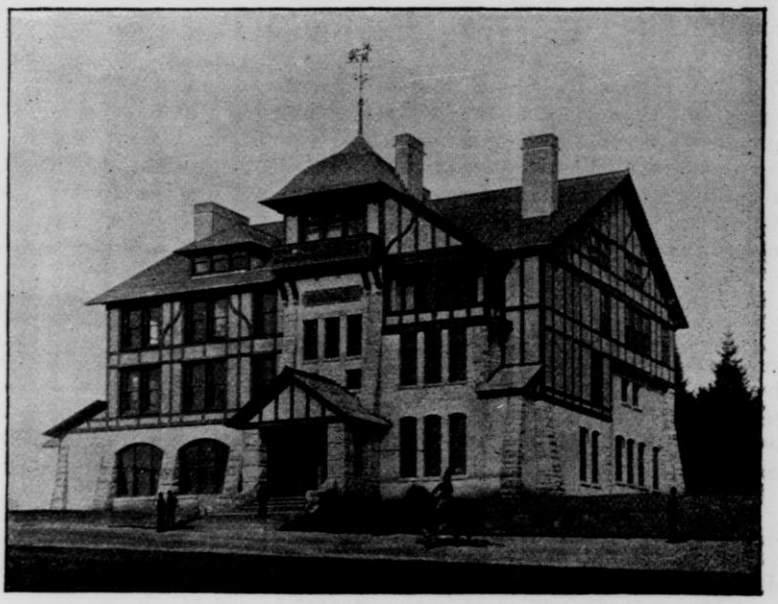
Residents of the state pay no tuition. Non-residents pay a tuition fee of $6. All students pay an incidental fee of $5; books will cost about $7. Students taking shop work will pay a fee of $5 for the material used by them at the forge and work bench. Furnished rooms can be rented at from 75 cents to $2 per week. Table board in clubs ranges from $2.25 to $3 per week. The expenses of the student may be summarized as follows:

Room rent, 12 weeks, at $1.25	$15 00
Board, 12 weeks, at $3	36 00
Incidental fee	5 00
Books	7 00
Expense of visiting stock farms	3 00
Total	$66 00

Non-residents will pay $5 in addition to the above sum. If the course in practical mechanics is taken, add $5 to the above.

DATE OF OPENING OF THE NEXT TERM.

The Short Course opens one week after the Dairy School. Recitations will begin Wednesday, January 11, 1893, the term closing March 29th. Most of our students can leave home Monday and reach us in time to register and secure room and board before Wednesday. Those contemplating attending are requested to send notice of their coming in advance. To all such, additional information in regard to hotels and other accommodations will be sent a week or two before the term opens.



HIRAM SMITH HALL—THE NEW DAIRY SCHOOL BUILDING.

THE DAIRY COURSE.

In Hiram Smith Hall the University of Wisconsin has a dairy building which, for size, appearance and equipment, is in some fair

degree commensurate with the great dairy interests of our commonwealth. This building is named the Hiram Smith Hall, in memory of one of Wisconsin's veteran dairymen, who long served as a member of the Board of Regents, looking especially to the up-building of the College of Agriculture, and to whose untiring efforts in no small degree the establishment of the Dairy School may be credited. It is constructed of Dunville white sandstone and white brick, the exterior of the upper stories being finished in pebble and beam work. With equipment it represents an outlay of about $40,000. The main structure is 75 feet front by 54 feet in depth, and three full stories in height. The boiler room and refrigerator form an addition 20x48 feet, one story in height. In the boiler room is a 60 horse-power steel boiler nd a 25 horse-power Allis-Corliss engine. The creamery, 36x48 feet, is on the first floor. Milk is delivered at a covered drive way in the rear, and from the weigh can flow by gravity into a large receiving vat on a platform in the creamery. Standing on this platform are six special milk vats in front of which are placed the separators, six in number.

At this date we have the following list of power separators assured us: DeLaval, Danish Weston, Alpha Belt, Alpha Turbine, Jumbo, Snarples' Russian and Butter Extractor. Most of the machines, kindly loaned by the manufactures, are of the latest patterns. Near the front of the room are the cream ripening vats, two churns of different patterns, the power butter worker and other apparatus incident to the creamery.

The cheese room on the first floor is 27x33 feet in size. In this are eight steam-heated cheese vats of 300 pounds capacity, each equipped with a complete set of cheese making apparatus. An elevator from this room carries cheese and other materials to the upper floors. Adjoining the cheese room is one for testing curd and a press room with a gang and vertical cheese presses. All of the floors of these rooms are laid with figured tiles.

In the second story is the office, with fire-proof vault-lockers for work clothes of 110 students and instructors toilet and bath rooms; also two cheese curing rooms and a large room for instruction in farm dairying and advanced cheese making.

In the third story is a dairy reading room lecture room and large laboratory for milk analysis and a private laboratory for advanced work.

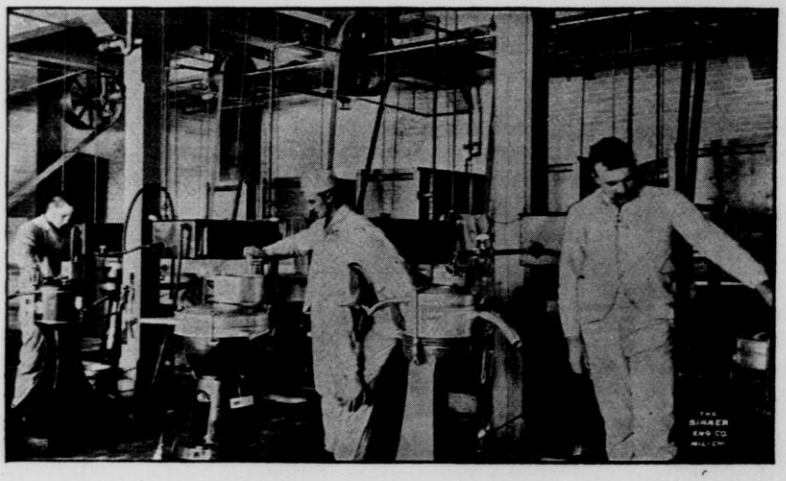
The building is heated directly by steam radiators and indirectly by hot air forced to the several rooms by a Sturtevant fan run by its own 2 horse-power engine. The building is designed wholly with reference to practical instruction in dairying, and is arranged for the accommodation of 100 students.

DIVISION OF DUTIES.

Dairy instruction will be divided into four sub-courses: lectures on dairying, milk testing, butter making and cheese making. The

class will be divided into three sections one of which will be assigned to the laboratory, a second to the creamery, and the third to the cheese room. All dairy students will meet in the lecture room on week days, except Saturday, for the lecture on dairying, from 8 to 9 o'clock. At the close of the lecture each section will pass to its assigned duties in the laboratory, creamery or cheese room. By changing from day to day each student will spend two days each week in each of the three departments.

The sub-courses are arranged as follows:



STUDENTS AT THE SEPARATORS.

SUB-COURSE 1—LECTURES AND CLASS-ROOM WORK.

(1) Twenty-four lectures by Dr. S. M. Babcock, on the constitution of milk, the conditions which effect creaming and churning, the various methods of milk testing, the preservation and aeration of milk, and allied subjects. In addition to the lectures, Dr. Babcock will conduct frequent recitations and other class work, involving practical questions relating to the dairy.

(2) Ten lectures and demonstrations, by A. W. Richter, Instructor in Engineering, on the care and management of the boiler and engine.

(3) Eight lectures, by Prof. F. H. King, on heating, ventilation and other physical problems connected with dairy practice.

(4) Eight lectures, by Prof. J. A. Craig, on the breeding and selection of dairy cows.

(5) Eight lectures, by Prof. W. A. Henry, on the feeding and general management of dairy cows.

(6) Eight lectures, by Dr. C. A. Woodford, on the common diseases of the dairy cow.

SUB-COURSE II.—MILK TESTING.

DR. S. M. BABCOCK AND MR. A. SCHOENMANN.

Through the recent invention of simple milk tests, great interest has been awakened on the subject of milk testing, and the time is now at hand when patrons of all our creameries and cheese factories should insist on receiving dividends according to the fat delivered by them in the milk. The factory operator will use the test not only to determine the fat in the milk delivered, but also in watching how closely the separator is skimming, how completely fat is being recovered by the churn, and what is lost at the whey tank. To be abreast of the times, the creamery operator and the cheese maker must be thoroughly skilled in the use of the Babcock test, an apparatus invented by Dr. Babcock, one of the instructors of the Dairy School.

Students taking this sub-course will be given thorough instruction in the use of the Babcock and other simple milk tests, and will be taught to determine accurately the amount of fat in a sample of ful. milk, skim milk, buttermilk and whey. Steam turbine, belt and hand power Babcock test machines will be provided. By the use of the test in connection with the lactometer the student will be taught to detect watering and skimming; with this test and a balance he will determine closely the amount of fat in a given sample of cheese.

He will also be taught to determine approximately the amount of fat in a given sample of butter.

Lastly he will be shown how to measure the necks of the test bottles in such a way as to know if they are correctly graduated.

SUB-COURSE II.—BUTTER MAKING.

Mr. H. J. Noyes assisted by Mr. E. S. Brubaker at the butter worker, and Messrs. F. Carpenter, and E W. Curtis at the Separators. In the creamery will be found the leading kinds and latest forms of centrifugal power cream separators and the butter extractor. The process of butter making will be conducted daily on the creamery plan, from analyzing the milk at the intake to marking the packages for shipping from the refrigerator.

Students in the creamery will be required to make daily tests of the milk used, the skim milk and buttermilk, and to determine and locate the losses in separating and churning. From time to time samples of butter secured from different sources will be scored by the class for the purpose of increasing their knowledge of the wants of the market.

SUB-COURSE IV.—CHEESE MAKING.

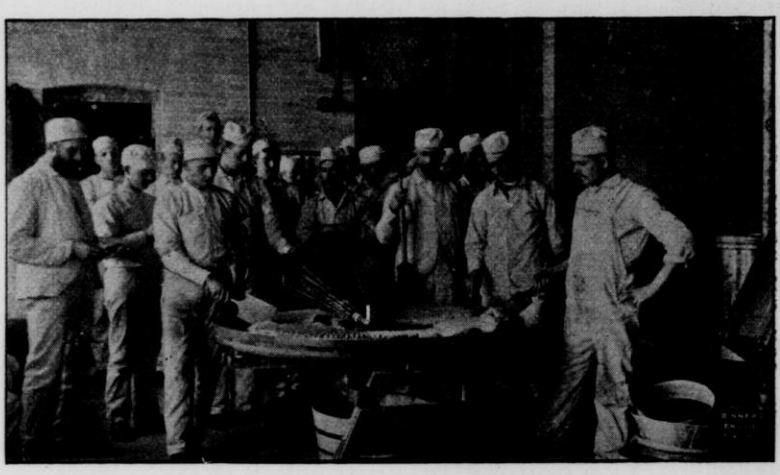
Mr. J. W. Decker, assisted by Messrs. U. S. Baer and D. Simmons. In the cheese room the students will be drilled in the use of the rennet test, which has done so much to advance cheese making. The hot iron tests, both for indicating the time for drawing the whey

and when to put the curd to press, will be used. The milk and whey will be tested so that the losses in the process of manufacture may be located. Instruction will be given in the proper bandaging, pressing and dressing of cheese, as well as the proper temperature of the curing room and care of cheese on the shelves. Samples of cheese from different sources will be secured and the students given practice in scoring them, estimating their worth and recognizing the demand of the market.

ADVANCED WORK.

Those pupils who have had experience before coming will be expected to join with others of less experience in the beginning, and perform every duty assigned. After a few weeks, examinations will be held and all who show by their proficiency that they are able to perform all of the necessary operations in a skillful, workmanlike manner, will be placed in an advanced class called the Experiment Section.

To this section experimental work in the production of butter and cheese will be assigned the grade of the work being regulated by the skill, knowledge and efficiency of the pupil. It is expected that each member will find problems that will tax his powers of observation and study to the fullest extent, no matter how much training and experience he has gained before and after joining us.



STUDENTS AT THE BUTTER WORKER.

EXAMINATIONS.

At intervals during the term and at its close, students in each of the sub-courses will be subjected to examinations, written and prac-

tical. At the close of the term a written statement signed by the Dean will be furnished, giving the work performed and his standing as shown by the examinations. No statement of standings will be given except to students who have attended the full term, and who have taken all the examinations

DAIRY CERTIFICATE

To secure the dairy certificate, the candidate must have spent a full term with us, and passed a satisfactory examination in all of the sub-courses. Further, he must have worked in a creamery or cheese factory for two seasons of not less than seven months each. One of these seasons must follow the period spent with us, and during this time the candidate must have practical charge of the factory in which he is working. He will report the operations of his factory monthly, or as often as directed, on proper blanks furnished by the University.

The University holds the right to send an authorized person to inspect the factory of the candidate; and no certificate will be issued if an unfavorable report is made by the inspector. If all of the conditions are satisfactorily complied with, the candidate will receive a dairy certificate. Owing to the expense of inspection the University does not agree to grant certificates to students operating factories in other states

THE DAIRY SOCIETY.

As with the Short Course students the Dairy students conduct a weekly literary society in which matters relating to dairy practice, the operation of the cheese factory and creamery are the main features under discussion. The association has proved itself a great help to its members.

IMPORTANT NOTICE TO ALL WHO WISH TO TAKE THE DAIRY COURSE

For two winters past we have been unable to accommodate all who came for instruction. Being particularly desirous of filling the school with operators from Wisconsin cheese factories and creameries, and believing it but right to give such the preference, we have adopted the following plan.

Our accommodations are for 100 students, and when this number is reached no more will be allowed to enter. We will hold the school open exclusively for applicants of our own state until December 15th, by which date if 100 have not applied from Wisconsin, applicants from other states will be admitted in the order of their requests. At the date of sending out this circular we have fifty applications for places, and the indications again are that we shall have to turn students away as in previous years. Indeed, we can easily fill the school with students from other states. Residents of Wisconsin

desirous of taking the course are especially urged to send in their names at once.

REQUIREMENTS FOR ENTRANCE.

Students of the Dairy Course should be at least 16 years of age and have a common school education. No entrance examination is required. If possible, the applicant should have at least one season's experience in a cheese factory or creamery before joining us. Our best students as a rule are those who have had previous experience, and such rarely leave us disappointed. It is but just to say, however, that some of our students coming without previous experience in a creamery or cheese factory, have left us for positions of considerable responsibility and filled them with satifaction to their emloyers. We strongly urge previous experience whenever possible. Judging from former classes we can promise that every student ambitious to excell, will find every moment of his time profitably occupied while with us, no matter how much previous experence he may have had in the factory.

DAIRY SUITS.

Each student will provide himself with not less than two white suits including caps which are worn during the working hours in the creamery and cheese factory. These suits can be obtained in Madison without trouble and at a very small cost.

FEES.

Residents of the state pay no tuition fee; students from other states pay a tuition fee of $6.

All students taking the Dairy Course pay an incidental University fee of $5 and a dairy school fee of $6, making $11 as fees for students from our own state, and $17 fees for students from other states. In addition to the sum above named, each student will deposit $2 with the Secretary of the University to cover possible breakage of test bottles and loss of key to the locker.

At the close of the term if there has been no breakage of test bottles and the key is returned, the sum deposited will be refunded to the student, or a portion only, if the key is lost or apparatus broken.

EXPENSES

Students usually secure rooms and table board separately. Furnished rooms for two can be had at from $1.50 to $3 per week. Table board in clubs ranges from $2.25 to $3 per week. The direct expense of the student for the school may be summarized as follows:

Room rent, 12 weeks, at 1.25	$15 00
Board, 12 weeks, at $3	36 00
Two white suits, at $1.50	3 00
Fees, incidental and dairy school	11 00
Note books	1 00
Key deposit	2 00
Total	$68 00

Non-residents will pay $6 additional. Of the above, $2 may possi-by returned to the student.

DATE OF OPENING AND CLOSING.

The next term of the Dairy School will open January 4, 1893, and close March 24. This is one week earlier than the Short Course opens.

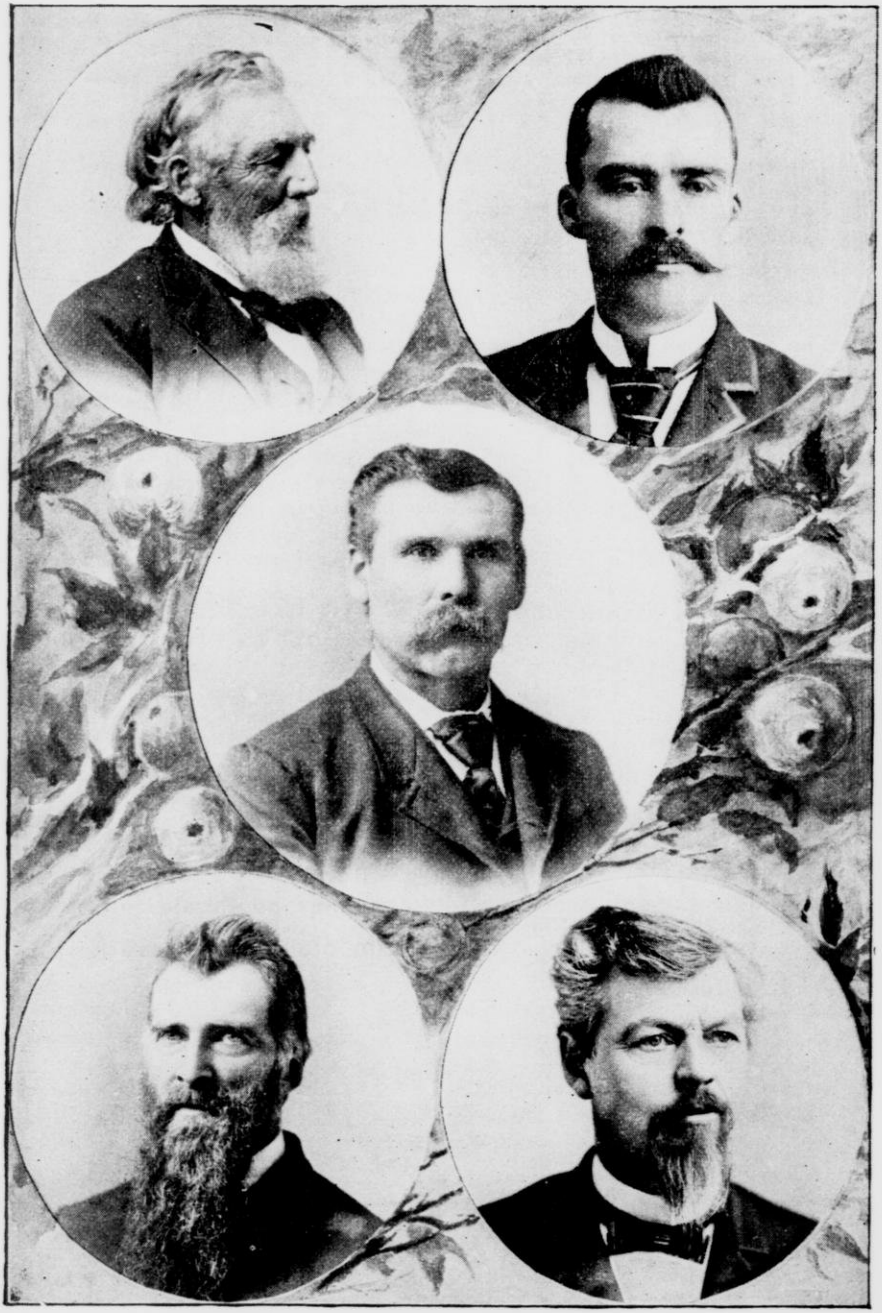
For circulars and particulars relating to the dairy and other agricultural courses, address,

PROF. W A. HENRY,
Madison, Wis.

For particulars regarding the other courses of the University, address,

PRESIDENT C. K. ADAMS.

The science of agriculture is in a great degree founded on experience. It is, therefore, of consequence that every farmer should know what has been done and what is doing by others engaged in the same occupation, and that he should impart to others the fruits of his own experiments and observations.— *New England Farmer.*



FARM INSTITUTE WORKERS.

HON. C. R BEACH.
W. H. COLE.
GEORGE WYLIE.
C. H EVERETT.
M. A. THAYER.

PROCEEDINGS

OF THE

Closing Farmers' Institute,

HELD AT

PORTAGE CITY, WISCONSIN, MARCH 16, 17 and 18, 1892.

Morning Session---Geo. McKerrow in the chair.

Prayer—By Father Brady.

"We come to Thee, O Lord, before we commence this undertaking, to consecrate to Thy great honor and glory the work that shall be done here, and to implore Thee to send down upon Thine humble servants Thy grace, that it may be directed according to Thy holy will for the best interests of Thy creatures, who, by Thy decree, must earn their bread in the sweat of their brow; and that all the deliberations here be conducted in a manner most agreeable to Thee. We know, O Lord, that we can do nothing without Thee, but with Thy help we can accomplish Thy holy will and help forward the principles of Thy divine economy. Conduct this Institute by Thy wisdom, bear down Thy blessings upon this undertaking, and may the deliberations here have a happy issue, and those who take part in them come to Thine eternal peace hereafter in Heaven. Amen."

Address of Welcome by E. S. Baker, Portage.

Mr. President, Ladies and Gentlemen of the Institute—Mayor Falconer having been unexpectedly called away from our city on business, at his request I have been called upon to welcome you to our city.

In discharging this duty it gives me pleasure to see so many present this morning, as the representatives of the noblest calling of mankind. Agriculture in its various branches is the foundation upon which the world moves in all other industries of life. As it prospers so do the arts, trades and professions. By its prosperity empires and nations have been called into being, and by its depressions they have been destroyed.

In the early centuries of the world the agriculturist was the nobleman of the land, and no less important is his position today. From its ranks come the men of action in all other branches of industries and professions. The history of our own nation proclaims this fact. Our greatest statesmen, financiers, philanthropists and teachers, almost without exception, come from the farm; and whenever the nation has been called upon to defend its freedom, or preserve its integrity, from the country homes have come the sturdiest warriors and the purest patriotism, for it is there that mankind is nurtured in purity of thought and freedom of action, so necessary and requisite for the full development of all his mental and physical abilities. It is there along the running rivulets of the hillside, or amidst the ripening fields of the prairie, that the purest thoughts and rarest gems of lit-

erature have been written. There is no other place or any other business or profession in which there is more real pleasure and time for recreation than on the farm, if you rightly employ your time. It is there you get the most wholesome food, and the purest air that all nature furnishes, and which is so necessary to good health, the greatest blessing God gives to man. It is there, more than in any other profession or business, you have time to study art, literature and science, and apply the useful knowledge thus gained in helping nature to produce her most bountiful rewards and assist you in your daily labor.

For that purpose you have met here today. Let this gathering be a profitable one for you all; your stay among us agreeable and pleasant; the knowledge you receive, by communion one with another, the means of developing new thoughts, and better ways and means for your daily labor, and raise to a still higher plain in the world's onward march, this, the greatest of all pursuits, agriculture.

And, Mr. President and members of the Institute, in giving you all a hearty welcome to our city, I am directed by his honor, the Mayor, to say to you that "you have the freedom of the city," believing that you will so use it, that many a happy thought will linger with its remembrance in years to come, and I assure you, that you will find that the hospitality and generosity of our citizens are not excelled by any.

Response to Address of Welcome, by M. A. Thayer, Pres. State Horticultural Society, Sparta, Wis.

I must admit that I am somewhat embarrassed. When I learned that the Mayor was absent, and that I was to respond to the charge of the District Attorney of the county in open court, I was embarrassed for the time, but since I learned that I am to respond to the acting Mayor on this occasion, I feel very much better about it. Mr. Acting Mayor: The eloquent words of welcome just spoken will long be remembered by your visitors today. Citizens of Portage, we read in your looks, in your accent, and in your behavior, the sincere welcome voiced by your honored representative. We feel it an honor to be so received by your city, and in behalf of the farmers and the Farmers' Institutes of Wisconsin, and in the name of "the gospel of good farming," I thank you.

Some years ago, Mr. Mayor, I had the honor, as you have today, to welcome a Farmers' Institute to my own little city. A small audience, a few progressive farmers in front, a few curious stragglers in the middle seats, and a few old farmers on the back seats, as dumb and cold as oysters, had come, firmly braced against the heresy of new ideas in farming. Few questions, few local papers, and little enthusiasm prevailed. Since then how things have changed. Instead of small meetings and no interest, we now have large, enthusiastic audiences, and those who first "came to scoff, now remain to pray." The progressive farmer is now our best worker. The curious straggler is now our intent listener. The old farmer on the front seat takes delight in telling his experiences. Best of all is a small army of bright young farmers, reading, thinking, talking, experimenting, testing and laying the foundation for intelligent work in the future—work that results in higher fertilization, more thorough preparation of the soil, better tillage, larger crops, finer stock, improved dairies and greater success in every way.

I tell you, my friends, the benefits of the Institute work in my own county can not be estimated in dollars and cents. A single industry in my own town, giving employment to hundreds of women and children, bringing us nearly $20,000 the past year, with the promise of $100,000 annually at an early date, received its first inspiration at one of our Farmers' Institutes, by a half hour's talk on the growing of small fruits. Monroe county alone could pay every dollar expended for Institute

work in the State of Wisconsin since their organization, and still have a balance in her favor. Now it has been my pleasure to attend numerous Institutes in different parts of the State, not as a regular worker, but as a humble servant, or volunteer, without pay, and I am satisfied that what is true of Monroe county is also true of many other counties. Institutes have never been so largely attended, and so much interest taken in them by the farmers of the state, as this winter. All former prejudice against them is fast passing away. Few criticisms are made excepting by those who do not know their value. If Supt. Morrison is permitted to continue the good work as begun, and place Institutes within reach of every town and school district, as contemplated, no better work will ever have been accomplished in Wisconsin.

The star of a higher and better education beams upon us from University Hill. The wise men, old and young, are turning that way for a new revelation. The gospel of good farming is being taught us in Institutes, Experimental Station, bulletins and reports. Our enterprising newspapers are taking up the glad refrain, and carrying it to every rural home.

Under these favoring influences the farmer sees that this is a progressive age—an age of invention, of steam, of electricity, of machinery, of manufacturing, of organization, of combination and better business methods of all classes. He realizes what a farmer should be in such an age—a man possessing good common sense; not brilliant, but having judgment in ordinary matters; not necessarily highly educated, but well informed; not visionary, but hopeful; not possessing great strength, but endurance; not having great self-esteem, but confidence in himself. He should understand political questions without being a politician. He should understand law without being a lawyer. He should be familiar to simple remedies without being a doctor. He should study nature and her loving ways without being a preacher. He should understand the nature of the soil he is working, and the best crops to grow. He should appreciate the value of manure, the necessity of saving the same, and the best way to apply. He should understand that "like begets like," and that good stock can be raised only from good stock, and that the best crops can be grown only from good seeds. He should understand the necessity of thorough preparation of the soil, and the great advantage of frequent cultivation. He should know how to feed, when to feed, and what to feed for best results. He should be systematic in his work. He should possess the accuracy of the successful banker. He should have the tact of the thrifty merchant. He should practice the close economy of the successful manufacturer. Yes, all of these qualifications he should have, and more. He should have a pride and respect for his business, and feel with his whole soul that there is no more honorable calling than that of tilling the soil.

Such, in brief, is the style of farmer as moulded and fashioned by the teachings of the Wisconsin Farmers' Institute of today, and in their name I again thank the citizens of Portage for their generous welcome.

YOUR INSTITUTE--AN EXPERIENCE MEETING.

The Chairman: In opening this session now, for active work upon the different topics laid out before us in this program, let me urge upon you to feel that this is your Institute and not ours. The success of this meeting will depend even more upon you than it does upon us who have come here to open these discussions. Be ready to take an active part in every subject that is brought up; be ready with your questions; follow the speakers carefully as they outline these subjects, and wherever they leave unsaid what you think ought to be said, have a question ready to draw out that point at the close of the subject. Be ready, also, to draw out such facts as shall be of importance to this immediate locality, and do not be afraid to ask your questions. At the close of many of our Institutes throughout the State we have been surrounded by farmers who want to ask a number of questions, which, of course, we are always ready to answer, but many of these questions are of that kind that the answers to them would be of great importance to the whole audience, and they have lost the benefit of that, and many times they tell us that they were afraid to ask questions. Sometimes they say: "I am not much of a scholar; I am not a public speaker, and I thought I might make a blunder, and then you smart fellows might turn around and laugh at me." Now, we are not here to laugh at anybody. We are here to give civil answers to civil questions. Just remember that we are only plain farmers, and of course we cannot answer everything, but we will do our best.

MAKING, SAVING AND APPLYING STABLE MANURE.

R. S. KINGMAN, Sparta, Wis.

Until recently, on our western farms stored with the fertility of ages, we have had little occasion to concern ourselves with the saving and applying of manures. In fact, the accumulations about the stables and yards were considered a burden. Farmers seemed to think the natural fertility of their lands inexhaustible. But the time has come when most of our farms begin to show exhaustion, and farmers are now beginning to look about for substances and methods to restore the productiveness of their lands. What I may say is based upon my experience and observation, rather than from a scientific and purely experimental standpoint. I am not a scientist, but a plain farmer, trying to keep to the front in agricultural pursuits.

Value of Stable Manure.

First, as to making stable manure. Chemists and expert experimenters tell us that the three essential ingredients of plant food are nitrogen, phosphoric acid and potash, besides some less essential substances. These substances

are what we buy in one form or another under the name of chemical fertilizers. Stable manure contains all the ingredients necessary to plant life, as much as milk contains all the food elements of animal life. Now the question is to ascertain, if we can, how to produce a stable manure that shall contain the greatest amount of the substances that enter so largely into the elements of plant growth. Chemists tell us, also, that some products of agriculture contain more of the elements above alluded to than others, and have given us tables showing us their value as food for our animals, and also the value of the manure made by feeding such substances.

Feed Makes the Manure.

Now if we feed our animals such things as are low in the essential elements, we shall have a manure essentially low in the desired elements of plant food. The manure made from animals fed on straw alone is barely worth the handling. Manure made from fattening steers, from yards where hogs and sheep have been fattened, and where dairy cows are kept as they should be, is worth many times as much as manure made from animals fed on straw. Why? Because the ingredients fed them, such as clover hay, ensilage, cotton seed meal, oil cake meal, etc., are many times richer in the elements of plant food. Referring to a reliable table, I find that, as compared with manure made from feeding one ton of straw, manure made from feeding one ton of clover hay (cut in proper season) is worth three times as much; if made from one ton of wheat bran, is worth more than six times as much; if made from feeding one ton of oil cake meal, is worth nine times as much, and if made from one ton of cotton seed meal, is worth twelve times as much. So our manure is rich or poor, according to the food given our animals. Manure made from animals fed on clover hay is worth nearly twice as much as from animals fed on timothy hay, and manure made from animals fed on timothy hay is worth more than twice as much as from animals fed on straw. If we add grains of almost any kind to these fodders, we are making a still richer and more profitable manure. Most farmers feed only such grain as they raise on their farms. To those who buy feed I would recommend the purchase of a certain amount of oil cake meal. Of course you cannot give a full ration of it, but for the amount you can feed, I regard it by all odds the cheapest and best grain you can buy, when you take into consideration its feeding and manurial value. From our own experience and observation, profits lie in the direction of judicious and liberal feeding of farm animals, and as far as making stable manure is concerned, it is emphatically true. Therefore, if you would have more manure, feed more liberally. You may not have as great a number of loads, but you may, if you will, have a manure that one load will have more fertilizing value than eight or ten loads of common straw manure, with much less expense in handling. The lesson to be learned from this part of our subject, is more liberal feeding of nitrogenous food to our farm animals.

A Great Waste.

The subject of saving stable manure is very little studied by the majority of farmers. Their farms, until recently, have been stored with natural fertility, and they have not seen the importance of saving this material. Their almost universal custom, from the early settlement of the country, has been to raise grain and sell everything from the farm, without putting anything back to restore the fertility that has been taken off from year to year, and they begin to realize that their crops are not as good as they were a few years ago, and that something must be done. The remedy is, pay back to the farm what you have been taking off all these years in the shape of plant food. There are several methods of doing this, but the one for us to consider at this time is the use of

stable manure. With the average farmer little or no pains are taken to care for the accumulations around the barns and the out-houses of the farm. Barns are usually built on some elevated land, or on a sidehill, where the drainage is good, in order to have a dry yard. Every rain that comes there may be seen a large stream of water, discolored with the soluble and most valuable part of the manure, running down into the ditches of the road, or into some stream or lake, where it is lost. Few realize the wonderful waste that is going on in this way. It has been demonstrated that manure left spread out over a yard during the summer actually loses one-half or more of its real value. That means a manure scarcely worth hauling and spreading. Again, how often we see the hog pen and yard built on the bank of some lake or stream of water, and this most valuable of all manures around the farm allowed to drain and wash away, thereby making a great loss of fertility to the farmer, besides polluting the water. Then again, the manure from the horse stable is thrown out into a pile resembling a hay-stack, and all the water that falls on it runs off, and the heap becomes fire-fanged, and is as worthless for manure as so much bulk of dry leaves.

Experience.

I do not know of any stereotyped method of saving stable manure. I will, however, attempt to give you the practice of some of the best farmers. One method may be adapted for one situation, another to some other location. Among our best agriculturists, nothing from the stable in the shape of manure is allowed to go to waste, either liquid or solid. Some stables and barns have plenty of room under them, and the droppings are shoveled through a trap-door in the floor to the basement below. The liquids keep the manure moist, and a few hogs keep the mass well worked over. This manure never freezes, but ferments all that is necessary, and by early spring is ready to go to the field. Where manure is thrown out of windows on the side of the barn to remain till hauled to the field, there should at least be a trough at the eaves to conduct the water away, or what would be better, build a light roof, supported by brackets wide enough to shed the manure piles. Some excellent farmers cart or wheel all the manure from the different stables and pile the same in a long pile, keeping the top flat and the sides perpendicular, and where practical, pump liquid manure from time to time from some tank or reservoir where they have been preserved. In this way fermentation can be carried on all winter, by starting the piles early enough in the fall to get up a heat. Some farmers have their stables so arranged that all the liquids are conducted to a large cistern where they are held till wanted, and then pumped into a tank on a wagon, and carried to the field and distributed similar to a street sprinkler, after reducing the liquid manure one-half with water. A plan largely practiced by farmers today is to haul the manure directly from the stable to the field as fast as made, and spread from sled or wagon, or put in small heaps and spread in spring. Others haul and put in large piles similar to the way described above, where the manure will ferment and then can be distributed when wanted. This winter method, I have no doubt, is the cheapest, for the reason that the labor of men and teams is less valuable at this season than in the hurrying season. And another reason is that the wash of the manure by the spring rains is absorbed by the lands where you want it, and nothing is lost.

Use Absorbents.

To those who have no better way for saving the liquids in their stables, I would say, use anything under the animals that will absorb the liquids and hold them with the solids until they can be gotten to the fields. For this purpose straw is the most plenty and convenient of anything on the farm. Peat

or muck, dug and dried in the proper season, or dry leaves, or anything that can be gathered about the premises that will absorb, can be put in the trenches to excellent advantage, and they cost nothing but the labor of gathering. Land plaster is an excellent absorbent, and will pay the cost as a fertilizer in itself. Scatter it in the ditches of the stable about every morning after cleaning them out.

One thing under this head, and that is in relation to fermentation. If manure is coarse with straw and corn-stalks, as the cleaning up of yards are apt to be, I would recommend the piling into large heaps. Tread down well; keep the piles flat on top and the sides as nearly perpendicular as possible. If a few loads more or less of horse manure can be added to the heap as you pile it up it will help to start the heating which is necessary. These piles can be made in the yard or the manure hauled and piled in some convenient place in the field. After about two or three months it is better to fork over the pile, and build a new pile along side the old one, putting the manure from the middle of the old pile to the outside of the new, keeping the top flat and the sides perpendicular as before. In two or three months more the manure is ready to haul on the land. This process, if thoroughly done, will kill most of the weed seeds and make the plant food in the manure more available for the plant roots to pick up.

Save the Fertility.

The time is at hand when farmers, if they would succeed in their business, must pay more attention to saving and producing fertilizers for their land. A great many of the farms in Wisconsin should produce double the amount of crops that they do today. The remedy is more thorough and more thoughtful farming; more attention to saving everything about the farm in the form of manure. If we could get at the value of manure wasted on these same farms, by carelessness and neglect, I am sure the magnitude of the sum would astonish us all. There are other methods of fertilizing and bringing our farms to a better state of productiveness, but they do not come under our subject.

We now come to the last, the subject of applying manure. If I had land with a stiff, heavy clay soil and subsoil, I would plow and pulverize as deeply as convenient, and if I had manure coarse with straw and corn-stalks, I would plow it under to lighten up the soil and make it less compact. All good manure I should apply to the surface after plowing, and work it into the soil with a spring tooth harrow, cultivator or disc harrow, before sowing or planting the crop.

On light porous soils, loams or sandy loams, where lands are more pliable, I plow as shallow as I can and turn the furrow well. I apply the manure to the surface and incorporate it with the soil in the manner described above. This leaves the manure near the surface, where the rootlets of the plant can readily get hold of it. To plow deep, and plow the manure under on light lands, is a vital mistake. This puts the manure so deep in the ground that before the roots of the plant get large enough to reach it the rains have washed the soluble parts of it forever out of their reach, and the best part of the manure is lost. I practice top-dressing my meadows and pastures heavily with fine composted manure, and when I plow under the sod I plow as shallow as I can, and turn a good furrow. My land being a sandy loam, I try to keep the manure near the surface.

I believe that no fixed and arbitrary rules of farming can be adopted, but a few general principles may apply. One of the charms and advantages of agriculture is that a farmer must think for himself. He should study principles and apply them in practice as best suits his circumstances. I am well satisfied that the farmer who fertilizes his brain the most with the knowledge of his business fertilizes his fields the best.

Discussion.

Mr. Favill: I thought of two questions as you were going along; first, do you consider the liquid part of manure more valuable than the solid, and, if so, can you tell us the commercial value of the liquid part of manure from one animal?

Mr. Kingman: That would be entirely comparative. As I have told you, the manure and its value depends entirely upon what you feed your animals. The liquids are certainly as valuable in my opinion, and more so than the solids. If you will tell me what the solids are worth, I will tell you what the liquids are.

Mr. Favill: Is the liquid part of manure increased in value for manure by feed, the same as the solid part?

Mr. Kingman: Most assuredly; the same elements enter into the composition of both.

Mr. Cole: What time of the year do you like to plow your soil that you are going to surface with manure?

Mr. Kingman: I generally have my land plowed in the summer, have my corn land ready, and apply the manure and work it in with a disc harrow, or something that mixes it with the surface soil.

Question: Immediately after plowing?

Mr. Kingman: Yes.

Mr. Cole: Do you think there is any loss by evaporation when the manure is spread on the surface?

Mr. Kingman: No, I do not think there is any perceptible loss.

Mr. Thayer: Mr. Kingman and myself join grounds in the city of Sparta, and last summer I was very anxious to get some nice fertilizers to put on my lawn. Mr. Kingman has a very nice cistern under his barn and saves everything of that kind, so I had been teasing him from time to time for some of that liquid to put on my lawn, but he always had an excuse; he didn't seem to want to. I urged him considerably, and finally he reached down into his pocket, pulled out a fat pocket-book and says to me: "Here, take that, but don't ask me for the liquid manure." He did finally give me a few pails of it, and my men took and scattered it on the lawn. Within a week or ten days' time I was looking over that lawn, and it lay in ridges; it looked as though we had been mowing with an old-style scythe, and had cut some places, and some not. I cut it down smooth, but in a few days those ridges showed up again, and they continued there, and showed perfectly clear just where the liquid manure had been put on, as if it had been chalked with a line.

Mr. Kingman: The trouble with Mr. Thayer was, he took it from the cistern and put it on in its natural condition. The result was that in a day or two, where he had thrown it, the lawn looked as if a fire had gone over it, but it started up in a few days. I think I can take a watering pot and write my name on the grass by sprinkling with liquid manure. In a few days you read the name just as plainly as if it were written on paper. Of course, this manure should be reduced, as it comes from the cistern.

Mr. Hatch: Do you think you get any advantage from saving this liquid separate, from what you could if you put an absorbent into the stable?

Mr. Kingman: If you put in enough absorbents, you will save all the liquid, but in throwing it into the yard, it is liable to be washed out. It is very soluble and washes out easily, and it must be handled with care. I think there is a good deal saved in having it brought into a cistern. Of course it costs a little something.

Question: Couldn't that all be obviated by carrying immediately to the fields?

Mr. Kingman: Yes; but you lose the fermentation then. When manure is put green onto the field and plowed under, it misses the fermentation.

Mr. Favill: How would it be if left on top of the ground?

Mr. Kingman: We may lose some of

the more volatile parts, but the essential things that we want are not lost so much as we are in the habit of supposing.

Supt. Morrison: Is there as much lost by drawing it out and putting it on the surface, as there would be if it was in a compost heap, or leaking and wasting in the stable?

Mr. Kingman: No, I don't think there is, because when the rains come, this essential part is washed into the ground where you want it.

Mr. Emerton: I was talking with a gentleman the other day, who was putting manure upon the surface in the winter, and he said that during a thaw, as the land sloped toward the east, he noticed a stream of water running over the land, and of a very deep color. Was there a waste in that case?

Mr. Kingman: Yes, that is what I say; a farmer must use some judgment. If his land is side-hill or rolling, this manure should never be put near a pond, or the banks of a stream. It should be put back, because these soluble parts wash down to the stream and are carried away. If it is far enough off they become absorbed before they reach the stream.

Mr. Convey: I wonder how many barn-yards Friend Emerton passed where the manure was washing away a much larger stream and much darker colored.

Mr. Emerton: The barn-yard would have a much smaller surface than the field, but I have this idea. Our barn-yards are liable to be on rolling ridges, and of course a large part of the manure is lost. I think if we put it out in the winter in such shape that the top will coat over and shed the water, we would save more of the valuable properties of the manure, than to take it out in the snow, and when a thaw comes lose a lot of it. The whole of our lands tend toward ravines, and it is an important question to us.

The Chairman: On this question we find considerable diversity in this State. I have often put it to people who have top-dressed during the winter, and then again to those who have allowed it to accumulate in the barn. Let us take a vote now, of all those farmers who have tried both of these plans, and see how it goes—those who have top-dressed, carrying the manure right along as fast as they could get it onto the land, and also those who have let it stay in the yards and then hauled it out and plowed it under. Now, let us have those who are best satisfied with hauling it out quickly and getting it on the surface. There seem to be about as many hands as on the double proposition. Let us have those who are best satisfied with the other way. I see three hands.

Mr. Everett: I have applied manure to the surface and did so because I get the best results. There will be some loss from washing on the surface, but I believe there is less than we think. A little of that liquid manure will color a great deal of water, as a drop of ink will color a whole bottle of water.

Mr. Weeks: It seems to me that idea of the English farmers is a good one, of putting the manure into a trench, but don't they pave the bottom of the trench?

Mr. Kingman: No; but I forgot to state that they put into the bottom quite a thickness of absorbents, the same as we put behind our cows an absorbent, horse manure, or any refuse that they could use there. They use sods a great deal. There is one thing I didn't mention. They told me, in piling up these piles for fermentation, I should be careful not to make them large so that the pile will be low and thin; if you do, the rain will percolate them and run out at the bottom. There is no loss by water falling on the pile as long as it does not percolate clear through; that is, it may wash the manure on the surface of the pile.

Question: Wouldn't you compact your piles by driving teams over them?

Mr. Kingman: In the summer I would; in the winter I would not. Fermentation can be carried on all winter

without any trouble, if a person will first get his pile started. Horse manure or hog manure, any rich manure, will start fermentation quickly, and after you have the heat started it will keep heated al right. There will come little breaks where you can see the steam, and it is a good plan to level down and stop those every once in a while.

Question: Wouldn't land plaster and salt both be good to keep the heat down?

Mr. Kingman: You don't want to keep the heat down. The object is to keep fermentation going on. If you can keep it fermenting all winter, under the stable or in the pile, you can get it fermented enough to use it for spring plowing, if you choose.

Mr. Hatch: My land is the stiffest kind of clay, and the loss by spreading the manure on the surface is more imaginary than real. I must say that I do not indorse Mr. Kingman's idea in regard to the fermentation. There is one experiment which has been carried on in England that will bear me out in my idea. I used to think that fermentation was advantageous to manure, but I find that in a dry season I can get my manure onto the ground in better shape and have better results. In England they took a certain area of turnips and fed, I think, twenty head of sheep on that area, and all the droppings were thus kept on the land. Then they took a corresponding area of turnips and fed the sheep in the stable, and carried all the excrement, solids and liquids, to that area, and then sowed them both to barley. There could be no fermentation there, and the difference between hauling from the stable and feeding on the land direct, was thirty per cent. They also found that the difference between plowing under that which was fermented, and that which was not, ran as high as between fifty and sixty per cent. I do not believe we can carry on any fermentation without loss.

Mr. Bender: Isn't there a lot of labor in piling it up and forking it over; doesn't it involve a great deal of work in the winter? It seems to me to be better to let it remain in the stable, and then carry it out when you have the time in the spring cultivation, and get it in with a disc harrow; you have it in good shape as you want it, and I think that the results will be better than in fermentation.

Mr. Kingman: The object in fermentation is this, that it puts the manure in a more soluble shape for the plant roots to get hold of and pick it up; for the same reason that we cook our meal that we are feeding our hogs; it makes it more digestible and more easily assimilated. If the manure is fermented, it is put in that condition that the plant roots can get hold of it. It causes a little labor, but not much.

Mr. Chairman: You don't think that fermentation can add anything to the solid portion?

Mr. Kingman: If I was situated so that I could, I would spread the liquids onto the pile as they were fermenting.

Mr. Emerton: Does not the fermentation take from the liquids?

Mr. Kingman: I find a chemical change going on in this cistern of mine. The contents are altogether different from what they were when it was built. There is no evaporation to speak of; it is covered, and you cannot even smell it standing over the cistern. I will say one thing; it is not so necessary in liquid manure to have fermentation, because the plant food is soluble all the time, and it is ready for the plant life whenever you feed it onto the ground.

Mr. Chairman: From this discussion we will have to draw our own conclusions. It looks to me as if some of them were quite plain. In the first place, Mr. Kingman shows you the difference in the values of manures, and I think his statements have all been borne out in experiments made at the Experiment Station in New York very recently, which show the value of the three main elements needed in plant growth in a ton of the different classes of articles

named on the chart, beginning with cotton seed meal, going along with linseed meal, wheat bran, etc. These values are based on the price of these elements in New York markets in commercial fertilizers where they have to pay some sixteen cents a pound for nitrogen, and six cents a pound for phosphoric acid. These figures may be too high for Wisconsin farmers, because the day has not come when we can pay these high prices for commercial fertilizers and get out of them again in our crops what we put into them, but I think we can safely divide it by two, and we can make the comparison, just the same.

Again, Mr. Kingman says, "Feed liberally." We know that it is a good thing for the stock as well as for the manure. Then he says the manure must be saved, either in a cistern or by absorbents, and it is only a question of expense to each farmer, how he shall save it, but take Mr. Kingman's advice and save it. If you are going to throw it out in the yard you cannot save it very well. Prof. Roberts told us a few weeks ago of his experiments in saving manure out in the yard in piles two feet deep, and how he lost in one summer forty-two per cent., and in another sixty-two, making an average of fifty-two per cent. in two years. We Wisconsin farmers, I presume, lose even more than that, because we don't take the trouble to pile it. There seems to be one safe way of taking care of it, and that is getting it onto the soil. The only trouble that has arisen here, is the washing off in the winter season, but taking all the arguments, it would seem that getting it onto the surface is the proper thing to do. It is needed for the growth of the young plants, and when it is there it is pretty safe. We find in our personal experience that top-dressing is the thing for us to do, and top-dressing on grass land satisfies us the best. It seems to give us a good crop of grass roots, which, in the case of clover, means lots of fertility. Then it acts as a mulch, and we all know that is a good thing. Scientists tell us that moisture comes up from below through the capillaries in the soil, and if we cover with a mulch or a dust blanket, we retain that moisture right near the surface, and the processes are going on in the soil which we want; the materials that are needed for the plant food are brought up. The fertility is near the top where your plant gets hold of it when it is young and weak, and it makes a good start in life.

MAINTAINING THE FERTILITY OF THE FARM

HON. CHAS. LINSE, LaCrosse, Wis.

How to maintain the fertility of the farm is the question of all questions in farm life. To solve it would add more to the prosperity of the country than to solve a great many of the so-called problems of the day. There are generally two sides to every question, but there is only one answer to this—namely: we must save the manure.

Clover.

Now, some of you may say: "I do not see the necessity of laying so much stress on the manure subject. Is there not this great fertilizer, the clover plant?" To this I say, in a certain measure you are right; there is, and lucky is the man who can cultivate a soil where clover will thrive. In Wisconsin it will grow on almost any soil but strange to say the clover plant is not honored, nor its real value understood by thousands of farmers. It will undoubtedly do wonders as a fertilizer,

and will, under favorable conditions, produce astonishing results. But if the effect is to be a permanent one, it is absolutely necessary to combine the clover plant and the manure pile in a co-operative system of action.

The idea of maintaining the fertility through clover culture alone, is entirely wrong, though a great hobby with many farmers. Our scientists tell us that on the roots of the clover plant are little knots or tubercles. In these are minute organisms—living things which have the power of absorbing nitrogen from the air. Now if this state of things would work in a continuous rotation, the problem would be solved, and I could then say, do away with the manure pile. But is it not a fact, I ask, that the first crop of clover on any soil is always the best? And I have repeatedly seen land completely played out on clover.

Manure is King.

There are certainly very few farmers who do not know that stable manure is, and remains the principal remedy to maintain fertility. They know that they must undergo the trouble of keeping stock largely for the purpose of producing manure, if they wish to attain success in farming.

There was a time when cotton was called king. Today corn enjoys that name, but I, with your kind permission, pronounce manure as king. Now is it not astonishing that the great life supporter and promoter of the soil is so poorly taken care of, and even squandered recklessly by thousands of farmers? Men who will otherwise save every grain, and every nickel, throw away dollars in the shape of manure in a most senseless way, by letting the largest and best part of it go to waste.

I have seen a statement made by Prof. Roberts, of Cornell University, to this effect: In a seven-months trial with forty-five head of matured animals he found that the value of their manure represented the astonishing sum of $1,682, taking the market value of nitrogen, phosphoric acid and potash as the basis. How many farmers have a clear estimate of their losses in dollars and cents through not taking proper care of the manure in a proper manner?

Now, how is such waste to be prevented? Our scientists tell us that the liquid part of the manure constitutes at least one-half of the manurial value of an animal, consequently our first aim should be to save that part of it as much as possible. The only place to save it being the stable, the floors must be made water-tight, to prevent the liquid from soaking into the ground. The next important thing is to have something for an absorbent. Where a man follows mixed farming, and does not make a specialty of raising stock, he generally has absorbents of straw, which is the best material for that purpose. I find land-plaster is not a very good absorbent, as it will soak up too small an amount of liquid in proportion to its weight, but may be otherwise beneficial in fixing the ammonia in the manure, and thereby act directly as a fertilizer. This is claimed by many good agriculturists, though I cannot very well understand how ammonia can escape before manure is in a state of fermentation, which is not the case if stables are cleaned daily.

A Good Absorbent.

A better material for an absorbent than plaster, and almost costless, is black loam earth, in a dry state, and kept under cover. I find that it does not require a very large amount of it, thrown into the gutter behind the cattle, to give the liquid part of the manure enough consistency to be easily taken up. A plan which I used to practice in an early day, when straw was abundant, was to take the manure out of the stable only once a week. In this way, even not having water-tight floors, but a very small part of the liquid went to waste. If we have no material to absorb all the liquid we must provide for a place to drain it into, which must be kept under cover. The solids of the

manure ought to be kept under cover also. The plan of carrying all manure onto the land as fast as it is made is a good one, if all circumstances are favorable, but such is not always the case. I would not draw manure on the slope of a hill in winter, when the ground is frozen, and covered with more or less snow. Neither would I like to draw manure when both it and the ground are saturated, as is often the case in a wet season, particularly in the fall, and to draw it during the busy summer season is well known to be an impossibility. The chances are that the manure will accumulate for months, and I believe that some sort of a building, to keep off the burning sun and pouring rain of the summer, is the best investment that can be made on the farm. If manure from cattle and horses is kept together under cover, it will be found that it will absorb all the liquid, if the same be taken up from time to time from the bottom and distributed over the top of the manure pile.

My Experience.

I will now give, in brief, my way of saving and handling manure. My stable floors are water-tight, as nearly as I can get them. The drainage all centers to one place, and the liquid not absorbed finds its way out into the manure house. This is built with a stone wall five feet high, with about two and a half feet under the surface of the ground. On top of the wall is a frame structure six feet high, with a roof. There is a drive-way through the center, with a sliding door on each side of the building. In one corner is an opening from six to eight feet square, and four feet deep, covered with old fence posts. In it I have a pump for the purpose of taking up the liquid from time to time, to be distributed over the manure. I find that the liquid is all absorbed by the solids, and the manure is kept in splendid condition. The building is from thirty to forty feet square, and will hold the manure from fifty to sixty cows about three months. As it is impossible for most farmers in Wisconsin to go to the expense of building covered barn-yards, and the droppings from cattle in an open yard are almost an entire loss, I follow the practice of giving my cattle all the stabling possible. In winter I allow my cows to be out in the yard only long enough to give them exercise—from one to two hours in fair weather. In stormy and severe cold spells I do not let them out at all. In summer I stable my cows also during the night, not only to give me a better opportunity for milking, but principally to save the manure. If you can bed your cows liberally you will be astonished to find what a nice pile of manure has accumulated during the summer. My practice in applying it to the land is according to circumstances. If I have well-rotted manure I use it for top-dressing on my meadows, and I try to have a portion of it in such a condition as to make it fit for that purpose, but I do not believe in putting coarse green manure on them, for the reason that a large portion of the coarse parts of it is taken up by the hay-rake, and mixed with the hay crop. I do not agree with the idea of leaving all manure on top of the surface, but always take particular care to plow it under as shallow as possible, so that I am able to under-reach, with the following plowing, at least two inches.

The ideas in regard to the best way and manner of applying manure have always differed, and will never wholly agree, as the location, the soil and the seasons will never be alike, but in one thing we should unanimously agree, and that is to save all the manure possible, and to give the manure question, simple as it may appear, our constant thought and attention.

Supt. Morrison: Prof. Roberts, of Cornell University, gave recently at the State Dairy Convention a very valuable paper upon the subject. The following is a summary:

"If from $1 to $2 loss a day was being incurred from the leaking of a grain bin we should feel that the owner was

a lunatic if he made no intelligent effort to prevent it. But if the same amount of loss is daily incurred by unnecessary waste of manures, we call the proprietor sane and let him remain at large without a guardian." He then proceeded to show that the quantity of manure produced in a year by some of the domestic animals, according to Boussingoult's estimate, was as follows: For a horse, 12,000 pounds of liquand 3,000 pounds of solids, a total of seven and one-half tons; by a cow, 20,000 pounds of liquids and 8,000 pounds of solids, or fourteen tons. He then gave results of his experiments in 1883-4 in keeping stock in a covered barn-yard, where no water fell upon the droppings. He found that in seven months mature animals would produce an average of ten tons each. A sample of each load was analyzed, which demonstrated that, computing nitrogen, phosphoric acid and potash, the essential fertilizing elements, at their commercial prices, 15, 7 and 4 1-2 cents a pound, respectively, the value of manure thus saved was $3.61 per ton. According to this valuation he found that the manure made by forty-five animals, two-thirds cattle and one-third horses, was worth $1,682. The result was so surprising that it was decided to repeat the experiment the next year, when an aggregate of 47 mature animals, averaging 900 pounds weight each, made a few pounds short of 200 tons of manure during the five months from Oct. 1 to March 1. In this trial less bedding was used than before, and the analysis showed the manure worth $3.05 per ton. In another experiment three large cows produced 802 pounds of manure, including forty-five pounds of bedding, in three days, and gave thirty-one and two-thirds pounds of milk each per day. Last year his eighteen cows, in milk, produced 1,452 1-2 pounds of manure in twenty-four hours, and an analysis showed its value to be $1.78. To be entirely safe, and for practical purposes, Prof. Roberts said it was safe to estimate the value of this manure at one-half the commercial value of the nitrogen, phosphoric acid and potash which the analysis showed it to contain, and, according to this rule, the manure made by eighteen cows in twenty-four hours was worth 87 cents to the farm, or a total value of $178 in the manure from eighteen cows in 200 days of winter feeding.

Manurial Products of Animals.

In other experiments Prof. Roberts found that, exclusive of bedding, the manure produced by cows was eighty-one to eighty-four pounds per day; by horses at work ten hours a day, thirty-one and a half to fifty-one pounds; sheep, weighing 140 pounds, seven and a half pouds; pigs, weighing 150 pounds, fed on a narrow nitrogenous ration, five and two-tenths pounds, and fed on a wide carbonaceous ration, one and seven-tenths pounds. The daily manurial product of sheep fed on a maintenance ration was: Rams, 5 6-10 to 4 71-100 pounds; ewes, 3 6-10 to 3 1-2 pounds; for 100 pounds of sheep, rams, 3 6-10 to 3 18-100 pounds; ewes, 2 96-100 pounds. Calves produced 3 6-10 to 8 4-10 pounds per day per 100 pounds of calf, the latter fed on milk. The present winter, in one of the covered barn-yards on the Cornell farm, nine horses, five colts, twenty-two cows and thirty-one sheep were kept sixty-four days, in which time they produced 128 3-4 tons of manure, which, at half the commercial price of the nitrogen, phosphoric acid and potash it contained, was worth at least $1.50 a ton or $193 in round numbers.

Value of Manures.

Prof. Roberts then gave the value per ton of manure produced by various classes of animals, based on the cost of commercial fertilizers, as follows: Horses $2.97, cows $2.27, sheep $4.19, swine $3.18. The value of the manurial product per 1,000 pounds of live weight of animal per year, nitrogen, potash and phosphoric acid computed at commercial values, according to results arrived at at Cornell in recent years, he said,

was: Horses $19.12, cows $29.82, sheep $38.55, swine $17.11. But as these animals were kept in stables but seven months in a year, and as nitrogen, potash and phosphoric acid in such manures were less soluble and consequently less available for plant food than the same elements in commercial fertilizers, to arrive at a positively safe valuation of the manurial product per 1,000 pounds of animal in a year the results of chemical analysis might be divided by three and would then be as follows: For horses $6.37, cows $9.94, sheep $12.85, swine $5.70. Still, he said, it was clearly shown that, upon this conservative estimate, there was sufficient value in this by-product to induce every thinking farmer to see that it did not go to waste on his farm. According to these modified figures the manure produced in seven months by an average quota of farm stock, say four horses of 1,000 pounds each; twenty cows of 800 pounds each; fifty sheep of 100 pounds each, and ten pigs of seventy-five pounds each, would be worth $253.

Losses from Leaching.

To the question, "Does manure waste as ordinarily kept in open yards?" Prof. Roberts proceeded to show that each inch of rainfall was equal to 100 tons of water on an acre, the usual thirty-two inches of rainfall during a year making 3,200 tons of water to the acre. A barn-yard with six 16-foot panels one way and seven the other to inclose it, he said, had almost exactly a quarter of an acre in it, and would therefore receive 800 tons of water in the usual rainfall of a year. He said he would as soon think of leaving hay out in the field all winter as of leaving manure in the barn-yard all summer. Continuing he said:

"The leachings from manure about one foot deep in our rotting receptacle showed that each ton of water that passed through the manure carried with it 60 cents worth of plant food. Two years ago 3,319 pounds of horse excrements mixed with 681 pounds of straw bedding, making a total of 4,000 pounds, was exposed in a pile about two feet deep from April to September. When the manure was put in the pile it was valued at $2.80 a ton; at the end of six months it showed a value of $1.06 a ton, a loss of 62 per cent. A similar experiment with horse manure in 1889 showed a loss of 42 per cent.

"In 1890, 9,278 pounds of excrement from the cow stable, mixed with 300 pounds of plaster and 422 pounds of wheat straw, total 10,000 pounds, exposed six months, from April to September, in a pile averaging nearly two feet deep, lost, according to chemical analysis, 30 per cent. of its fertilizing value. In all of these experiments it must be remembered that the per cent. of loss given does in no way express the true loss, for that which is washed out or escapes in any way from the manure heap is the most valuable part and is usually worth as much as the same elements are when found in commercial fertilizers; only the plant food which is slowly soluble is left behind, and so I believe that it is no uncommon thing to find farm manures which have been exposed to rains and drippings from the eaves of the barn for five or six months, so fully robbed of the soluble part of their constituents as to be worth less than a quarter of their real value when thrown out of the stable window."

How to Prevent Loss.

The best method of preventing loss from such washing and leaching, Prof. Roberts said, was to draw the manure from the stable directly to the field and spread it on grass land, during the fall and winter months. During the months from March 1 on until fall he did not favor applying it direct to the field, but wanted it saved free from rain drenching and apply it to grass lands in the fall, or to land to be plowed again the following spring. Proper storage could be had in the basement story of a barn, by keeping the stock on the second floor, on a perfectly water-tight floor,

and dropping the manure down through, using enough absorbents to hold all liquids. The ideal method, however, was to have a covered barnyard, or big shed, and wheel all manure from both horse and cattle stables to it, using plenty of bedding, and let the animals run on it much of the time when out of the barn. In the absence of either the basement or the shed a leanto six or eight feet wide should be built at the side of the stables, supplied with a water-tight cement floor and the manure thrown into it when not being drawn direct to the field.

Application of Manures

Upon the question of applying manures, Prof. Roberts said there were two methods. First, spreading them directly from the stable in their raw or undecomposed state. If spread in the fall or early winter such manures formed a very beneficial mulch; the losses which might occur from holding them were prevented, and there was economy of labor in it, as they had to be handled but once, and it was done in winter when labor cost least. Such raw manures, however, he said, acted slowly, and the plant food contained was less valuable than that in well-rotted manures. But the danger of loss was so great, even if kept for a year in deep, well-snugged piles, that it was always advisable to draw direct from the stable to the field and spread it at once, on grass land, if the ground was not covered too deeply with snow.

MY EXPERIENCE ON A SANDY FARM.

M. T. ALLEN, Waupaca, Wis.

The farmers of an early day, who settled the territory called the "Indian Land," which lies north and west of the Fox river, did not use the good judgment that they do at the present time. Thirty years ago they cut off and broke up the land which required the least labor to prepare it for a crop, and nine acres out of every ten proved to be the very poorest they possessed. Fifteen years of continued cropping got the majority of them ready for emigration to new pastures green. Those who weathered the storm looked about them for some way to reclaim their worn-out fields, which, by this time, had gotten so they could scarcely produce more of a crop than the seed sown upon them.

Clover the Restorer.

Clover was being talked of, and a few venturesome ones had already commenced raising a few acres. Very well do I remember the first clover seed that was brought upon the farm. It was in the month of March, 1865. Father went eight miles on foot, to a party having been reported as having a little medium clover to sell, and bought forty pounds, which he brought home upon his back. The forty pounds cost him an even ten dollars. It was sown upon four acres of nearly worn out land. The season for clover was a very good one and the result was a most excellent stand in the fall. When vegetation began in the spring our expectations were blighted entirely, for the clover had all killed except along the fences where the snow had drifted. This one set-back did not block the game, however, although many said that clover could not be raised upon the sand.

Worn-Out Sandy Soil.

We continued to sow, and the results, as a whole, were very gratifyng. Sandy soil, once worn out, or nearly so, be-

comes cold and compact like the more heavy soils, and there is no better antidote for this than clover roots, fed by a liberal ration of stable manure spread upon the surface,—an imitation of nature's method of mulching the growing vegetation.

While clover is one of the greatest fertilizers for a worn out soil it will do far better work if it be given the right kind of help. Selling every ton of hay and straw save what you might need to keep your team and two or three cows, is not the kind of help that clover demands. Feed every ton of hay and straw, and every bushel of grain you can of what you raise. Better buy than sell, for thereby you convert that which you have taken from the soil into the very best of fertilizers,—stable manure.

Stable Manure.

We do not believe in barnyard manure as a rule, for it has lost a great percentage of its value before it is applied. Stable manure contains elements of greater value to our soils than any commercial fertilizer yet heard of at the same cost. We can also increase the value of stable manure by feeding most of such feeds as have the greatest manurial value, such as clover, hay, bran, oilmeal, oats, &c., ever mindful that it is just as essential that we should save the liquid as the solid manure. We would, and do, apply directly upon the field from the stable, consequently avoiding losses that would otherwise occur. You ask, what shall we feed, or what kind of stock would you recommend keeping, and so on. It matters not so long as you get the products of your farm into the most concentrated form for the market. By so doing I shall be satisfied that you are feeding your farm, while the farm is more than feeding you. The application of these fertilizers should be made upon clover sod, if possible, which is to be plowed in the spring for corn or potatoes, not plowing until just before planting time. Our reason for this is to give the clover and other grasses as large a growth as possible before turning them under, thus making a vegetable mulch, which places the soil in the finest condition for the growing crop, making it light and porous, besides very quick and more productive.

Rotation of Crops.

While we are not an advocate of the general purpose cow, we do believe in mixed farming, in a measure. The farmer who has pork, beef, butter, potatoes, wool, mutton and a colt or two for sale every year must get paying prices for most of his products, and at the same time has the production of the soil left in the very best possible condition, if properly handled, in the shape of fertilizers. A good system of rotation is also necessary to get the best results from clover. Clover sod, with good stable manure applied upon the surface during the fall and winter months, turned down just before planting to corn, followed by a grain crop, seeding with clover again, will give excellent results. We have yet to discover soil that will respond quicker to good treatment than sandy soil under such care. It is warmer, quicker and equally as productive as any other, and much more pleasant to work. So with our experience upon a sandy farm, we would tie firmly to clover,—feed all hay and grain produced upon the farm,—adopt a system of rotation,—avoid plowing too deep, and never sow an acre of grain without seeding to clover, even if you plow it up the next spring. The fall feed you get will doubly pay you for the seed, as will also the tons of roots left to decay.

Discussion.

Mr. Favill: Mr. Allen, do you recommend, as a panacea for worn out farms, clover, clover and more clover?

Mr. Allen: Yes, with all the stock I could keep on the farm connected with it.

Mr. Thayer: If you had no stock to eat the clover, would you still recommend it, and cut it down in the green

stage as a mulch, or let it lie on the land for its manurial value?

Mr. Allen: Better do that than sell it off the farm in the shape of hay.

Question: How did you have the best success in getting a good catch of clover?

Mr. Allen: One of the ways that has proved very successful with me is to sow it very early in the spring on fall grain; frosty mornings when the ground is frozen sufficient to hold you. I sometimes sow it on spring grain, but as early as possible.

Chairman: Two years ago you all remember how dry it was, and the new seeding of clover all over the state was a failure. Holding institute the following winter, it became a custom to publicly inquire if any of the farmers present had secured a good catch of clover. A farmer in Waushara gave he following and said he had never failed in securing a good crop of clover: He soaks his clover seed some twenty-four hours; he then takes it on the barn floor, and with a bushel of clover seed he mixes a bushel of land plaster and shovels it together until each clover seed is entirely covered with a coating of land plaster, and his neighbors all said that he never failed of a catch, even on very light sandy soil. This was sown and brushed in as early as possible in the spring.

Question: Have you tried sowing clover by itself, and allowing it to grow for a crop without any other crop?

Mr. Allen: I never have.

Question: Have you tried sowing it in buckwheat?

Mr. Allen: I never did, but I have seen it tried, and the result was generally loss of seed. The clover does not get sufficient growth before the burning suns in July, so that it is sometimes burnt out. Then again, when the buckwheat is taken off, the clover is so young that it will not stand the fall weather. I sow clover as early in the spring as I can sow my grain.

Question: Won't clover do well in your sandy soil sown right with the grain?

Mr. Allen: The trouble is there is too much of it and it gets too big.

Question: Did you get a catch of clover on your sandy soil last year?

Mr. Allen: I got a catch all right, but I didn't hold it, and that is really the main trouble.

Mr. Goodrich: There is a way to get a good catch of clover if the summer is one that anything will grow, and it seems to me that this year is a time when we want to be sure and get a catch. If it is sown by itself, no grain with it, early in the spring, you will be sure to get a catch of clover if you do anything, and it seems to me this year, if we have good seed, we will get quite a growth of clover. I have had a ton and a half of clover when there was nothing sown with it the same season it was sown.

Question: How much seed would you sow when you sow it alone?

Mr. Goodrich: I would sow five or six quarts.

The Chairman: I sowed clover alone in the dry season and had a perfect catch.

Mr. Chadwick: I have had some experience sowing clover, and I have had the best results by sowing the land that I plowed each day. When I got through plowing, that land was seeded at night. The clover got a good catch and I succeeded three years ago, when my neighbore did not get a stand of clover. I have never missed when I sowed clover seed in that way on spring plowing.

Question: Have you ever had any experience sowing clover on the snow in March on winter grain?

Mr. Chadwick: I never had. The trouble with us is the sand don't open up in the spring like heavy soil, and there are not those fissures and cracks in the soil.

Mr. Everett: I believe that is the best possible way to seed clover. I have never missed getting a catch and a good stand when I seed it in just such weather as this. Last year all the clover

seed that was sown with us in that way is a good stand today, while all that sown with grain in the fall is dead.

Question: If you sowed clover seed now, would you harrow it when the first frost gets out of the ground?

Mr. Everett: No, I would not; sown as early as this you will get a good, strong, vigorous growth and it will stand the dry weather.

Mr. Kingman: Suppose the seed was put on last fall after the ground was frozen up, is there any danger of the seed losing its vitality before spring?

Mr. Everett: I am inclined to think not, but I couldn't answer from experience.

The Chairman: I sowed once as early as December, and had it lay over until spring and it came out a fair crop.

Mr. Kingman: I had a little experience in that line. Last fall I put in thirty-two acres of winter wheat and sowed clover seed and timothy seed with the wheat, not drilled in, but sowed. The seed came up very fine; indeed, it was perfect, but the dry weather, later, choked it out, or burned it out, the same as it did in the spring. When I found it was gone I got more seed and sowed it on the same land in December, just before Christmas, and there it lies, and I don't know whether it is going to germinate or lose its vitality. I think it will be all right.

Mr. Thayer: In my vicinity there are large areas of light, sandy soil. Now, I wish to know whether it is a practical thing to bring that light soil to a condition where it will pay for farming, by the use of clover or in any other way?

Mr. Allen: I should say it would be.

Mr. Morrison: You can raise potatoes on that kind of soil.

Mr. Allen: You can raise anything that you get started with clover.

Question: On white sand?

Mr. Allen: I don't know anything about white sand. I will say that in our twenty-seven years' experience on the farm we never have met with but one complete failure in raising clover, and that is the past season. Our land is called as poor a sand as there is in the country. Our trees are jack-oak. We have good soil on the farm, but this experience I speak of is on land that was first broken on the farm and it is very sandy.

The Chairman: You spoke of helping your clover with plaster and salt sown on the farm.

Mr. Allen: I don't know that salt is as much of a help as plaster; we always sow plaster the same time we do the seed.

Question: How deep is your sand?

Mr. Allen: Clear to the water, all sand.

The Chairman: Does this sand drift when there is nothing on it in a windy day?

Mr. Allen: It does.

Mr. Wiley: Can you keep that soil rich for any length of time?

Mr. Allen: By a rotation of crops and plowing and manuring I generally get over the farm.

Question: What crops are you growing or can you grow successfully?

Mr. Allen: Anything I have tried. We don't pretend to raise wheat, except winter wheat; that will grow quite well. We raise corn, potatoes and clover. We have sown oats, barley and rye to seed with.

Mr. Kingman: Has there been any clover seed raised in your section this last year?

Mr. Allen: There has not. I can't tell why.

The Chairman: Clover midge, isn't it?

Mr. Kingman: That is part of it, of course. I don't think there has been a bushel of clover seed raised in our country.

Mr. Allen: In the town of Rhodes there was a man who raised about one hundred bushels of clover seed. A large portion of that was medium, which I prefer to our sandy soil to mammoth, because in the medium there is most feed and you can get most moisture.

The Chairman: A question is handed to me as to where clover gets its nitrogen.

Mr. Allen: Through the roots, or from the air.

The Chairman: From the air in the soil, you mean?

Mr. Allen: More where the soil is made porous. In a compact soil I don't think it will get as much.

Mr. Thayer: I believe it is claimed that there are more pounds of plant growth in the ground than there are above the ground in the clover plant; more fertility in the portion below the ground than in that above.

Mr. Everett: You know that the midge will destroy the medium clover when the mammoth clover is all right, for the simple reason that the medium clover matures first.

Mr. Chairman: From this discussion we are led to believe that clover is a good thing. Mr. Allen says it is a good thing for them up there on their sandy soil, and I do not believe that there is a farmer in this room but that believes that it is a good thing anywhere. We see that clover adds fertility to the soil, and as friend Everett has told us, the scientists have discovered how it gets that fertility. Laws and Gilbert find that by analyzing the roots of the clover crop in the soil, and the crop that grew on it, there was a fine amount of fertilizers found in the roots of the clover crop, and in the product, and yet the soil was just about as rich as it was before the clover crop was taken, and this German professor discovered that in the warts that grow on the clover root there is a little germ,—they differ somewhat about the scientific name to be applied to it,—there is a germ there that has that facility of drawing in the nitrogen and taking it to the clover plant so that we find it in the root and in the clover. Also the clover plant has a mechanical action that loosens up our soils, going down into the subsoil a great distance and allowing the water and air to go through it. These roots abound with the fertility that has been stored away for ages and bring it up near the surface and leave it in the ground in a position where it can be most easily taken up by plant life. Now, if clover is a good thing, we want to get a good catch. Mr. Allen says, help it by the application of manure, and help it with plaster; and others think it is a good plan to help it with salt. By sowing two hundred pounds in the spring of the year with the clover, we find we get good results. I think the best plan for sowing clover according to what has been said here, is to sow it early so it will get a good root before the dry weather comes on. In some parts of the state they do well with clover by sowing it with buckwheat, thin. They claim the buckwheat shades the clover till the dry time is past. In this matter as in almost every other, each one must determine just what is best for his land. A short time ago I had a long conversation with Henry C. Wallace, who has a large farm in Iowa, devoted largely to the growing of clover seed. He says the only way he has a crop of seed since the midge began its work of destruction up there, was to cut off the first crop of clover early in June, from the first to the tenth. I was told that Mr. Wallace failed this year on part of his land in carrying out this idea, but that he cut the earliest, about the first of June, was all right.

The Institute adjourned to meet at 1:30 p. m.

AFTERNOON SESSION—MARCH 16th.

The Institute met at 1:30 P. M. Mr. Geo. Wylie in the chair.

THOROUGH TILLAGE OF THE SOIL.

A. F. NOYES, Beaver Dam, Wis.

Have you ever taken the time to figure the loss sustained by the farmers of Wisconsin in a single year by the neglect of thorough tillage? If you ever do it will astonish you. But look back with me through the wicket gate of memory and see the fields of golden grain, succulent roots, Indian corn, and waving grass, choked with weeds, the result of a lack of good tillage. Yet try as hard as we may, we cannot always plow and cultivate, harrow and roll as we would like. But you know, and I know, that we are a long way from the limit of successful tillage. The first agriculturist tilled the ground with a crooked stick before the seed was sown, and some of his descendants are farming the same old way yet.

Tillage and Fertility.

Soils are combinations of chemical and mineral matters, and for the purpose of this paper may be divided into the soluble and the insoluble. The soluble elements are in an available condition for the tender rootlets of plant life to carry into the plant for growth of foliage, stalk and grain. Tillage, if properly done, only effects this soluble portion as it retards its waste, or hastens its creative power. How to best convert the insoluble into soluble and available fertility is a problem that has taxed the minds of the best and hardest thinkers of the world.

I do not propose to argue that we can add fertility directly to the soil by tillage, but I do say that by thorough tillage we can increase the plant food available in a given field, that will enable it to produce a larger crop, and that by more tillage alone we can maintain this increase for years. It is unfortunately true that clean culture has a tendency to rob the soil of its fertility as well as to make plants grow better. Water being the medium through, and with which, plants get their food, whenever plant growth stops the evaporation of the water caused by warmth carries off much available nitrogen—the most costly element of plant growth and that most easily wasted.

Impoverished Land.

I have had some experience in bringing up run down land, that was producing below the average of Wisconsin yields of crops, obtaining, one product with another, double the crop per acre in the course of from five to seven years, and increasing the yield from thirty-three and one-third per cent. to one hundred per cent. over the Wisconsin average in the various crops of grain, clover, timothy, corn and potatoes, on eighty acres of this land without a load of manure, by and with better tillage alone. In what I do I can no more control sun and weather and their action on the work we have to do in the sowing, tilling and harvesting of our crops than you can, and as on these three operations depends our success, we must so even up the work on each variety of crop as to conduce to the general excellence of the products of

the whole farm. I will say that the land I try to farm is clay openings, and has been quite stony. Some of it is yet, though not so stony as previously, as the stone fences about us can prove.

Plowing.

In plowing, experience has taught that it is best for me to use a gang of three-inch plows, the depth and width of right hand plow regulated by levelers, the connection rod between axles regulating the level set of plows in the different depths of plowing, using spring eveners and saving dollars in horseflesh and plows, besides the comfort. Always buy extra lays with plow. Use three or four horses, weighing from one to three thousand pounds, plowing from four to five acres per day. Keep coulters and lays sharp, and remember that the farmer who works his teams reasonably, the most days in the year profitably, is the one who is getting ahead. I know that for me twice plowing for every crop, except sod, and sometimes on that, is paying work. If your fields are broken and small, look the farm over and see if you cannot straighten them up. Grub out that thicket; clean out that stony knoll; drain that wet spot; clean up your fence rows; make the fields as long as you can; plow them the way they will wash least, if possible, about six inches in depth generally, though four inches on a manure covered sod is best; leave the land as level as possible because the nearer level it is the easier you can put in a crop, and more perfectly weeds, stubble, manure, or cornstalks are covered. If you have a ridge next to the fence set your lands out so that you can plow away from the fence until level. Then plow away and back alternately. In plowing toward fences three horses on gang will make a good job. In plowing away use two horses on handle plow, the near horse with whiffletree half length, the last time the near horse drawing the plow alone with short whiffletree. This last furrow after it is once broken is the easiest turned in the field, being shallow, which leaves the land nearest level, and thus leaving but a few inch margin to fence. Next to my stone fences there is but a very narrow line of timothy and June grass, but unless you seed right up it is a rank place for weeds to grow. Gee around until your plowed strips are as wide as unplowed center, then haw around, not plowing on the ends. In plowing away from the fence leave a strip the same width as head lands, and plow away from around the whole field to finish. In plowing towards the fence the headlands are best plowed by carrying furrow; it takes but a short time and land is not tramped hard. I do not want to go over the whole program, but want to say right here, don't put any manure within a rod of the fence. Did you ever notice a larger growth where the snow bank lay?

Top-Dressing.

Strawing or coarse manuring our pastures has the same effect as the snow bank, and are but ways of conserving moisture and fertility, as tilling by fining the soil does plowed land. If you plow early and do not or cannot sow anything to plow under, plow three or four inches deep the first time. Then you can plow deeper at a later date and make a good job. But always harrow or cultivate as soon after plowing as possible; this fines the soil and retains moisture, and the more moisture we can retain in a well drained soil the less plant food is wasted. After plowing corn stubble under, roll at once, thus solidifying the stubble before they are propped up by the rain washing down the fine soil around them. Use the gang for stubble, potatoes, corn and timothy sod. I use a sixteen-inch plow on wheels for clover sod and ensilage corn plowing, cutting fourteen inches in width, which is wide enough for any plow to cut, always plowing when dry. In cultivation to prepare fall plowed land for a crop, I

use cultivators built on the principle of the Disc, a spade harrow or cultivator that does better work and which I prefer to the Disc, for first cultivation. Then use Acme for second cultivation, always across and back, one tool following the other throughout the whole operation, and across the furrows, if possible, from one to two inches in depth, and thus doing all the work on this small depth of surface. This makes it much finer than if trying to get three or four inches pulled up into lumps to gather all the light showers and letting the moisture escape from below as well. Follow this by twice or more cultivating with the roll; then sow the seed with a drill, either hoe or shoe; then roll or harrow, one or both, to finish.

Compact by Fining the Silo.

It has been generally understood by many farmers that grain needed a fine upper surface, but a harder and more compact soil below, for the best results, but we intend to try the experiment of cultivating and plowing both to a depth of from three to four inches and sowing with a shoe drill not to exceed two inches in depth. It is proven beyond doubt that grain on rolled land gets up from three to six days sooner than that on unrolled land. Still it was shown at the Experiment farm last season that more water per square foot was evaporated out of rolled land than out of that portion of field harrowed after rolling, and while it may be better practice to harrow after rolling in a dry season to prevent this undue evaporation, we must maintain that the few days gained in the growth by leaving the land as rolled in an ordinary wet or moist season is of too much importance to gntly change to harrowing last. Yet here is a point that requires wise judgment on the part of the farmer, for we believe on land properly fitted it is only after a crust is formed by the first good rain that undue evaporation does take place, the extra warmth of the ground on the rolled surface may then hasten it. All grain not seeded to grass and clover should be harrowed and cross harrowed, if possible, three or four weeks after sowing, although it may not do on all soils in every year. It loosens up the soil, retains the moisture, and if done early enough where wild buckwheat is prevalent will kill much of it, as well as other weeds which are then small.

Save the Moisture.

In tilling to prepare for corn and potatoes, I would use the same cultivators to cut as deep as plowed on fall plowing, and as deep as possible on sod and manured land, spring plowed, without turning up grass roots and manure. Roll and harrow until fine. Plant both with a planter in drills as fast as the land is prepared, taking advantage of every particle of moisture and day of growth possible. Follow the planter in either crop with cultivator or plow, throwing or drawing up about two inches of soil, covering up planter mark, and if soil is loose follow this with roller. Then it is ready for harrowing, which keep going so as to go over the ground every three days at least, until you begin to think you have pulled up most all the corn, or until you break too many potatoes.

The science of agriculture is but nature and her secrets, and the farmers who use their knowledge gained in various ways to co-operate with the varied influences of earth, sun and air are bound to succeed. The more my men and teams can cultivate and plow the more satisfactory the results, and while I do not favor the non-application of manure as a proper farm practice, I do claim that the results on these fields, as a consequence of more and better tillage, are of great importance to the owners of many Wisconsin farms.

Discussion.

Mr. Thayer: You recommend thorough tillage. When is that to stop?

If you cultivate until the weeds are gone, is that enough in cultivating corn?

Mr. Noyes: I would cultivate twice a week as long as there are any weeds.

The Chairman: Is there anything in the idea that tillage is manure?

Mr. Noyes: I hold that it is, and that it breaks down the insoluble and makes it into soluble matter that the plant can take up into its growth.

Mr. McKerrow: I believe that when you said that there was no green crop growing there was an escape of fertility Will a dust blanket kept there by a continuous stirring of the soil hold that fertility?

Mr. Noyes: Not all of it, although it is a good thing even in a growing crop.

Mr. Favill: How deep would you cultivate when it was very dry?

Mr. Noyes: Not over an inch if I could avoid it.

Question: Did you mean to state that you want to cover wheat two inches deep?

Mr. Noyes: I want to do my cultivating for grain in the spring two inches deep; then I would sow with a hoe drill. If you cultivate with a shoe drill of course it would go a little deeper.

Question: Do you want your grain covered two inches deep?

Mr. Noyes: On the lighter portions of the field it will not hurt. I would not sow it two inches deep on all soils.

Mr. McKerrow: Is the amount of moisture held in the soil by a dust blanket, or a thorough fertilizing of the surface, as much as there is held there by a mulch?

Mr. Noyes: They answer the same purpose, but I think the mulch will hold more; that is my experience.

Mr. Goodrich: Will not this thorough tillage with any application of manure in time exhaust the fertility of the soil?

Mr. Noyes: Yes; I think in about three hundred years it would exhaust mine if I didn't put anything back.

Question: Do you claim that we should not plow only from four to six inches?

Mr. Noyes: I claim that for me that was best. It depends on the kind of soil, of course.

Mr. Ames: Do you practice plowing the sod more than once?

Mr. Noyes: I have, some. The first time you have to plow it deep; the second time I plow it shallower.

Mr. Cole: How many crops did you ever raise without one inch of manure?

Mr. Noyes: I have one eighty acres I have raised seven crops on. I had clover on it one year.

The Chairman: Does the amount of moisture conserved by tillage increase with the depth of tillage?

Mr. Noyes: I think it decreases. The deeper you go the more the moisture evaporates.

Mr. Convey: Prof. King states that three inches is the most favorable depth for the conservation of moisture, providing the surface is reasonably level.

Mr. Chase: You talk of stirring the land to keep the moisture. Isn't it more a matter of stirring the land to fertilize this soil and make it better for the crop?

Mr. Noyes: Both.

Mr. McKerrow: You said that the kind of soil would make a difference in the depth of plowing. Do I understand that if you had a rich subsoil which you found by experiment would grow crops when turned up, that you would plow deeper?

Mr. Noyes: Yes, that is it.

Mr. McKerrow: But if your subsoil was poor ground you would turn it up very slowly if at all.

Mr. Hayes: There is one point you have not made very clear and that is as to the depth of sowing. You take a heavy soil and sow two inches deep and your seed is never going to come up while you can sow three inches on sand and it will do just as well as if you sowed three quarters of an inch on heavier soil. Everything depends on your soil.

Mr. Favill: You mean by that the farmer has to mix brains with his work?

Mr. Convey: Prof. King claimed

that three inches might not be the most favorable depth for all crops, because root pruning might take place at three inches.

Mr. Kingman: Mr. Noyes, have you had any experience with the press drill on clay soil?

Mr. Noyes: Yes, it works satisfactorily; it goes over the soil all right.

Question: Does the fineness of the tilth on top have anything to do with the moisture?

Mr. Noyes: Yes, the finer the surface is the more moisture it can hold.

Mr. Meacham: How did your seventh crop compare with your first, Mr. Noyes?

Mr. Noyes: I have increased the yield on that field from 33 to 100 per cent. for the different crops. The last crop I raised was last year, and I got a paying crop. The land is capable in ordinary seasons of producing forty bushels to the acre, when eight years ago it did not raise more than from ten to twelve.

Question: How have you kept up the fertility of the land?

Mr. Noyes: By keeping up the cultivation. I will say it is away from the house and it is not practicable to put manure on it.

Mr. Chase: In my opinion the deep sowing or shallow sowing depends a little on the season. If we have a moist season you do not want to dig so deep, while if it is dry you want to get it to a certain depth.

Mr. Noyes: Mr. Chase is right about that, but I know a good many fields of twenty acres that never produced nearly the amount of grain they should have from the seed, and I think that was the reason. There is one thing, cultivators work so differently. The cultivator I use is on the disc principle, and doesn't go in so deep in the lower portions as on the higher.

Mr. Allen: Don't the shoe drill run in such a way that you have patches where the grain don't grow, while the hoe drill will cover it more evenly?

Mr. Chase: We calculate to get the stones out of the way before we run over it with a drill. That is generally the trouble with the shoe drill. It is pretty expensive getting the stones out of the way, but it pays.

Mr. Allen: This land that you brought up by tillage, was it by fall or spring plowing?

Mr. Noyes: Fall plowing invariably.

Mr. Hutchinson: Is your land clear from weeds?

Mr. Noyes: Not entirely; it is clearer than when I went onto it. That is the result of better tillage.

Mr. Hill: We are told by those who have examined them that the roots of grain, clover and corn grow very deep. Don't you think we ought to cultivate a little deeper in order to give these roots a chance to grow and not have to be working their way down through hard soil?

Mr. Noyes: If by cultivation you mean plowing deeper in soils that would stand it, that would be all right, but in surface cultivating we do not cultivate our ground, only to harrow after the grain is up.

Mr. Hill: In preparing a seed bed for spring grain or small grain, I mean.

Mr. Noyes: It has generally been considered in all my reading and observation that it wanted a compact bed below. That is the reason so many make a failure with spring plowing; they don't make it compact enough.

Superintendent Morrison: The idea that Mr. Hill wants to bring out is a deep seed bed, so that in case of drought it will act as a reservoir of fertility and moisture.

Mr. Noyes: We have always understood that we wanted a compact bed below for grain sown a shallow depth. Now, we know that plowed land in the spring is looser, more porous; the horses' feet will press down in it when they won't in a piece of stubble land left over.

Mr. McKerrow: Isn't it true that in the spring plowing the land is so loose that the moisture coming from below cannot get through it, whereas if it has

been fall plowed and has all winter to perfect it, the moisture can come to the surface where it is needed?

Mr. Noyes: It may be that way. We find the best depth to make a seed bed to be from one to two inches for small grain, and I like to have my seed bed made before the drill goes over it, twice cultivating and a rolling anyway; then the drill, whether hoe or shoe.

Question: Does rolling the ground tend to restrain moisture better than if the roller was not used?

Mr. Noyes: According to the Experimental farm last year the unrolled land evaporated more water per square foot than the land that was rolled and afterward harrowed. The time gained in the spring in our short seasons by having our land rolled is valuable. Grain will come up from three to six days sooner, and that is of more benefit in my opinion to lay down the rule that we must harrow it after rolling. There are times, perhaps, in a dry season that it would be better to harrow after rolling.

Mr. McKerrow: In case you did that, wouldn't you harrow with a very fine harrow that would just simply leave the surface fine?

Mr. Hatch: It was recommended a few years ago in regard to subsoiling and plowing very deep.

Mr. Noyes: That, I understand, is the second plowing, going down in the surface and loosening the soil below, not turning over.

Mr. Hill: We have passed through a very dry season and all of our talk is with regard to retaining moisture. We may have a very wet season this year and want to get rid of some of the moisture.

Mr. Chase: My experience is, the deeper you plow the better it is in a wet season, and in a dry season the more subsoil you get at the surface the better. I am talking about good, hardpan land.

Mr. Favill: But you wouldn't bring that up to put a crop on, would you, and turn your rich soil under, way out of reach of all the growing roots?

Mr. Chase: Yes; I don't care if I turn up the soil eight or ten inches from the top.

Mr. Hayes: He must have a very different soil from mine. That is all right if he wants to raise spring wheat to turn up that hard pan, but for the average farmer it won't do. If we want a subsoil there is nothing equal to clover; that will do all the subsoiling.

Mr. Bain: In plowing this depth of soil that Mr. Chase speaks of I think he would have better results to turn it up in the fall than in the spring.

Mr. Cole: In my vicinity it is very detrimental to turn up much of the subsoil to the top whether it is done in the fall or spring, although we know of other places where they have grand success doing that. Where the soil is a dark red subsoil and it packs we don't get a good crop for several years after doing that. We don't wish to plow up over a half inch of that subsoil, and we wish to do that in the fall of the year.

Mr. McKerrow: In Waukesha county, where I live, we think we have a good subsoil, but we can't turn up more than two inches and have a good crop off of it. I tried it some four years ago in two fields; we plowed from the two ends. I plowed first with an old Scotch plow that just turned it over on the side; then we run our ordinary plow through, and the lower part of it fell back into the furrow a very little, but we did not turn the fresh subsoil up. They tell us over in Sheboygan county that they can turn it right over and can raise a good crop on it.

Mr. Noyes: You can't plow eight inches deep on my land with any satisfactory results. The only satisfactory crop that I ever could raise with this deep plowing was corn. The corn got in down below that subsoil that was turned up, but the good farmers around me are generally coming to the opinion that about six inches is deep enough.

Mr. Hill: Don't you think a better way than you suggested is to plow

right around a piece one year and then the next year plow back, so as not to have any furrows?

Mr. Noyes: I never have done very much that way.

Mr. Thorp: My practice has been to plow the way Mr. Hill says. My land is square on both ends, and I find that I generally get the best results when I have no dead furrows in the field, and no bother in planting corn or cultivating the crop, and I think the best plan is to commence in the center one season and on the outside the next and avoid all those furrows.

Mr. Hill: It isn't necessary in order to plow this way that land should be square on both ends. I started a man to plow on a three-cornered field this last fall and he came out pretty near right.

The Chairman: We would like to get a little better expression on this subsoil plowing.

Mr. Hatch: My experience is, especially if I am going to plow for corn, that it is better to plow deep, and certainly next season you will have a better piece of corn; it mixes up the subsoil and the top soil, and you fertilize them with the cultivator or the drag, and it makes it a great deal more productive. My land is loam with hard-pan underneath the clay loam.

Mr. Thorp: What do you mean by hard-pan?

Mr. Hatch: I mean after you get from about four or five inches you strike a hard pan that holds the water and holds your manure, so that it don't leak. If you have sand, you can plow as deep as you are a mind to, but if you have hard-pan, most assuredly if you plow deep you will get a good, fair crop.

Mr. McKerrow: I would like to give you a suggestion about plowing when you get home. Plow one strip at a depth of two, three or four inches to suit you, another strip an inch deeper, and another strip an inch deeper still, and so on until you get as deep as your team can pull. Then grow your crop for three or four years and you will know all about it.

Mr. Benedix: On our sandy soil if you go deeper than six inches your land is spoiled for a number of years. I had a piece of land that I let out to a party who had a poor plow. He plowed rather deep, and for five or six years afterward that piece was a great deal poorer. We haven't much clay in this part of the country and so we want to know about sand.

Mr. Noyes: I think I can give the chairman a good receipt. If he will come down and buy me out I can tell him how to raise crops on light land.

Mr. Goodrich: There isn't a great deal of difference in soil. I know that on my land if I plowed deep I would injure it, while there seem to be other men here who are sure that plowing deep is the only way to do. I know of a man in Washington county who said that the land was so rich that if two feet of the surface land was taken off the land would be better for it. I have had no experience with land of that kind myself, and I believe that the richest of the soil is on the surface, and we don't want to go down into the subsoil. I believe that clover is the best subsoiler we can get.

Mr. Sampson: The gentleman who just spoke is quite an authority on the Jersey, but I don't consider his opinion worth anything on plowing. I would like to take his farm, plow it deep and put it into grain, and I would make pretty nearly as much in the next five years as he has made in dairying five years. On ordinary farms I believe seven or eight inches is better than less. Perhaps it is not good to turn up too much of the subsoil at once, but I never found any trouble on my farm from plowing too deep. It helps the drainage in wet and dry weather both, and you will get better crops right straight along. It gives a better root for the grain, and it will stand up better. Deep, through cultivation, is what we want.

Question: How deep do you plow?

Mr. Sampson: Seven or eight inches; it depends on how good a team I have. I would rather plow nine inches.

Mr. Phillips: I want to say a word in defense of my friend Goodrich. If you will go down to his place I think you will find that the man who beats him in the dairy, or in plowing, or in any other way, is pretty hard to find in this state. None of us can beat from eighty to one hundred bushels of oats to the acre.

Mr. Goodrich: I don't know as I can tell any bigger story than Mr. Phillips. But with my land I have had experience with plowing what I call deep. What I call shallow plowing is from four to five inches. I have tried plowing a good deal deeper and I am satisfied that it does not work on my land.

A Member: Take it right in this locality. We have very little land to the acre and what land we do have lays very near the surface. A great deal of it, if you go down about three inches, is like a quicksand, nearly worthless to produce any kind of a crop, and we find that from three to four or five inches is all that the majority of our land will plow.

Mr. Sampson: I would like to have some one give a receipt for raising one hundred bushels of oats to the acre.

Mr. Phillips: Mr. Thayer does it and Mr. Kingman did it last year.

Mr. Kingman: I do it every year.

Mr. Baker: It seems to me that in order to produce results with the deep or shallow plowing we have a good deal to do with the fertilizers that have been used on the land. Is it not a fact after land had been cultivated for a number of years without fertilizers that undoubtedly the subsoil may be richer to a certain extent than the top ground?

Mr. Hutchinson: It seems to me that most of you are in a bad way. I have farmed twenty-eight years in Wisconsin and I know nothing about your discussion. I don't know how to sympathize with you at all, for I never have had any experience with this kind of plowing you tell about. My crops are growing better year after year and I don't mind so much about the plowing. I do a good job of plowing, but that is not the main thing that is the matter here today, as I understand it. I have worked hard to reduce the fertility of my land all I could. I keep stock—have kept a good deal of stock all these years—and my farm is growing better year after year. If I know anything about farming, the matter here is that you have not fertility in your soil. You are not putting back, but just skinning. Your plows won't save you; you have to go to putting fertility back there. Keep a flock of sheep that will consume all the roughage and small grain you raise and you will have fertility in abundance.

Mr. Sampson: As I understand it this discussion has no reference whatever to fertility, but simply to proper cultivation of the soil. As far as the one hundred bushels of oats are concerned, that is not done on very rich land; it would go down and you could not get your crop, because the harvesting would be worth almost as much as your crop, if you harvested it. I believe that deep, thorough cultivation of the soil is of great benefit.

Mr. Everett: I know that deep cultivation is a positive injury to any soil that I have. Where we turn up the red clay subsoil it injures our land for five or six years. I got up to say, however, that I think most of us would be interested in seeing a vote taken to find out how many of this audience believe in deep and how many in shallow plowing. I call deep plowing from six to eight inches.

The vote was put to the Institute and the result declared in favor of shallow plowing

Mr. McKerrow: There is no question in my mind but what this question of plowing depends very largely on the quality of the soil. I have three different pieces of eighty acres, which have all been worked differently until they came into my possession. One

was owned by an Englishman and he has the soil eight inches deep without taking the subsoil; another eighty is about six inches, and I have another eighty that has always been rented and skinned and the soil is only four inches deep. Now, I find, taking one season with another, that the farm that has the eight inches of soil on has the best results, and I am trying to deepen the soil that is shallow by taking off half an inch at a time. I believe the deeper soil on clay is a good thing, but on sand I should judge you would want to solidify and compact the sand by stirring as little as possible.

The Chairman: I take it that if there has been a point in favor of deep cultivation, this audience is sharp enough to see it, and the same way in regard to shallow cultivation.

CORN GROWING.

S. THORP.

About thirty-six years ago it was father's good fortune to secure a few acres of land in the limits of what is now the city of Beaver Dam, and my first recollections of the corn crop dates back to some time in the "fifties," when I, a small boy, used to drop the corn in the hills for him as he made them with a hoe. My instructions were to drop just four kernels, no more and no less. When the corn was up it was I who rode the horse while father held the old-fashioned cultivator, and how often I wished that old horse's backbone was made of softer material I will leave for you to imagine.

Deep Cultivation.

In those days deep cultivation was the general practice, and the last time through we used a plow, going twice in a row and hilling the corn as high as possible. At that time if a man had been seen harrowing his corn his neighbors would have thought him a fit subject for a lunatic asylum. Now the man who does not harrow his corn and harrow it often and well is so far behind the general procession that he will need a larger pair of ears than mine to hear the music. Still these fellows are quite numerous, but they are a class who do not take an agricultural paper, nor do they attend the Farmers' Institutes because they are run in the interest of some political party. They sneer at the Institute workers, and call them braggarts, and let their corn feed on pigeon grass and wild oats until the pigeon grass and wild oats get the advantage and sap the life blood out of the corn. Then because they do not have a good crop the season has been too wet or too dry, or it has been too hot or too cold, or the chinch bugs damaged it badly, and several other reasons too numerous to mention But they are careful not to give the true reason. If they did it would be that the land was not properly prepared for the seed, nor was the corn properly cultivated and cared for.

Immensity of the Corn Crop.

Probably few people realize the extent to which the corn crop is grown and the number of acres devoted to it in the United States. It is estimated that during the year 1891 this crop reached the enormous amount of over 2,000,000,000 bushels, grown on or about 60,000,000 acres of land, with an average of about thirty-four bushels per acre. Allowing each man forty acres, it would take an army of 1,500,000 men to work. The money value of the corn crop exceeds the value of any other crop raised, and if all of last year's

crop could be sold at present prices the amount would exceed $800,000,000. Now if the average for the United States is but thirty-four bushels per acre, some of us must be raising corn at a loss. I think without going into details you will acknowledge that it costs more to produce a small crop than a large one, or in other words, the smaller the crop the more the cost of production per bushel. Now if this is true the question arises: What shall we small crop raisers do to increase our yield? One way, and the best I know, is to fertilize. Fertilize with stable manure as much as possible; fertilize with growing clover. and fertilize by a better and more thorough system of cultivation. Another way to increase the yield is, I think, to plant in drills, and it is my opinion that if all the corn planted in the United States last year had been planted in drills and properly tilled, the average per acre would have been forty bushels, at least. Some of you will say that you do not like to plant in this way, as it requires so much more labor to keep it free from weeds, but my experience of the last five years has proved to me that drilled corn can be kept free from weeds with as little labor as that planted in hills.

Prepare a Good Seed-Bed.

I once heard an old farmer say that he preferred to pulverize his ground after the corn was in. Where that old gentleman and I differ is that I prefer to pulverize my ground and pulverize it thoroughly, to the depth of four or five inches, at least one week before I plant the corn. This gives the weeds a chance to start. We then plant in drills with a two-horse planter; the planter shoes and wheels destroying all weeds in the rows. Then we leave it for a few days until the corn is well sprouted, when we take the two-horse cultivator and with the shovels set to throw the dirt on the rows cultivate the corn deep and close. This loosens and warms the earth deeper and closer than it can be done again that season. It is then left again for a few days or until the corn would be about up if the land was smooth. We then take a heavy harrow and harrow it crosswise until it is perfectly level. By this time every weed has ben destroyed, and the corn has such a start of the next crop that about once more harrowing with a light slanting tooth harrow the corn will be large enough to be worked close and kept clean the whole season.

Discussion.

Mr. McKerrow: How deep do you plant this drill corn?

Mr. Thorp: That depends on the season. Last year we planted it till we got the moist dirt, about four inches.

Mr. Weeks: Why do you consider you can get a larger crop from drilled corn?

Mr. Thorp: I think you have more stalks on the field, and there are better ears.

The Chairman: How early do you plant?

Mr. Thorp: I used to advocate pretty early planting, but I find that by early by planting if it comes on a little cold you hurt the corn more than you would to plant late. I would rather plant next spring nearer the 20th of May than the 10th.

Mr Everett: What is your mode of cultivation with drill corn after your corn is up?

Mr. Thorp: I use a two-horse cultivator, and I have a little device that I had made at the blacksmith shop to mark close to the row. I take off one shovel on each side, and I have a device made with three fingers on it just about like two teeth, six or eight inches long, and it will work right close to the corn and won't hurt it, even if they go over a row. If it is a wet season I don't mind going pretty close to the corn; in a dry season I go pretty shallow.

Mr. Chase: How far apart do you plant?

Mr. Thorp: Three feet, eight inches. If I am going to drill dent corn I will plant it a little closer than field corn,

perhaps six or seven inches apart. Field corn ought to be at least ten inches apart.

Mr. Hutchinson: Do you harrow your corn after it is up before you cultivate?

Mr. Thorp: My corn last year, when some of the leaves were eighteen inches long, was harrowed, after I cultivated it and threw the dirt over the rows.

Question: How much dirt did you throw on?

Mr. Thorp: Just as much as the shovel will hold.

Question: You wouldn't throw on an inch and a half?

Mr. Thorp: Yes, I would throw on six inches if I could.

Mr. Bender: Why do you drag that ground instead of harrowing?

Mr. Thorp: If you harrow corn thoroughly before it is up it only tends to compact the soil thoroughly, and I think at that time, early in the spring, what we want is to get the air down to the ground as deep as possible, and by cultivating before the corn is up you can leave it in shape to get the air much better in future.

Mr. Bender: Are you not losing moisture very fast?

Mr. Thorp: I don't think so.

Mr. Bender: In throwing that depth of dirt on top of your corn are you not getting the plant down where it is cold?

Mr. Thorp: I don't generally plant till after the ground is warm.

Mr. Bender: You still keep it cooler than if it were nearer the surface?

Mr. Thorp: That is all right; it sprouts and grows.

Mr. Hayes: What is your object in putting this dirt on?

Mr. Thorp: Keeping the ground loose until the corn gets a good start; and then it helps kill the weeds. If you plant your corn and go right on with your harrow and it is rather dry weather, the first you know the weed seeds on top have sprouted.

Mr. Chase: I have tried both ways. I have tried planting and dragging, and have dragged it as many as three or four times, even after the corn is up, when we had to shut our eyes and harden our hearts and go ahead. Of course I have the drag teeth short, so it wouldn't get down to the roots, and that corn produced in the neighborhood of one hundred bushels of ears to the acre.

Mr. Noyes: I want Mr. Thorp to try planting about two inches deep next spring; then put in about two inches of loose soil on top of that; then he can stop to harrow. I don't care a cent about weeds between the rows; it is in the rows I want the weeds killed.

Mr. Thorp: By cultivating and getting your field in shape a week before you plant the weeds that are on the surface have all started, and when you plant your corn the planter's shoes and the wheels destroy every weed there is in the row.

Question: Do you fall plow that land:

Mr. Thorp: Yes, if I can.

Mr. Goodrich: Are you ever troubled with cut worms?

Mr. Thorp: Not a great many times. Five or six years ago I had an old pasture that I plowed up in the fall and planted it to corn, and the cut worms took it out pretty thoroughly, so that I had to plant it over.

Mr. Goodrich: The cut worms did a great deal of damage in our part of the country last year. They destroyed twenty-three acres for me, and I very naturally went to studying cut worms. I wrote to the entomologists and learned what I could about it. You have to study into the history of these insects to know how to circumvent them. As I have learned of these cut worms, they come from moths and lay their eggs on short, fine grass, or other fine vegetation in the month of August, and they hatch out the last of August or the first of September into a worm which feeds for a short time on grass and then in the fall goes into the ground some six or eight inches, where it remains until the next spring, when it comes up and feeds on anything it

can get. It will eat corn, oats or grass, anything that is green, and finally they will eat one another. Now, the way that I have found to circumvent them is this: If the land is plowed before they hatch out in the fall, then you have them, but if it is plowed late in the fall it does no good to any amount; but if it is plowed early, before they hatch out, and then the ground harrowed, so there will be no more eggs laid on it in the fine grass, that they may grow up, you will be sure not to have any cut worms in the field unless it is upon the edge of it where they come from an adjoining pasture; but last fall it was so very near dry it could not be done in our part of the country. Now, if we fail to plow early in the fall, or the first of September, the next best thing is to delay plowing as late as possible next spring, when the grass has as good a growth as it can. Plow it the last part of May, then plant the corn immediately, and if the cut worms are not all gone, after feeding in the spring till about the 10th of June, they don't do any more damage; but if there is some grass turned under they will feed on that and not so much on the corn. If the land is plowed and the corn planted by June you are reasonably safe from the ravages of the cut worm. There may be a few when the corn first comes, but you all know that corn can bear a little nipping off at the top and still make a good crop. Last year I planted a field that was divided into three parts; three different men cultivated it. One man plowed it early, and planted it about the 20th of May, and his was all destroyed by the cut worm. Another man plowed his about the first of June. His corn came up quick and the cut worms commenced on it and ate it off on top. They kept at mine, but I kept harrowing and I had a good crop. I think in our part of the state the first of June would be a safe time if you failed to plow up in August or by the first of September.

Mr. Hutchinson: Mr. Goodrich says that early plowing in the fall, he thinks, is a sure cure in regard to the cut worm; it will destroy them through the winter, I suppose. I have had thorough experience in this matter. I had thirty-six acres two years ago which I commenced plowing in September, and then kept it up at different times all along through the fall; then in December there was a thaw, the ground thawed out, and I plowed another strip I expected the worms would work on it, but I thought I would test it by planting early. I put my check roller on and planted the whole field. It all came up as nicely as I ever saw, and after it had been up about a week I saw the cut worms were at work and in two or three days every bit of it was destroyed except a little on the outside of the field all around. Fall plowing didn't save it that time.

Mr. Goodrich: It was not plowed early enough.

Mr. Curtis: Some years ago, probably twenty-five or thirty, I was in the broomcorn business and planted about thirty acres. When the corn came up that part of the field that I went onto was eaten off as fast as it come up by the cut worm. I went onto the piece in the night with a light and it was a curiosity to see the number of worms there were. They were probably not a foot apart, and they continued to eat until the whole thing was destroyed, and I supposed that I would have no green corn at all. In that thirty acres there was about twenty of it of this character, and there were ten acres of it that was fall plowed about the first of September, and I found on going onto that part that the broomcorn was not injured at all.

Mr. Ames: My experience is different from Mr. Goodrich's. A great many years ago I was troubled with the cut worm, and from that time on I never was troubled at all. Some three years ago we went to work and plowed up a sheep pasture and clover sod, and we did it in November. It was frozen hard. Now, that piece of corn was nearly destroyed. The next spring we

plowed up twenty acres just as soon as we could get onto the land with our teams. We plowed through the center. First I would say we put in forty acres which were plowed in the fall; we took the next twenty, plowed it in the spring, put it in, and that was not touched at all. That was put in reasonably early, in May. Then I went to work and plowed up six acres, and what grew on that six acres that was plowed and planted the first of June they destroyed. So you see there was one lot of fall plowing, one early in the spring and another late in the spring. The next fall we plowed fifty acres in the month of December, and they did not touch them at all the next spring. We plowed eighteen acres right beside it in the month of May and put it in, and that they thoroughly destroyed, so that we didn't get any crop at all. So you see I have had all sorts of experience.

Mr. Favill: I do not believe that the plowing will protect anybody, but it is the kind of soil we put it in, or the condition, or the crop that has preceded the corn. Now, any old pasture or old timothy sod is very liable to be destroyed by the cut worm, no matter what time we plow it, while a clover sod is never. Mr. Ames talked about an old sheep pasture. There is no clover sod; there was plenty of old timothy and blue grass for these worms to feed on. What I mean by a clover sod is a field that has been down just one year to clover, seeded this year, next year mown for hay and then plowed for corn. If you follow that method I will pay for all the corn that is eaten up by the grub.

Mr. Convey: Several years ago I lost my entire crop of corn with the cut worms. Since then where I expect they will exist, or where they are likely to be in the soil, I plow the soil rather early in the fall so that it will become well rotted, and seed to oats the following season, and in the second season we may very safely sow to corn. Old pastures are full of cut worms, as a rule.

Mr. Favill: Does it help the corn to be eaten off?

Mr. Barker: It doesn't hurt it much; I remember having a flock of sheep getting out in the night and eating my corn to the ground, and it came out all right.

Mr. Owen: I think that if you will take the trouble to drop a spoonful of salt on every hill you will destroy the cut worms.

Mr. Noyes: Some seventeen years ago I planted a piece of corn on the 21st of May, and another lot after the first of June, which was on grass sod, and several years after that I planted and never saw it. Mr. Chase speaks of the birds taking the worms. Sometimes a flock of blackbirds will get lots of them out. They know where the worms are.

Mr. Everett: I have had a little experience with the cut worms. Four years ago I had four acres of June grass and I heard it stated that if I plowed the first of June they wouldn't bother me. I plowed the first and second, and the third and fourth harrowed it, and after we had planted it the ground was covered with little chunks of sod very thick. Two days afterward I went out there after a shower and I kicked over those chunks of sod, and I found anywhere from one and two to seven and eight corn grubs on that sod, and they never damaged a bit of the four acres.

Mr. McKerrow: We have found in our experience that by waiting until the first of June and allowing the grass to get a growth on the sod land, and turned and quickly rolled, it avoids the ravages of this cut worm, and we would get a good crop. One season we had a piece of land and got it ready in that way, but we waited a week after it was ready before planting and we had some trouble in this matter. I want to ask Mr. Phillips what are the disadvantages in cultivating deep close to the rows, four or five inches?

The Chairman: Mr. Thorp, you said you didn't care how deep you cultivate your corn.

Mr. Thorp: In the center of the row.

The Chairman: In a wet season are not the corn roots nearer the surface than they are in a dry season, and isn't it a fact that you find corn roots anywhere from eight inches up to two feet in length? Now, what advantage can you gain by working those roots off?

Mr. Thorp: I don't know that you gain any advantage, but in a wet season it doesn't destroy the roots so badly, and the corn grows just about as well with deep cultivation in a wet season as it does with shallow.

Question: But if you prune off these roots and get dry weather isn't there a disadvantage?

Mr. Thorp: What I mean by wet weather is soon after the shower, when the corn is pretty wet, and we have to go on and work it.

A Member: Does any one know of a remedy for the white grub with which we have been bothered a good deal in our neighborhood?

The Chairman: Keep plenty of hogs.

Mr. Ames: I would like to ask the gentleman who suggested sowing oats as a first crop what success he has had?

Mr. Convey: I had the best success in seeding that way, but it is absolutely necessary that you plow your ground sufficiently early in the fall so that it will decay, and get it in with the drill. I think it is the best way to handle old sod.

Mr. Sampson: I have had experience in planting corn and sowing oats on the same piece, and the worms killed all my corn. It didn't seem to hurt the B. & W. corn as badly as the other. I tried all sorts of ways and everything was destroyed except what I sowed early.

Mr. Hill: In our rotation we have tried sowing oats on sod for twenty years, except one year, when I planted an old piece of sod a few years ago. Oats are always grown on our sod the first year, then we manure and plant with corn and go on.

A Member: Is it best to have level culture or have it in hills?

Mr. Thorp: I prefer to have level culture for several reasons; it is easier to work, nicer to handle your product after you have it, and I think it leaves the land in better condition than to have it ridged.

Mr. McKerrow: There are some gentlemen here who are not satisfied with the answer to the question brought up in regard to deep and shallow culture. I believe this to be one of the most important questions we can discuss. I believe that when we cut off the deep roots in an ordinary season we are damaging that corn crop and we are delaying its ripening, and the early ripening of the corn means a great deal to us. I believe that if we will cultivate shallow and cultivate level, leaving a smooth surface, cultivating continually, we will hold the moisture and save all the roots, and it will ripen quicker and give us a better crop. Therefore, I advocate shallow and continual culture.

Mr. Bloor: I would like to give an experience of mine. A neighbor had a clover sod, about the same as our clover of sod, about the same as our was put into corn about the same time. He was very careful in setting his spring tooth cultivator to work shallow. The first time he went rather deep; he kept his cultivator going, and each time he set the teeth of his cultivator back. I asked him what he was doing that for, and he says, "The corn roots are running down and I don't want to catch them." My boys were running my farm and they thought they didn't run deep enough. They kept that up, going through our corn deep, and pretty soon it was all wilted, while his was all right. Says I, "How is this?" Well, they didn't know; the land was different. He cultivated again, went through the corn about eight times, but each time setting the teeth down so that the last time you couldn't see anything but the ground mulched over, no marks. The consequence was, we had the larger stalks, but he had the most corn by a good deal. He raised about eighty

bushels, and we raised about half as much.

Mr. Noyes: To follow out Mr. McKerrow's statement about the corn and the danger of cutting off the roots, I want to say if you cut a man's lung out he can't be as good a man as he was before.

Mr. Bloor: We have found by close examination that there is a certain time in the summer that you can't take a knitting needle and put in the ground near the plant and not touch a root.

Mr. McKerrow: I saw samples of corn this year where the stalk was about seven or eight inches long and the roots were from eighteen to twenty-two, and they are spread out in all directions. If you cultivate deep you are cutting off your corn all the time and destroying just so much vitality.

Mr. Chase: I don't think cutting off these roots injures the crop one particle. As a matter of fact when we cut off these running roots it gives a chance for the main root. When it reaches down to penetrate the hard-pan it will get the strength of the land.

Mr. Bloor: We maintain that these roots that go down do not feed the corn. The top roots are the feeders. The main root is simply a brace root and keeps the corn standing up.

Mr. Convey: I suggest you take a vote as to shallow or deep cultivation.

Mr. Bain: I find that in a dry season shallow cultivation is far better than deep cultivation, but in a wet season it don't make so much difference whether it is deep or shallow.

The Chairman: Of course only those who have had experience with both deep and surface cultivation can vote intelligently, but we will put it to a vote on the deep cultivation first. I see four hands. Now on the shallow. About forty. I used to have the idea years ago that the deeper the cultivation went the better and more effective was the work. Two years ago I tried a little experiment as between a surface and a deep cultivator, and we found that the corn that was worked with the surface cultivator ripened from one to two weeks earlier than that worked with the deep cultivator, so we are bound to conclude that deep cultivation tended to retard the ripening of the corn.

Mr. Weeks: Didn't it retard the growth as well as the ripening?

The Chairman: Yes, we had the best corn under the surface cultivation and it gave the most bushels. I am satisfied that by the method described by Mr. Thorp, drilling in his corn as compared with planting it in the old-fashioned way with check rows, you can raise as much corn from six acres of ground as you can in the old way from eight acres of ground.

WINTER WHEAT GROWING.

GEO. C. HILL, Rosendale, Wis.

It is reported by the Department of Agriculture that nearly 1,000,000 acres of Wisconsin soil was occupied with the wheat crop of 1891. I have not the means of knowing what proportion of this was winter grain, but from the general interest taken in the subject throughout the state and from observation in Fond du Lac and adjoining counties, I judge that winter wheat is largely taking the place of spring wheat.

A Sure Crop.

For causes which do not seem to be explained, a series of years, including the past decade and the present so far, have been favorable for the growth of this crop. Previous to those years few farmers in our section would think of risking the crop except in favorable locations. Doubtless we have had winters, and shall have such again, through which the plant would not survive. But I have come to think that the plant is not so tender as many suppose, and that with proper management winter wheat may be as successfully grown in Wisconsin as in Ohio or Illinois. There have been two or three trying seasons during the time in which I have been growing this crop, through which it has come fairly well.

Aside from its hardiness the plant seems to be subject to fewer things that hinder or destroy its growth than is the case with spring wheat. The insect enemies peculiar to winter wheat have not made their appearance in this state so far as I know. On our farm chinch bugs have done little damage to winter grain. The plants seem to be stronger, growing faster than spring grain, and resist their attacks.

A peculiarit.y of the winter wheat plant is its tendency to branch out and produce a large number of ears. If a field seems quite thin of plants in the spring, these will often make a good harvest I note four requisites in the successful growing of winter wheat: Choice of location, good soil, good culture and good seed. A field that has a gentle slope in any direction except towards the west, or one that is protected with timber on the west, is the best location. Standing water and ice are fatal to the plant. It is often killed, also, on the top and sides of knolls. Good soil is required for any crop. Under favorable conditions twelve or fifteen bushels of wheat may be grown on poor soil, but that is not a paying crop. We can double it by growing our wheat crop with a proper system of rotation, which may include two years in clover, one in oats, one in corn and one in wheat, and keeping sufficient stock to consume the clover, corn, oats and straw, together with bran and oil meal as is needed.

Clover Sod.

I have found clover sod of one or two years' growth, and also an old June grass pasture sod, both good for winter wheat. Our two best crops were grown on such soils, turned over in July and cultivated occasionally until spring seeding time. On a farm where the proposed rotation is practiced, four-fifths being devoted to live stock and the grain from only one-fifth being grown for market, the soil may be maintained in first-class condition.

We need not say much about good culture, as that subject is discussed by abler persons, but I will give you some experience with soil preparation with winter wheat. In the summer of 1890, after taking a heavy clover crop off of a field, a light dressing of five or six loads of coarse manure was plowed under the last of July. The field was harrowed every few days, and when the seed was drilled in the 2d of September the surface soil was in the finest condition, as nice as for garden seed. The wheat came up quick and grew rapidly, covering the ground before winter. The somewhat open winter did not injure the plants. Notwithstanding the parching drought of last summer, the yield was thirty-four and a half bushels per acre of wheat that scaled sixty-three pounds. After this field was seeded an adjoining field of stubble was hurriedly prepared and sown broadcast about one week later than the first mentioned field. The wheat plants here made slower growth, not covering the ground, consequently were a good deal injured by the freezing and thawing of early spring. The product was twenty bushels per acre—fourteen and a half bushels loss from proper preparation per acre. I attribute the larger crop as the result of three things. First. it followed

clover, second, it had thorough preparation of seed bed; and third, the seed was planted with a drill and early in the season. In a word, and in the main, I believe that it was clover and culture that produced the results.

Summer Cultivation.

I would give another fact that came under my observation. A piece of land lying across the road from my gate was owned by old people not able to cultivate it. So far as I know the land had never been manured. Of recent years it had been worked on shares, often in a shiftless manner, until the last crop had barely paid for harvesting. The field had become cloddy with patches of June grass. In June, 1889, the owner had the field plowed and during the summer cultivated with a disc harrow as often as any weeds or grass appeared. In September it was sown broadcast with winter wheat. If the seed had been drilled in I think the result would have been better. As it was the crop made a fine growth, producing thirty bushels per acre of a very fine quality of grain Here was one crop of thirty bushels, without manure, but taking two years to produce it. I am quite sure that if the land had been cropped each year in the usual way it had been cultivated the total crop for both years would not have exceeded twenty bushels, besides the difference in favor of the thirty bushel crop of only one seeding and one harvest. I give credit to the result solely to that summer cultivation.

Good Seed.

"Whatsoever a man soweth, that shall he also reap." In one of the parables of the New Testament it was reported to the householder by his servants that there were tares growing in his field. He said, "An enemy hath done this." In these days the farmer who grows wild oats, peas, cockle and chess with his grain is his own enemy and need not lay the blame to his neighbor, evil spirits or the hard winter. If, instead of spending our time at the village store, trying to convince our associates that frosted wheat will produce chess, we go into our granary and thoroughly clean our seed grain, we would be better satisfied at harvest time. I have cleaned a good deal of seed wheat with a riddle. At other times have paid five cents per bushel to have it cleaned by passing it through the cleaning machinery of a flour mill.

In buying seed grain or exchanging with other farmers at a distance, it is best to be careful not to introduce thereby noxious and troublesome plants. There may be advantages in a change of seed, but unless we wish to try a new variety, I think the risk of foul seed is too great.

An Average of Thirty-One Bushels.

My experience in growing winter wheat is limited to the last nine years, in which a fair crop was grown every year. The smallest yield was twenty-four bushels. The largest was forty-seven and one-half. The average for the nine years was thirty-one bushels. This is about three bushels per acre more than the yield of spring wheat on the farm for the same term of years. The crop for this year is looking well and at present appears to be in good condition. This was planted on a corn field after the corn had been removed to the silo. This is the second year we have followed this plan, and so far it is satisfactory. If the corn crop can be ripened and gotten off the field the first week in September, there is time to seed the field to wheat. I believe that next to a rich clover sod, a corn field is in the best condition to seed with winter wheat, it having been manured and cultivated during the season. We plow the stubble under and roll down, working smooth with a light harrow.

We have found winter wheat an excellent crop with which to sow clover and grass. The seed can be sown when convenient in March. This early seeding has an advantage over that sown

later with spring grain. On our farm we have seen no benefit to the winter wheat crop from the application of salt.

Having grown spring wheat in this state the past thirty-seven years, with some good crops and a fair average, yet with the experience of the past ten years we believe that winter wheat can be relied on to take the place of spring wheat in Wisconsin grain crops.

Discussion.

Mr. McKerrow: Mr. Hill, what is your object in the weekly cultivation before sowing?

Mr. Hill: I don't know that I can explain it scientifically, but I know from experience that it is a good thing to do for winter wheat, and I presume it might be for spring wheat if we had a chance to get that seed up in fine condition, but I believe that it is better to spend two months in doing it than two days. I don't believe in summer harrowing unless it is necessary. If a man has more land than he can cultivate, he had better cultivate half of it thoroughly each year.

Mr. Noyes: You said you raised eight bushels less of spring wheat to the acre than you did of winter wheat. Do you consider it good farm practice to sow spring wheat under those conditions?

Mr. Hill: I don't raise any barley and consequently our last crop must be wheat of some kind, and often the land so comes out at the end of the rotation that it may not be a proper place for winter wheat.

Mr. Jones: What effect does spring harrowing have on the winter wheat, does it increase its productiveness?

Mr. Hill: I don't think it does it any injury. We sometimes fail to sow our clover seed, being not sure that the winter wheat plant is alive, and sometimes we put it off until the ground is hard enough to drag on, and then we sow it and drag it.

Mr. Hayes: I have raised winter wheat for twenty years, except one or two, and I cannot get a good growth of it on oat stubble. I prefer to have a clover sod, cut off and plowed and thoroughly cultivated. We are in the barley country and that comes next.

Mr. Ames: To get a crop of chess must you sow chess seed, or will you get it without sowing it?

Mr. Hayes: I have seen a crop of chess grow where it was not sown. It was in the land, though.

Mr. Ames: It does not originate from wheat?

Mr. Hayes: I never had any originate from wheat.

Mr. McKerrow: Have you experimented any with top dressing winter wheat ground?

Mr. Hill: I have done a little top dressing with coarse manure, but it was not satisfactory. I did it more to see if it would protect the plants than anything else, but I think it smothered it more than it protected it.

Question: Do you roll your land after sowing?

Mr. Hill: That depends upon the season. If it is wet when we are sowing, which is not usually the case in the fall, we generally roll. I want my winter wheat to come up early and I want to make a growth that will cover the ground, which I think is very important. I see winter wheat all over the country that just makes out to get out of the ground before the winter and that is bad policy. I want my winter wheat ground nearly covered with the leaves, so the plant is strong and every little freezing and thawing won't affect it.

Question: What time of year would you prefer for winter wheat sowing?

Mr. Hill: From the first to the tenth of September.

A Member: I want to emphasize what Mr. Hill has said regarding our grain running out. With all our small grain and our potatoes and other things, they are always running out. I think if we would pay a little more attention to our seed we would find it pays.

Mr. Convey: I want to ask Mr. Hill what is the least amount per acre that he considers will pay expenses. I believe there are a good many farmers in this state raising an inferior quality of wheat and not paying expenses.

Mr. Hill: I cannot give anything very definite about what it costs to raise a bushel of wheat, but it is my opinion that anything less than fifteen or sixteen bushels per acre is produced at a loss on land as valuable as fifty to seventy-five dollars per acre.

Mr. Robinson: At what time do you harrow, as soon as it thaws out in the spring?

Mr. Hill: No, I would not put the teams on while it is soft; I would wait until it can bear them without making much of a hole in the ground. Then it needs to be dry enough so that the ground will work. If it is wet the harrow will do damage rather than good.

Mr. McKerrow: What kind of winter wheat do you find the best for your locality?

Mr Hill: We have grown mostly the Fultz wheat. That is not first-class wheat, but it is a fine milling wheat.

Mr. Jones: Are you ever troubled with smut?

Mr. Hill: Not very often. This Fultz wheat never has been known to smut; we put blue vitrol on it.

Mr. Morrison: I wish you would give your experience with thoroughly preparing a piece of ground, a clover sod having a perfect dressing, and the difference between that and where it has not been put.

Mr. Hill: I have answered that question in the papers and I gave an illustration of two pieces of land that we prepared. One was a piece of land from which a heavy crop of clover had been taken for hay, and it was immediately plowed over, and that land worked until the 2d of September, with a very light dressing of five or six loads of barn yard manure; the other piece, not being so far removed, was regularly manured. That was a piece of land that was prepared for several weeks until it was in a very fine condition. The other was plowed over and hastily prepared right away and was not in as fine condition, and sowed with a broadcast seeder instead of a drill, and a good deal of the wheat lying near the surface was killed out.

Question: How do you apply this vitrol?

Mr. Hill: We take an ounce for every bushel and dissolve it in as much water as we think will dampen it all over. We put the seed wheat on the granary floor and sprinkle it with this vitrol water solution, and then take a shovel and turn it over until we know that it has all been wet.

Mr. Hyatt: I was thinking while listening to these sage farmers what the thoughts of a first-class English farmer would be if he sat here listening. They are on land that has been tilled two hundred years before Columbus discovered America, raising forty and fifty bushels of wheat on an acre. I think he would either leave in disgust or he would go to the door and cry, "Turn up your ground, turn up your ground."

Mr. Everett: Have you ever had any experience sowing winter wheat with corn in the last cultivation?

Mr. Hill: No, sir, I have not. It don't look to me to be the best way. I think I would rather have the ground plowed and the stubbles, than the other way.

Question: Do you raise more than one crop in succession on the same piece of ground?

Mr. Hill: Not usually.

Mr. Convey: Mr. Hill's yield per acre is larger than the average yield for Great Britain. This year it was thirty-one and one-fourth and it has been increasing for the last thirty years.

Mr. Hyatt: We must remember that Mr. Hill's average is double the Wisconsin average.

Mr. York: My wheat crop has averaged about twenty-five bushels per acre, but I have cultivated my corn level culture and cultivated it long as I could.

Mr. Jones: How do you sow your winter wheat.

Mr. Hill: From one to two inches. I would prefer to have it from an inch to one and one-half inches deep.

Mr. McKerrow: Have you experimented with salt on your wheat?

Mr. Hill: Only one year and that was this past dry season, and I don't think the salt ever dissolved. I never tried salt as a mulch on my wheat.

Mr. Hudson: Don't you think it is a good plan to take a disc harrow instead of cultivating so much?

Mr. Hill: I don't know of any object in plowing except to get the stalks out of the way and the roots.

Mr. Favill: Wouldn't the disc harrow cut those stalks off and tear them down?

Mr. Hill: They wouldn't be out of the way. If they are on top they are in the way.

Mr. Chase: Can't there be a roller heavy enough to flatten those hills down?

Mr. Hill: Yes, but they are still on top of the ground in the way of the wheat.

Mr. McKerrow: Not so much in the way of the wheat as in the way of the machine, providing that wheat was lodged and you had to get it out.

Mr. Weeks: A good harrow will cut up the corn stubble so as to make it pretty fine.

THE FARMER'S GARDEN.

M. A. THAYER, Pres. State Horticultural Society, Sparta, Wis.

The question is often asked, "Does a garden pay?" I answer, "A poor garden like any other portion of poor farming, will never pay." But a garden properly laid out, highly fertilized, planted in season to best varieties of fruit and vegatables and well cultivated will pay you better than any other portion of your farm. Now, for the purpose of showing what enormous crops may be grown by heavy cultivation, fertilization and thorough cultivation, let me give you certain facts.

Peter Henderson in his "Gardening for Profit" gives the receipt and expenditures for one acre of a few of the leading articles we cultivate, taking the acreage for ten years, hiring all work done with results as follows:

Paid for manual labor	$300
Paid for horse labor	35
Paid for manure 75cd	100
Paid for rent of land	50
Paid for seed	10
12,000 early cabbage at 5c	600
14,000 lettuce at 1c	140
30,000 celery at 2c	600
Allow for wear of tools	10
Allow for selling produce	100
Total expense	$605
Total receipts	$1,340
Deduct total expense	605
Leaves a net profit	735

He further says the rotation crops of early beets or onions followed by horseradish or sweet herbs, as a second crop give nearly the same results.

I think I hear some of you object, "Oh, that is down near New York, where there is ready sale for such stuff; we can't do it here." If so, let me cite the garden of J. M. Smith, of Green Bay, Wis. Forty acres, originally poor, pine, sandy land, of little value. I visited this garden not long since, and looked it over thoroughly. I also saw his books, showing sales of some $14,000

from vegetables and small fruits the previous year.

Fertilization and Cultivation.

The secret of these successes is in the high fertilization and thorough cultivation. If this is still too far away let us go to Sparta, where I can show you a little berry patch managed by a woman, on one acre of which two hundred bushels of blackberries were grown, and sold for over $500. I can also show you a one and one-half acre piece in strawberries on which nearly two hundred bushels per acre were grown this season, selling for $836.50. The same party raised over thirteen hundred bushels of blackberries on nine acres and sold them for $3,543.26. Still the secret lies in heavy manuring and thorough cultivation.

I call your attention to these facts to remind you of the world of wealth in your own acres at home, and to show you how high fertilization and good culture will bring it out. Now, you cannot all raise fruits or vegetables on a large scale and make this money but your land is just as good, with the same care you can raise just as much per acre and so far as you have a home market you can make just as much money accordingly. Every farmer has a home market, at least to the extent of his own family. It is the best market and the easiest to supply. There is no competition, no freight and no commission to come out of the proceeds.

The Best Half Acre on the Farm.

A half acre fruit and vegetable garden, well cared for as a market garden is worth from $100 to $200 to any intelligent farmer's family in this county, and yet many farmers say they haven't time to attend to a garden. What would you think of a person who buys milk, cream and butter from a neighbor, because he don't have time to take care of cows, or one who says, "it's cheaper to buy pork and chickens than it is to raise them." And yet there is more value in a good garden in proportion to the time required than in cows, pigs, poultry, hay, grain or stock.

A radical change in farmers' gardens is needed more than in any other part of their work. Now, what are the facts about farmers' gardens in Wisconsin today. The Wisconsin State Horticultural society has been looking this matter up. Early last August over four hundred circulars were sent to different portions of the state, asking questsions and reports on fruit and vegetable gardens. Question No. 5 was as follows:

"What portion of the farmers in your vicinity raise all the fruit the family need, of any or all varieties usually grown in this state? The following is a fair sample of the replies:

Not one in 100.....Jackson county
Not one in 5.....Brown County
Not one in 10.....Dane county
Not one in 20.....Richland county
Not one in 100.....Rock county
About one in 50.....Vernon county
None in this locality.....Grant county
Not one in five miles...Calumet county
Very few what they need.....Pierce

Do Your Farmers Have Good Vegetable Gardens?

The answers to this question were more satisfactory, but still show very great neglect and from these replies we must conclude that not one farmer in fifty raises all the fruit and vegetables needed for family use.

Farmers are you satisfied with this report? Are you not losing one or two hundred dollars every year by this neglect? Are you not neglecting the health, pleasure and comfort of your family by this failure? A good garden will often banish the doctor from your house and the sheriff from your door. It will make the boys and girls love the farm when everything else fails. In fact it is an important factor in making the home what it should be. "the dearest spot on earth."

Now, I do not recommend every farmer to undertake a fancy garden, any more than I would advise him to raise

trotting horses, or deal only in imported stock; but I do say, don't raise scrub stock and don't have a scrub garden; there is no money in it, nor comfort either. I venture this assertion without fear of contradiction, I can raise ten bushels of ripe, luscious berries ready for the farmers' family to pick, with no more labor than you can raise and deliver to me ten bushels of wheat. You sell your wheat for seventy or eighty cents per bushel, while good farmers came to my berry field this season and paid me three dollars per bushel for berries, because they say, "it is cheaper to buy berries than to raise them." What do you think about that?

Now, I want to tell you a secret about this small fruit business. I am going to tell you farmers who bought fruit of me last season, just what it cost me to raise that fruit; just how much I made out of you, and just what you would have saved in money had you raised it yourself. I had this year from my own farms over 2,500 bushels of berries, or about 82,000 boxes, and they cost me when ready to pick just two cents per box. These same berries can be raised on your farm, ready for your family to pick, for two, or at most three cents per quart. So when you buy berries at ten cents, you are paying at least seven cents that you ought to save.

A little common sense in laying out a garden will save half the labor of tending it. First let us discard the old notion that a garden must be a little square plat of ground, with a few raised beds, where all work must be done by hand or hoe. That is a scrub garden.

Preparation of Garden.

The ground should be thoroughly prepared by covering with barnyard manure, well plowed in, and top dressed with rotted manure. This should be thoroughly mixed with the soil with harrow or drag. Thorough preparation will save much labor in caring for the garden and greatly increase the crop. We should aim to do all the labor possible with the horse and cultivator, and will therefore stake off the ground, (in rows running long ways) for fruit seven feet apart, for vegetables two or three feet, leaving a head land at each end for turning. Always use a line to get rows straight, as you can then cultivate closely, and save much hand work. Plant all vegetables in drills, and use flat cultivation. Weeds must not be allowed to grow. For a vegetable garden your own taste must decide the varieties and quantity to plant. A general variety coming in succession throughout the season, will add much to the pleasure and value of the work.

A complete supply of fruits, fresh in summer, and dried, canned or preserved for winter, may be readily produced by following the suggestions of the farmers' one quarter acre fruit garden, a plan of which, with full instructions for growing all small fruits will be sent on receipt of name and address.

Discussion.

Mr. Woodman—You spoke of mulching and cultivating. Can you do both of these at once?

Mr. Thayer—Yes; our rows, you remember, are seven feet apart. In mulching, we put the mulch on each side of the hill running through about two or two and a half feet wide, and that leaves a space in the center of that row of about three or four feet and that is the part we cultivate.

Mr. Fenner—Would you cultivate at once, or would you mulch immediately?

Mr. Thayer—I would cultivate only the first season.

Question—Do you let the runners take root and bear fruit?

Mr. Thayer—Yes, although in certain varieties that are very prolific with runners it has been the custom in large plantations to pull off the runners. I do in my fields. Take them off about the first of August, then allow them to form what we call a matted row, and keep them clean and clear.

Mr. Jones—What time should strawberries be planted?

Mr. Thayer—I recommend the spring for the general cultivation. Of course, with care, you can set the strawberry bed any month of the year; for blackberries, red raspberries and currants they may be set out in the fall to advantage if the ground is in the right condition.

Mr. Hayes—In one thing a mistake is generally made, and that is taking the weeds out in the spring. If there are any weeds under those runners, if you dig them out, you will destroy your crop. You can cultivate them up to the middle of August or the first of September and then you want to let them alone, don't you?

Mr. Thayer—I keep up thorough cultivation all through the season in the row, but I allow no weeds to grow.

Mr. Webb—When we order a quantity of strawberry plants do we ever get any out of the old beds?

Mr. Thayer—That depends upon whom you buy them from.

Mr. Webb—If we bought them of you?

Mr. Thayer—I have nothing to say as regards that. I know I would not use them myself, or give them away, or sell them, but my advice to you about buying your plants would be if you have a responsible dealer near at home that you know is honest, buy of him, do not send away for them.

Mr. Hyatt—Wouldn't it be better for the average farmer of the state of Wisconsin if he calculated to have that quarter acre of garden, to kill the weeds next year and buy what he wants, and then start out without many weeds to contend with. Wouldn't it be better to kill the weeds first?

Mr. Thayer—Yes; I would kill the weeds as far ahead as I could.

The Chairman—You would not advise the farmer who calculated to grow lots of weeds to have a garden at all?

Mr. Thayer—No. That is the idea.

Mr. Hutchinson—Do you have any trouble with blight in black raspberries?

Mr. Thayer—No; I haven't been troubled; if I were I should dig it out root and branch and burn it.

Question—Is it material to have the rows run north and south, or east and west?

Mr. Thayer—No; I don't think it makes much difference, and still in a large plantation if the rows run north and south, all the bushes receive an equal distribution of sunshine.

Mr. Jones—How long would you have a strawberry bed without changing?

Mr. Thayer—Not to exceed two years, and if you get a heavy crop you had better set out a new bed every year.

Mr. Allen—How many acres of small fruit have you?

Mr. Thayer—I have sixty now, although quite a portion of this is new setting, set out last fall and summer. I always cover my strawberry beds in the fall when the ground is frozen up with either marsh hay or corn stalks or clean straw, and I would leave that on in the spring between the rows to act as a mulch and to keep the berries clean.

Question—Do you ever mulch in the summer?

Mr. Thayer—Not strawberries, except my bearing beds. I mulch by the straw that is put on the fall before.

Question—Do you cover red raspberries?

Mr. Thayer—Yes; I cover everything that grows on the ground on my farm except currants and gooseberries.

Mr. Cannon—What varieties of blackberries would you advise a man to start with?

Mr. Thayer—It depends upon what you are starting for. If you want them for your own use, I regard the Ancient Briton as the best blackberry that grows.

Mr. Hayes—You can take runners from an old bed that has not borne berries, can't you?

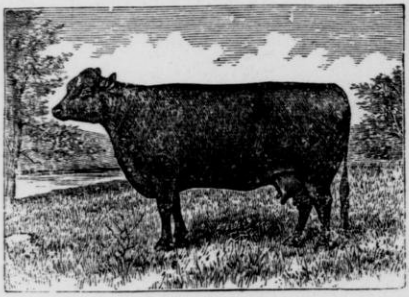
Mr. Thayer—Yes, but still you cannot get as good runners as from a new bed; the parent stem has lost strength, it

has lost vitality and taken it from the bed very rapidly with it.

Mr. Morrison—I want to say a word of caution in reference to those tree peddlers for foreign nurseries. We hardly go to a place in the fifty-five counties of this state but what we hear somebody asking about this and that nursery; some of them in Canada and some in the New England states, some in the state of New York, and they all have agents in Chicago. I want to say to you that this nursery stock that comes from foreign nurseries is bought just the same as any other stock. Sometimes it passes through half a dozen hands, but if you will just make up your minds to have nothing to do with them unless you know something about them you will save thousands of dollars to our state. Last spring there were a couple of agents came into the city of Madison, who took away with them something like three or four thousand dollars for rose bushes, shrubs and flowers, and almost invariably nothing but dead plants were received. If you have a good nursery at home, patronize that; leave your money with those you know raise good plants, something that is adapted to your climate and you will get your money's worth.

The Chairman—In closing this discussion I want to say one thing, and that is, that a scrub garden won't pay. I know it from experience. We have a new superintendent at our place and under her management it does better. I think you will all be wise in selecting your officers to elect a woman, not only to the office of treasurer but to that of superintendent of the garden itself.

The Institute adjourned till 7:30 p.m.



EVENING SESSION—MARCH 16th.

The Institute met at 7:30 p. m. Mr. Thayer in the chair.

SUCCESS.

A. X. HYATT, Sheboygan Falls, Wis.

Success cannot be measured entirely by the accumulation of wealth. Its accumulation may cost health and peace of mind. Success, then, is punishment. Such success is poison—there is a worm at the core. The young man who earns five hundred dollars a year and saves one quarter of it and has a sounder mind in a sounder body at the end is a successful man. He might have an annual income of five thousand dollars and yet if he spends five thousand five hundred dollars, he is a slave and draws behind him a chain of trouble heavier than a clanking chain of iron. The man who went to California and procured a million dollars was not successful if he incurred habits of recklessness and intemperance that rendered him an object of scorn and pity to all good people forever after.

Good Work.

Success in any vocation means doing it well. Doing it well is all that is necessary to make the humblest occupation honorable. Whether we raise corn or calves, peg shoes or write sermons, doing it well is the true ambition for every worker. It is this ambition that gives us the successful farmer and the model farm.

To become successful in any avocation a young man's time must be devoted to it by an iron rule. It was the conceit of a silly poet who wrote:

"Man wants but little here below,
Nor wants that little long."

Less poetry and more truth is what man wants a great deal here below. Man is a creature of wants—of constantly recurring wants; wants physical, wants intellectual and wants moral, all of which are essential to success. Too many people were born wrong. The sins of their ancestors were visited on them. I do not offer this as a theological dogma, but a truth of natural science, to which the world will do well to take heed. We cannot now remedy the defects entailed upon us, but the generations yet to come will hold us responsible for their proper development. If parents expect their children to succeed in life they must be well "brought up." Some polite people call it educated, but father and mother called it " brought up." This means something. It means that our boys and girls shall be taught grammar and arithmetic, algebra and latin, and music and dancing perhaps, and the mind disciplined to grasp the obtuse and profound, and it means that they obey father and mother; love their brothers and sisters; reverence God, and do willingly and well all their situation calls upon them to do. King Solomon meant "bring up" Ladies, you can hardly be spared to go help make our laws and command our armies, but you bring up the boys who do both. One of our greatest American statesmen, whose father was nearly his equal, said: "If I have benefited mankind or done the world any good the credit is due to my

mother." Ladies, mothers, your influence in the world is very great, whether you vote or not. Your influence in this world is almost supreme, whether men admit it or not. There is nothing like you under the sun. You can make home a place that can be surpassed only by Heaven, and I am told that you can make it just the reverse. Your smiles or frowns can cause the sun of domestic happiness to rise or set. God help and bless or mothers.

Every Man Should Have a Home.

The first business of every young farmer should be to secure one, a spot upon which he can stand and proclaim to the world that these acres more or less broad are his. A place which he and his wife can say, "We are monarch." Jean Paul has said that no man can live piously or die righteously without a good wife. I am of Jean's opinion myself. We are told by the great Jewish historian that when man was created Infinite Wisdom saw it was not good for him to be alone and so created a helpmeet for him. Men need helpmeets more now than they did then. Jean Paul said a good wife; God said a helpmeet, which means a creature of capacity of action of life.

If a young man finds that his newly wedded wife considers that respectability consists in jewelry and complexion, and idleness and furniture, he may as well pitch to some familiar tune Job's lamentation "Man is born to trouble here below," and hum it continually. His nose is on a grind stone. The idea of some verdant young men and maidens that they can live on no matter what, and no matter where, is an illusion it sometimes takes too long to cure. Love is poor stuff to live on, although a most excellent desert after a dinner of roast beef and vegetables. The old maxim that when poverty comes in at the door, etc., is one of the maxims of wisdom.

If a farm is worth earning and subduing it is worth occupying permanently. We should heed the doggerel of poor Richard:

"I never saw an oft removed tree,
Nor yet an oft removed family,
That throve as well as those that settled be."

A farmer who pitches from abode to abode with no more affection than a crow in its flight, resting first upon one dry limb and then another, must find his labor cheerless, and he deprives himself of the keenest enjoyment of life—a home. The law of this state renders the homestead sacred. Neither the heartless grasp of extortion, the rude brush of misfortune, nor fell disease or sudden calamity can deprive a family of a home once honestly acquired. If the farm is worth occupying permanently it is worth adorning, and if it is worth adorning it is worth preserving. Perpetual improvement must be the rule of every successful farmer.

A Comparison.

You may start two young men in life with farms of equal size and fertility. One restores all organic matter to his land. He wastes none of the elements that enter into animal or vegetable life. The other takes no heed of the great preservative principle. At the end of thirty years one farm blooms with fertility and its owner a successful farmer. The farm of the other will be exhausted and its owner as exhausted as his farm. Every pound of manure that is wasted away carries some of the elements of the fertility of our farms.

In the countries of Europe where population presses hard on the means of subsistence, the preservation of manure is carried to an extent almost incredible. After the defeat of Napoleon at Waterloo, ending a twenty years' war, the great men of the nation turned their attention to agriculture. Every available means to enrich their soils was resorted to. Manufactories were established for the purpose of converting dead animals and all offensive matter into valuable fertilizers. Agriculture was the pride of France. No one was too good or great to work. The

result was France raised the value of her real estate from eight billions of dollars to sixteen billions of dollars in thirty years. We can do the same if we will. With all these improvements of France she is behind Great Britain, although she had been tilled two hundred years when Columbus discovered America. Agricultural colleges in Europe have been a source of agricultural wealth, as they are fast becoming in this country.

Success to the farmer demands that he propagate only from the best. A farmer is about to sow forty bushels of wheat; his seed is not clean or mature. With a little time and the money some foolish habit costs him a month he could change his wheat for a good article, which would make one hundred dollars difference at least in the value of his crop. One hundred dollars a year in the course of years make all the difference between success and failure; between an educated, well dressed family and happy mother, and a ragged, ill-bred family and a forlorn mother. A man has eight hogs. He feeds them eighteen months and they weigh two hundred and fifty pounds, worth four cents per pound. His neighbor feeds eight of an improved breed, with improved methods and they make three hundred pounds of six-cent pork. The scrub hog man milks twenty cows. They are cows, and all cows are cows. He takes no stock in Dr. Babcock's test or blooded stock. He says the milk pail breed is the breed for him, and he shrugs his shoulders. However, his cows are long-legged, raw-boned, wild looking, vicious animals that will hold his dog a tug in a long run. His neighbor milks eight silken-haired, yellow-skinned, fine-limbed, gentle creatures and gets more milk in a year than the other does from his twenty. The men plant orchards. One at odd times takes out his knife and clips a dead or needless limb. He restores a tree to symetry here, eradicates a scrubby, mean one there. He tests the fruit and if not the best, he grafts it with the best. He slips a bud under the bark of another tree. After ten years compare his orchard with that of the man who thinks all cows and trees are alike. One orchard groans under an abundance of delicious fruit, and the owner of the other groans because he has a crop of stunted, mean fruit. The principle that like begets like must be controlling. We find farmers with good horses and scrub cows. Obey the same law and all may be improved alike. This law will obey labor and care, but treated with defiance it will visit retribution.

Success, Intelligence, Knowledge.

Success on the farm is the surplus over expenses. Without a surplus a farmer may be a desperate toiler all his life. By propagating from the best of everything he always finds a market for his surplus; it brings the highest price and it will always pay his debts. There is an almost incredible difference in what different farmers would call the art of agriculture. All the difference between the Irishman who pulled up the bean because it came up wrong end first and set it out right, and the German who raises seventy bushels of barley on an acre of land. It is this difference that makes our farm institutes so valuable. The farmers, of all men, should be included in the term learned profession. He is the great physician of nature, therefore if he is ignorant of the laws of natue, he is, of all men, the greatest quack. A farmer educated to his business is to no small extent a learned man. The more extensive his education the better he is prepared to till his fields. The law by which all success on earth is attained is the farmer's law. Toil and study is that. The lawyer, the physician, the divine who attends to his business faithfully is a laborious man. The successful merchant labors hard. Sleepless nights and anxious days are a part of the tribute paid by merchants, lawyers and doctors for their fortunes and their celebrity. Some of the best and wisest men that have lived have been farmers. George Washington was a

farmer, and the best farmer in the thirteen United States. Cincinnatus was called from the plow to be dictator of Rome. King David was a shepherd. Uncle Jerry Rusk could run a threshing machine, put down a mob, or hoodwink the German empire, and Hiram Smith, as good a man as any of them, was a dairyman of Sheboygan county.

A successful farmer is the most successful man on earth. He passes few sleepless nights. While he sleeps his calves are growing, and his cows elaborating milk. His children are aloof from the contamination of the city, and finally, if the lowing of herds, the bleating of his flocks, the prancing of his colts, the humming of his bees, the melody of birds, the beauty of a well tilled farm, the glories of the garden with its delicacies always on hand fresh and pure, and the reflection that all this has been obtained by his own industry and management can make a man happy, then is the skillful and industrious farmer among the most successful and happy men on earth.

SECRETS OF SUCCESS IN FARMING.

T. J. VAN MATRE, Fayette, Wis.

The first question that usually presents itself to the mind of the average American when he contemplates engaging in business is will it pay? This is a very common inquiry and a question which everyone should ask himself before entering upon any great or important enterprise or line of business. If, after looking over the broad and diversified field for labor, we make up our minds to follow farming for a life work, a number of questions very naturally present themselves to the mind. The selection of a farm to live upon and work and try to make money from is a matter that involves serious thought. The primary question to be settled is, what branch of farming is best suited to our state and knowledge?

Live Stock.

I have noticed that almost every person has a preference for some particular kind of stock. Some men take naturally to horses, and with no especial education they are wonderfully apt in picking out the good points of an animal. Their judgment of the value of a horse is seldom at fault. They can talk of nothing but the horse. They can tell you which horses have made the best time in almost every contest for years. They can almost give you the pedigree of every prize winner both in Europe and America. And so it is with some men in regard to cattle. They seem to know all about them. I do not mean to say that they know intuitively, but they learn very easily. It is their forte. They are always noticing and showing up the good points of an animal, usually of some particular breed whose form and symmetry especially fill their eye. Some manifest a preference for sheep, some for hogs, and some again for poultry. The pertinence of the question will now very readily be seen. If we are naturally inclined to hogs it would be very unwise to buy land that would not grow corn, because corn and hogs are inseparable. Although many farmers manifest a preference for some particular kind of stock a large majority of them are not specialists in their tastes or attainments. In such a case it would be very unwise to select a farm for

purchase on which a specialty only could be most profitably pursued. Many farmers are always behind time and under the harrow, although they are industrious and economical. This is often because they are on the wrong track and have mistaken their calling. Many men who have neither capital nor experience adopt farming for a business and then wonder that they fail. Muscle without brains on the farm is like a ship at sea without a compass. The voyage, to say the least, is very uncertain and is usually attended with humiliation and disaster. It is very important that we should know what we can do best; what comes most natural and easy for us. And it is of no less importance that we know this at the start. Begin right and then there will be no need of a change. The man who makes frequent changes from one business to another will not succeed. Many men are now on the verge of distraction about sheep. They attend every sale in the neighborhood and buy sheep, for which they pay fabulous prices. They are anxious to get out of the cattle business because it does not pay. By the time they get out of cattle business and well established in sheep industry sheep will be down and cattle up. With such men, whenever it rains, mush and milk, their dish, is wrong side up. It is a dull man who learns nothing by experience. The longer we follow a given way the more familiar it becomes. To change after this is to lose much of the benefit of our former experience. Hence the necessity of a right start. A blunder here may cost us the race. If we have no consciousness of any particular trend, then mixed farming is our proper calling. This is safe, pleasing, usually profitable, and I believe makes a man of broader mind. The rich grain producing, fine grazing lands and clear, pure water of Southern Wisconsin makes it admirably adapted to mixed farming.

Common-Sense Farming.

The road to successful farming passes through no labyrinth of mystery. In the foremost rank of those who travel therein may be found the practical men who undertake this as they would any other serious venture, expecting reasonable return for prudent investment and intelligent manipulation. The successful farmer is the practical man who has few theories to work on; in short the man who has learned what to do and how to do it, and then does it, is the man who will make farming pay by reaping profit where less practical men find disappointment and disaster. I am what might be called an enthusiastic farmer. I believe that farming, when conducted with the same skill, economy and enterprise which characterizes most other fields of industry, affords ample remuneration; that it leads to a better physical development than almost any other vocation of life; that its lessons and surroundings promote a higher moral and spiritual development than any other calling, and therefore, it pays. Nothing is more important to successful farming than a judicious application of time and an intelligent rotation of crops. The era for hap-hazard, slip-shod farming in Wisconsin is passed. Extended railroad facilities place us in direct competition with the fertile lands of the west, where innumerable herds of cattle wander at will, and with which we can only compete by raising the very best. How to maintain the fertility of our soil is a question of primary importance. No more than two crops of grain should precede the sowing of clover. The farm should be in grass at least one-half the time. Another important question is the division of time. Show me a man who works from fifteen to eighteen hours each day and I will show you a man who is invariably behind with his work and out of sympathy with his business. A reasonable amount of good, sound judgment is just as essential to success in farming as in any other vocation of life, and he who hopes to succeed by the use of muscle without brains will miserably fail. Ten hours is enough for any man to work in one day, and if the work is systematically

arranged it will be surprising the amount that will be accomplished. Close attention to details make up the aggregate of profits. If we ever take our place among the business men of earth, to which the laws of nature and nature's God entitles us, it will be when we make the very best possible use of the means placed at our disposal. I mean it will be when we provide ourselves with the very best agricultural papers printed for our use; when we regularly attend our Farmers' Institute, which affords us a maximum amount of knowledge at a minimum cost; it will be when we cease to educate our brightest boys and girls at the literary colleges and send them into the learned professions; it will be when we give them a thorough agricultural education, so they may understand the possibilities of the soil and the feeding value of the different products of the farm. There is no business in which a diversified knowledge is so essential. The man who does not love farming and follows it as a hated necessity is the man who will degrade his profession as far as a noble employment can be degraded. Had I the power as I have the will; had I the ability as I have the desire, I would speak continually and spare not until every farmer, not only in this state, but throughout the nation, should appreciate the importance of his calling.

"The sceptered king who sits in state,
The hero of red battles' shock,
Is not half so noble, half so great,
As he who plows and tends the flock."

THE VALUE OF EDUCATION TO THE FARMER.

HON. JOHN JOHNSTONE, Milwaukee, Wis.

Mr. Morrison called upon me a few weeks ago and told me about this meeting, and as I had to go to St. Paul this week, I was very glad to avail myself of this opportunity of seeing one of these institutes which are doing so much good throughout the state of Wisconsin.

I think the subject upon which I am announced to speak is a little unnecessary. The two speeches which have preceded mine have turned upon that subject. I think we all agree that with a good education and a good wife success is very certain. We are all agreed that the wonderful advance that farming has made in the last thirty or forty years has been entirely the result of education. I think you will find if you look over the world that education and good farming go together. Where you find scrub cows and poor horses, and an old-fashioned plow, you will find there is no education; where you find farmers such as they should be, with all the latest implements and inventions, there you will find education. I was raised on a farm where my forefathers had been for two hundred years, and my grandfather used to tell how they couldn't make enough off the farm to make the rent they had to pay and keep body and soul together, so during the long winter evenings the men as well as the women had to knit socks and mittens and sell them in order to eke out an existence. I can remember when I was a little boy that our farm was largely covered with water. A creek, or bourne, as it was called, ran through it, and it was full of rushes. About 1847 or 1848 education in farming matters began to spread abroad through the land, and the idea of draining land was promulgated. The

British government agreed to lend to any landlord a certain sum of money if he would loan it again to his tenant for the purpose of digging drains and ditches. My father borrowed money from the Earl of Aberdeen, and they dug drains, and where the rushes and water had been standing all these years by and by there got to be splendid dry fields, and then guano came to be introduced from foreign countries, and today on that farm they are raising forty to fifty fat cattle where a hundred years ago they could not make a bare living, and that has been done by education. cultivation, intelligent thought and handling of the soil together.

Americans by Adoption.

The whole country around here is settled by men who came from the old country; they have left the land of their fathers and have come to America as the land of their adoption. Sometimes in this state we hear men putting on airs because they are native Americans. I have always maintained that we are the best Americans of the lot. They were born in this country; they were not consulted whether they should be Americans at all, but we, after we had attained years of discretion, looked the world over and deliberately left the grand old land of our birth and came over and chose this, and so we are the best Americans of all. They have come here, out in the woods, and cut down the timber and plowed the land; they have worked hard and have had little time to cultivate their minds, because they wanted to leave a farm to which they owned the title to their children. I believe that that is the feeling of everyone born in the old country, and in order to get it they are willing to work from early morn until late at night. The time in which it was necessary to do that kind of work is past now; the fields are cleared and we are advancing to another era, the era of education, where you must not only plow and sow, but you must make progress and advance intellectually. You must keep up with the procession, if you do not wish to be crowded out of it. We complain of the boys going to the cities, but if we will think of it we will understand that it is largely because the farm is not made interesting to them; but such institutions as this Farmers' Institute will tend to keep the boys in the country and put an interest into everything pertaining to the farm, and they will see that it is just as good a profession as that of the minister, or the lawyer, or any other.

Our State University.

The State University, with its thousand students, is doing a great work. Every year two or three hundred are leaving the university and spreading all over the state; but still there is a feeling that it can do a great deal more. We cannot all leave our homes and go up to Madison and study, but the State University can send its men away from Madison all over the state and thus convey knowledge and information. In the city of Milwaukee we have had lectures on many topics, English literature, Norwegian literature and many other subjects, and the State University is trying to extend its work in that way, and I believe that before many years the knowledge that is now being given at Madison to one thousand students can be given to ten thousand, all over the confines of Wisconsin.

The word education is derived from two Latin words, which means to lead the mind out; to draw the mind out. It is not to cram the mind unnecessarily with a great deal of information, and we all know that some boys go to school or to the university and are not educated after all. Their minds are merely crammed full of stuff that they cannot use. Some of them have not the natural ability to use the information that has been given to them, and so you cannot call them educated. Others do not appreciate their opportunities,

and never become educated for that reason.

You will find some able and very successful men who have never been to college or even to school very much, but you cannot tell how much happier and more useful they would have been if they had gone to school. A man may make a great deal of money in some particular way, but he lacks the breadth of a man who has been educated. I have no doubt that if the fathers and mothers who are farmers in this state took more pains to make life interesting to the boys, getting them books and magazines to read, and otherwise keeping their interest at home, they would be more willing to stay on the farm than they are, and not crowd to the cities as they are apt to do. If you will look at the last census, even of Europe, you will see that the percentage of the population of towns is increasing altogether faster than the population of the country.

The Future is Full of Hope.

Now the last few years have been very poor years for the farmer, largely because vast territories have been thrown open for the production of agricultural products. Then there have been wonderful inventions in agricultural implements, reaping machines, threshing machines, and so on, and that has tended to increase the production of agricultural products, and in consequence the price has gone down. But there are no more such new countries to be opened up, and in twenty-five years from now the American farmer will be the most independent man in the whole world; he will own his own farm and he will be getting good prices for his products, without having any of the worry and the wear that the business man in the city has. Why! the competition that is going on among business men is making their lives miserable, and all these troubles, the strikes and all that sort of thing, of which I don't know where the end will be, unless it is through education, when men will understand things better and be willing to live and let live. There is no class of men that enjoy the independent position that the farmer does. I think he has the best future before him of any of the great classes of our community. I might talk much longer, but it all comes to this, that the man who is trained will be the successful one, and if you have a farmer whose mind has been trained at the university, or by reading books at home, or in any other way that he acquires it, so long as he is educated, then he will be a successful farmer. A man must have brains nowadays to make a success of anything and must use them.

The boy who is raised in the country is fifty per cent. more of a boy than one who is raised in town without the privilege of visiting the country. The tender memories and hallowed associations that belong to those of us who have been brought up in the country and can look back to our homes there, are among the best things that we have. We in this age are making wonderful progress. Tennyson never wrote truer words than when he said:

"I doubt not through the ages,
An increasing purpose runs,
And the thoughts of men are widened
By the process of the suns."

Every year that passes we are learning something new, and the minds of men are being gradually widened. I look, therefore, to the time when all men will be devoted to the arts of peace. Peace hath her victories, and in those arts and victories we shall all excel if we but appreciate the value of education.

POSSIBILITIES OF THE WISCONSIN FARMER FOR EDUCATION IN AGRICULTURE.

A. F. NOYES, Beaver Dam, Wis.

I ought to be enabled to speak to a Wisconsin audience of farmers and citizens by right of birth and profession, if not of education, owning by purchase and cultivating as I do the farm upon which I was born in the year grand old Wisconsin first received her charter of sovereignty, and having been directly interested all of the years that have since come and gone in the growth of farm products, from the germ at the seed time through various processes of nature to the finished products in the markets of the world.

Nature's Laws and Secrets.

We know that the energy derived from the sunlight acting on the elements of plant life in the soil and out of it produce through the digestive and secretive organs of the cow and the manipulations of man the butter we eat on our bread; and who can say that man may not, without the process of nature, produce the same product directly from the rays of the sun? Already they send messages and tones of voice over mountains, under seas thousands of miles—carry trains of people and merchandise with electricity, which is what? Did you ever see it? We all have seen its power and its work. Some day we may see it and understand more about it. Just so in our farm operations with the forces and powers of nature and earth. It is becoming necessary to more thoroughly understand the science of agriculture, which is nothing but nature's law and secrets. Now I want to say to these young men and young women, and I don't believe it makes any difference whether you are of the farm or of the city, for the boys and girls of the farm are seeking the trials and pleasures of the city, and those of the city are looking for homes on the farm, and what I am going to say to the young people I want the old people to hear, too, that if the agriculture of Wisconsin is to keep pace with the other professions and even with the reputation Wisconsin agriculture has all over the world, both at home and abroad, there must be an advance all along the line. Instead of the few who are making a success with the farm, the picket line, as it were, the whole number of farmers must advance and keep advancing until success without words is written on every farm in Wisconsin. You young people are the builders of the Wisconsin of tomorrow, and let me tell you in words of sincerity and truth that Wisconsin expects every one of you to do your duty. Resolve to be a success. Make every step forward and never move back. Begin at the beginning, learn principles and wherein they apply to agriculture. Learn why you till the soil and how, the action of fertilizers and all the forces of nature, remembering that never in the history of agriculture were so many men with trained intellects studying the laws of husbandry, not forgetting that down by the little "City of the Lakes" the people of Wisconsin have provided an institution of learning, where all the gathered knowledge of agriculture, as well as of other professions, are given a place and home; and by the grace of God and the will of the people those homes shall be large enough to hold every boy and girl, old and young, in the state, to receive their full share of all there is of the theory and practice of their chosen profession.

The Dairy School.

For the young people who wish to know of agriculture, there is now a model dairy school, the finest, largest and best equipped building in the world for that purpose, where during the school terms are given practical lessons in all the advanced methods of butter and cheese making; the Experimental Farm with all its means for experiment in various directions, and the short course in agriculture, of which I venture to say that no young man who intends to farm or to work as a farm hand, as a matter of knowledge as well as a matter of dollars and cents, can afford to do without. I know whereof I speak. I have looked the field of agriculture over; have talked with the boys there at the school. I have been with them in their classes, have seen them and their teachers at work in their laboratory and work shop, and have followed, in a measure, their career after the course was finished, and I tell you out of a heart full of good will to every boy in the state that if I had had the chance when I was twenty years old that you have today and taken two or even one of those short course terms, their value to me in my chosen profession for the years since could not be reckoned in dollars and cents; for much of what I do know about farming has been learned under difficulties, hard work and bad mistakes, many of which might have been avoided if I had had any knowledge. Knowledge in any department of life is a factor that pays for the getting, and the more there is on the farm the better for the farm, the farmer, the farmer's family and the farmer's community.

Apathy and Indifference.

It is no wonder in the face of the fact of the slow growth of dairy knowledge, of the smallness of the number of the scholars in the classes pertaining to agriculture, of the attendance at our farmers' institutes and at the apathy of the farmers generally, even of the enmity of those who should be its friends. Only last winter we witnessed the battle royal of the massed enemies of farm institutes, dairy and food commission, yea, of agricultural school and experiment station; and of agriculture in general on the one side and on the other side a handful in the legislature of both political parties to their credit be it said, backed up by the friends of agricultural knowledge, and we won the victory. Men who had been gathering knowledge from these various sources, quietly, silently, almost unknown to themselves, went down to Madison and with a calm consciousness of power told the committees of the work which had been done, and firmly said you cannot abolish one iota, and you dare not. They did not, but voted a tax for a magnificent dairy building that today has a hundred students. Surely the world does move.

Are We Farming at a Profit?

or as much of a profit as we ought to? If not, why not? If ten of us raise from 25 per cent. to 100 per cent. more than the average of half a dozen field crops, how about the twenty or thirty others who are raising almost nothing, to bring ours down to the average, and the other farmers are farming for fun? But we have the most fun and don't do so much grumbling either. In my locality farms are being bought at $70, $75, $80 and $85 per acre by right down bonafide farmers, and they mean to farm them at a profit, too. If they do, we hope to learn something, yes, several things, because if they do they must farm it on the square; the deal must be equal on both sides; there must be reciprocity on the part of the farmers as well as on the side of nature and earth. It must not be all take and no give. I believe and hope that they will make a success of it. If they fail there will be many to say, "I told you so." And now in conclusion, let us stand together; stand by our own; stand by our Agricultural College, the Experiment Station, our Farm Institutes, our farm

papers, our successful farmers, and all that is good and fair in nature, God and native land. Stand by them all and for them, and thank God tonight that you live in a community where the genius of both poverty and riches have joined hands to work out the problem of soil fertility. The crowns of the mental empire are not in waiting for either riches or poverty. Plato was rich; Socrates poor; Washington the child of good fortune; Lincoln of adversity, and yet they came to one greatness as if to teach this generation that no wealth or poverty need separate the heart from great principles.

Mother Earth's possibilities are so great, her unsolved problems so many, that the patient toiler in her mysteries may expect to rank with the learned of any other profession. Remember that the law of compensation is unalterable; that to grow a perfect crop as to obtain success in any other profession, all the conditions must be right. We must work with intelligence and skill, with minds trained to harmonize the contending forces of storm and sunshine, aiding nature in every process of husbandry; and thus out of the power of knowledge gathered from a thousand sources, aggregated as a common whole, shall we stand forth in the blessed sunshine of prosperity an enduring monument of the power of mind over matter, the components only grains of white sand.

"Those who toil bravely are strongest;
The humble and poor become great;
And from these brown-handed children
Shall grow mighty rulers of state.
The pen of the author and statesman,
The noble and brave of the land,
The sword, and the chisel,and pallette
Shall be held in the little brown hand."

THE AGRICULTURAL DEPARTMENT OF THE STATE UNIVERSITY AS A SCHOOL FOR FARMERS' SONS.

HON. C. R. BEACH, Whitewater, Wis.

The claim that the great need of the farmers of the present time is a more thorough knowledge of the scientific principles upon which the various branches of their business rests, and the best way to apply them is admitted by the farmers themselves. That this need is real is obvious from the great number of agencies at work to supply it.

First on the list are the agricultural newspapers, some devoted to the general diffusion of agricultural knowledge, and others which confine themselves to some particular branch, as dairying, cattle breeding or horticulture. Added to these every city and county newspaper has its column for the special benefit of its farmer readers. We also have books on every conceivable subject relating to the farm and everything grown upon it,'or in any way related to it; some of them worthless for want of practical teaching and others so filled with technical terms that few can understand them. We have annual reports of the Agricultural Department at Washington; reports of the State Agricultural Society; of the Horticultural Society, and of the State Dairymen's Association. We have Farm Institute Bulletins and bulletins

of the various Experimental Stations. We have yearly exhibits at county and state fairs, with the view of presenting object lessons, to show farmers what can be accomplished; and last but not least we have Farmers' Institutes, in which men skilled in the various branches of farming give to others the benefit of their experience.

All these agencies and others I might mention are doing good work in helping the farmers of Wisconsin to solve the problems that are confronting them in trying to conduct their many-sided business with profit.

But the trouble with all this mass of knowledge that comes to us in so many ways and under so many forms is that we fail in being able to classify, systematize and arrange it so that we can use it when we most need it. Neither could we if we would, out of this heterogeneous mass of facts, experiences and opinions, frame a system of agriculture that would be harmonious in its various parts or be in keeping with what is called agricultural science, of which we hear so much and of which we know so little.

To supply this deficiency is the object of Experimental Stations and agricultural schools, among which is the Agricultural Department of our State University.

I shall not at this time attempt to give a history of this department, but will only say that until the last ten years if anybody received any benefit from it, we are quite sure it was not the farmers of Wisconsin, and it is not many years since that the feeling of opposition to its connection with the University was so strong that a meeting of the farmers of the state was called to consider the advisability of separating it entirely from the University and locating it upon some large farm in another part of the state. I think it fortunate for the best interest of the Agricultural Department, fortunate for the University, and fortunate for the farmers of the state that the plan was not carried out. Since the Experiment Station came under the control of its present efficient manager there has been a growing appreciation of the work being done, and a general acknowledgment of the benefits that the farmers of the state are receiving from it, and at the same time a kindlier feeling towards the University.

But the object of an Experiment Station is not so much to teach as to determine what is true and of practical value, and to show how the deductions of science may be applied to farming to make it more profitable. To teach the various branches of science in their relation both to theory and practice so as to furnish sure guides to the farmer in his every day work in all the different departments of his business and thus place farming upon an intelligent basis, is the special work and true sphere of an Agricultural College, and since the reorganization of the Agricultural Department of the University, by the establishment of the short course in agriculture and the dairy course, I believe there is no school in this country, or in any country, that furnishes more or better facilities for a thorough education in all that relates to the theory and practice of farming, and in all the branches of learning that in any way pertains to it, than is furnished by the University of Wisconsin; and what is most gratifying is that since the establishment of these two courses and the Farmers' Institutes, the opposition, both to the location of the agricultural school and its connection with the University, has entirely disappeared, and today there is no class that is giving the University, as a whole, more cordial support or are prouder of its success than are the farmers of the state. As a proof I will only state that ten years ago there were only three scholars in any way connected with the Agricultural Department. Last year they numbered ninety-seven and this year one hundred and fifty. Hon. J. L. Mitchell, of Milwaukee, has shown his appreciation of the short course in agriculture by donating last year $1,000

to pay the expenses of twenty boys while attending it, and this year he offers to duplicate the sum.

The College of Agriculture of the State University offers to students the choice of three courses of study. 1st. A long course that requires four years of study. 2d. A short course of two terms of twelve weeks each, both of them in the winter of two consecutive years. 3d. A dairy course. The long course is designed mainly for those who hope to qualify themselves for teachers in other agricultural schools or positions with experimental stations. But the short course and the dairy course are for the special benefit of those who expect to return to active work on the farm or in the factory, and it is to the practical value of both of these courses that I wish for a few moments to call the attention of the farmers of the state.

To the farmer who has sons whom he expects or hopes to keep on the farm, the short course offers peculiar advantages. Let me mention a few of them. First, it requires no special qualification to enter. Any boy sixteen years old with a common school education will be admitted. Second, he goes from home only from January to April of two winters, a time when he can best be spared from the farm. Third, the cost will be small; his railroad fare, his board and a few incidental expenses. If he worked well the previous nine months on the farm he will have earned more than enough to pay his expenses while attending the school. And even if he has not, if he is allowed to go and is interested in his studies, and goes back to the farm, and is allowed and encouraged to put into practice what he has learned at the school, he will be worth enough more in a single year to pay for all the extra money expended for his benefit. In nine cases out of ten he will be more likely to stay on the farm; he will appreciate how wide a field farming offers for intellectual as well as physical exertion; he will catch glimpses of the possibilities of farming beyond what has been attained, and will become enthusiastic in its practice. It has been my good fortune to meet several who have attended this course, and they all manifest an interest in farming that I have never seen in boys who have never been from the farm. They know that what they have learned is going to help and they are eager to put it into practice.

Let us look for a moment at what is taught in the course: Breeding and all that pertains to it; how breeds originate and how perpetuated; the points that indicate excellence in the various breeds of horses and cattle, so as to qualify one for judging or selecting them; feeding for certain purposes; the composition of the various feeding crops grown on the farm and how to combine them so as to get the desired results; the chemical elements of the soils, and how to maintain fertility; manures, and how, when and to what crops to apply them; theory and practice and benefits of drainage; construction and ventilation of farm buildings; dairying, the composition and handling of milk; how to run the separator and use the milk test. The scholar will also be taught something of veterinary science, so as to determine unsoundness in animals or detect and administer to common ailments; the proper application of power in running farm machinery, and much more that I will not attempt to enumerate.

While this course does not claim to teach the sciences in all their relation to farming, it aims to make its teachings scientific and to make them practical. It aims to give the scholar a start in a scientific direction; to teach him to plan intelligently rather than depend upon chance, or to work blindly.

A word as to the teachers. They are all of them thoroughly equipped for their work; men of national and world-wide reputation, and aside from what is learned in the school it is worth all the money expended to be associated

with them for twenty-four weeks—to know how they talk and act and think. Scholars naturally catch something of the spirit and enthusiasm that moves their teachers. The boy also comes in contact with his fellow students, with whom he exchanges ideas, and so learns to think and to express himself. He takes notes of the lectures and so learns how to follow a public speaker, and to analyze and report what has been said. He comes in contact with the President of the University and various professors; he visits the legislature; he sees the Governor and the state officials, and has a hundred opportunities in being educated in forming estimates of others, and so is able to form a more just estimate of himself. We may think these things are trivial, but it is the sum of these that gives one the ability to use himself and what he knows to the best advantage, and so exert an influence and be better able to perform the duties of citizenship.

We may say that men become successful farmers without scientific learning or much learning of any kind except what they have learned from experience and observation. True, but it requires the experience of a lifetime, and then in the special line in which they have best qualified themselves they are not half so likely to be right or half as able to give a philosophical reason for what they do as the boy fresh from the short course in agriculture. A milk tester in the hands of one of these boys will beat the judgment of the best dairyman in the state in determining the value of a dairy cow, or in mixing a ration for a fattening steer he will match the best cattle feeder in the state, or the best jockey in pointing out the indications of speed in a trotter.

There is another view of this subject. To carry out the object of the short course and of the dairy course, buildings have been constructed, apparatus have been purchased and an able corps of teachers employed, all of which cost money. These expenses are met in part by a direct tax, of which every farmer of the state pays his part. If, through his boy, he avails himself of the advantages of these courses, he receives back the worth of his money; if not, he is so much out of pocket for another's benefit, or the general good.

I have said there were grounds for encouragement in the increase of numbers in these courses, but if instruction in them is worth what I believe it to be, we ought to have one representative from every town in the state, which would give 1,600 scholars. Do you say that no such number could possibly be provided for? From what I know of those who have control of the University I feel assured in saying that when any number of scholars express a desire to be admitted to any of the departments of the University, and especially to any of the departments of the Agricultural College, there will be ample provision for their accommodation. Could there be but one farmer in each town in the state who had thoroughly mastered what is taught in the the short course in agriculture, and who was so situated as to put it into practice, they would revolutionize the whole present system of farming. Can anyone compute the pecuniary benefit of such a change, to say nothing of the intellectual and social improvement of the whole community?

I hope and trust that the farmers of the state will investigate this short course in agriculture, and if they will do so I feel sure that we will have a large increase in the number of scholars who attend it.

But before closing let me say a few words with special reference to the dairy course.

Dairying, while standing in the front rank of the farm industries of the state, seems to have reached a point where little improvement can be hoped for. There are two great obstacles to its further progress. First, the pooling of milk without reference to quality, by which a premium is paid for poor milk from poor cows, poorly kept, and tax-

ing to pay it those who by skill in breeding and feeding are striving after a higher standard and better products, while the second obstacle is a want of scientific knowledge and skill on the part of those employed in the factories, the professional knowledge of most of them consisting of what has been learned in a single season while serving as an apprentice to a maker as ignorant as themselves.

A part of the poor work in factories is directly chargeable to owners of factories, who make butter and cheese for a fixed price per pound, and then in order to put as much money as possible in their own pockets, hire makers whose chief recommendation is that they will work for low wages, and the result is poor goods that sell for low prices, and a general feeling of discouragement among milk producers.

The State Dairymen's Association has for the last few years been trying to improve the quality of dairy products by employing men skilled as cheese makers to visit factories and impart instruction, make suggestions and in every possible way help to produce a better and more uniform standard of goods, and their labors have produced favorable results. But the amount of money at hand has been so small that only three or four instructors have been employed, so that but a small part of of the state has been benefited. To meet these wants is the object of the Dairy School. This school has been in operation two years and the Board of Regents of the University has spared no pains or expense to make it in every way a model institution by thoroughly equipping it with every conceivable appliance for the handling of milk and placing it under the control of the most learned and skilled teachers that the country affords. It is designed to teach in this school, theoretically and practically, all those scientific principles that are in any way connected with dairying in all its branches, from feeding of cows that produce the milk to the finished products ready for the market. Its aim is to train its students so that they shall be able to handle milk without waste, and to make butter and cheese of uniform standard and of the highest quality. The course is of twelve weeks in the winter of each year.

Last year there were seventy students in attendance; this year they number one hundred, most of them practical cheese makers, and while it may be early to give positive results, the indications are most gratifying. In addition to the number already sent out it is expected that this school will furnish one hundred yearly.

Can anyone estimate the power for good that this body of educated butter and cheese makers will exert? Scientifically trained, both in the theory and practice of their business, able to give the reason why for every change from the milk pail to the finished product; yes, more than that, able to tell how the cows should be fed and handled to give good milk; able to run a steam engine or a milk separator, or any other dairy appliance intelligently, skillfully and scientifically; skilled in the use of a milk tester, so as to be able to detect any loss as the result of their own carelessness or fraud on the part of any of their patrons; able to determine accurately the relative value of each portion of milk delivered, so that each shall receive pay for what his milk is worth; in short, knowing how and feeling a professional pride in doing good and honest work. Can anyone conceive of a better instrumentality for the improvement of our dairy products?

The educational work of the Agricultural Department of the State University has thus far been largely preparatory, but when we consider what has been accomplished we may anticipate for the future most surprising results, and I thoroughly believe that the next ten years will mark a new era in this work for the advancement of scientific education among the farmers of the state.

HOW TO PREPARE.

(A Suggestion for the World's Fair.)

MRS. R. HOWARD KELLY, Chicago, Ill.

Shortly after it was decided that the World's Fair would be located in Chicago and not in New York I met at a social meeting in the older city a professor in an Eastern institution. Our conversation very naturally fell upon my home, and he informed me that he had never been West. I realized that the World's Fair at that time was a rather delicate subject, but could not refrain from suggesting that of course he would find his way among us during the summer of 1893. He looked at me with a poorly suppressed sneer on his patrician features and said, "Oh, you people from the 'Windy City' never miss an opportunity for blowing about your Chicago, what a great place Chicago is and what a big show Chicago is going to have, etc., etc." "Why," he continued, "There won't be any World's Fair worth going West to see; when they sent it to Chicago they might just exactly as well have send it to the arid plains beyond the Rocky Mountains, so far as expecting anybody east of Buffalo to take any interest in it."

Well, I was glad to find that he knew something about the arid plains, though he evidently thought they practically commenced where the Empire State left off. I found myself getting ready to answer him in a manner which possibly had more acidity than ardity in it, when a gentleman who stood near us spoke, "Professor, let me tell you what I believe will happen to you. You will go to the World's Fair, of course, and you will be so delighted with the people you will meet and so overwhelmed with astonishment at the great city of Chicago and the glorious country to the west and northwest of it that I shouldn't be surprised if you forgot all about the exposition and came away without seeing it at all."

I think of that New York professor every time I read of some magnificent addition to the wonders to come, or go down to Jackson Park and see the transformation going on with the rapidity of magic and the perfection of skill and beauty.

Who can blame Chicago for being proud of the work that is being pushed forward within her borders? We are proud of it, and we love to talk about it, and behind all our pride there is something else which is a source of considerable anxiety to some of us. You see we feel this way—we believe that nine-tenths of the educational benefit of the great Exposition will be received by those under twenty-five years of age. You can't do much with old folks; they are very "set" in their ways and in their modes of thought, and it is a waste of time and effort to expect much of them; but the boys and girls, the young folks just growing up are impressionable. They are eager for new experiences, and it will pay to put an extra environment around them that will fix the character of those impressions and experiences.

What we are fearful of is that all the young folks we have in Chicago and the many more who are found all over the country, as well as other countries, will in 1893 come to Jackson Park, will look at all those magnificent buildings till their eyes ache, and walk about among all the wonderful things till their legs ache, and then come away empty-handed and empty-headed, leaving all behind; every marvelous piece of mechanism, every exquisite morsel of statuary or paint-

ing, every curious bit of the old world, every one of the specimens of humanity and of the other animals that will swarm there and meet them at every turn.

It would please me greatly if I could make a bit of suggestion that would enable every one of you young folks to bring home with you a good solid chunk of something valuable, something different to anything you have in your home now, something that will be pleasant to think about and remember as part of the great Columbian Exposition as long as you live, and hand down to your children and grandchildren. You know that Emerson among the other good things that he has written, once said, "If you would go to India to bring India back, you must take India with you," and so I say, if you are going to the Exposition with the expectation of there finding anything that will stay by you, you must take it with you; or, in a little plainer English, you cannot be expected to be interested in things that you know nothing about beforehand, no matter how interesting they may be in themselves.

I have no doubt that most of us have already fixed upon the point to which our footsteps will be first directed; our teachers to the educational department; our mechanics to machinery hall; our artist friends to the art gallery; our archaelogical friends to the department where Indian mounds and Mexican Pueblos and rusty old Roman and Trojan relics are found, while the great body of farmers will naturally gravitate towards the agricultural department or the dairy school. Whichever it may be, you will find it is with the idea of following up the subjects upon which we are already the best posted, and we will as naturally take no lasting, or what we might call absorbing or appropriating interest, in those subjects on which we are ignorant.

Now, you see how it is going to work. There is coming to our very doors an opportunity of gaining detailed, accurate knowledge on a thousand subjects; an opportunity that will never come again, certainly not to us, and probably not to our children and grandchildren. There will be spread out before us enough object lessons to make every one of us for the rest of his life a man or woman of the highest and most varied intelligence, equipped with the most liberal education that could possibly be acquired in or about a university, and whether it means all that to us, or whether it simply means an enormous, tiresome, stupid aggregation of "things" with no life in them, depends upon our capacity for digesting them as we mentally take them in.

Some one, not Emerson, has said that some people can see more through a keyhole than others can through a telescope, and so they can, and it is because the eye that peers through the keyhole is backed by a brain which recognizes a thing when it sees it. We can't expect to go to the Fair and assimilate all the thousand things we see, but years hence when our grandchildren ask us, "What did you see at the World's Fair in 1893?" we don't want to be obliged to say, "I can't remember a single thing but a lot of big Norman horses," or a "beautiful crazy quilt," or even the "dairy school," and the number of beautiful, curious and useful things we shall remember will be exactly in proportion to the number of different subjects we have made it a point to study beforehand.

Books to Read.

Every town that pretends to be up with the times nowadays has a public library, and no doubt the officers of such will take pains during the next year and a half to see that they are supplied with such books as you need. If they do not, they will doubtless be glad to have you suggest to them the kind that you think will be useful, and so I am going to suggest a few which treat of some things which you will see at the great Columbian Exposition, and probably will never see anywhere else unless you are fortunate enough to be

able to do a great deal of traveling. Not dry, heavy books, but such books as Miss Edward's "Thousand Miles Up the Nile," or E. E. Hale's boy's book, "A Flight Through Egypt." These will put life into a mummy and deep meaning into a pyramid. Or read Hawthorne's "Marble Faun," which will send you with eager feet to the Roman department, or Bulwer's "Last Days of "Pompeii," which will send you hunting for long buried treasures beneath the Versuvian lava, or Mrs. Catherwood's "Tonty," which will put a vital interest into everything connected with the early French missionaries in the Northwest, or Irving's "Knickerbocker Tales," or Hawthorne's novels, to brighten your interest in the exhibit from Holland and early Puritanism, or some of the interesting modern histories that will make you ashamed that you know so little about your own country. Or else read some of the fascinating works on geology, science, mechanics and art, which will give you a feeling of being at home when you get among the good things at Jackson Park. I will add a few more books to this list: George Eber's "Uarda," and "Egyptian Princess," calculated to make you so absorbed in Egypt that you will want to pack right up and go there; Lew Wallace's "Fair God," giving you an idea of the magnificence of Old Mexico under the Montezumas; Scott's "Heart of Midlothian," setting you down in beautiful Edinburgh; Dickens' "Tale of Two Cities," located in both London and Paris; and George Eliot's "Romola," located in Florence. Also read George W. Cable's stories of the French settlers in the South and Charles Craddock's tales of Tennessee; Helen Hunt Jackson's "Ramona," which will make you feel that, after all, the Indians of our country are made of the same material as the rest of us. Add to these "Barbara's History," a Roman story by Miss Edwards; "Voyage in the Sunbeam," a lovely story of travels in a yacht, by Lady Brassey; "An African Farm," by Ralph Irons; "Ben Hur," by Wallace; "The Bondman," an Iceland story, and "The Scapegoat," a story of Morocco, by Hall Caine; "The Lead Horse Claim," a Californian story, by Mary Hallock Foote, and Miss Sara Jeannette Duncan's charming book describing a trip around the world, taken by two young ladies, entitled "A Social Departure."

With these, and others which they will suggest, you will have a list of standard works, nearly all novels, and first-class reading, even if you never get to the Exposition.

You can afford to lay aside for a short year and a half much of the so-called literature that has been taking your time and devote what time you have for reading to a slight preparation for the treat before you. Boys and girls, go to reading, and to reading good books. If it goes a little hard at first do not be discouraged; every chapter will be easier, and after a while you will begin to feel that only the best is good enough for you. If it is hard to read alone, get up a "combine." Choose a good book, invite your young friends, or perhaps one particular young friend, to come together once or twice a week, and pass the book around. Take turns reading; stop when you strike something you do not understand and ask each other questions; look up the answers in the encyclopedia or somewhere else, and keep a bright lookout for suggestive articles in your weeklies and your monthlies. Keep a scrap book; divide it into topics such as historical anecdotes, architecture, mechanics, costumes and many others. Carry it with you to your meetings and give your friends the benefit of it. Compare notes; keep your brains oiled up; then when the time comes go up to Chicago alert, wide awake, interested, ready and eager for more information along the same lines.

Other Practical Things.

Another practical thing to do is to call a course of neighborhood talks, or, if you please so to call them,

lectures, on subjects akin to World's Fair topics.

I know of a little community where a course of ten lectures is in progress. The whole matter is in charge of a small committee of quite young people, their material is drawn almost entirely from local talent, the variety of subjects is very wide, the price for the whole course is only one dollar, and if one or two turn out to be failures nobody is out very much money. The complete program is printed on the first page of a four-page sheet, and the other pages are occupied by half a dozen patriotic songs, words and music, and I have heard that several of the course members feel that they have their money's worth in the privilege of lending their voices twice each evening to "Hail Columbia" or "Marching Through Georgia."

I might add that even at that low admission price they have paid all expenses of printing handbills and programs and advertising, also a small amount to cover actual expense of light and heat to the church where the lectures are given, and have enough money left to pay the expense of importing an outsider or two during the season, and to buy every book mentioned above, and more too.

The different departments of the World's Fair are organized with great care, and officered by parties who not only thoroughly understand the work before them, but who have so classified and systematized that work that they are prepared at any time to give to those interested such information as to details and plans as is within their knowledge. Anyone undertaking a line of study on any subject connected with the Columbian Exposition will, I am sure, receive the most courteous attention and the best assistance within the power of such officials to render, as well as a vast amount of literature that is being constantly put out by the Department of Promotion and Publicity.

A choice of many subjects is before you that could be profitably pursued by some of your bright young men and women. A review of the attractions of the Centennial of 1876 will very appropriately be followed by a bird's eye view of the coming exposition with charts, maps and explanations, and these will make two good evenings' work. Then, let one of your bright women study up the art treasures to be shown here with the many interesting facts connected with their history, transportation, etc. The study of the parliament of religions will do one of your ministers good, as well as the rest of you. The architecture and the costumes of the countries to be represented will each form topics worthy the attention of somebody who can give you drawings in connection with their talks.

The mining exhibit, the flower show, the horticultural department, the exhibits of electricity, geology, fishery and a score of other departments are all good subjects, not forgetting the dairy school, which has been so magnificently provided for, and so skillfully planned for by the Columbian Dairy Association.

You will want two or three good historical talks; you must give some of your old army men a chance to tell some of their big stories, and with a blackboard always handy, an atmosphere of freedom to ask and answer questions, a war song concert, with a magic lantern show in the same line, and the stars and stripes always above the platform, with your local band to help out on special occasions, if you don't know more about what you are going to see in 1893, you will at least have a number of pleasant and profitable evenings, and will have added to your stock of patriotism.

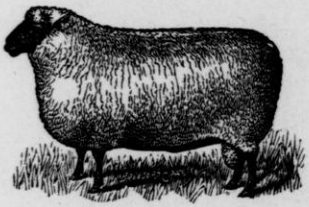
When the kodak fiend goes out to "take a few pictures" he rejoices in the fact that it won't require any brains or effort on his part to do his deadly work. "You press the button, we do the rest" is his complacent motto. Many people will go out from their homes to Chicago in 1893 with the idea that all they have to do will be to press the button and

the image of each of the objects before them with all its significance will pass in turn through the lens of the eye and be impressed upon the plate of the brain, and carried home as a permanent addition to their stock of information. But we forget—"we" have already done the rest in the case of the kodak. The ray of light that penetrates this little box reaches something more than blank, empty space; if it did not the fiend would carry out the same empty blackness that he started out with. On the contrary it meets a sensitive, highly prepared sheet that fairly leaps to meet the object exposed to it by the light.

It is for the quick, responsive, highly prepared intelligence which will fix and carry home its impressions, to be placed in the scrap book of memory for future reference, that it is our business to work.

If the many millions of the young people of our country go to the Columbian Exposition in that spirit and with the preparation hinted at, the enormous outlay of money, time and brains put into this project will have been spent to good purpose, and the results will be seen, if not in this generation, surely in the next, and the next indefinitely, in the vastly increased intelligence among our people, in the general welfare and in added wealth in those things that money cannot buy.

The Institute adjourned until 9:30 a. m. the next day.



MORNING SESSION—MARCH 17th.

The Institute met at 9:30 a. m. George McKerrow in the chair.

PRAYER BY REV. J. H. RITCHEY.

"Almighty God, our Heavenly Father, Thy throne is an everlasting throne, and Thy dominion shall never cease. We would humbly recognize our dependence upon Thee for life and all its manifold blessings. We bless Thee for our homes, and for the measure of prosperity which we have enjoyed in the past and for the power still to stand and to execute our plans. We bless Thee for the civilization of this age, especially this land of ours, with all its law and liberty and growth and wealth into which Thou hast brought us by Thy beneficent Providence. Further, we pray Thee the deliberations of this convention, conduct them in all their inquiries, inspire their hearts with the thirst for usefulness and a desire for improvement, and especially, Dear Lord, may all the influences of this meeting be of such a kind as that every person here may not only be a better farmer, but a better man, a better citizen. We pray Thy blessing upon all those who are here, guide us all by Thy Holy Spirit, by the light from within, guide us while we live in the world, and prepare us that we may have an abundant entrance into the joy and fellowship and glory of Thine eternal kingdom, through Jesus Christ, our Lord, Amen."

BLUE GRASS.

W. W. CHADWICK, Monroe, Wis.

Varieties of Grass.

The grazing of stock is practiced not only in this country on our cheap lands, but also in England, Ireland, Scotland, Switzerland, Russia, and in fact in all civilized countries. There are almost 4,000 species of grasses. They are distributed over all parts of the world. Some are characteristic of the warmest tropical regions, and some of the vicinity of perpetual snow. Some grasses are annual and others perennial.

The question is, what kind of grasses are best for grazing purposes in this locality, and how can we grow the best and most on our lands? Let us grow a perennial; one that contains the most nutriment, that will make the best and the most beef, mutton, butter and cheese; one that is indigenous to our climate and soil.

In my judgment the kind required is blue grass. We can grow it on our soil, that is underlaid with clay and lime-

stone, with scarcely any effort, and we should not be afraid to let it grow, and grow, and grow.

Mature the Grass.

Don't you think it pays to let your corn, oats, wheat, and, to a certain extent, your hay, come to a state of maturity before you harvest them? Don't you think, Mr. President, it would be a wise policy to have our cattle, horses or whatever kind of stock we raise, on a good, well matured pasture, where they would not be obliged to wait for the grass to grow in order to have all they wanted to eat? If it pays to prepare our pasture lands at all, it certainly will pay to have good pastures. If they were on a good blue grass pasture they could do the same labor in eight hours that otherwise requires from sixteen to eighteen or twenty, and make more than twice the gain in the same length of time, for it is matured grass that makes them gain.

Where you have what we call a good, solid, well matted blue grass pasture, that same land will produce at least twice the amount of feed, for the reason that it catches the snow, holds the rain much better, and not half the rain runs off that does from our short pastures. It holds a greater amount of moisture, because the grass is a mulch for the soil, and it will keep growing for weeks in a dry season, after it has ceased to on our land that is grazed to death.

Don't Pasture too Closely.

We almost murder our lands by pasturing them too closely. How many pastures there are in this part of the country that are about as smooth and as even as the floor of a skating rink. Where you have a well grown blue grass it makes your land richer, you don't have to rely upon the snow for protection of your soil, and you can pasture it when the soil is moist, without the stock cutting it all to pieces, for the grass is a great protection to the soil as well as to hold the moisture. We have no grass that will accomplish these results as well as blue grass, and that is an important point.

Most of us plant too many acres of corn. Raise no more corn that what your land can fertilize. It is far better to raise 1,000 bushels of corn from twenty acres than 1,000 bushels from forty acres. It will bring a much greater revenue to have the twenty acres in blue grass and save your soil and labor.

Put the same amount of fertilizer on an acre of blue grass that you do on an acre of corn land and let the blue grass remain unmolested until November; which do you think would be worth the more in proportion to the cost—the corn or the blue grass? In your corn field you plowed and harrowed, and harrowed and plowed, and worked and toiled to keep vegetation down. On your blue grass the good Lord sent his rain and sunshine on every particle of the soil, and it all responded, and we certainly would receive a good return for our labor.

I don't want to be understood as opposed to the growing of clover and corn. We need them to assist in bringing our lands to a higher state of cultivation, as well as for hay, but I do prefer blue grass for a permanent pasture, as it will yield more beef, more mutton, more butter or more cheese to the acre, other things being equal.

Better Quality.

We are complaining every day of the low price of all kinds of stock. Who is to blame? Is it the consumer? No. Who is it? It is the producer. The great trouble with us farmers is we keep too much stock. It is quality, not quantity, that commands good prices. What is required is better pastures and better stock. Keep no stale stock on your pastures, but let them be less in quantity and of a better quality, and we will see better results.

When shall we pasture our lands? If it pays to pasture through July and August during the heated term, it certainly will pay equally well in April and

November. There is a certain quantity of nutriment in our pastures, and we must put it where it will do the most good. Let us make a practical illustration. Forty stockers in April, weighing on an average 800 pounds, worth $2 per hundred, would cost $640. In November your forty stockers would average 950 pounds, worth $2.50 per hundred, and would bring $950, a net gain of $310.

Twenty feeders in April weighing on an average 1,100 pounds, worth $3.50 per hundred, would cost $770. In November your twenty shipping or expert cattle would average 1,400 pounds, worth $4.50 per hundred, and would bring $1,260, a net gain on the twenty cattle of $490. Therefore, the twenty cattle with $130 more invested would net $180 or more, and your pasture would certainly be in 50 per cent. better condition, and you have had a less risk from lightning or any other cause. The same rule applies equally as well to other stock.

Discussion.

Question: Mr. Chadwick, what do you mean by well matured blue grass?

Mr. Chadwick: I mean that the grass has to a certain extent matured before you use it.

Mr. Bloor: What do you mean by blue grass?

Mr. Chadwick: I mean what is often termed June grass, or Kentucky blue grass.

Mr. Noyes: At what time of the year in your locality, in Southern Wisconsin, do you consider it matured enough to turn your stock upon ordinarily?

Mr. Chadwick: I think it best to let it mature until July.

Question: What do you do for pasture in the meantime?

Mr. Chadwick: I keep pastures from the previous year.

Question: When and how do you sow blue grass with the best results?

Mr. Chadwick: It is indigenous to our soil. We don't have to sow it.

Mr. Hatch: How many years does it take to make a good blue grass pasture?

Mr. Chadwick: About three years.

Mr. Hatch: Can you afford to let your land lie that time without getting any use from it?

Mr. Chadwick: That would be on timber land cut down if you did not wish to cultivate it. If you want to, you can sow it in timothy and clover and pasture it until it comes to blue grass?

Question: Then we are to understand that your remarks on blue grass apply only to permanent pastures?

Mr. Chadwick: Yes, I spoke of it as a permanent pasture.

Mr. Bender: How long will it remain a pasture in blue grass without going back to clover and timothy?

Mr. Chadwick: I couldn't answer that question. We have some pastures with us that we have had more than twenty-five years.

The Chairman: Do you ever top dress or renovate with manure, or anything of that kind?

Mr. Chadwick: Yes.

Mr. Convey: What would you depend on for pasture from the middle of May till the middle of July?

Mr. Chadwick: As I said before I keep pasture from the previous year.

The Chairman: Does your stock do as well on that dry grass from the previous year?

Mr. Chadwick: Yes, they would get fat on it if I had enough of it.

Question: Do sheep do well on that grass?

Mr. Chadwick: Yes.

Mr. Ames: On a farm where the rotation of crops is carried on is there a place for this blue grass?

Mr. Chadwick: No, I think not. I spoke of it as a permanent pasture.

Mr. Hatch: I don't see how you can afford to leave your land lying so long You have two pastures using for the same amount of crop, and you have to wait three years to get this pasture.

Mr. Chadwick: No, we don't have to wait three years to get that pasture.

You seed your land to timothy and clover and the blue grass will come up and take the place of the timothy or clover. You don't lose a moment's time. In regard to the length of time, if it pays to pasture at all it pays to have good pasture.

Mr. Linse: I am living in a blue grass region and I have tried a number of years to give my pasture a good start and turn in my stock late in the season. If I turn them on in June or late in May I have poor pasture all the summer.

Mr. Hyatt: I like the ring of that gentleman's paper. I like the mulch part of it. Land must be mulched; it grows richer; if you would cover it with boards it would grow richer, but I think we must have a different breed of June grass from what we have in Sheboygan county. We call it the most miserable, insignificant grass that ever grew.

Mr. Bloor: I have a hundred acres of land that has never been plowed, and my whole idea has been to keep out that June grass, and I put on all the sheep I can get on before it heads out. It will then keep getting up greener and better all the time, but some years it will get ahead of us in spite of all we can do, and we find it very poor pasture.

Mr. Sampson: Don't blue grass do better on rather low land than on high land? That is my experience.

The Chairman: It appears to me, taking it all in all, that there is no question but what here in Wisconsin grass is pretty near, if not quite, king, and that blue grass has its place. On our lands we find that rolling lands, that are too rolling to cultivate nicely, come in well in the form of permanent pasture, so with our creek bottom lands that are too cold and wet to produce a good crop of small grains or corn, one year with another they do very well with permanent pasture, and the blue grass is the main grass in those pastures. Like some of the gentlemen here, I depend upon this blue grass pasture, first as an early pasture, as it starts early in the spring. Then through the summer season, when the clover and timothy are well up, I can rest it, and I find it does well again in the fall for a very light pasture. It comes in very nicely for a winter pasture, for a flock of breeding ewes, or for brood mares to run out upon, and I think that it is in that way that Mr. Chadwick means that it is valuable. He is not advising you to use it in rotation, but on those rough lands where the soil is apt to wash away, and where it takes a good deal of labor to produce a crop. There blue grass has its place, and also, upon low, damp land, that we cannot cultivate properly.

BEST FORAGE CROP FOR SILAGE.

JAS. BLOOR, Neosho, Wis.

Mr. Chairman, Ladies and Gentlemen: I cannot make a speech; I can simply give my experience in this matter. We have filled our silo six years, and we find it very satisfactory. We fill it with corn, so I cannot tell you anything about what other stuff would be good, but my neighbors who have filled it with clover say clover is good. I notice, however, that they don't fill it the second time. The next time they fill it with corn again. I don't know

that I have much to say, but if there are any questions I will answer them the best I can.

Discussion.

The Chairman: I have known Mr. Bloor for years, as one of the best farmers in Dodge county, and he is a good man to question.

Question: How did you build your silo?

Mr. Bloor: I built the first one of stone, thirty feet inside in length, twenty-four feet wide, and twenty-six feet deep. It did very well, until we found that it was not large enough. After that I built a wooden silo. Both silos that were put in last year hold thirty-two acres of corn.

Mr. Curtis: How deep was your silo in the ground?

Mr. Bloor: About twelve feet.

Question: How thick were your walls above ground?

Mr. Bloor: The walls were started three feet.

Mr. Hayes: Let me answer that question. I was the second to build a stone silo in our neighborhood, and I gave the thing a good deal of study. It was not a whole stone silo, but was part wood and part stone. We all have basement stables there, and we sunk our silo to the bottom of the stables, and built up a two-foot wall to even with the ground, the same as you would a cellar wall, firm and even. You must be very particular to have it plumb. Then we level our wall off and put a frame on, say a six-inch frame. We board that frame on the inside with any cull boards, merely a packing. The frame is on the outside of the wall. Then we board it over outside and inside with inch boards and continue it right up to the top of the silo, and that is plastered smooth and level with common quicklime.

Mr. Thorp: How are the corners made?

Mr. Hayes: They are made square with us, but I would recommend any man to build round.

Mr. Thorp: There is one in our neighborhood built with the corners round, and I think it is the best I ever saw.

Mr. Curtis: The point I want to get at is whether the silage comes in contact with the stone wall.

Mr. Hayes: Yes, sir. Now, there is a particular point. You plaster your wall up smooth and level, you must not have any stones standing out, it will interfere with the ensilage in settling. Plaster it up with common quicklime, and let it thoroughly dry before you put the water lime on. Put on a coat of water lime, smooth it all off, and have it level and nice, and you have then a permanent silo that will stand just as long as you keep a roof on it.

Mr. Curtis: I have understood from somebody's writing, I don't know but Prof. King's, that the acid in the silage would destroy the wood.

The Chairman: It is Mr. Hayes' silo Mr. King speaks of.

Mr. Hayes: Mine has been filled eleven times. Prof. King called my attention to that little place; it was something new. As quick as he went away, I found that same softness in my cistern, mine never has been touched, never a particle of the plaster came off.

Question: What kind of water lime do you use?

Mr. Hayes: I use the Lewis cement, not the best; it was cheap. It will hold water. I went into my cistern and found that same softness there. The silo has been filled eleven years and I believe it will be good as long as I keep a roof on it. There is no frost gets into it. There is an air space, and if there is any frost gets in from the outside, it isn't going to peel the cement off. The wooden silo was all right for a short time.

Mr. Curtis: In that or any other silo where the silage comes in contact with the wall, you will sometimes find rotted silage. Now, I want to know if you can find any advantage in stones over wood in that respect?

Mr. Hayes: A great advantage. I

always more or less rotted at the door. I have a wooden silo also, and always where it comes in contact with the wood it is a little decayed.

Mr. Thorp: I want to ask the gentleman why he didn't build another stone silo instead of the wooden one.

The Member: That was only put into the barn as a temporary affair. When I build another barn there will be another one go up; a good stone one.

Mr. Hayes: In filling a silo you want all the depth you can get. It never ought to be less than thirty feet, and thirty-three feet would be better. It doesn't cost much to elevate it. Another thing; a silo should not be built in a barn, in the first place if you cover the top, it is dark, in the second place there is always more or less steam working out of that silage, and it settles in your barn, and when the frost comes it will work down from the top into this. I don't like that steam in the barn.

Question: A ventilator directly above will take it out.

Mr. Hayes: You can't put a ventilator in your barn.

Mr. Thorp: If you are going to build another silo would you build it round or square, or how?

Mr. Hayes: I would have rounding corners, but it is according to a man's fancy, I suppose. Sixteen feet square and twenty-five feet deep with round corners, is just as good as a round one.

Mr. Noyes: Do I understand you to say, Mr. Bloor, that clover is no good in your silo?

Mr. Bloor: No, sir. I said that my neighbors, smart, intelligent men, filled their silos with clover once, and they never did again. I never have tried it.

Mr. Hayes: I never have but I see the report of Mr. Powell, who says he has ensiled green clover with good results.

Mr. Noyes:—With my experience of four years with the silo, I think I can safely assert that clover is the best crop for me to put into it, on account of the feeding value, and on account of the value to the land of the clover roots. I have put some in each year of the four The first season was second crop on top of the corn with very good results, but some waste on account of not weighting. I have come to the conclusion that it is more necessary to weight clover than it is to corn ensilage. My stock take to it better than to their corn ensilage, and you all know that cow or any other live stock like corn ensilage. I have usually filled the lower half of the silo uncut, the other half cut, on account of elevating it. I don't think there is any difference. I wouldn't give ten cents to have the lower half cut.

Mr. Bloor:—I have only tried corn, and I have tried different varieties of that. My experience has been since we have had so much stock on the farm, the land is so rich that we find it hard to get the corn to stand up, and we have to cut it by machinery. It grows so large that it is down.

The Chairman:—What kind of corn do you find best?

Mr. Bloor:—We have tried the White Flint and the Yellow Flint; any of it grows big enough. The object with us is to get the most grain we can in the corn. We are using our silage for fattening stock.

Mr. Hyatt:—It strikes me that any living vegetation, clover, rye or anything, can be preserved in the silo.

Mr. Weeks:—I have filled the silo a good many years, and one year particularly with clover, and it was pretty near a perfect success under conditions that were not the most favorable, so that I can see no reason why, with ordinary care, a silo may not be filled with clover and produce the very best results. I had a field of clover which was very rank and lodged, and I cut and drew sixteen loads of it and put it into my silo. It was a very hot time, and it matured very rapidly, and probably was a little too mature, the blossoms were becoming brown, and though I had a cutter and every thing

at hand to cut it up, I thought I would try putting it in whole, being the cheapest and easiest way. I tramped it very thoroughly, and then put some marsh hay on top, as I always do with my corn ensilage, and then put planks on top and weighted it moderately with stone. When my corn was ready to cut I opened this silo, which was about one-third full, one pit, and removed the silage, taking up two planks and work thoroughly, put some marsh hay on top, as I always do with my perfectly clean, and left the clover en silage in a perfectly clean and beautiful condition, just as it was put in, with the exception perhaps of a foot all around the side, in which there was a little mould, and I then went on and filled the balance of my silo with corn. Prof. Henry had told me that that was a dangerous experiment before, but I thought I would try it and learn for myself. The result was that when I opened my silo, and worked down, I cut it down in the section in front at that time, taking up two planks and working down from the top to the bottom and then I could have mixed silage, which I consider a very important point in this ensilage business, and I think we are going to work on that line hereafter, in putting different crops into the silo. I think by experiment we will find out the proper time to ensilage different crops so as to get the best results, and then we shall have a mixed ration for our cows, without using so much grain. The result of this experiment of mine was satisfactory. The corn and the clover ensilage were both perfect, except the clover, as I have said, about a foot around the side. That was the first crop of clover.

Mr. Bloor:—Did that foot of mould go clear to the bottom of your silo, or just a little on top?

Mr. Weeks: It went pretty nearly down.

Mr. Emerton: How large was the silo?

Mr. Weeks: My silos have two pits thirty feet each in length by twelve feet wide, and sixteen feet deep.

Mr. Emerton: Then there was a waste of a foot?

Mr. Weeks: In the clover ensilage clear down. Of course that would be considerable. I attributed that to the fact that the clover was a little mature and would not pack properly. I never had any such trouble with corn ensilage. I have put in seven years and there was never a failure to my knowledge in any respect. My silo, I will say, is built of grout, mainly. It is in a bank, the wall against the bank is stone, although it was first built of grout, but I found it had bulged from the soil freezing and thawing, and I took that wall down and built an eighteen inch wall of stone to the level of the ground, but the balance of the walls are made of grout and plastered with cement, and it is in as perfect condition today, as far as I can see, as it was when it was built. I cut out a section just where it was joined together of this mixed ensilage and put it in a box and sent it up to Prof. Henry to show him that it necessarily need not be a failure, and he said it was perfect.

Mr. Bloor: I would like to give a little of my six years' experience. We find on our farm that it is different from what we hear here; we have too much fertility, we are feeding too much grain, the boys say. To illustrate what I want to get at, a few days ago I saw that my ewes were going to have their lambs. I also saw that the stables had not been cleaned out, and I said. "Boys, these stables must be cleaned out." Well, they said "We have no where to draw it." Well, draw it on that field." "That field was manured heavily three years ago; it is no use; the stuff couldn't stand up last year." "Well, take it to that field." "That is no better; there's fifty or sixty acres in that condition," and they actually didn't know where to put it. Now, to show where the manure comes from, we don't sell a spear of grain off

the farm, but what comes back, pound for pound, that goes away, there comes two pounds back. We sell our barley and buy grain right back.

Mr. Sampson: Do you feed any other grain with your ensilage?

Mr. Bloor: Why, yes, oil meal and bran; but there isn't a single thing sold from the farm; hasn't been for years but what comes back twice over. I have kept a large flock of sheep on my farm. We have kept from two to three hundred all the time for forty-five years, and now we are feeding from five to seven hundred a year.

Mr. Favill: Where do you get all the feed for all that stock?

Mr. Bloor: Right out of the corn fields.

Mr. Favill: Raise it all yourself?

Mr. Bloor: Yes, all except what we buy. The money that we get for stuff sold from the farm comes back in something else. We will sell a carload of barley and get two carloads of corn right back.

Question: How many acres of corn do you raise?

Mr. Bloor: Forty acres.

Question: How much does it go to the acre?

Mr. Bloor: I can't tell, but very large crops; larger than we usually want on account of the harvesting.

Question: Don't you buy a great deal more grain than you raise?

Mr. Bloor: Yes, sir.

Mr. Favill: That is what ails his farm; he is buying from all around and feeding out on his farm.

Mr. Bloor: We are feeding out three dollars' worth of grain where we make only one on the farm. That same disease can be taken to another man's farm.

Mr. Hayes: Do you raise your feeding stock or buy it?

Mr. Bloor: Buy it on the market.

Mr. Hayes: Can you buy it cheaper than you can raise it?

Mr. Bloor: Yes, sir.

Mr. Favill: What becomes of the man you buy of?

Mr. Bloor: Oh, well, he has to look after himself.

Mr. Robinson: How do you prepare that cement?

Mr. Bloor: Take two barrels of sand to one of water lime. My silo was in that proportion and it has been there six years.

Mr. Thorp: What is the best forage crop for ensilage?

Mr. Bloor: Corn.

Mr. Thorp: How do you know.

Mr. Bloor: From my experience and the experience of my neighbors. Corn we know is a success.

The chairman put to vote the question of how many in the audience have silos, and counted twenty-two hands raised. Then, upon the further question as to how many were well satisfied in using ensilage in feeding stock and making butter, the same number of hands were raised.

The question as to clover ensilage was also put to the house, and it appeared that eleven had ensiled clover, six had been disappointed in the results and four were perfectly satisfied.

Question: Have you ever tried sweet corn for the silo?

Mr. Hayes: Certain localities require different treatment. As I understand from Mr. Thorp, Mr. Noyes has more land than he knows what to do with; his land is poor, as I understand. Now, I advise him to stick to clover. With us we want to raise corn with a feeding value in it. When we raise a hundred bushels of ears of corn and put it in a silo we can put it in cheaper than we can get it in any other way to our live stock. Any man, after he has worked four or five years at it, can put it in for one-third the expense.

Question: How much is your land worth?

Mr. Hayes: From seventy-five to one hundred and twenty-five dollars an acre, according to the locality. Now about sweet corn. A man would think it was the best, but now any man knows that sugar, when it is diluted with water, will come to acid, and when it is in full

sugar in the milk, when you put it into the silo unless you let it heat greatly, it will be very acid, and that is the reason why those who have put in sweet corn are dissatisfied. It is not as good as our common corn. A man on sandy land will want heavier corn than on clay land. We want corn that will grow the biggest stalk and the biggest ears, and the most bushels to the acre, and corn that will mature. Another point, you must cut the corn when it is in the right shape. If it is too green it becomes sour, and if it is too dry it becomes woody, and the stock will not eat it as well, and I do not think there is as much nutrition to it as if it were a little more green.

Mr. Emerton: I think that we ought to find out some method by which these six men out of eleven who are dissatisfied with siloing clover could be satisfied.

The Chairman: The vote proves that you have to use a good deal of judgment and thought to find out how to silo clover properly.

Mr. Weeks: Probably most of the causes of failure in ensiling clover is as to weights. You have to weight it heavily. If the air gets into it it will be damaged.

Mr. Bloor: Have you any proof that there is more feeding value in one acre of clover than there is in one acre of corn?

Mr. Thorp: Yes, sir, I think I have, as it took seven acres of good heavy corn to fill my silo. The next year it took ten acres of the first crop of clover to fill the same silo, leaving me a good second crop of clover to offset the difference in the number of acres of each crop it took to fill the silo, and I claim that there is more feeding value to the acre in clover. I have filled my silo four times, twice with clover and twice with corn. Last year I put ten acres of clover into the silo and the balance was made into hay. The second crop of clover was made into hay, and I wintered nineteen head of cattle, and cows, besides my young stock, and that was all the fodder I had on the place except a few cornstalks, and my cows in milk were getting clover ensilage, all they would eat, I don't know how much. I gave them grain, an average of about ten pounds of grain per head. This year I had corn silage and I fed them the same amount of grain, the same kind of grain and the same cows. Now, the mature cows that I have this year are not giving within five or six pounds as much milk as they did last year on clover silage, and they have had corn silage this year with all the corn in it.

Mr. Emerton: How did you put that clover in is what we want to know?

Mr. Thorp: It was the first crop. Last year the last crop of clover I put in was the first crop that grew on the field. We went on with a mower and when we first commenced to fill we let it wilt a very little, and what we cut in the morning we would put in in the afternoon, run it through a feed cutter and keep it pretty well leveled up; did not pack a great deal; and after we had been working two or three days we put it in as fast as we could get it down and run it through the feed cutter and get it in. We did not weight it and we had considerable mould on top.

Question: Was there any mould upon the outside of the silo?

Mr. Thorp: A little on top. Mine has square corners and there was some quite a way down the corners.

Question: Did it keep its green color?

Mr. Thorp: No, sir; it turned red, and it had a very pleasant smell. I did not weight it and that is where I missed it.

Question: In starting to cut with a mower in the morning are you very careful to get the dew all off first?

Mr. Thorp: I haven't been so particular about it, but I like to run a tedder over it to prevent its turning black. You have to commence your clover when it is very green in order to get it in before it is too ripe. We only had three men and we had three-quarters of a mile to draw, and it took us eight days to fill our silo; but with the first

and second crops of clover I am positive that I get more feeding value per acre for a milch cow than any other feed I ever had.

Mr. Noyes: How many tons to an acre of clover?

Mr. Thorp: I don't know; it would take about eight good loads to the acre.

Mr. Bloor: We are getting twenty-three.

Mr. Thorp: I get more bulk than you do; you are getting about twenty per cent. more water.

Mr. Bloor: Was it cornstalks or corn that you got?

Mr. Thorp: It was corn; it would average a hundred baskets to the acre easy enough.

Mr. Noyes: I want to say right here that neither Mr. Thorp nor myself go back on corn ensilage. I had a hundred tons of corn silage that was worth five dollars a ton to me in feeding my stock.

Mr. Convey: I want to say a few words regarding the frame silo. Where I admit that the stone silo is the best where you have the material to build with, yet I feel satisfied that the recommendations in last year's Bulletin by Prof. King are correct in the main, that the round silo is the best form of silo. It is comparatively inexpensive; it is sufficiently strong with four-inch studding to resist lateral pressure, which is one of the principal things to consider in the construction of a silo. I believe in the round silo you will have a good silage, and there being no corners, you will have better results, so that, all things considered, I think that the remarks made by Prof. King probably form the best information in existence on that subject.

Mr. L. H. Adams: It seems to me we can hardly afford to pass this question without crystallizing some thought on it. Let us remember that the principle involved in the preservation of food in the silo is the same, no matter whether you choose corn, clover, rye or anything else, but that they differ and we must treat them according to that difference. Now, the clover crop is too valuable and the silo is too good a place to put the clover for us to pass it hastily. We have not learned to handle clover in the silo as we have corn. There are many things to consider. For instance, the clover is course, and the riper you let it get the harder it is to pack in the silo. On the other hand, if you get it too green you will get very rank smelling ensilage that will produce bad results. Now, in the filling there are two things to consider; first, the depth of the silo, because every pound of stuff that you put in makes weight of itself for that which is underneath and presses it down. You get more in cubic feet, and the one roof covers a thirty foot silo just as well as a twelve foot silo in depth. The next point for us to study out is just when to cut the clover. We mustn't take it too green or too ripe. My opinion is we had better let it stand until the most of it is in bloom, and then put it into the silo and weight it down so as to press the air out, and when we get sufficient weight on there will be no trouble. Rye and oats in the silo are even harder to keep than clover, because they get to be course and leave air spaces, and in that case we must put on more weight. We have been working in many different ways and have had all sorts of results in this line, but we are coming back to this idea of weighting more. It makes a little more trouble, but it enables you to get more of the silo in cubic feet and it presses the air out, and when the air is out you can keep anything in the silo.

The Chairman: Mr. Adams has summed up this clover question very nicely. He has made good points and he has shown us the weaknesses of clover and what we must guard against in putting it in. I will say that these two gentlemen, who were on the program to open this discussion, are known in the eastern part of this state as very successful farmers, as large feeders of sheep and steers. They are men who have made their farms rich, as they have told you, and not only have done

that, but have bought their neighbors all out so that they might put their boys on these farms, which goes to prove that stock feeding and ensilage with some good brains mixed, are bound to bring success in this line. They feed ensilage, and yet they are noted as men who put the very best class of selling stocks on the markets in Eastern Wisconsin, both in sheep and steers, so that shows that ensilage is a good thing for feeding stock. They have told us that they want the corn well matured, and we find throughout the state that dairymen seem to agree with them. The silo has not been placed upon the Institute programs throughout the state so much this winter as formerly because Superintendent Morrison thought it had been pretty thoroughly discussed, but we have found that when we were talking upon corn culture and even upon other subjects that this silo would break in upon us, unexpectedly, and we have found in all portions of this state that the men who have tried the silo are all, or nearly all of them, well satisfied with them.

OATS AND PEAS.

THOS. CONVEY, Ridgeway, Wis.

Mr. Chairman and Gentlemen: There is scarcely any question as to the value of peas as a feed. The only objection offered by those who have experimented along that line is the expense of seeding, the difficulty of harvesting, as well as the additional expense as compared with other grain crops. Being a legume, as beans and clover, it is not very exhaustive of fertility, containing a large amount of albuminoids, and it is very rich as a feed. To avoid the expense of harvesting in the old way, I have sown them with oats for several years past as a grain crop, to be handled in much the same manner as oats; cut with a binder, shocked and stacked, and threshed as oats, at about the same expense and with no more risk. Peas when fed alone are entirely too rich, but when fed in connection with grains they give excellent results, no matter what class of stock you feed them to. I have even fed them to horses. When threshed, of course, they have to be ground for cows. I have fed them more for poultry and hogs. For a few years past I have also used them as hay, and I prize them more in using them this way than even as a grain crop. Of course they are not allowed to become fully ripe. I pay no attention to the maturity of the peas when cutting up, but cut the crop when the top grain of the oats is about right. I have cut them with a mower and raked them with a horse rake, but I prefer to cut them with a self-rake reaper where you can use your binder, throwing them in gavels, and allowing them to wilt in that condition. In wet weather it would be better to crop them the same as hay, but they are not so easily damaged as a hay crop is by a little exposure to dew or rain. In the past I have recommended seeding two bushels of peas to one and a half of oats. I think this is rather heavy, unless your ground is not very rich. As a rule I would recommend seeding a bushel and a half of peas, and the same of oats, varying this according to the quality of land, putting less peas and more oats on rich land and vice versa. You can learn readily by experience just what proportion of the seed should be used on the land. I

would advise, however, that they be sown, if possible, on fall plowing, and early in the season. I know the practice as a rule has been to allow the late seeding, and I see by a late report of the Dairy Convention that it was recommended there by Gov. Hoard to seed as deep as eight inches. I think three or four inches is sufficient, excepting to sow on the surface of the ground and harrow them in. The better way is to cultivate the ground thoroughly before seeding and then seed with a drill. With regard to the variety of peas, I would suggest I have used both Choice Field and Choice Green with equally good results. You should avoid, however, having mixed varieties of peas, as that sometimes occurs in seed sold on the market. This is one of the richest, most valuable crops that we can produce on the farm Of course I would not suggest its use to the exclusion of clover hay, but I think on many farms less clover hay might be used and fill up with this pea crop. I have fed this crop to horses the past winter, that is, the hay crop of peas and oats, cut up, using a portion of ground feed, about one-sixth of a bushel, with a bushel basketful of the cut feed, feeding twice a day, and I have never kept horses in better condition nor on cheaper feed, everything considered, so that there is no objection to feeding it to any class of stock that I am aware of.

Discussion.

The Chairman: Have you ever pastured peas and oats any?

Mr. Convey: No, sir, but it is an excellent thing to turn hogs on, but you can only feed for a short period. I think the pea crop would be a very valuable crop, for the Wisconsin soil and climate is adapted to its production.

Mr. Favill: Do you sow the oats and peas at the same time and bury them all three inches deep?

Mr. Convey: Yes, and the oats do well. I sowed the oats and pea crop on black prairie soil, and on my soil I find I get much better results in seeding deeper than farmers usually seed; in fact I believe from what I know that the oat crop of Wisconsin would have been at least ten or fifteen bushels to the acre more had the oats been plowed instead of being sowed with a broadcast seeder.

Mr. Noyes: Wouldn't it be better farm practice to feed the peas at the time when you couldn't get grass to the swine?

Mr. Convey: As a rule, yes, but I have fed the pea and oat crop to cows in the summer time and with grass.

Mr. Jones: I have fattened hogs for several years on peas, but lately a certain worm or weevil has gotten into my peas and eaten them.

Mr. Convey: It has not visited our part of the country and I believe there would be no bother about it where the peas are sown with oats.

Mr. True: I think that any of us will get satisfactory results from sowing our peas, or peas and oats together on well prepared soil, broadcast, and then putting them in by running lightly over with your disc harrow. It covers them very nicely.

Mr. Adams: Is not one of the chief benefits arising from the cultivation of the oat and pea due to the fact that combined they afford a ration which is well balanced and easily managed by dairy men who live distant from town?

Mr. Convey: That is one of the valuable features of the pea and oat crop. Not only the pea itself, but the pea straw when cut for hay is very valuable on account of the nitrogen it contains. The albuminoids are worth five times as much as the carb-hydrates, as a rule. If we had to purchase our nitrogen and put it on the farm, the same amount that we can find in a pea crop, it would cost us a great deal of money. I will guarantee it brings better results than feeding bran.

Mr. Hodgson: How is it for a soiling crop for a certain time?

Mr. Convey: I have had no experience with soiling with the green crop,

except feeding green corn, and I can see no reason why it would not be one of the most valuable crops for soiling purposes.

The Chairman: It is used on some of the Canadian farms as the main soiling crop. They sow at two or three different times, and they commence cutting when it is quite green, when the oats are just heading.

Mr. Adams: At what stage of maturity would you advise cutting for a hay crop?

Mr. Convey: When the top grain of the oats is about ripe.

Mr. Adams: If you let the peas get too ripe isn't there a tremendous loss in shelling out?

Mr. Convey: No, I think not. They won't get too ripe if you cut your oats at the time I speak of. I find the oats more matured than the peas as a rule.

Mr. Allen: A friend of mine has raised peas the last five years on heavy soil. He sows his peas first in the drill, and then puts the oats in afterwards. He gets his peas in deeper than his oats, and he has the best success that way. In putting them in with a harrow or a disc harrow they seem to be inclined to work to the surface.

Mr. Convey: For sandy land, or a black prairie soil, drilling oats at that depth will not be too deep, providing you give the ground a proper preparation before attempting to seed.

The Chairman: I have noticed that among the very best Canadian farmers they depend very largely upon this pea crop. Peas, or peas and oats, give us a highly nitrogenous food, and there are some advantages in raising that crop for a hay crop, as Mr. Convey speaks of. They are easily cured, and they ripen at a time between haying and harvesting, which is very convenient, and if it is very bad weather, so you cannot harvest early, you can let this crop stand till it ripens, and have it in another form. Along the lake shore in the eastern part of this state, pretty well north, they are raising peas very largely, and we have not found a farmer who has grown peas but who says they are one of the very best crops he can raise. I think Mr. Selle can tell us something about this. Tell us how many you raise to the acre.

Mr. Selle: Last year I got seed from the old country. I sowed two bushels and I got sixty-five bushels on about an acre and a quarter, which I sold for $1.05 a bushel. Then I bought corn and paid forty cents for it, so I got about two and a half bushels of corn to a bushel of peas; but if the peas were the same price as the corn I would keep them.

Mr. Bender: I have raised peas. I put them in with a drill, and a week after they are sown I sow the oats on top. The season was a dry one last year, but I succeeded in raising one hundred bushels of peas from seven bushels of seed upon three acres, and I think if the season had been a good one I would have had one hundred and fifty bushels at least. I mixed them with corn, and had them ground, and put half and half bran with them, and I found it an excellent feed for the dairy, so that I shall certainly sow more peas this year.

The Chairman: We have learned from this discussion that we must be careful in sowing peas to get them in a good fair depth. Do not depend on sowing your peas on the top and harrowing them in.

Mr. Selle: I generally pulverize the ground very fine and sow with a seeder and then roll in several times.

Mr. Bender: That is a great point. People should be particular about the preparation of the ground. When you get a uniform depth of peas on thoroughly harrowed and rolled ground, you will get a good, uniform crop. Even in very dry seasons I have succeeded in getting a very uniform stand of peas. I think if you are going to put the harrow on and sow your oats, you will get many of those oats in the drill mark, and they will help hold up the peas better than if the ground was harrowed first.

A Member: Can peas be siloed successfully?

The Chairman: Senator Palmer, of Michigan, last season put in the product of ten to fifteen acres of peas, oats and barley into the silo, and it was as profitable feed as I ever saw. It was run through the cutter. It was in the dough, both the peas and the oats. His man, Mr. Van Orman, claims he had never fed more satisfactory feed.

Mr. Bender: There is one point in this pea business. If you raise any amount, I don't see how you can stack them to save them all right.

The Chairman: First cover the stack with marsh hay and over this put a canvas stack cover.

A Member: I would like to ask what kind of soil is suitable for raising peas, and also if tiled marsh is suitable, and if so, what fertilizers, if any, are necessary?

The Chairman: One thing you must be careful about and that is, putting peas on too rich ground, or you will have a tremendous growth of vines and a small growth of fruit. An ordinary soil seems to do well with peas. They grow on all kinds of soil, but they fruit heavier on not too rich soil. They grow at Grand Forks, North Dakota, with great success, on that rich, black land. They will grow wherever they can get moisture.

Mr. Bender: I put my peas in with drills. I drilled them in four inches deep, then I sowed oats on top of the ground about a bushel to the acre, or two and a half bushels to the acre, of small Canada peas. I cut them with a mower, oats and peas together. In places the oats did not hold the peas up, but I made up my mind I could get the whole crop better with a mower than I could with the harvester. I put them up in bunches and dried them. I then put them in a sack and covered them, and threshed them with a machine.

A Member: How much did they yield?

Mr. Bender: I raised a little over 100 bushels on three acres, and it was a very dry season. I get them ground and put them with the bran and feed in that way.

The Chairman: Pea meal, gentlemen, is almost as good as linseed oil.

Mr. Bender: I will say heretofore I fed my cows corn ensilage, about forty pounds, with a mixture of bran, but I have never had my cows do as well as they have this year with the peas. I believe I formerly fed too much corn to the cows in the ensilage. We have never had as much butter from the cows as we have this winter.

Mr. Favill: You didn't try feeding the peas without threshing, feeding it as hay?

Mr. Bender: No, I didn't.

Mr. Favill: I have met some gentlemen who have done that. They would cut the oats as soon as they were in the dough, before they got very ripe; they would put up the whole crop the same as hay, and fed it as hay and saved the threshing and grinding, and they have gotten most excellent results.

A Member: Wouldn't it be better to run it through a feed cutter?

Mr. Favill: Yes, if you have a feed cutter. But these gentlemen are feeding it whole, as you would hay, and it was all eaten up with a relish, straw and all.

Mr. Bender: Do you think the cows like to eat the peas whole?

Mr. Favill: Yes, they have good teeth.

A Member: Mr. Bender, did you have an increase in the milk as well as the butter?

Mr. Bender: It would be hardly fair to compare it that way with the year before, but I will say the flow of milk has kept up better. The cows have been in better working condition, and the amount of butter has held up better on this feed than ever before.

A Member: I have cut most of my peas with the reaper and binder, as they are largely composed of oats and barley. I sow one bushel of peas to the acre, and one of barley and oats. In the first place I plow my land. I

sow my barley and then I drag it. That gets the peas in deep. Then I put my peas and oats in together.

The Chairman: I would like to ask the gentleman what is the reason for mixing that barley with the feed; why not put it all oats?

A Member: I think it makes a little heavier feed. I got in the habit of it anyway. I first went into that about eight years ago for soiling purposes, and having some left over, I found it very valuable to grind, and for the last five years I have raised it for that purpose, and whenever I have that I don't have to buy any bran or any other feed. I think barley is an excellent feed for milch cows.

The Chairman: We must all consider what we are going to do with what we have, in the economy of our dairy farming. Now, we are paying out hundreds of thousands of dollars to Minneapolis for bran when we ought to keep that money in our pockets; at least we ought to keep two-thirds of it, and we can do it if we have sense and wit enough to grow peas. The pea is a deep rooting plant; it needs to be planted and covered deeply. Everybody has been planting them on the surface of the ground, then when there comes a rain storm their bones whiten the field. Peas should be planted not less than four inches deep. Now, I want to show you a little calculation. You take ordinary bran today at $15 a ton. Now, two pounds of pea meal, as near as I can find out from men who have tried it, and from a little experience of my own some years ago, is equal to six pounds of ordinary bran, as a butter food for the cow. Now, if that be true, you can produce on ordinary land easily 25 bushels to the acre. Mr. Bender produced 33 bushels. 25 bushels will give you 1,500 pounds of pea meal At the rate of 2 to 6 the value would be equal to 4,500 pounds of bran. That would be $33.75 for your peas per acre, which you have saved at home, and which you have put in your own pocket. You have saved paying it all out, and I tell you, my friends, that when we get at this pea experience we will find it will prove a great thing for the State of Wisconsin if we will only study it a little more.

CLOVER AND CLOVER HAY MAKING.

C. H. EVERETT, Beloit, Wis.

I will not take up any of your time in discussing the value of clover. That subject has been thoroughly discussed and accepted, so I will go at once to making clover hay. I want you to remember, however, that clover is a valuable crop to raise. It stores up the nitrogen for future use; the liberal use of clover will make our soil richer, and it makes a heavier soil work easier. The deep roots penetrate the soil and loosen it up, and act largely as a subsoiler, and if we sow it with all small grains our farms will be comparatively free from weeds.

Clover hay is something that is difficult to make; it has the highest feeding value of any, and it is the hardest to make into good hay. It is hay that heats very severely, more so than any other. It must always heat somewhere; that process has to take place, and it is usually in our barns and hay lofts, and when it takes place there it is always at a loss of feeding value. Nothing can ferment and heat without

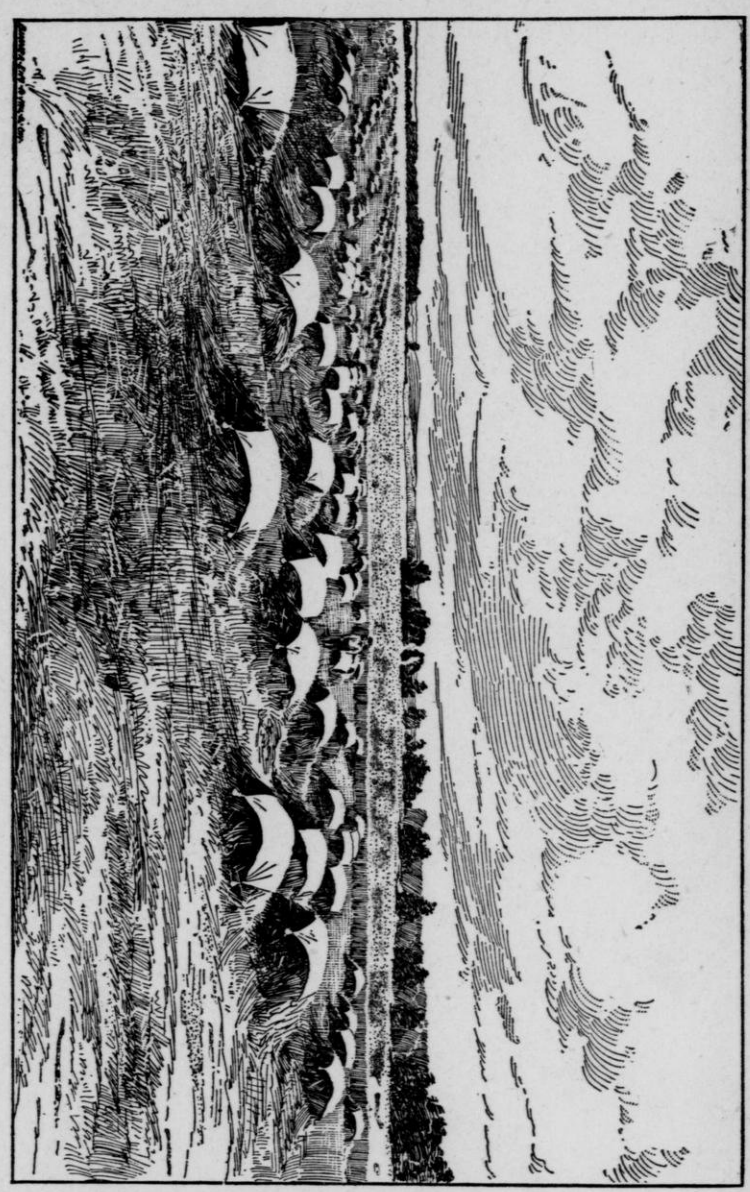
there being a loss in feeding value. With my method of making clover hay, the method that I adopted four years ago, and which gives me entire satisfaction, I can make as good hay one year as another, although last year the quality of my clover hay was not as good as I would have liked, owing to the very dry season. But I get a certainty of success one year with another by that method that I have never been able to get, or ever seen any other man get, by any other methods that are commonly in use. I sweat the hay in the field, cut it down, cock it up green and let it sweat in the pile.

Hay Caps.

I have to protect it from the rains and dews, and it is necessary that I provide myself with something to protect it, so I use hay caps that are made of cotton cloth. I have five or six hundred and they are made a yard square and cost me about seven cents apiece, ready for use, seven dollars a hundred. I will say right here that if I were to make them over again I would make them a yard and a quarter square; it is a better size. I fasten these caps onto the hay by using a weight at each corner. The first year that I adopted this method I used wooden pins about twelve inches long, fastened by a string to the corner, but that caused me trouble. They were light, and the pins were constantly blowing in the wind, and they would become unfastened and bothered us; sometimes they would work to one side and the wind would blow the cap off the hay. It was also more work to put the cap on that now that I have adopted the stones. I can take hold of the cap and throw it over. The stones that are used as weights can be readily picked up, I think, in your country. They weigh about four ounces, and should not weigh less than that. They are tied up in a little piece of the same kind of cloth, just large enough to tie up nicely, and then tied by the same string to the cap itself. The string should be very strong hemp and fine; if you use coarser it will perhaps work loose.

When to Cut.

We cut the clover hay when it is in full bloom. It has more feeding value then than it ever has at any other time. The object of the clover plant is to mature seed, and after it is in bloom the stalk becomes hollow and woody. If we wish to make the best quality of clover hay we cut it while the foliage is in the best possible condition, and can be saved in that condition. By cutting at the time I speak of and handling it in that way it is saved entirely. By the method usually in use you lose a large part of the plant; it is lost in the barn and in the field. By this method the hay is absolutely free from dust, if it has been properly sweat out in the field before it is put into the barn, after being aired. Your hay does not reheat in the mow or in the stack; that takes place in the field. I will handle fifteen acres here, very briefly, right before you, as I do on the farm. Fifteen acres of clover will require four hundred of these hay caps. If you are cutting fifty acres of clover, you cannot use more than a thousand of them to good advantage. I will commence cutting this morning after the dew is off, and I will cut down enough to make, perhaps, six loads of hay, or 150 cocks of clover hay as nearly as I can guess at it. After dinner it is raked up and cocked up. I don't care to cure it; I like to wilt it; the better I can wilt it the better I like it, for the simple reason that it handles better. It is quite stiff to handle after it is cut, and it does not cock up as nicely as after it is wilted. After it is put up in cocks and covered, it is left there three or four days, until it sweats out. We are never certain what the weather will be; even last year the only rain we had came right in haying time. On the fourth day the hay that was cut the first day is sweat out sufficiently to be aired, so the caps are removed and it is left to air. It must be aired. It was



C. H. EVERETT'S CLOVER FIELD.

put up green, you understand, so those cocks of hay will settle down solid, and when you open them up you will think they will never cure out, but three or four hours in the air makes perfect hay. It drives the moisture all out of it, leaves it in fine shape, ready for the barn, and the foliage is all retained there in it. It has a bright color and a sweet flavor, and you get it into the barn in the best possible shape. In opening that hay to air it is not necessary that you tear it all to pieces. You merely take four or five forkfuls and turn it over in two rows. Your judgment will tell you just how much you need to loosen it up to let the air through it to dry out the moisture that has settled there. It is then perfectly made hay. The caps that we take off the hay that morning can be used on hay that is cut that morning, so that after the first four days we have four, five or six hundred cocks of hay in the sweat, and we commence to draw in the hay that was cut the first day, and so on, putting up as much each day, readily handling 150 cocks daily. These hay caps are very valuable in making oat hay. I make it almost exactly as I do clover hay, cutting the oats when in the milk, sowing them thick in the first place, cutting them in the milk when the straw is green, wilt them, cock them up quite green, cover them with hay caps, let them sweat two or three days, then open out, and I have good hay that pays good feeding value. It is better in my judgment to make oat hay that way than let it stand long enough so you can cut it in the binder, when you have lost the feeding value in the straw. I can also make millet hay in the same way, and I have no doubt that would be a valuable feed. These caps are as effectual in a rain storm as a canvas cap. It sounds big to some men to say that a piece of cotton cloth will shed water as well as canvas, but it will do it. In a twenty-four hour rain it will sweat under that cap all right, and will not get wet. There have been several thousands of these caps made throughout Wisconsin last summer, according to the directions that I gave last winter, and I have yet to find a man who has made and used them who is not pleased.

Discussion.

Mr. Sampson: Two years ago I went and bought a lot of cloth. I didn't put the caps on the first day but I did the next. There came a rainy time and the hay all got mouldy in the hay cocks, and I didn't like it at all. We don't know whether we made our hay according to the proper rule or not, but we always like to get at it as early in the morning as a sickle will run and cut hay, and then get a tedder and go over it and give it a good shaking up, and draw it in the next day, take it to the barn and let it sweat; another objection, I should think that when that hay was airing, if a thunder storm came up, it would ruin it completely. It seems to me this plan is a pretty slick one and ought to work.

Mr. Everett: We are enabled to put up fifty tons in twelve days by that method, and we are satisfied. We are careful not to open out that hay to air if we think it looks as if it were going to be stormy. Sometimes we will get caught, but the hay isn't very badly damaged. We only open up what is cut in one day, six loads. Of course you can sweat the hay without the cap.

Mr. Hyatt: The best hay that can possibly be made can be made in the way Mr. Everett says. If our time is worth more than the better quality of hay, is a question for us. I think, however, farmers want to be cautioned not to cut the hay up too green in damp, wet weather.

Mr. Hayes: There is one point that Mr. Everett ought to have explained fully, and that is that the cocks should be small. When his hay is cut he lays on about four or five forkfuls. If you tedd this hay, you can't cock it nearly

as well; the cocks must be put up with a small bottom; that is the great secret.

Mr. Chadwick: If you use the Eureka mower you won't need any hay tedder, and your hay will cure better if you cut it down with a hay cutter.

Mr. Bloor: You say, Mr. Everett, that you prefer to cut when the hay is in full bloom. Now, you have 150 tons to cut; if you are going to cut only so many cocks each day, if you start when two-thirds of the heads are out, by the time you are through won't it be a little too far gone the other way?

Mr. Everett: I always commence when the field looks universally red, and that is the time when it is about two-thirds in blow. Then we get through before any of it has become over-ripe.

Mr. Cole: I purchased several hundred of these hay caps last season. The only storm we had came in haying time; one blew over the hay cocks, so they were no good then, and the next storm wet through all the hay cocks that didn't have caps on, while those that did have caps on were all right. I was well pleased with them. Even if you do not use caps I believe that this is the proper way to make clover hay, but with the cap you are absolutely safe.

Mr. Thayer: Have you tried cutting your clover in the evening and letting it lie the next day?

Mr. Everett: Perhaps there would not be any serious objection to that plan, but I never have tried it. I aim to cut in the morning and get it under the caps the same day.

Mr. Sampson: I don't see why these caps, made long enough to cover a shock of ten bundles, wouldn't save a good many thousand dollars in barley. Two or three years ago I got in a thousand bushels of my barley before rain came, and that I sold for 52 cents a bushel, while that that the rain got on I only got 30 cents for, and it was all exactly alike to begin with, only one got caught in the rain.

Mr. Everett: That cap would cover a round shock of ten bundles.

A Member: I have shocked barley and put a round cap on it, and I have shocked it long and capped it.

Mr. Cole: I used some of those caps with very good effect; I also use them on oats and peas.

The Chairman: We want to get at what has been brought out by this discussion. First, it seems that clover hay is hard to make; I guess we all know that. Another thing is there is a great difference between good and poor hay, so that the method that will cure this hay in the best manner and with the least risk is what we want. In our experience this method described by Mr. Everett gives us the best forage hay. In cutting the grass green and letting it wilt a little and putting it in nicely shaped cocks, we find it will stand considerable rain, whereas dry clover that is allowed to dry and then cocked up will preserve moisture a long time. In cocking green we can get along even without the cap, but the hay cap is a good thing in keeping off moisture. The best way to settle whether you agree with our friend, Mr. Sampson, or with Mr. Everett, is to buy a few caps and try them. Let us carry these suggestions home in our minds and apply them according to our circumstances.

THE OAT AS A GRAIN AND FORAGE CROP.

L. H. ADAMS, Madison, Wis.

For several years past, especially since the advent of the silo, we have had the corn plant on the witness stand before us, bearing testimony as to its fitness to hold first place on our farms as a forage crop. It has been thoroughly questioned by the farmers and cross-questioned by the experiment stations for the purpose of finding out its weak points, and satisfying ourselves that it was abundantly able to fulfill the mission that its enthusiastic friends claimed for it. The result of this investigation has been that the superior merits claimed for corn have been quite generally conceded by all those who have learned to utilize, without waste, both the ear and stalk of the corn plant.

Is it not in order to next call the oat crop in question, inasmuch as it ranks next to corn in importance on the stock farm, especially, if not the grain farm?

If we discovered in our experience with corn that it was reckless extravagance to waste the stalks the way we did, how is it with the oat straw that is usually piled up in a great heap back of the barn, to be washed and bleached out by the weather and trampled under foot by the inhabitants of the barnyard?

The Usual Way.

It cannot be said that those who follow this practice with straw do so under the impression that it possesses no feeding value whatever, for the truth is that they generally set great store by the straw pile as a means of subsistence for the motley throng that gather around and burrow in it until some morning the hired man reports a steer, two or three hogs and a cow or two missing, and it only takes a few minutes of brain work for the owner to make up his mind that they are lost to mortal view under the straw pile. The same individual, after he has exhumed the various animals from the bowels of the straw stack and done all in his power to relieve the more fortunate (?) animals that sustained but slight injury and left direction with the hired man to skin the rest, will sack up fifteen or twenty bags of oats, and drive eight or ten miles to town, and stand on the market all day to get twenty-eight cents per bushel at night, when he might have taken twenty-seven for them in the morning, and got home in time to put in a half day. It is difficult to understand the reasoning that governs the farmer in paying so much attention to the lesser half of the crop and treat with so much indifference the larger half.

Proportion of Straw to Grain.

An average of a number of observations made by the Illinois Experiment Station shows that the proportion of straw to seed is 1.84 pounds of straw to one pound of grain, or something over fifty-eight pounds of straw per bushel. A yield of forty bushels of oats per acre, then, would yield 2,320 pounds of straw, which contains about 390 pounds of digestible nutrients above what would be found in the grain that came from the straw. When it is intelligently cared for and properly fed out, straw is worth nearly as much as timothy hay. An experiment that is described in the eighth annual report of the Wisconsin Experiment Station, by Prof. Craig, shows in a very convincing way the economy of oat straw as compared with corn fodder and blue grass hay for maintaining breeding ewes during the winter season. The ewes, which were grade Shropshires, were divided into three lots of four each.

Feeding Oats to Ewes.

The feeding covered a period of eight weeks with the results given as to amount of food eaten and the cost of each ration. If the price of straw given is considered too low—and I am nclined to think it is—it still appears from a comparison of the three lots that if the straw was priced at five dollars a ton it would still afford the cheapest ration of the three.

Cost of Rations Used in Maintaining Four Breeding Ewes Eight Weeks.

LOT 1, CORN FODDER.

392.5 lbs. corn fodder, at 20 cents per 100 lbs.	.78
704 lbs. sugar beets, at 10 cents per 100 lbs.	.70
56 lbs. oats, at 88 cents per 100 lbs.	.49
56 lbs. bran, at 60 cents per 100 lbs	.33
Cost of maintaining four ewes eight weeks	$2.30
Cost of maintaining one ewe one day	1.4c

LOT 2, OAT STRAW.

262.5 lbs. oat straw, at 15 cents per 100 lbs.	.39
704 lbs. sugar beets, at 10 cents per 100 lbs.	.70
56 lbs. oats, at 88 cents per 100 lbs.	.49
56 lbs. bran, at 60 cents per 100 lbs.	.33
Cost of maintaining four ewes eight weeks	$1.91
Cost of maintaining one ewe one day	.8c.

LOT 3, HAY.

343 lbs. hay, at 40 cents per 100 lbs.	$1.37
704 lbs. sugar beets, at 10 cents per 100 lbs.	.70
56 lbs. oats, at 88 cents per 100 lbs.	.49
56 lbs. bran, at 60 cents per 100 lbs.	.33
Cost of maintaining four ewes eight weeks	2.89
Cost of maintaining one ewe one day	1.2c.

In the light of these facts is it not a rather expensive material with which to bed cattle, and is there any reasonable excuse for it in these days of low prices and fierce competition?

There is another side to the oat question that is somewhat difficult to bring out so that it will be properly appreciated, and that is the intrinsic value of the oat in the hands of the skilled feeder, when it is employed to balance up the rations of mature animals, but more particularly when it is used to develop substance and quality in the young growing things on the farm, from the colt to the pig. It is impossible to ascertain the true worth in dollars and cents of a food product that enters so largely into formation of bone and muscular tissue as does the oat.

Oats Judged Unfairly.

If we were to judge of the comparative worth of oat and corn meal solely by the difference that the scale indicated between animals fed on either, by itself, we would be sure to do the oat an injustice, for the cornmeal will make the biggest showing every time. Data as to the actual money value of the oat when fed alone for increasing the live weight of animals is not very plentiful. Prof. Sanborn, in the second annual report of the Utah Agricultural College for 1891, page 23, reports an experiment with six lots of pigs of three each where one lot received nothing but oats. "They were fed three times a day, the food being made into a dough." Figuring oats at twenty-five cents per bushel, the cost of making one pound of gain with oats alone was five and one-tenth cents. Compare this with three and six-tenths cents, which was the cost of making one pound of gain on the same experiment with corn alone, figured at thirty-five cents per bushel, and it places the oat at a great disadvantage. But these figures do not give the whole truth, since it is reported further on by Prof. Sanborn that in a

subsequent experiment with these same hogs that "the corn fed lot broke down," and further "that an examination and an analysis of the dressed carcasses showed that the oat made the most solid and best appearing flesh." I quote this for the purpose of showing what an unsatisfactory light can be thrown upon the oat when it is not fed to the best advantage.

Oats and Hogs.

In an experiment made at our own station with hogs fed oats and cornmeal in different proportions it was found that where the ration was composed of one-third ground oats and two-thirds corn meal the cost of making one pound of gain at the prices quoted was two and seven-tenths cents. Let us group the cost of the different rations together for better comparison:

Cost of one pound of gain with oats alone..... 5.1c.
Cost of one pound of gain with corn meal..... 3.6c.
Cost of one pound of gain with 1-3 oats and 2-3 cornmeal..... 2.7c.

It is apparent from a study of the above figures that oats, when intelligently used, will serve an admirable purpose in reducing the cost of heavy rations intended for fattening purposes.

The next and last side of the grain question that I shall discuss is the actual money value of the oat when fed to the dairy cows, as against bran.

Bran and Oats.

The oft-repeated and sometimes wild assertions made as to the relative value of oats and bran made it necessary for the station to set about obtaining some definite information on the subject, and as the result of two experiments with cows in full milk it was found that when fed pound for pound the cows invariably did better on the oats, going up in milk when oats were fed and down when put upon bran, and to quote Mr. Woll's words in the seventh annual report of the Report of Wisconsin Experiment Station, page 65, "This result was shown to have been produced from about equal quantities of food materials in the two cases, and the oats, therefore, seemed to have a higher nutritive effect with milch cows than has bran. When the financial aspect of the question is considered, it will be seen that at the present market prices of the two feeds—bran $11 per ton and oats 28 cents per bushel—the former is the cheaper food of the two. The conclusion reached by the two experiments is, that when the difference in price between the two feeds is greater than ten per cent. in favor of bran it is not good economy to feed oats to milch cows in preference to bran." Or when bran is worth $14 per ton oats is worth very nearly 25 cents per bushel for milk production.

These figures do not take into consideration the manurial value of the two foods, nor the additional cost to the farmers of the bran over and above the market prices by the time it is delivered to his farm. This item of expense will be offset, however, by the cost of grinding the oats which must be added to that side of the question.

Thus far we have confined the discussion of the value of the oat crop to those who regard the grain only as being worthy of serious consideration, and it appears to me right here is where the most serious mistake is made.

Cut the Crop in the Milk Stage.

If, instead of allowing the crop to stand until dead ripe, in order to bind up at once, as is usually done, we were to harvest it when the grain is in the milk stage, preferably, with a self-rake reaper, or, in the event of not having that machine, then with the mower, and give the crop the same intelligent care that we willingly give a grass or clover crop, the result would be that we would not only save the cost of the threshing, which single item of expense amounts, when all things are considered, to nearly one-fifth of the price usually obtained for the grain; but we should have a hay that contained about

twenty pounds more of digestible nutrients to the ton than does clover hay and twelve per cent. more than is contained in timothy. Moreover, the grain left in oat hay does not reach the animal in excessive quantities, and by reason of its being eaten along with the straw is well masticated, and in this way another item of expense for grinding is obviated that is met with when feeding the threshed grain.

Right Treatment of Oats.

Should not the advantages that I have enumerated arising from a more rational treatment of the oat crop be sufficient to overcome the great temptation that is due more to force of habit than anything else, to let the oat stand until the straw has become so dead ripe that the self-binder may be rushed over the field and the straw compressed in bundles?

There is great danger of loss from the crop lodging when it is left to become so exceedingly ripe, for after passing a certain point of maturity the process of breaking down and decay sets in, and it is hard to get the full feeding value out of such straw, for what nutriment it does contain is put up in such an unprepossessing package that horses and cattle cannot be induced to eat it without great waste.

Threshing or Non-Threshing.

I do not contend that there should be no threshing of oats, for under some circumstances it is very necessary for the feeder to have the threshed grain, but it is undoubtedly true that a very large part of the oat crop of this and other states is handled in such a way as to cause a very heavy loss of food elements.

Perhaps the worst feature connected with the management of the oat crop in the way I have indicated is the trouble sometimes caused by mice working in the straw. Trouble of this nature can be largely overcome by stacking the oat hay conveniently near the barn, and then hand it in as required for feeding purposes, and run through a cutting machine enough to last two or three weeks, or even a month at a time. It is said that there will be no trouble from mice burrowing in this pile of loose chaff, as it is difficult for them to work through it. As far as my own experience goes I have never had any trouble of this nature, and we have put considerable quantities of oat hay in the mow at the station farm for the past two or three years.

In conclusion, if our progressive beef and milk producers have learned by dear experience that they cannot afford to waste their corn fodder, how much less can they afford to treat with indifference even the threshed out straw, which contains sixty-five pounds more of digestible food material per ton than does the former?

Discussion.

Mr. Everett: Was there any difference noticed in the butter fat from the cows when oats and bran were fed? You say there was a difference in the amount of milk, was there any in the butter fat?

Mr. Adams: The fat went up invariably when oats were fed, and down when put upon bran. There was more milk given and therefore more butter fat.

Mr. Goodrich: Do you consider oat hay or oat straw a good feed for milch cows?

Mr. Adams: I most certainly do, from our experience at the farm in feeding. We are feeding it this winter.

Mr. Sampson: When I began farming sixteen years ago I settled among some Welsh and English farmers, who kept sheep, and I found that their straw stack was considered one of the most valuable parts of their fodder. I know that you can feed straw to your sheep and make first-class mutton of it, and you can feed it to your cows; you can feed barley straw. I am glad to have this from the Experiment station; I am glad I voted $5,000 to them last winter,

and I will do it again. I tell you, gentlemen, that straw is worth money; it is worth more than poor clover hay. You can raise barley and mix it with oats and make money out of it. Those Welsh and English farmers have taught us a good many other things.

Mr. Hyatt: In cutting the green oats, did you do it with a self-binder and bind it very loosely? I find that it must be done that way; bind it as loosely as it can be done in small bundles and set it up, and put on Mr. Everett's hay caps. I want to know about the condition of the cows at the end of this experiment; isn't it better than if they were fed on bran?

Mr. Adams: I don't care how rich any food is in the various nutrients, it will not do to feed on it alone. We can't get along without clover hay along with our oat straw, for the clover is rich in albuminoids where the oats are a little lacking, but by feeding the two together, and the grain being in the straw, then by adding corn that you raise on your own farm you get a ration that is mighty hard to beat, and if the bran is high priced in your locality, as we all know it is going to be, you have a very good substitute for it by feeding your oat straw and some oil meal and corn and you will have a ration that, in my opinion, will give you just as good results in milk production as bran and corn meal mixed together.

Mr. Convey: All things considered I think the paper read by Mr. Adams is one of the most valuable that has been read in our institutes. I believe you can get all the nutrients in the form of hay. Some one has spoken about mice here. You need apprehend very little trouble from them when this hay is put up in bulk. They will find it more convenient to work at the grain bins or the corn cribs than to forage around in oats put up loosely. The only improvement I could suggest would be the addition of more or less peas, as Mr. Adams admits that pea straw is even more valuable than oat straw. I wish Mr. Adams would explain how it is that the difference in the number of pounds where oat straw is compared to timothy hay is less than where it is compared with clover hay.

Mr. Adams: The oat straw being richer in carbonaceous elements, the fat making elements, than timothy hay, balances up where the oat straw is lacking in albuminoids.

Question: You said that clover hay represents twenty pounds less feeding value and timothy hay twelve pounds?

Mr. Adams: No; twelve per cent. That is, in one hundred pounds of the straw there would be twelve pounds more digestible nutrients than in 240 pounds of the timothy. In other words, the oat hay was twenty pounds better per ton, that is, 240 pounds better than a ton of timothy.

Mr. Thayer: Is the value of oat straw as a feed relatively the same for all animals? You gave it to the sheep only.

Mr. Adams: I think that when the grain has been taken off it can be used to the best advantage with those animals that are not doing heavy work on the farm. Take a farm team of horses; they could just as well live on a nice bright article of oat straw through the winter as to be giving them Mr. Everett's nice clover hay, which would come in better later on, when they were heavily worked, and the same way with the dairy cows. The oat hay, when it is cut green, with the grain all on, is an excellent feed for the dairy cow, but we must understand that it is richer in the protein elements, the grain being with it, than when the grain is taken out, and therefore, if you feed the oat straw to the dairy cows, you must not feed it in too large proportion; you must feed enough clover hay along with it to balance the parts where the oat straw is a little weak.

Mr. Scott: I agree with the Dodge county man in regard to cutting oats a little bit green and then feeding it. I have been doing it several winters,

feeding it to my horses and sheep. They eat it all, and so do my cattle.

Mr. True: I do not want to detract in the least from what I consider the value of oat straw. As it stands at this time I am willing to concede to my friend, Sampson, all he demands for his bright oat straw, and I don't know but that straw as he handles it would be better than clover hay, handled as he handles clover hay, but putting the hay, as I know it is produced by my friend, Everett, against the straw stack, the straw stack has to be remarkably good.

Mr. Goodrich: I consider that corn is the cheapest feed that we can raise for cows, and I want them to have all the corn that it will do to feed them, and have a well balanced ration. Now, as I understand it, corn is highly carbonaceous, as also is oat straw. Now, if I feed all the corn that I can afford to give them, it seems to me that I ought to give them clover hay, and I want the oat grain to balance it up, and leave out almost all the oat straw. I let them have what little they want, but I don't want them to be forced to eat it. Am I not right, Mr. Adams, to feed all the corn I can, because corn is the cheapest feed? And then shouldn't I balance that with oats and clover hay, and leave the oat straw out pretty much?

Mr. Adams: When I spoke about the value of oat straw for dairy cows I meant with the grain on and made as a hay. The addition, then, of grain to your straw, furnishes the protein elements and increases its value. I am willing to concede all the enthusiasm that these gentlemen have for clover hay; it should go along with the oat hay, but the point I tried to make is this, that there has been a great leakage in the handling of the oat crop; that we could save a great deal of feeding value in the oat crop if we were to handle it with a little more care.

Question: Do you sustain much loss in your oat crop by smut?

Prof. Goff: The percentage of loss from smut varies greatly in different seasons, but I have never seen a field in which the seed was sown without treatment where a close examination would not discover more or less smutted heads. In 1889, which was a very dry season, the loss at our station, determined by careful counts, was less than one per cent. In other seasons it has been very much greater. A field may have one-tenth of its heads destroyed by smut, and yet not appear to the ordinary observer as being badly affected. In 1888 and 1889 the losses on the experiment farm at Manhattan, Kansas, varied all the way from 3 to 25 per cent.

The hot water treatment recently developed by Professors Kellerman and Swingle, at the Kansas experiment station, is so cheap and so effective that there is really no excuse for any farmer having a smut in his oats. The increased yield from the clean seed will abundantly repay the slight cost of the treatment. For the benefit of those who have not the directions for this treatment at hand, a description of the process is here given.

Method of Treatment for Wheat.

Have two kettles of water not more than two feet apart. Kettle No. 1 should contain warm water (from 110 deg. to 130 deg. Fahrenheit). The water in kettle No. 2 should be heated to 135 deg. Fahrenheit. "The first is for the purpose of warming the seed preparatory to dipping it into the second. Unless this precaution is taken it will be difficult to keep the water in the second vessel at the proper temperature." The seed to be treated should be placed in a sack that will allow the water to pass through readily (a coarse gunny sack is good). According to the size of the kettle the sack may contain from one-half to one bushel. A less amount will make the process slow and a larger amount will be unwieldy, and some of the kernels may escape treatment. Dip the wheat into kettle No. 1, lifting it out and plunging it in two

or three times. This process will take but a minute or so. Now dip it into the second kettle with water at 134 or 135 deg.; keep the wheat well stirred. Perhaps there is no better way than to lift it out and plunge it in several times. This should be continued ten or fifteen minutes, according to the temperature of the water, and then spread out to dry. A second person should regulate the temperature of the water and do nothing else. Probably it will be found best to have a fire under kettle No. 2 sufficient to raise the water to 145 or 150 deg. Fah., and then add cold water to reduce it to 134 or 135 deg. F. when the seed is put in.

If at the end of ten minutes the temperature of the water has not been reduced below 133 deg., the seed should be removed and dipped into cold water. If below 133 deg. F., it should be left in fifteen minutes or even longer if the temperatuer should fall below 130 deg. F.

For Oats.

The treatment is essentially the same for oats, except that the temperature of the water in kettle No. 2 should be 139 or 140 deg. F. when the oats are put in. If at the end of ten minutes the temperature is not below 135 deg., the oats should be removed and dipped into cold water; if below 135 deg., they should be left in fifteen minutes, or even longer if the temperature falls below 130 deg. F. When taken out dip in cold water.

The Institute adjourned until 1:30 p. m.

AFTERNOON SESSION—MARCH 17th.

STOCK FEEDING SESSION.

The Institute met at 1:30 p. m. Mr. Geo. McKerrow in the chair.

SWINE FEEDS AND FEEDING.

A. SELLE, Mequon, Wis.

Mr. Chairman, Ladies and Gentlemen: I was requested by Superintendent Morrison to write something upon feeding hogs, for this Institute. Whatever induced Mr. Morrison to assign me this subject, or any subject at all, is more than I know. I do not see how I am to enlighten so large and intelligent an audience as this, and it is hardly fair to get me in with such old veteran breeders, who have been in the business almost as hany years as I am old. but I hope no one will expect me to say anything new or startling.

Almost all kinds of food lack some important elements in their composition, when fed alone, except milk. For instance, use corn and water alone, and in a short time the pigs will become costive and feverish and the appetite grow less. Under all circumstances our domesticated hogs need a variety of food to keep up a keen appetite, and keep them in a healthy and thrifty condition, and if the object is to induce them to eat as much as possible, nothing is so calculated to stimulate the appetite as variety; but for growing hogs this variety should not be all of a concentrated character, as corn, peas and barley, but rather make up half the ration of a coarser or more bulky texture, as clover or ensilage, having less heat-producing and fat-forming elements.

At present prices pork cannot be profitably produced on an all-grain ration, neither can it be produced on an all-grass ration. Where hogs are raised on a large scale, corn still is the handiest food, but there is no manner of doubt that it is sometimes used unwisely and harmfully, and the hog crop is being raised every year often at a loss, when it might be at a greater gain.

Diversity of Feeds.

In hog feeding there are a good many things to be considered, and it is believed by a large class of people that hog feeding is as simple as that two and two are four, and the idea of conducting a system of feeding seems to them regular nonsense. The foods that are used for feeding are numerous, and you cannot turn up anything grown on the farm that a hog will not eat. But in order to obtain the best results, the feeder should be a little acquainted with their elements, also with the relative quantities required for sustaining the animals and maintaining their growth. There are certain foods, excellent in their way, when given judiciously, which are useful to pigs, but which, without the addition of other substances, would not only fail to increase their weight, however large the quantity given, but would prove not sufficient to keep them in a healthy condition. The cheapest food for hogs that we can raise is clover or grass, and in corn we have perhaps the best food for fattening that can be found. The corn is brought to the feeding places and

simply thrown on the ground where the hogs help themselves and pick up their food out of the dirt. Most of the stables are nothing but miserable little shanties, very often a fence corner, where the hogs must live in filth and dirt, tormented by all sorts of vermin. Now I will say that it is not necessary to have an expensive or stylish hog-house, but their sleeping places should, in all cases, be clean and dry, well ventilated, and well provided with bedding. Rye straw makes an excellent bed for hogs, and they will appreciate it as much as their owners do a feather bed. When hogs are lying without shelter and in wet stables, they are liable to pile up in their effort to keep warm, and often the under ones are suffocated, or all are liable to scald, or grow mangy, and wet bedding will also produce coughs and distemper, and if a contagious disease is around in the neighborhood they are just ready to catch it.

Hot-Bed of Diseases.

Such methods of feeding and handling hogs can in no way be recommended to our Wisconsin farmers, and it is really strange that hog diseases do not appear more frequently, for filth, with improper food, is the genuine hot-bed of diseases.

The hog, in its natural, wild state, is more vigorous and enduring than when domesticated, and therefore less liable to disease. But as raised and fed under our handling, close breeding and high feeding, it is one of the most sensitive animals on the farm. Disease is not natural to the hog any more than to the horse or cow; it does not get sick easily, but will succumb to some diseases so rapidly that assistance often comes too late. They are, in many cases, not observed to be sick, until they creep around, hide themselves, refuse food, and finally die, very often without the owner knowing what ailed them. The diseases of hogs are more difficult to diagnose than of other animals, as their obstinacy or stubbornness makes a thorough examination almost impossible. On the other hand, many symptoms, as, for instance, the pulse, cannot be made proper use of. The first reason makes the treatment more difficult, as they refuse to take medicine, and the result is naturally less certain than with other animals. It is therefore in the interest of the hog raiser to prevent disease by proper care and food, for in the mistaken idea that a hog can stand everything, it is not taken proper care of in many directions.

The manner of hog raising, and the kind of breed most profitable for each particular farm, cannot very well be indicated, as this is a matter of taste or fancy, and all popular breeds are good and have their advocates. One of the first important points is the condition of the sow at the time of breeding. She should be in a good healthy condition, well developed, but not too fat. When she is pregnant I give her free exercise in the yard or field, and I do not feed her too much corn. A slop made of ground corn, oats and middlings, mixed with steeped clover, also vegetables, and all kinds of roots, are good. If one has skim milk it is still better to mix the slop with that, as there is less danger in over-feeding, and the bowels are kept open and regular, which is a good point.

Oats for Hogs.

Although oats are a natural horse food, it is very beneficial to give it to growing pigs as well as to breeding stock. Next comes farrowing time. Each sow should have a separate pen, in which she is put a week or two before farrowing, in order to get used to it, and not be fretful. Do not use long straw for bedding; a few baskets of coarse straw will do. After the sow has farrowed do not commence to stuff her at once, with strong slop or heavy feed. The first day or two she needs almost nothing, only a little warm water, then a light slop made of clover leaves and middlings, for a few days, and increase her food gradually. Give her some oil-cake meal once or twice a week, and don't forget to add skim milk.

When the pigs are about three weeks

old they will commence to eat, and it is a good plan to have holes for the little pigs to slip through into another pen. In this I put shallow vessels, with milk and ground feed or soaked wheat and corn to induce them to eat. From this time on I give the sow plenty of good rich slop, made of middlings, corn, oatmeal and bran. Nothing will increase the flow of milk like bran, and I very seldom forget to add skim milk. Also push the little ones. Give them all they want to eat; keep them growing all the time, and don't stunt them. The most profit I get out of a stunted pig is to knock him on the head. If at the end of six or seven weeks the piggies are growing nicely and look well, we may think of weaning, but it should not be determined by their age, but how they are eating and growing, and their ability to take care of themselves. I continue to increase their feed, and begin to diminish the feed of the sow. This must be done gradually and continue two weeks. I then take away the two strongest ones in a litter; the next two days two more, and so on till all are weaned. This will prevent a caked or spoiled udder, and if there are any smaller ones in the litter, on account of poor teats they can keep up with the rest.

I then put them on the pasture when the weather is suitable, as that is the best place to keep them. If you keep them shut up in an old pen all summer, with their unhealthy surroundings, and bad atmosphere, which is particularly injurious, you are losing money.

Early Maturity.

Another important point is successful fattening, and the sole end of hog breeding is to obtain a large quantity of meat, of a good quality, in as short a space of time as possible. A cheap and quick fattening depends greatly upon the health and age of hogs, as well as upon the season and condition of the food. On account of the rapid digestion, hogs cannot assimilate from the dry food, and it should therefore be prepared in such a manner as to make the loss as small as possible. I would prefer all grain, ground fine, only for a change I give it whole, but well soaked. Some good feeders are in favor of giving all grain, as corn, well soaked, and never would feed it ground. Which of the two will give the best results any one can find out easily, by giving both methods a trial. To begin to fatten lean hogs with rich food from the start is a wasting. Full rations of corn or peas ought to be left for the finishing of the process. I feed three times a day. The same amount of feed, given in three portions, is better than given in two portions. Feeding should be done regularly at the same time each day, and not too early in the morning, for to get up too early does not suit a hog any more than myself when I have to get up and build the fire on a cold morning.

On hot days in summer and when the pigs are on pasture, I only feed twice a day, morning and evening, and I never feed more than is eaten up clean, as pigs prefer fresh feed, no matter where it comes from. Some rules have to be observed in fattening to insure success. The best is to have the previous feed succeeded by one more nourishing, and when the appetite begins to diminish, to feed less in quantity but more in quality.

Rest and Quietness.

As much as breeding and growing animals need exercise for their prosperity, the hogs for fattening need rest and quietness. To sum up, we have to direct our attention to obtain a short and profitable fattening. This, with a normal development of the body, will be greatly assisted by pasturage for the animals, and will be accompanied by the best results, the more regular and uniform the feeding takes place during the first seven or eight months. The farmer should not try to get his hogs to an extreme weight, but should sell them before they have cost too much. Besides the meat of young quick-fat-

tened hogs will sell better than that of older fully fattened animals.

We often see at fairs hogs that look like real monsters. The head hardly visible, deeply hidden in fat. The legs stick deeply in the body, and are hardly able to carry it. From a short distance they look more like a giant potato resting on four pegs. Such fattening is only a hobby which may prove useful for the purpose of exhibition, to show the fattening capacity of the breed, but such experiments are not profitable to the farmer in any way.

SWINE FEEDS AND FEEDING.

GEO. WYLIE, Leeds, Wis.

It is well known that there are certain foods or combinations of food better adapted to growing and fattening swine than others. Corn is usually the cheapest when fattening alone is considered, but other foods in connection with corn must be used in growing the animal if the best results are obtained. Skim milk is the best single food for swine that I know anything about; but when we consider the number of pigs annually raised in Wisconsin, and the amount of milk produced, it will readily be seen that there is not enough skim milk in the state to even give a coloring to the moisture consumed by the pigs. Many farmers, however, can afford some skim milk, and when the pigs are very young a little milk can, by judicious use, be made to do good service.

Soaked Corn.

In the absence of milk we feed soaked corn to young pigs between the ages of two to six weeks old, almost without stint, and I find that at this age the pig will stand more corn in proportion to his size than when a few weeks older—that is, if his dam is being well fed on milk producing food. When they are from four to six weeks old the dam should be milking her very best, and this is why soaked corn can be fed at this time without injury to the pigs. They are getting sufficient milk from the dam to neutralize corn that would otherwise be injurious from its lack of bone and muscle making material. When the dam's milk begins to fail, or perhaps I ought to say, when the assimilative capacity of the pigs has increased beyond the power of the dam to supply it, which is usually at about six weeks of age, we do not continue increasing the amount of soaked corn feed, in the same ratio, but begin feeding slop made of good shorts and oil meal, in the proportion of one part oil meal to four parts shorts. We find by soaking them together between feeds that the pigs do much better than if fed on the slop as soon as it is mixed. No one will claim that soaking adds anything to the feed, but soaking six or eight hours dissolves the shorts and makes them easier of assimilation. With shorts, oil meal and soaked corn, good pigs can be raised without milk other than that supplied by the dam. I have observed that many farmers lose interest at once, as soon as oil meal is mentioned as good for any kind of stock; they regard it as something beyond their reach, when the facts are that in combination with other feeds, and when its beneficial effect on the system is considered, it is usually one of the cheapest feeds within our reach. As a preventive of harsh-haired, hidebound pigs, it has no equal. Last summer we found one bunch of thirty pigs at ten weeks old consuming two pails of

shorts, one-half pail of oil meal, and a pail of soaked corn at each feed, fed three times a day. The shorts and oil meal being well mixed before water was added, and while the above may seem like heavy feeding, I observed the pigs were doing some heavy growing. About this time the bunch was divided into two lots of fifteen each, and a quick rise in their demand for increased feed was noticed, showing that thirty was too large a number to feed together to obtain the best results. An adjoining bunch of thirty of the same age and practically the same as far as breeding was concerned, were fed and treated exactly the same, except that the shorts and oil meal were fed as soon as mixed. We found that while they would eat as much corn as the other lot, they consumed about one-third less of the oil meal and shorts, and were not showing nearly as good results as the first lot. At eleven weeks we concluded the experiment was growing too costly to continue farther; but the first lot held what they had gained, and while individuals of the second lot caught up with them, their comparative general average remained about the same until fall. As good or even better results can be obtained by soaking corn as can be had by grinding. All the advantage of grinding is that it makes the food more easily penetrated by the juices of the stomach, allowing the work of assimilation to begin at once. Soaking the corn gets at the same result with more effect if the cornmeal is fed without being soaked. Cornmeal soaked may be better than whole corn soaked, but not enough better to pay for grinding.

Clover and Grass.

The farmer who neglects to provide grass for his swine is neglecting one of the most important essentials to success in the whole business. The amount of pork made from an acre of clover we have heard estimated as high as 800 pounds, but it is evident that this amount never has and never will be produced directly from an acre of clover alone, unless the nature of the hog can be changed. Experiments by Prof. Henry show that hogs on the best of clover pasture, with plenty of shade and pure water, will make little or no gain whatever in weight. The conclusion, then, that is forced upon us is that the benefits of the pasture in swine raising is in keeping the animal's system in a condition to utilize the grain fed to the best advantage. It would seem a little inconsistent that hogs on grass alone make no gain in weight, yet when a ration of grain is added they will show gains out of all proportion to the gain made on the same amount of grain fed alone without the pasture. And again, after a run on grass alone for a month or two, if the hog is put on a full feed of corn, he will be found giving larger returns for the food consumed than at any other period of his existence. From the benefits derived from pasture in summer it is but a step to the consideration of roots as a part of the hog ration in winter. If grass economizes grain by keeping the system right in summer, why do farmers neglect providing something in the way of roots to tone and cool the system, thereby helping to assimilate it better than the grain fed in winter? The cheapest feed fed to our swine in winter is the roots they consume, notwithstanding the fact that we are told that mangel wurzel contains 90 per cent. water.

Sow Peas.

Peas sown as early in spring as possible make good feed for hogs. This crop is not appreciated by our farmers as it should be, and they probably will be in the near future. They are ready for use just when the pasture begins to fail and before any other farm crop is available. When the price of feed is high a crop of peas to turn the hogs and pigs into is valuable. If care is taken to keep the hogs out of the patch after rains, not enough will be wasted to pay for

harvesting. If it is desired to seed the ground upon which they grow, to clover, the catch will be almost a certainty. If harvested and threshed, as a rule the crop will then be too expensive to be used for making pork. Peas range in price from 75 cents to upwards of one dollar per bushel, and while they are worth far more than corn for growing bone and muscle in young pigs, we have no authentic evidence that when the hogs come to be finished up for pork they will make more pounds of pork at that particular time than will a bushel of corn. Yet I believe a bushel of corn and peas, half and half, will make more pork than a bushel of either fed alone.

Prices for Pork.

A careful examination of the prices obtained for pork for the last ten years, ending January 1st, 1892, will show the average price to have been $5.05 per one hundred pounds. This average was obtained by taking the highest and lowest price for each month in each year for the last ten years and striking an average. The result certainly shows as good an average profit, when capital invested is considered, as can be shown by any other branch of farm stock. And the farmer who has been and is now in the business to stay, and who keeps swine bred and fed well enough to make 10 pounds of pork from a bushel of corn, sees no obstacle in the way of making the business as profitable in the future as in past.

Discussion.

Mr. Hacker: If farmers have no clover, what kind of grain would you like to sow in order to make a pasture for your hogs?

Mr. Wylie: You can sow rye or oats, and sow clover with it. Oats are as good as anything else. Sow them very thick. In the summer time do not feed a hog old corn. New corn in the fall, of course, doesn't need soaking.

Mr. Favill: I simply want to say that I consider the first paper that we had here pure orthodox hog gospel, and I want to emphasize what was said about taking nice care of the hogs. There is not an animal on the farm that will respond to nice, generous treatment any more readily and profitably than hogs, and if you don't believe it, try it.

Mr. Ames, Sr.: I was impressed with what the gentleman said about the filthy condition that he found in a slaughter house. I believe that all the diseases that have brought a stigma upon our pork have arisen from just such a condition of things. I visited a slaughter house last fall, and I was surprised to think that men would fatten hogs for human food in such a place as that. Brother farmers, that is what is bringing our pork into disrepute. I never saw such a filthy place in my life as that slaughter house was. It was in the state of New York.

Mr. Hutchinson: Is not clover pasture just as much better than old pasture for hogs as for other stock?

Mr. Wiley: All the experiments and all the light that we have go to show that there is no pasture as good for hogs as clover, and especially white clover, if you have it; but medium or mammoth clover is better than blue grass.

Mr. Hodgson: Do you feed your hogs warm or cold slop?

Mr. Wiley: In the winter time we feed warm slop. A young pig is a very delicate animal. If you have milk that is set cold, don't feed it without warming it up.

SHEEP FEEDS AND FEEDING.

GEO. McKERROW, Sussex, Wis.

Mr. Chairman, Ladies and Gentlemen: This question of sheep feeds and feeding I feel is just as important to the breeders of Wisconsin as the question of breeds and breeding. The two must go hand in hand. I am one of those who believe in the old adage that a flock well wintered is half summered, and well summered is half wintered, or, in other words, that our flocks should be kept in good, plump, healthy condition the year around, and a flock in that condition is not susceptible to disease, while a flock that is allowed to run down, by mismanagement and poor feeding, is very subject to disease and to the parasites that trouble our flocks. Therefore, I can speak with a good deal of confidence in regard to this subject of feeding. Every sheep feeder should have, as his aim, that the lamb should be kept growing from the time it is born until it is put upon the market.

Variety of Feeds.

Now, the feeds that we must use here in Wisconsin for wintering our flocks are such mainly as we can raise in this state, but every flock master should strive to have a variety, or as much of a variety as it is possible for him to raise on his farm, and some variety seems to be an absolute necessity for the best results. We can raise here in Wisconsin clover and timothy and other grasses to make a little hay, corn fodder, oats, barley and wheat straw that may be used in feeding, and we can procure oil meal and bran. All these feeds are good in their proper place, but I find from my experience that I can get more value out of these feeds that I have mentioned by having some succulent food mixed with them.

Roots and Ensilage.

We can get this succulence in the form of roots, mangel wurzels, ruttabagas, turnips, part of the ears and also well cured corn ensilage, and where you can put it up successfully, clover ensilage will answer the same purpose. In the summer season we must also look to it that our flocks have a plentiful supply of good food; a variety then, as well as in the winter, gives us the best results. Permanent pastures, and even weeds and small tender brush, take a place in the sheep's ration. The blue grass spoken of this morning by Mr. Chadwick cuts a very important figure because it is excellent for early and late feeding, and it has been found from actual experiment that our sheep will eat over three-quarters of the weeds that trouble us on our farms, and will clean our farms from many of the weeds that are otherwise troublesome. Clovers, mixed Mammoth and Medium, and even Mammoth, come in nicely in our pastures. I like a mixture in clover pastures, and then I like both permanent and clover pastures, that the flocks may have access to both in the summer season. In the dry season some soiling crop comes in very nicely on the farm; oats and clover, cut and fed. I find that the Canadian farmers look to peas as a soiling crop that will help out their pastures wonderfully. They depend upon this crop mainly. Later in the season we may sow rye at the last cultivation of our corn, and have some succulence in that, and some feed.

Rape.

We can also sow rape. This is a comparatively new plant in this state. I have experimented a little

with it, having seen the good work it has done on Canadian farms in fattening up the surplus stock in the fall. It is a plant something of the turnip nature, or, as friend Adams, of the Experiment Station, says, it is a turnip gone to leaf. It throws out a large number of cabbage-like leaves and the flocks do remarkably well in the season on this. It comes in for a late fall feed remarkably well in fattening up the surplus stock that you wish to turn off at that season or later. It is also very good for breeding flocks.

Good Flesh in the Fall.

We like to see plenty of flesh on our flocks just before the winter sets in. Some sheep men are beginning to talk a great deal about feeding condiments, such as a mixture of salt, copperas, gentian and other stimulents. If your flock is in a healthy condition I don't think it best to feed many of these things. Salt should be kept before the flock always. We do feed some sulphur in the summer season to keep off the attacks of the internal parasites, but it should be handled with care, especially in the changeable weather of spring, fall and winter. Now, as to the best methods of using these feeds that we have spoken of. In the first place, as I said, the greater the variety the better, but with variety we must have regularity in feeding. Every flock master knows that at a certain time, if his flock has been properly handled, they expect certain things.

Regularity in Feeding.

We shoul set a time to feed, and feed at that time each day, and we should feed the same class of food at the same particular time. In feeding we should strive to save all the feed possible, not allowing any of it to go to waste, and still be careful in the winter time that our breeding flocks get plenty of exercise. It is well to have one of these permanent blue grass pastures to put your flocks upon in the fall. I claim that it is a very good plan to fence off some ground eighty or one hundred rods from the barn so that your sheep will have to travel out that distance to get their feed, and then back again after feeding upon it. The feeding generally should be done in racks or troughs. There are a variety of racks which we might describe, all of them having their good features, and all of them having some objectionable features. But we should study carefully these different racks and then decide for ourselves which will suit our own condition best. For a stable or shed rack, I have found a round rack economizes room, and also gives me very good satisfaction in feeding. I use a V shaped trough, and there are some reasons why I think that is good. It has a flat bottom. In the summer season pasture having a variety of grasses gives me the best result, and a pasture neither too long nor too short.

Don't Turn Out Too Early.

In the spring we should be careful not to turn onto our pastures too quickly, for then the grass is soft and watery. It is a good plan to let a flock out early in the spring, to just get a bite of this green feed. It answers very nicely, especially for ewes with young lambs, because it helps to increase the flow of milk, but you must not depend upon any of these watery grasses in the spring for the main feed. If you do the milk of your ewes will be very thin, your lambs will do poorly, and you will lose money by it. There is not nutriment enough in these watery grasses or in rye to keep your flock up. Continue the dry feeding, and fill in both dry and green feed both in the fall and spring. Do not make a sudden change in your feeding operations. In pastures I have been the best satisfied when I could change my flock from one pasture to the other every week, ten days or two weeks, as the growing season would permit, not allowing the grass to get too long nor

to be cropped too short, but having a fair growth of grass, which acts as a mulch, keeping the moisture there, and we have a better growth of grasses and a better pasture throughout the season.

There are many of these points that I could elaborate, but I will not take further time by doing so, but will be glad to answer any questions you may ask.

Discussion.

Question: How many times a day do you think sheep ought to be fed?

Mr. McKerrow: I think twice a day often enough to feed a flock, yet it is very hard where you are feeding a variety of food to only feed twice a day, and so I feed them three times. I would feed in the morning before sunrise, and I would feed in the afternoon, so that it is all done before dark.

Mr. Cole: I have tried this plan of changing my feed back and forth, and I find that there are certain spots in the field where the grass will get the start of them, so they will eat down in certain places and leave the rest.

Mr. McKerrow: Then the mower should be put on and cut them off and leave it as a mulch. We pasture our colts on our sheep pastures a good deal for the purpose of taking care of just such spots.

Prof. Craig: I have followed Mr. McKerrow's plan of feeding the breeding flock twice during the day and it has proven satisfactory. In fattening sheep for the market quick gains in a short period are desirable, and for that reason fattening sheep require more frequent feeding. To get the best results they should be fed small quantities at a time and the day should be divided into at least three feeding periods, the grain being given morning and evening with fodder and roots, and the noon feed consisting of hay or corn fodder.

Mr. Hatch: How often would you feed roots?

Mr. McKerrow: If I had a plentiful supply I would feed them once a day, but not heavily to a breeding flock in this cold climate.

Prof. Craig. In Canada, where roots are fed extensively, many cases of weak lambs have been traced to over-feeding the ewes with cold turnips. Discrete shepherds feed but very few just before the time for lambing, and some will not feed them at all. If fed warm from the cellar or pit, trouble seldom follows their use.

Question: In feeding ensilage what proportion of your ration would be ensilage?

Mr. McKerrow: I have closely observed a neighbor who has been striving to make ensilage his main sheep food. Three years ago he wintered his flock of one hundred grade Cottonwoods on eight pounds of corn ensilage twice a day, and dry feed at noon. His flock came out in the spring looking better than they did in the fall, but his lamb crop was unsatisfactory, there being weak lambs. Later he reduced this ensilage feed, giving four pounds a day, and one feed of straw at noon with hay in the evening, with satisfactory results.

Mr. Hatch: Do you think this failure of the lamb crop was owing to the ensilage or to the lack of properly balanced ration of corn, oat straw, etc.?

Mr. McKerrow: Yes, that is true. I consider corn ensilage and straw are both highly carbonaceous foods, and there might be something in their being fed that amount of ensilage.

Mr. True: I want Mr. McKerrow to tell us what feed, grain and roots he would feed to a ewe that was suckling a lamb, in order to produce the best flow of milk.

Mr. McKerrow: A ewe that has her lamb by her side, I would increase the root ration gradually until she was getting about all the roots that she would eat up clean and also feed a mixture of oats and oil meal, and I would not object to some bran in it.

Mr. Hill: Is there any objection to

feeding our grain in the same racks that the sheep eat their hay from?

Mr. McKerrow: We can have tight bottoms in our racks and feed both hay and grain, but you will have to clean out all of the hay every time you feed the grain.

Mr. Bloor: I would like to know if the sheep will eradicate the weeds from the farm?

Mr. McKerrow: A year ago, Mr. Bloor, I started on a rented farm, and it was pretty well smothered with brush and weeds, and I would buy eighty acres at a time, and I found plenty of weeds and brush to kill out.

The Chairman: What is a good daily gain for a lamb up to six months?

Mr. McKerrow: That is a pretty hard question to answer. He will do very well if he gains three-quarters of a pound daily, or two-thirds of a pound.

Mr. Cole: Have you ever had any bad results feeding too exclusively a clover diet for feeding ewes?

Mr. McKerrow: I don't know positively that I have, but I think I have.

Mr. Cole: What is the best ration you know of for a flock of breeding ewes?

Mr. McKerrow: Good clover hay once a day; good early cut oat or barley straw or corn fodder for the other ration, and a mixture of oats, bran and a little oil meal always ground coarse or pea size, so we won't waste it.

Mr. Cole: You want to put in corn ensilage and you have a good ration.

Mr. McKerrow: And a few roots. I would take the roots preferably.

Question: Which market, mutton or wool, is most likely to be affected by future competition?

Mr. McKerrow: You are not leading me into politics? I will answer to the best of my ability. I think the main competition will be in the wool line. and the question may be right here today with us, are we making any profit on the wool that we are producing now at present prices. A committee appointed, I think, in Ohio, to determine what it cost them to raise a pound of wool, decided, I think, that it cost some forty cents a pound to raise it.

Question: Can we produce mutton alone, regardless of wool, and still have profit?

Mr. McKerrow: The experiments of different Experiment Stations and of the best feeders, such men as Mr. Bloor, and Mr. Hays, tell us that we can produce mutton at the price regardless of the wool.

Mr. Bloor: With the experience that we have had for the last three years, we can well afford to throw the fleece away, and then make a better profit on our sheep than upon anything on our farm.

Mr. Green: The country then wants a new breed of sheep that don't grow any wool.

Mr. Sampson: I believe the country does demand new sheep, big, heavy muscular sheep.

Mr. McKerrow: The Experiment Station at Guelph, Ontario, between the years 1875 and 1880, carried on an experiment through those five years to determine what sheep was the most profitable for them to breed and raise in Canada, and they found from their experiment that the sheep that produced next to the highest fleece for the five years was the sheep that paid the highest profit, taking both mutton and wool into consideration.

Mr. Evans: Have you had any experience in pasturing on alfalfa?

Mr. McKerrow: No sir. A friend of mine in Sheboygan county has had alfalfa on his farm for several years, and has been very well pleased with it as a pasture grass and as a hay, that is, been well pleased with the feeding results but not with its productive qualities, and he has decided to drop it because it does not pay.

Mr. Morrison: I know there is quite a large patch of alfalfa on the University farm, and I would like to ask Mr. Adams what he thinks of it, and if he would advise Wisconsin farmers to sow it or not?

Mr. Adams: I don't think, farmers.

that we want much to do with alfalfa, and I well tell you why. Our experience with alfalfa at the Station farm has been something like this. We prepared the ground, and sowed seed on it. The first year we got a straggling crop; it came up spindling, and there were more weeds than alfalfa on the plat. The second year there was less weeds and more alfalfa, but that year it only gave us one crop. The first year we didn't get anything. The third year it began to get in its work in pretty good shape, the roots being coarse and long reaching, went down into the subsoil, and began to pump up the fertility to the plant above, and now if you visit the farm, you will see the first crop of alfalfa ahead of any green thing on the farm. It will be three inches ahead of anything else we have, and last summer I got three crops from that plat. Now, understand, this was three years we had to wait for growth. When you once get it in your soil it is permanent, and the only conditions, with my present knowledge under which I should recommend a trial of alfalfa is on a piece of ground that you don't know exactly what to do with, that is stony, or the surface soil is shallow. If you could work alfalfa into that you would have permanent feed, something that you could leave there, not expecting to plow it up and re-seed, because it will stick when once established, and the roots go down deep enough to retain moisture, so it will always stand when other crops die out, but on our expensive costly soils, it is too slow, I think, and we do better to raise red clover.

Mr. Woodman: Has any one tried alfalfa on sandy soil?

Mr. Metcalf: I have tried it several years and never got a good catch, except one year, and the next winter it froze out.

COW FEEDS AND FEEDING.

JOHN HODGSON, Pewaukee, Wis.

As the rumen of a cow empties itself of grain of all kinds ground or not, every four to six hours, the question is, how can we get the most of it ruminated. The way we do so is to feed grain, after rough feed. If it is corn on the stalk would feed it also last and let the cow be as quiet as possible after feeding; also see that she has all the water she wants, as she will not ruminate as quickly if thirsty. By this process we get them to ruminate quicker after foddering, hence we get more of the grain re-chewed. Take such grains as we have spoken of, I think it would be advisable to feed it three times a day, thus we would have meal in the rumen twelve or eighteen hours instead of from eight to twelve hours, and we would also receive a better re-chewing of the grain or meal fed, besides the third and fourth stomachs would not be as crowded with grain at any one time, thus giving them better chance to do their work.

We will next follow whole, rough

feed. This also passes to the left, and is mixed with what has already been in the rumen, the majority remaining till raised and ruminated. Then it is returned to the rumen, where it is fed to the third and fourth stomachs as fast as they can use it, the long stringy pieces acting as a sieve through which it is sifted. As to cut feed, especially corn, if cut less than one inch, some of it does not go through this process as it is passed on to the real stomach as fed, the other we find is not as thoroughly re-chewed, not having the long stringy pieces the whole feed had, hence the sieve was not as good.

Cut or Crushed Stalks.

The length of time that one foddering of rough feed takes to pass through the four stomachs, differs greatly from that of grain, taking, we should judge, two days or more to pass through them. The way we take advantage of the machine in feeding corn on the stalk dry, is, we cut it early, when it is in the boiling state, thus the corn adheres to the cob better, and there is not so much broken from it when first chewed. Our reason for trying to have so little shelled corn in the rumen, is, as we have shown there is but little hope of getting it re-chewed, this way of cutting corn early would work equally well, if we wished to cut it with the feed cutter, the corn would not be as likely to shell when being cut through the ears. Also if I had any corn to husk I would cut it early, when it first began to glaze, husk it as soon as safe to crib the corn and leave the stalks in the field till dry, then I would have them run through a threshing machine which leaves them in the best shape for a cow of anything I have ever seen.

In planting corn for ensilage, we plant so thick that there would be but little corn on it, as we believe there is the most waste in the grain, and this we would cut also early, and if I preferred cut ensilage, I would cut it as long as it would keep in the silo, but if I wanted the best results I would put it into the silo whole, and feed it the same every time.

Our Method of Feeding.

I will close by giving you a short sketch of the rule we follow, as near as possible, in feeding our cows. Their first feed bran and middlings, equal parts by weight, at seven in the morning. As soon as they have eaten the mill feed we give them four to five pounds of clover hay, cut when in full bloom, that is when we can raise it. When we cannot get clover I would take good corn stalks, or timothy hay, cut before blooming. After breakfast we give them twenty-five pounds of uncut ensilage. We then leave them so that all will be quiet in order to get them to ruminate as soon as possible. At 3:30 p. m. feeding in the same routine as in the morning, with the exception of sometimes substituting good oat straw, for the hay. This is the day's ration for a full milch cow. As to water we want them to have it where they can get it at will, as our way of keeping cows in summer is soiling, and we find for this purpose our common red clover is king.

Discussion.

Mr. Bloor: You speak about the shelled corn being a bad thing in the ensilage. Now, our object in feeding is to get as much corn in our ensilage as we can. Speaking also about the feed being cut long or short. We cut ours a quarter of an inch.

Mr. Hodgson: If you examine the droppings of your stock closely, you will find some of that ensilage right in there as it was fed.

Mr. Bloor: We have tried ensilage and ground cornmeal, and we find that feeding the corn whole, without grinding, putting it on the ensilage, brings better results. We have proved it by weighing each week. We find that the more corn we get to them the faster they fatten.

Mr. Hodgson: I suppose the reason

is on account of the grain. I have noticed this matter very closely. I find that in watching the workings of rumination, that the corn meal, as soon as it is in, begins to work on the outside, and I think it has a little preference above everything else, to pass on into the other two stomachs. In one hour after the cow is fed, the meal will be two or two and a half inches up in the manifolds, and in about three hours the meal will be perfectly cleaned out.

Mr. Bloor: We satisfied ourselves by feeding first one way, and then another, each a week, and that feed that puts on the most flesh in the least time, we adhere to. The difficulty with us is getting shell corn enough.

Mr. McKerrow: I don't believe that Mr. Hodgson is understood. He has been a great experimenter in this particular line. The butcher in our village has told me time and again within the last five or six years, that that man Hodgson is a regular crank on feeding cows. He says, "every cow that I get to kill, Hodgson wants to feed her an hour before she is killed, two hours before, or three hours, and then he comes at killing time, and takes the stomachs and holds an examination.' and that is how Mr. Hodgson has arrived at all these conclusions he has given you in his paper. He has been studying this matter of mastication and rumination, etc., for years. I am afraid we are hardly able to catch onto some of these things just because we dont understand that he has found them out by experimenting.

Mr. Goodrich: He has gotten way ahead of the rest of us, but I want to learn something of him. Shall I mix my meal with coarse fodder when I feed it to my cows?

Mr. Hodgson: It don't make any difference.

Mr. Hayes: Would you wet the meal in feeding?

Mr. Hodgson: No, I want a cow to mix all the saliva she possibly can with her food.

Mr. Faville: Didn't you tell us you would feed the coarse first and the fine meal afterwards?

Mr. Hodgson: In such cases as corn, peas and barley. Bran would not be made much finer, but take such as corn meal, it helps it some to be raised and re-chewed.

Mr. Ames: For any purpose whatever you would not make a slop for a cow?

Mr. Hodgson: No, we lose sight of this saliva in helping cows with the digestion. When a cow eats anything, I want her to chew it when she first takes it into her stomach for the reason that some of it is never raised again. If it is all swallowed too quickly, the saliva does not mix with it, and it passes on as it should. If you will take the droppings of a cow that has been fed whole feed and turn her over and feed cut feed, you will find it there. I have found in cow's stomachs dry corn stalks one inch long.

Question: Do you think if it were cut a quarter of an inch it would be objectionable in that way?

Mr. Hodgson: I would cut it as long as possible. The only way you can do these things is to take and fill your silos, a little strip of two feet with whole ensilage, weigh it to your stock and weigh the results, and then compare. You cannot do it by guess work.

Mr. Hayes: I say the shorter you put it into the silo the better.

Mr. Hodgson: I would like to have some of you who believe in this ensilage business investigate this matter a little more, and I think you will agree with me that there is considerable waste in the cut ensilage.

Mr. Convey: I think Mr. Hodgson's suggestion is worthy of consideration. The cut silage certainly produces more acidity than the whole silage. He, however, raises a small variety of corn. He has experimented along that line and he states that there is better digestion where he feeds whole silage, but he don't put in the large variety of corn. In packing in the silo he takes every precaution to have it closely packed, and in that way I doubt if we

can get any more cut ensilage in than he can of his whole ensilage.

The Chairman: Why do you claim that you get better results from long than from cut silage?

Mr. Hodgson: When a cow takes food, if you watch her, she chews it, and the saliva that is mixed with it goes with it. You take corn whole and she is apt to eat it fast, and we find quite a number of pieces that are swallowed. If it is cut from a quarter up to an inch, it passes on to the fourth stomach, and that must hurt that stomach; those rough corners must hurt the whole digestive organs; it is not so well mixed with saliva; there is not so much raised to be ruminated because there is no stringy feed in the stomach to keep it back.

The Chairman: In other words, the cow bolts her food.

Mr. Hodgson: Yes, that is it.

The Chairman: Have you any figures showing that corn, cut in the silo, and uncut corn that you have siloed without cutting, produce any difference in feeding?

Mr. Hodgson: Yes, sir; our first cow we separated from the rest of the cattle, and of course gave her the necessary time for the changes. We weighed our ensilage for the week; gave her twenty-five pounds, all ensilage and hay. We weighed the results. We changed off another week and weighed it, and we found the week she was fed whole ensilage she gave eighteen pounds more milk than when she was fed on cut feed. Then we changed again, and she came back to a certain amount.

Mr. Adams: Can't you obtain the benefit you claim for the digestion by cutting the ensilage much longer, say three or four inches long?

Mr. Hodgson: I said I would cut it as long as it would keep in the silo, if it is cut at all. In my experiment the first was an inch and the next was half an inch. I might say that the first one, we took twenty pounds of the droppings of the cow and washed it out, and the settlings we dried, and took it down to a druggist and had it weighed, and there was double the amount in the cut that there was in the uncut of waste. Then about six weeks ago we separated another cow and gave her half-inch ensilage, weighed the milk the same way and passed through the same process, and she gave nine pounds of milk more, composed of five per cent. cream. I noticed after the last three days, when we were changing over, that her bowels were not as good as before, indicating bad digestion.

Mr. Linse: I find that the temperature, the weather, will make such difference in my cows quite often.

Mr. Hodgson: I will say we had a thermometer in the stable and kept the temperature the same all the time.

Mr. McKerrow: Mr. Hodgson has everything in the stable that means comfort to the cow and to himself, everything from a thermometer to a patent machine to hold the cow's tail while he is milking her.

Mr. Morrison: He has a device that the cow can water herself in the stable, also.

Mr. McKerrow: Yes, and the manure walks right out of doors on its own account.

Mr. Convey: Would you expect to obtain the same results in handling dry fodder as in the handling of ensilage, cut and uncut coarse fodder?

Mr. Hodgson: I rather think that the same thing would hold, but I haven't tried it at all. If I was a rich man I would go to work and have a machine that would cut the cornstalks the other way, lengthwise.

Question: Can you increase the butter fat in milk by feed?

Mr. Goodrich: That depends upon circumstances. If the cow is being fed in the best manner to produce rich milk, and has been so fed for a sufficient length of time previous, so that she is doing her very best in that way, of course you cannot increase the per cent. of butter fat further. But you

can increase the per cent. of butter fat by feeding watery feed that is deficient in nutriment and taking away the grain feed. Then you can increase the butter fat by adding the grain ration again. I will tell you what I have done. A few years ago my cows that came in in March and April were being fed grain liberally and doing fairly well. In May they were turned on good pasture, the grass being very fresh and watery, and the grain feed was taken away. In a few days the amount of milk had increased considerably, but no more butter fat was produced. After a few weeks I added a grain ration of about eight pounds a day of equal parts of bran, oats and cornmeal, and very quickly the amount of butter was increased, though I did not get a pound of milk more by adding the grain feed to the grass. The milk came back to nearly the same richness that it was before turning out to grass. I have known cows to be given an extra amount of salt, when they had previously not had sufficient, which induced them to drink down more water, and the next day give more milk, but that would make no more butter. One time in winter I had been feeding bran dry. I thought to try the experiment of wetting it, and made a thin slop of bran and warm water, and each time put in a little salt. I was pleased to find that the amount of milk increased considerably, but was disappointed when I got no more butter. I had simply watered the milk through the cow. So, you see, I am certain that the composition of milk can be changed by feed, watery feed deficient in nutriment producing poorer milk than food containing a sufficient amount of the right kind of nutriment. But I have not found the range very great, never having been much more than one-half a pound of butter to the one hundred pounds of milk as the immediate result of a change with the whole herd of cows. Ensilage from immature corn with little or no grain in it will produce poorer milk than when a good ration is added.

Question: What is the best ration for butter fat?

Mr. Goodrich: I have never found anything better than bran, oats and corn, with a pound or two of oil meal in addition to good clover hay and ensilage in winter, and good pasture in summer.

Question: Will not cornmeal make richer milk than wheat bran?

Mr. Goodrich: I have never found that it would, unless by changing from bran to cornmeal the quantity of milk decreases, as it often does; then, in that case, there would probably be a slight increase in quality.

Question: Will straw and swale hay produce milk as rich in butter fat as will clover hay and grain?

Mr. Goodrich: I have never fed milch cows in that way, therefore I cannot answer from experience. I know some men who do feed that way, and I believe, as a rule, they fail to get any milk. If some cow treated that way should give a pint or two of milk a day, possibly it would be as rich as though she was better fed, but I do not know. I do know this, however, that no cow can produce butter fat, or anything else, unless she has sufficient nourishment in her food to enable her to do so.

Question: You spoke of improving the quality of the milk by adding a grain ration to one lacking in nutriment. Do you think the capability of a cow for putting butter fat in her milk can be permanently increased?

Mr. Goodrich: I do, though it is the work of time. Gradual improvement can be made as the result of the right kind of feeding, long continued, until her limit is reached and she can be developed no further. This may take two or three years. But, after all, you cannot make a 3 per cent. cow into a 6 per cent. one, or anything near it, but you can make some improvement. Let me tell you a little experience.

Years ago I fed cows the way many good farmers do now; good hay and cornstalks and a fair ration in winter, with good pasture and grain in summer. I made the milk into butter. Then I commenced feeding better; fed more grain and a greater variety of fodder in winter, and also fed grain all summer. That year these same cows did much better; they gave more milk and made more butter per hundred pounds of milk. I had increased the quantity and also improved the average quality. These cows, I believe, were permanently improved. The year before I commenced my good feeding it took, as an average for the year, twenty-four pounds of milk for one pound of butter. The next year, twenty-two pounds, and the next year but twenty-one. The old cows are gone now, but their descendants give much richer milk, though this is partly due to improved breeding and not all to development by feeding.

Question: Don't you believe that feed plays a greater part in getting good milk than breed?

Mr. Goodrich: No; though breed without good feed is worthless. Yet all the feed in the world would not make a Jersey out of a scrub, or a Holstein of a Polled Angus. Still, feed plays as important a part in establishing and improving breeds as any of the surrounding conditions. In fact, feed is the foundation of all improvements. As to the question of feeding butter fat into milk, I am aware that there is a difference of opinion among eminent men. The German experimenters and some professors in this country say it cannot be done, and that we must look to breed for all improvements in this respect. Prof. E. W. Stewart (and who is any better authority?) and some other professors say that it can be done. Prof. Stewart gives several instances of carefully conducted experiments where the per cent. of butter fat was greatly increased by long continued good feeding. Practical, intelligent dairymen, the men who handle and feed the cows, weigh and test the milk, nearly all say it can be done. Such eminent dairymen as W. H. Gilbert, H. S. Weeks, John Boyd and a host of others say it can be done, for they have done it. And would it not be strange if such a thing could not be done? Cannot the character of the secretions be changed in a manner by the food? It has been positively proven that by feeding a pig on certain kinds of food the per cent. of red meat in his flesh can be greatly increased over what it would be, fed on the ordinary corn diet. But there is a limit to all these things. You can't produce a pig all lean meat, or make a cow give you clear butter fat.

Superintendent Morrison: Experimental research has demonstrated that the familiar fact that certain cattle foods are more valuable, pound for pound, than others, depends upon three points: 1. The relative proportion of dry substance contained. 2. The digestibility of that dry substance. 3. Its constitution.

To illustrate, a pound of hay may contain about three times as large a proportion of dry substance as a pound of the grass from which hay was made; if this dry substance has lost none of its digestibility in the conversion of the grass into hay, the latter will be worth three times as much per pound for feeding purposes as the former; but a pound of cornmeal may contain the same proportion of dry substance as a pound of hay and yet be more valuable because its dry substance is more digestible, or contains a larger digestible proportion of constituents than the hay.

German experiment stations have been studying this problem through digestion experiments, in which certain animals are fed for a definite period on the food under investigation, both food and excrement being analyzed, and the proportion digested determined by difference.

In our country several stations have

done some work in this direction, notably of Maine, located at Orono, W. H. Jordon, director, and a recent bulletin from that station gives the results of trials in 1891 with a variety of cattle foods, the trials being made with sheep. The following is a summary of the results:

1. The Hungarian grass, both when fed green and after drying, proved to be more digestible than the average of other grasses—notably more so than timothy.

2. The drying of the Hungarian grass into hay did not diminish its digestibility. This is in accordance with all former experience.

3. The corn plant as cut for the silo is one of the most digestible of fodder plants, rating in these experiments as compared with timothy as 100 to 120. Sixty per cent. of the dry organic matter of timothy was digested, while with the various corn fodders the average was 72 per cent.

The experiments this year disclose no especial differences in the digestibility of the Southern, field and sweet corn fodders.

4. The digestion trials with roots show them to be the most digestible of any of the foods tested, the amount of waste material being very small, averaging not over 8 per cent. of the whole.

5. The gluten meal, which is a waste product in the manufacture of glucose from corn was digested to the extent of 89 per cent. of its dry organic matter, which does not differ at all from the figures given in the German tables for the entire grain. The treatment which the grain receives in converting the starch into glucose does not seem to affect the digestibility of the refuse.

6. The second trial of the digestibility of American wheat bran gives average figures almost similar to those obtained in the first trial, and shows this cattle food to be but slightly if any more digestible than good hay, and much inferior in this respect to grains such as maize, oats, barley, etc.

The Institute adjourned until 7:30 p. m.

EVENING SESSION—MARCH 17th.

COUNTRY ROAD SESSION.

The Institute met at 7:30 p. m. Supt. Morrison in the chair.

John M. True, Secretary of the State Agricultural Society, was called upon to preside.

Mr. Woodard: Before the business of the evening is entered upon I would like to ask the forbearance of the Institute and permission to introduce a resolution, which was suggested from the discussion this afternoon on the hog question. I have a resolution which I wish to introduce and which is as follows:

"Whereas, Considering the widespread practice which exists in all parts of the country where slaughter houses are found of making the hog the scavenger to dispose of the filth, offal and carrion from such slaughter houses, as well as the practice which obtains in some localities of obtaining this offal for the purpose of fattening hogs, with the knowledge that in almost every instance where the meat of the hog has been found to be diseased he has been subject to conditions and surroundings of this kind, thereby injuring the sale and restricting the market of animals which are well fed and cleanly kept, both at home and abroad, therefore be it

"Resolved, That it is the sense of this Institute that the farm committee of the Board of Regents of the State University be requested to report or see that a bill is reported to the next legislature making it a criminal offense, punishable by such penalties and under such restrictions as may be necessary to prevent the feeding of hogs with offal and carrion of this kind."

Mr. Woodard offered the adoption of the resolution.

Motion seconded and carried unanimously.

HIGHWAYS AND NATIONAL PROSPERITY.

STEPHEN FAVILL, Madison, Wis.

The question of good or bad roads is one that does or should intensely interest every man or woman in all this broad land, no matter where their dwelling may be—in the city, in the village, or in the country. This statement applies to the railway as well as to the public highway, for the better the railway the less will be the cost of transportation, and all are financially interested in lessening the cost of the goods we use, and the carrying cost of what we sell. But it is the public highway, or country roads that we are to talk about a little.

Country Roads.

I have said that all have an interest in this, no matter where they live. Let us look at this a little. Those living in the city or village are interested that

their communication with the country may be easy and at all times reliable, so that their supplies, which come largely from the country, may be regular, and be furnished to them as cheaply as they can be produced. And to the dweller in the country, the farmer, it is of more importance that his means of communication with the village and city should be of a kind that can be used without difficulty at all times of the year and under all conditions of weather. The reasons for this need only to be stated to be admitted by all. The city and the village is the farmer's market for all his surplus products, either for home consumption, for sale, or for transportation to distant markets, and he wants to avail himself of this market at the time when it would be most advantageous to do so, when prices are the best and when the things he has to sell are most in demand. And then it is to the city or village he goes for his mail, his church privileges, and oftentimes for the schooling of his children. And again, many of his social enjoyments come from the town, so that if the roads are such that he can avail himself of the public lecture, or the concert, or other entertainments, it will not only be a source of financial profit to him, but a means of social enjoyment, and mental and moral improvement as well.

Highways an Index of Civilization.

Some one has said that, other things being equal, the measure of a country's civilization could be determined by the conditions of its country roads, and I ask you, applying this test, where would we of Wisconsin stand in the scale? In asking this question I do not forget that as a state we are young; that many of our people came here poor, and that for some time the question of bread and butter was the main one that crowded itself to the front, and so, of course, the cheaper methods of caring for the public highways were excusable. But I submit to you, ladies and gentlemen, whether we have not come to the time when we ought to try to do something better. I need not take your time to tell how horribly bad our roads are. Certainly your memories are not so short that you have forgotten their condition for the most part of the time since last November, and you know that every year at least one-third of the time our roads are impassable with anything but a part of a load, and you know equally well that this condition of our highways has a direct tendency to block all the wheels of commerce. And now, the question is, what are we going to do about it? Shall we go on with our slip-shod methods of road making or shall we try to do something better? I think all will agree with me that our present methods are totally inadequate to give us anything better. Our present method of road making has been tried in this country for nearly two hundred years and in our own state for over fifty years, and I ask you what have we to show for all the labor that has been expended and the expenditure has been large in the aggregate? Mr. Robert Fargo, of Lake Mills, Jefferson County, Wis., has taken the trouble to examine the records and ascertain the amount of highway tax that has been paid into that township in the last 50 years, and it amounts to over $100,000, an amount large enough to macadamize all of the public highways of the town, and I ask again, what have they to show for it? The answer is just what the rest of us have to show for our road tax. Without attempting to describe them, I will simply say that our country roads are a disgrace to our civilization. I have said that I have no hope that our present methods would give us anything better. Let us look at this a little. In the first place the man who is to have charge of the expenditure of the road tax is not chosen for his fitness for the position or because of any skill he may have in road making, but often with the view that he is the man who will let the boys

have a good time on the road. I grant this is not always the case, but my observation is that it is the rule and not the exception. Those of you who have been in our town meetings, where our road overseers are chosen, know that their selection is more like a farce than a bona-fide transaction. The whole business is treated more like a huge joke than like a serious transaction that directly effects every man, woman and child in the county.

What Shall We Do?

But I fancy I hear some one say, "Granted that all you say about our roads is true, and that what you say about our present system is true, still what are you going to do about it?" That is just the question that we hope the associated wisdom of this convention will be able to satisfactorily answer. As I understand the division of the question it is my duty to try and point out some of the benefits that will come to us as a people from having good country roads, and leave for others to point the specific plan for getting them.

It is an established principle in the world's economy that something cannot be gotten for nothing, though many seem to be trying to do so. It was decreed in a very early day in the world's history, that "man should eat his bread in the sweat of his face," and that law has never been repealed, so that any good thing that is gotten today somebody has to sweat for it. And this road question is no exception to the general rule. Good roads mean a large outlay of thought, labor and money. Now comes the question, will the benefits that will come to us from good roads pay the cost of getting them? This is the whole question in a nutshell. My answer is, I think they will, and my farther effort in this paper will be mainly to try and prove that my belief has good foundation on which to rest. I suppose no one will question but what the railroads of this country are a great benefit to it,—indeed, I think I might safely say an absolute necessity, for without them the immense volume of traffic and travel that is now carried on would be an impossibility; and that they are a good investment for the capital put into them, we have every reason to think is true, else capital would not be seeking investment in the new roads all over the country,—and that we as farmers are getting a much better price for what we have to sell than we could if we had no railways, and that all trade and branches of commerce are greatly stimulated by them.

The Economy of Railways.

We must remember that these roads have been built by an immense outlay of brains, muscle and money, and that they are paying their owners for this outlay we have every reason to believe. But they are constantly making improvements in them in every way possible, one of the most important being in the improvement in the road-bed. The result of such improvement has been to greatly reduce the carrying cost. As an example of this, in 1870 it cost the New York Central railroad one and one-sixth cents to move a ton of freight one mile, but small as this seems it has been reduced so that now the cost is less than one-half cent per mile. Another road shows a corresponding decrease in running expenses, due largely to the improvement of tracks and road bed. Now, what does this prove? It proves that improving the road-bed lessens cost of transportation. and if this is true on a railroad, is it not equally true of the country road? But I hear the objector saying that the railroads are doing such an immense carrying business they can afford a good road-bed, indeed it is a necessity for them; but for the country roads, oh, no! my no. Let us look at this a little. My friend, where does this immense volume of business that the railroads are doing come from? Do you know that a very large pro-

portion of it was first loaded onto a wagon and toted over the country roads, and that the amount carried by the railroad, vast as it is, is only a part of what is first loaded onto the wagon. Just think of the millions of tons of produce that are carried on wagons direct to the consumer in city and village, and that instead of the railroad doing all the carrying they are only moving the surplus products out and bringing back the goods we take in exchange. Another objector will say that there are only a few of the railroads but the country roads are everywhere. And that is true. But we must remember that these railroads are built at a cost of from $25,000 to $40,000 per mile, while the roads we are asking for can be built at a cost not to exceed $2,000 per mile, and in many places for less than that, so the comparison is not so unequal as it might appear at first thought. Another objection will be that these railroads are built by corporations having unlimited capital under their control. True, but are not we a corporation as a state, with capital under our control, railroad and all, and if a few men find it profitable to build and run railroads would it not be profitable for us to build and care for our own wagon roads that are the tracks for more than twice the freighting that is done on the railroads?

Will Good Roads Pay?

But the question of whether or not it will pay to build and care for our country roads is fortunately not all theory, but the practical demonstration has been worked out. England, France, Germany, and many of the other European countries have solved this problem to their entire satisfaction, and some parts of our own country have tried this matter far enough to prove conclusively that as a business venture it is one of the very best for the farmers. There has been no general taking hold of this matter in this country as in European countries, but some of the states have laws allowing counties to bond and borrow money to build roads. My time will allow me to give only one or two of the many good results that have come from good roads. In Union County, N. J., the road improvement fever got hold of the people, and they expended $350,000 in macadamizing their roads, and the testimony of those best qualified to know is that the increased valuation of their lands would more than six times pay the cost. Just one case, of a man owning 123 acres that he valued at $65 an acre, and could not find a buyer at that, had, since the advent of good roads, refused $200 an acre for the whole tract. I do not claim that all land would be advanced in price at that rate, but I am confident that the increase in the value of our farming lands that would follow the advent of good roads in our state would very much more than pay all the cost of building them, to say nothing of the convenience and luxury of having a road that could be used at any season of the year. Please tell me this, my brother farmers; supposing you were going to buy a farm to live upon yourself, say about five miles from your market town, where you went for your mail and marketed your products, and perhaps where you attended meetings, etc., how much more would you give per acre for it, other things being equal, if there was a good road over which you could draw a full load at any time of the year, or could hitch up your team at any time and trot into town in 30 or 40 minutes, without regard to the weather? I have asked this question several times, and the answers range from $5 to $25 dollars an acre. Now, the facts are that the lowest sum, $5 per acre, will a good deal more than pay the whole expense of macadamizing all the principal roads in any town. I mean by this a single track of macadam ten feet wide, and a good dirt or gravel track by it for use in dry weather. And an assessment of three dollars per acre will cover all the cost of building such road. And do you know, my farmer brethren, that in the matter of the less

number of horses it would require to do your work, and the wear and tear of wagons and harness, you would save in a few years enough to pay the entire cost, leaving out of the question the many other advantages that would come from it.

Necessary Legislation.

I have no well digested plan to offer, but as before stated will merely make suggestions. And I want to say, first in regard to plan, to be acceptable it must not contemplate increased present taxation, for as a matter of fact the farmers of this country are now taxed about all they can stand. If you will pardon me this bit of personal history, I want to say my sympathy is with the farmers. I have all of my life been dependent upon the farm for my bread and butter, and I know the hardships of farm life, and they could not and would not submit to largely increased taxation. The only change that I would recommend in the way of taxation is that the tax that is now worked out should be payed in money, and this from my standpoint would not be any hardship at all. In my last personal supervision of a farm, which was three years ago, I was summoned to go on the road at a time when I would much rather have hired extra teams and men on the farm than to have sent my own away, and I think this often happens with every farmer. But then how would we get the money to build these roads? My answer is, I would borrow it. It could be gotten on state and county bonds on long time at a low rate of interest, say 3 per cent., or at most, 4 per cent., and all that I would ask of the present generation would be to keep up the interest and let the coming generations, that have the full benefits of the good roads from the start, pay for them. Let them be paid for when the population of the country has doubled and the assessed valuation of the property is more than tripled, which state of things will come in the not very distant future, if we first get the good roads. But I desire to be a little more specific in my recommendations. I would have a law passed allowing any county that chose to, to bond the county for one-half the money needed to give them good roads, and then I would have the state furnish the other half, and I would have the money expended under the direction of the state engineer in consultation with an engineer chosen by the county, if they chose to have one. I am aware that I shall be met at this point with the statement that it is not the state's business to build roads and that to tax one county to build a road in another county would be unjust; that it is taxing property for the benefit of others. And it is true in regard to the taxation, and more than that it is just what is being done now all over the country. Property is being taxed, not directly for its own benefit, but for the general good; for instance, our school tax. I have not had a child to be benefited by the public school in twenty years, but I have all these years been paying my full quota of school tax; and so through a long list of other taxes. But it is not true that it is not the business of the state to see to it that we have good roads. Everything that tends to promote the general good is of interest to the state and should receive its fostering care and financial support wherever it is needed. This idea of government aid is no new one. Witness the immense donations of land that have been made to the railroads, and that, too, for private enterprises. Why not then for an enterprise that is wholly for the public good? And most certainly the whole public are interested in having good roads. Well perhaps I have said enough to indicate my thoughts in this matter. I do not present this as a well digested plan for raising money, but I verily believe that along this line will be found the solution of this important road problem.

On the Up-Grade.

In every department of agriculture we have made great improvements in the last fifty years. The sickle, the

grain cradle and the reaper have all been superceded by the self-binder; the spinning wheel and the hand loom have been banished from the domestic economy; the luxurious palace rail car, with its speed of 60 miles an hour, has taken the place of the lumbering stage coach, and so on through the whole catalogue of improvements. But our wagon roads remain substantially what they were fifty years ago—mud, mud, mud and only mud for at least one-third of every year. Do you realize, my farmer friends, what an expensive luxury this mud is? In making up the team we shall need to carry on the farm work the marketing of the products of the farm has to be provided for. It is impossible to come at this only approximately. (I mean what part of the work would be marketing.) I think it would not be far out of the way to say that one-twelfth of the work of the team would be on the road, getting the crops to market and hauling back supplies. Now, with the kind of roads I am advocating at least one-half of this could be saved. The number of horses needed for a farm of 200 acres would be four, so that the roads we are pleading for would save the use of one of the teams, with a man to drive 26 days (I count only the working days, though they would have to be fed 30 days), and this at $2.50 per day, the least that they can be kept for with driver and wagon, would amount to the nice little sum of $65, and you remember this is not counting any of the other advantages that would come from a good road that could be used at all times of the year; and those in my judgment would amount to fully as much more, and you have the nice sum of $130. Now, cut this in two in the middle, leaving out all the incidental benefits that would come, and you still have enough to pay the interest on a $1,625 bond at 4 per cent., and this would be vastly more than the cost of the roads to each 200 acres.

A Good Legacy.

One thing more, and I will stop. Almost everyone, after supplying present needs of self and family, are trying to lay by something for their posterity. What better legacy, I ask, could one leave to their children than good roads? 'Tis a legacy that can be used for all time to come, and what is better it cannot be squandered. You know, my friends, that large possessions left to the average boy or girl is too often a damage to them, too often proving their ruin. But the good road will be a monument to which the children of future generations will point with pride and say, "My father," or "My grandfather was one of the moving spirits in securing this good result."

HOW SHALL WE IMPROVE OUR COUNTRY ROADS?

HON. JOHN DAWSON, La Crosse, Wis.

"How shall we improve our country roads?" This seems like a very simple question, but the people of this state have been wrestling with it a long time without any very practical results. What I have to say on this subject cannot make the matter any worse than it is at present. Grumbling and fault finding at the neglect of our law makers will not improve them; neither

is it just or right to be continually making comparisons between our roads and those of Europe. Our state is very young yet. Money has been needed for the payment of debts on our farms and in the general development of the resources of our state. But the time has now come when we must do something for the permanent improvement of wagon roads in Wisconsin. We need brains and muscle, backed with a firm determination to have better roads, more than we need legislation.

Make a Beginning.

Work should commence at the annual town meetings this spring in making an effort to secure appropriations, be they ever so small, for permanent road work, and when obtained see to it that this money is well expended. We should also use our influence for county appropriations. Get the people interested by getting a piece of good road started in your town. This is the way a few of us started in our county twelve or thirteen years ago. We are now making good progress in permanent road work. We are also gaining in experience from year to year and can now accomplish better results with less money than when we first started. Our county has expended $8,000 for stone the present winter. These stone are for macadam work, and have been distributed to the different towns in the county where most needed. Most of them have been delivered by farmers this winter at less than three dollars per cord. They will be placed and broken next summer. The cost of a ten-foot macadam track ten to twelve inches deep in La Crosse county is from thirty to forty cents per running foot. This is for bad places. Where the subsoil is good and gravel can be obtained within easy distance it can be used in combination with stone, or alone, reducing the cost very much, to $900 or $1,000 per mile. Our county has erected a steel bridge across Black river the present winter, at a cost of $8,000. The approaches will cost an additional $2,000. I don't speak of these improvements boastingly, but in the sense that if we want good roads we must use our influence, our labor, our advice and our money in the interest of better roads.

Good Suggestions.

Life is too short to be eternally waiting for something to turn up. In the way of legislation for better roads I think they should be made under county supervision, and highway tax should be paid in money. I think a road mill tax, similar to our school mill tax, would be a good plan, and every town that did build a mile of permanent road should receive from the state a bonus of so much per mile from this fund. Also in behalf of better roads and in the interest of agriculture and every other industry in the state, we should petition Congress to create a standing committee and a national commissioner of highways. No doubt some of the millions of dollars claimed to have been expended for the improvement of rivers and harbors could have been just as wisely and economically expended, and perhaps much more beneficially, to commerce and the people, for the improvement of country roads when it usually has been expended by a ring of politicians. The present Congress ought to appropriate one million of dollars to Wisconsin for permanent road work, to be apportioned to the different counties in the state where most needed. Perhaps that time will come; when the farmers of this good land get hard sense enough to drop their prejudices and some of their politics and unitedly demand what we are justly entitled to.

THE IMPORTANCE OF GOOD ROADS.

HON. B. E. SAMPSON, Oakfield, Wis.

The people pride themselves on their advancement in all that makes life more worth living; on their civilization and their ingenuity.

The present is the age of machinery. All labor is lessened and quickened by the machine. It writes your letters, it mows your grass, it cuts and threshes your grain. It is impossible to enumerate the useful machines that have been invented or improved in the last fifty years. What is the road that passes your door but a machine, a part of the machinery of agriculture? It has the same relation to your wagon that the steel rail has to the railroad car. And does not the quality of this machine effect your prosperity and your happiness to quite as great an extent as any machine on your farm, or as any of the so-called great questions before the country? In all our great advance in wealth and in the comfort and improvement of the people in almost every direction the country road seems to have been forgotten, for it is but little better today than when first laid out. True, streams have been bridged, and obstructions partially removed, but it is virtually the same dirt road that was used a hundred years ago by the naked savages. In all years it has not changed exchanged except that it is more or less churned and mangled by narrow wheeled tires.

Poor Roads, an Expensive Luxury.

We are supporting hundreds of horses to drag loads through holes that ought to be filled, and through mud that ought not to exist. We have the misery of bad roads and are actually called upon to pay a premium for them. A road well built is easily kept in repair. A dirt road is a costly investment.

The actual cost of repairs of the common country roads under our working out system is much greater than the cost of keeping a similar length of gravel or macadam road under a systematic plan, and worst of all, through our lack of knowledge both work and material are misapplied or entirely thrown away.

To our system of working out road tax is chargeable much of the unsatisfactory condition of our country roads; it is a relic of feudalism borrowed from the statute labor of England. The system was abolished years ago in that country because of unsatisfactory results. Under a more enlightened system England has built up a grand system of country roads. Rome in the height of her power built roads throughout her empire that remain to this day. Her example has been followed by nearly all the modern European nations. France, England, Germany, Italy, Austria and the Netherlands build their roads at the expense of the state. The public roads are under a department of the government, and they are built under the direction of competent engineers.

It is said that a country's civilization is indicated by her roads. If the common roads of this country are the true criterion of our civilization, our standing as a civilized nation is not at all flattering to our trade.

The Government Should Assist.

Our government digs our harbors, subsidizes steamship lines, and gives of the public domain to build railroads, but not one cent is appropriated to build the common country road. If our state would pay one-half of the expense of construction of permanent roads, built according to specifications furnished by the state, I believe many miles of

good road would be built in Wisconsin in the near future.

The importance of our railroads has often been recognized by our government, in the development of our country, and they are indeed a great factor in our national prosperity, but they do not, in any sense, take the place of our common country roads, but act rather in connection with them in transporting produce to distant markets.

The Commissioner of Agriculture for 1888 says: "The common roads of our country are the veins and arteries through which flow the agricultural products, and the commercial supplies which are the life blood of the nation, to those great ducts of travel—the railroads of the country." While our railroad system has become the most perfect in the world, the common roads of the United States have been neglected and are inferior to those of any civilized country in the world. There are over 160,000 miles of railroad track in the United States, representing an investment of over nine thousand millions of dollars, and they are undoubtedly worth very much more. We have no common road statistics, but we know that many millions in labor and material have been wasted through unsystematic hap-hazard work.

It costs no more to ship a ton of grain three hundred miles on the railroad than it does for a farmer to draw it five miles from his home to the station.

The benefit of better roads is not all to the farmer, but to the consumer as well, for everything that lessens the cost of transportation cheapens the product. It is thus to the interest of every person in the land to have better roads.

Good Roads Tend to Sociability.

The farmer's life is isolated at best. The greatest drawback of farm life is the lack of social and intellectual advantages. Hundreds of young men and women leave the farm every year because of this, and hundreds more of farmers and their wives go to town as soon as they are able for the same reason. Much of this isolation would be obviated by better roads. With good roads a farmer could have many of the advantages of the city, and at the same time enjoy the delights of country life.

It is useless to expect an improved road system under existing laws and methods. Nothing short of state and county supervision and the employment of competent men to lay out and supervise the work, will accomplish the desired result. The people of this country are beginning to recognize the necessity of better roads and the inefficiency of our road laws, and many of the states are revising them so as to secure competent supervision. New York, Pennsylvania, Maryland, Tennessee, Ohio Texas, Illinois, and in fact from Maine to California does this move extend. The present may be regarded as the revival of the road era, and those states that first provide themselves with a system of good, firm highways, passable at all seasons of the year, will be first to reach the goal of commercial prosperity.

Wisconsin to the Front.

Shall Wisconsin with her wealth of mines and forest and fertile soil, with her beautiful lakes, her grand scenery, and her delightful climate, be behind her sister states in furnishing to her citizens a system of better roads?

Wisconsin stands formost in her dairy interests, her agriculture and her manufactures. Her citizens are entitled to as good roads as the citizens of any state in the Union or of any country in the world. Our public schools are among the best in the United States. "The little red school house" dots almost every hillside, and the politicians all stand by it; but the children stay at home one-fourth of the time, chiefly because the roads are so bad that they cannot attend.

Our last congress appropriated $10,000 to make a preliminary test of free delivery of mail in country districts, and the experiment is reported to show encour-

aging results; but free delivery of mail can only be successful in country districts having good roads the year round.

Good roads would help relieve our agricultural depression and would stimulate business of all kinds. It would extend our social relations, would increase the value of our farms, and induce desirable emigrants to make homes among us.

We will not get better roads until we demand them. Let the people once become interested and demand better roads and their wishes will be speedily listened to by all the law makers.

Let good roads be your motto. Talk it to your neighbors, and above all talk it to your law makers, and the time will not be far distant when our country roads will be what they ought to be—good as any in the world.

AN OPEN LETTER TO A FARMER (ON COUNTRY ROADS).

B. H. MEYER, Port Washington, Wis.

Pt. Washington, Wis., March 16, 1892.

Friend Daniel:—To read the proceedings of literary societies and debating clubs is not always an inviting task, but the account you gave in your letter of the Kingston Young People's Club is so true to life among our farmers and so full of pithy statements tht I read it all wiu the greatest of pleasure.

The very fact that questions like "How shall we spend stormy days on the farm?" "The farmer during winter evenings," "The price of middle men," and "The power of the farmers' vote," are being discussed, illustrates clearly that the young men and women of Newton township are moving away from old traditions to the light of modern intelligence. A score of years ago the fathers and mothers of that same community would have been shocked to hear their sons and daughters, together with their neighbors' sons and daughters, discussing at a club "Wives and daughters on the farm." And how complete would have been their amazement at such of your statements as "While she is still expected to have a real personal interest in and knowledge of all things on the farm, she is no longer suffered to plow and ditch." Well you may rejoice over this, farmer maids. A better day has dawned. A day in which your desire for cozy homes, breathing an air of intelligence may be realized; and in which the girl on the farm who could spread manure but could not spread a table, who could mow, but not sew, shall be regarded as a curiosity rather than a reality.

While all these thoughts delighted me, Dan, you fanned in me a flame of enthusiasm when you chronicled the defeat of old Michael on the district school question. Most certainly it is high time, even for District No. 7, to have something of greater moment than twenty-five cents on the monthly salary decide between an intelligent, warm-hearted woman or man and a machine; between teaching the children and keeping them in school.

It is with great reluctance that I drop Michael's and other cases, which I would like to write about at length, because they lie in line with my life work, while the question you ask me to discuss confines me more to experiences of my boyhood on the farm. Still those experiences, together with obser-

vations of later years, furnish data from which profitable, and I trust, interesting conclusions may be drawn.

What We Miss by Bad Roads.

One sentence in your letter, "On account of bad roads sister and I were unable to attend the last club meeting," serves admirably the purpose of opening the discussion on Country Roads. This time it was a club meeting that you missed. Some other time it may be a social gathering, or a sermon on Sunday. In the latter case the wrong may be two-fold, for the many empty pews on such days might provoke irritable influences in the otherwise gentle preacher and weave a wrathful thread through his discourse, to the discomfiture of those few brave ones who are present.

Farm life is not very social at best. The loss due to absences from club meetings or social gatherings in itself may not be great, or non-attendance at Sunday's services have any direct or disastrous effect on the farmer's morals; but who will deny that his donning his best suit, and with wife and children beside him, driving proudly along with horses and buggy in proper condition for the occasion, meeting his more remote acquaintances, exchanging views and comparing experiences, discussing crops and cattle, house and home, politics and religion, I say, who can deny that these seemingly incidental things may profit him quite as much as the direct object of his jaunt, the sermon, the club or the social gathering?

Mrs. Boyd once made the remark that the cheerfulness gathered by her husband on such occasions brings sunshine into the household and makes the hard farm less monotonous, while the hired man is ready to testify that, whenever Mr. Boyd is prevented from going to these as he has planned, his mind is in such a state that the breaking of a hay rake, or the kick of a cow, which ordinarily pass without particular notice, will then provoke profanity.

Opportunities on the Farm.

And this same hired man, a brilliant young fellow, speaking of farm life, says: "A farm offers many opportunities to think, if excessive work does not dominate the man, and repeated stay-at-homes do not rob him of the self-sustaining force derived from contact with his neighbor. The rustle of corn leaves, the fragrance of clover fields, the twitter of birds, the beauty of the heavens, all these inspiring things become monotonous and depressing to a man who is continually alone with them, whose heart remains empty. If you can make your farmer friends realize, Dan, their loss in social life, due to poor roads, you will have taken a great stride towards improvement.

Allusion was made above to the power of farmers' votes. That suggests a distinct line of thought on the road question. Before we can approximately measure the power and effect of their votes it is necessary that they should vote. And when old Michael asserts that to have town meetings in April is only a designing scheme of wire pullers, we must admit that there is some truth in his assertion, for on many an election day a light vote is polled because of impassable roads.

Michael and Boyd are both ardent politicians. Several weeks ago Michael sent Boyd the following clipping from the New York Tribune of January 27, 1892: "The law provides that town meetings must be held all through the state on the second Tuesday of February unless the board fixes another date. The second Tuesday in February is apt to find the weather and the country roads in such a wretched condition that many a voter is deterred from attending town meeting who could be counted to do so in April, when traveling is easier and the weather more agreeable."

In his political ardor Michael seems to have forgotten that he was now advocating for New York State what he had denounced in Wisconsin, as the following comments, appended to the above clipping, will indicate: "I tell you,

Boyd, this is a downright plot on the part of Hill and his fellow conspirators, who manufactured this law, to defeat Cleveland. Let them build good roads, and hold town meetings when they please, or let them fix a date on which the farmers of New York can put teams on the road and go to the polls. Even in Wisconsin, Boyd, our political orators would do much more good to themselves and less harm to the world if they harangued less about tin-plate, blankets and diamonds and came out in a straightforward way on "road reform," as well as on tariff reform, civil-service reform, pension reform and the reform of reforms. I have never thought of oratory, Boyd, but if one of our political parties makes the road question an issue, I will take the stump, old as I am, and carry the county solid in favor of the candidate who represents it.

There is Bradley. He would make much less noise about gerrymander or no gerrymander if our legislature would enact and our executive enforce a good road law, so that the alleged "extra miles he must travel because of the alleged gerrymander, might be done on good macadam. All his political wrath would be transformed into smiles by the exhilarating influence of a long ride on a first-class road to attend a political convention."

Working (?) on the Road.

You say, "Write me about the way roads in your district have been made, and how the pathmasters have conducted the working forces." This can easily be done. Since you are so familiar with our people, I shall describe roads and roadmasters by designating them by names, which, of course, you will be discreet enough not to mention in your debate before the club.

If we are to judge our faith by our actions, the chief qualities to be sought for are leniency, and an ambition to improve the road in the immediate vicinity of his farm. If, then, his watch is behind time in the morning and fast at noon, it is very unlikely that the workers will bring in a complaint. On election days, if the district is rather equally divided, the most boisterous faction is victorious, and sometimes a person is chosen pathmaster for one district by votes of men and boys of another district. Two such cases are known to me.

Then think of the impossibility of a fair vote, when the voters packed into a hall are told to separate into groups, representing districts, each more noisy than the other; and then the confusion resulting from voting on two or three different names proposed simultaneously.

We judge of the competency of a cook by the meals he can prepare; his treatment of the sick indicates the doctor's ability, and the teacher is judged, or rather, ought to be judged, by his ability to teach a school. Apply this to the question under discussion.

"Say Nye, you bring a plow for the first day," says the boss. "Oh, no, I can't do that," answers Nye, "my plow is new and good. Go to Jennings. He has one that will do for road work."

The boss then sees Jennings, who agrees to bring the plow. While preparations are in progress the following conversation takes place between Jennings and his hired man:

"John, take the point off the plow and put this one on."

"But that's no good."

"Oh, it's good enough for the road, and what made you put on that new harness? Go straightway and put on the old one."

John does as directed, and at last Jennigs and John set out for the place where the boss has directed them to work. Soon the boss appears on the scene.

"Well, well, Mr. Jennings, you are too late this morning."

"Why, no, Mr. Boss; you see this is mighty hard plowing. The harness broke and John had to go after repairs. It'll be all right now."

"Why didn't you put on a better harness?"

"Why, would you put on your new coat, Mr. Boss, working on the road? Guess you wouldn't. Get up. Go more slowly, John, you might break the plow and harness, and we would never get our pay for it."

Large Pay, But Little Work.

So they work on with that rickety plow. The men who have been directed to remove the earth loosened by this plow, though their shovels are the poorest to be found, have not enough to do, and enjoy the day in bluster and fun. When the day is ended these men together have to their credit twenty-three dollars road work, but the people have reason to feel thankful if no harm was done to the road.

Old Michael says, "Elucidate things well if you will be understood." Let me then elucidate this a little farther.

"McGann," says the pathmaster, "last year you promised to bring new dumping boards; where are they?"

"That's so," says McGann, "I ought to have them; but really, Mr. Boss, times have been hard and these must do for this year," forgetting that he had made that same promise year after year for the last decade, and will likely do so many times more. But McGann has come to "work on the road," and with a wagon equipped with fence boards barely reaching from stake to stake, he enters the gravel pit to have it loaded. McGann would feel no compunctions in asking his laborer at home to convey the same load on a wheel barrow. However, this is for the public at $3.50 per day, while his laborer would do that wheel barrowing at $1 per day.

But McGann's outfit drops the gravel long before it reaches its destination, so he hits upon a new plan. For the second load he enters the gravel pit with a triumphant smile, having doubled the fence boards for the bottom, and substituted a fence rail for side boards. At this McGann and the boss have a squabble for the amusement of the workers in the pit, which, however, is soon ended by the cry of "Go; get out there; teams are waiting." McGann drives away, sowing the gravel as he moves along.

The Farce Continues.

Following McGann was Mr. Councill, a more earnest and honest man. His planks were strong, and sideboards high and long; but to see McGann and consorts waste time and public money with such impudence chagrined him so much that at noon he also put on short planks and lower sideboards, and returned to work in disgust. That afternoon you could have seen a procession of nine teams powdering the road along their course with dust and gravel. To see one of the horses in this procession balk was no exception, and to have a wagon tire come off with the first load was one way of receiving credit for half a day's work on the road.

Culverts.

The building of culverts, as commonly carried on, deserves more than passing notice. To begin with, the getting of pipes or planks for this purpose is often an extravagant waste of time, and not infrequently of money. I have known a team to be on the road half a day to get four planks, though the distance was but three miles. Not only this, but the owner of the team asserted his right to full pay, claiming his team had been on the road all the time.

Adjoining McGann's farm the natural course of the water is north, but the ditch not being open, the pathmaster saw fit to lead it north about ten rods, then through a culvert to the opposite side of the road; then south fifteen rods; then diagonally across the neighboring field to the east and west road, where, after crossing the road the third time, it enters the creek. On the same road further south, the owner objected to the opening of a ditch past his gate entrance, and the obliging pathmaster put in two culverts to accommodate his headstrong neighbor, thus keeping open and in repair on this one-mile road five culverts, where one good ditch would serve the same purpose much

more effectually, and avoid the inconvenience of danger of passing numerous culverts.

Again, the culvert near Jennings' old barn was built in the fall of '82. In the spring of '83 the new pathmaster took it upon himself to remove it to what he considered a better place. But when Councill was elected the following year he finally had it put in the right place.

Efficient Work Brings Defeat.

Then most of our pathmasters believe that every mud puddle must be drained by a special culvert, instead of opening well the side ditches. Councill was not one of them. On the one-mile road leading east from Jennings' there were for years eleven culverts. Councill had the ditches opened, closed seven of these culverts and thoroughly rebuilt the other four. This almost defeated him at the next election. The following year, nevertheless, a certain piece of work cost him his head as pathmaster.

For years and years about twenty rods of the road past Bradley's was impassable during rainy days and poor in dry times. Councill, instead of scattering the working force along a mile or two of that road, put the whole army at work to improve this. All the stones in the gravel pit and those that lay in and along the road were gathered and carefully laid on a drained foundation. On this he dumped the sod and dirt taken out of the ditches, rolled it, and then covered the whole with about one foot of gravel. While scientific road builders may object to Councill's method, the fact remains that that piece of road is now the best in the town. And when the north and south roads leading into Milwaukee are impassable for two or three weeks, or sometimes for four or five weeks, as they always are in the spring of the year, Councill's road is in good condition.

Speaking of Councill's defeat recalls the much better fate of his neighbor, Knoppel, who held the boss-ship for five successive years. Knoppel was one of the "Vaterland" persuasion, and felt elated over the opportunity to show his American friends how he built roads. Evidently he had noticed carefully how the German road builders dig out the road-bed, but had forgotten how they fill it in on the Telford plan, for this is what he did:

In his "peculiar" way all the ditches were opened, and the earth thrown up on both sides in about the way a scientific road builder would store the macadam kept for repairs. When Knoppel's road was finished a transverse section of it presented the form of a modified U. This caused Schopman to exclaim, "Now you have built us a pig trough." And sure enough it was a trough, for when rain set in the roadbed was afloat. But Knoppel was lenient, and not a prohibitionist, and liberal in keeping accounts, which was one of the kind of men to be re-elected. On Schopman's advice, Knoppel began filling that trough with gravel. Schopman, who was Knoppel's successor, continued the same policy, and for seventeen years gravel has been put on that piece of road, mixed with dirt, churned and mangled, mangled and churned by narrow wheel tires, until now it is of a molasses consistency that defies the descriptive art of Jules Verne.

The Present System a Failure.

These accounts of roads and road work, which might be multiplied indefinitely, show plainly the great waste of time, money and energy under our present system. Think of the absurdity of leaving the care of the sick to our farmers, the management of the dairy to preachers, and the cultivation of the soil to lawyers. But are we not doing just as absurd and culpable things in the building of our roads.

It was during my last holiday vacation that my old farmer friend, Mr. Shep Wilbur, visited me.

"Well, well, Shep, I am glad to see you, old friend."

"So am I happy to be able to greet

you, for I've almost forgotten how you people of Cedarville look."

It was not long before I took occasion to refer to Mr. Wilbur's remark that he had almost forgotten how we looked.

"You may have forgotten how we look," said I, "but some of our people have not forgotten the promise you made them."

"Why, what's the trouble?"

"Didn't you promise Radbourn's some apples and potatoes, and Barry's two jars of butter?

"Yes, so I did, but how could they expect me to come through these roads. Why, my team could hardly get through to-day without a load, let alone drawing a load just before the holidays."

"Barry's wanted your butter for Christmas. They had company, and Radbourn's children had been promised the apples for Christmas Eve, and the poor little tots almost cried their eyes out for disappointment."

"Well, Barry's will value my butter much more in the future if they had a taste of common market butter; and as for Radbourn's children they will relish the apples quite as much next week. That's nothing; nothing's lost. But think of me. Eight hundred bushels of barley on hand, and couldn't haul it for the same reason Radbourn's children didn't get the apples. The price has fallen seven cents in the meantime too, think of that. There's fifty-six dollars out of my pocket. That's something to talk about."

"I feel sorry for you Shep, but if you should go down to Simmon's, he would talk about your loss in barley just as lightly as you spoke of Radbourn's apples, for he says that these bad roads cost him from three to five hundred dollars in holiday trade alone. And the loss sustained by Cedarville, he says, runs into the thousands."

Profit of Good Country Roads.

Shep and I were soon deeply interested in the road question. It was past eleven o'clock, and he had accepted my invitation to dinner. "Shep," said I, "here's something good about 'Profit of Good Country Roads.' We can easily go through the article before dinner."

"Let's have it then," answered Shep, looking furtively at his mud-bespattered coat.

In a moment I had begun reading the article by Mr. Isaac Potter, in the Forum for November, 1891. Occasionally Mr. Wilbur interrupted me by offering different views, or expressing doubts. What we read about the roads of Union County, New Jersey, is worth repetition.

"There are fully 600 miles of Telford and Macadam road in the State of New Jersey, and the increase in land values brought about in Union County alone, would pay every foot of stone roads put down in the State. The costs and expenses of these magnificent roads are easily computed. The total outlay of the Board of Freeholders has been nearly three hundred thousand dollars, and there are now nearly forty miles of Telford and Macadam roads in the county. The figures are not in excess of what was expected by those who had given the matter careful study, thus showing that the management of the financial part had been as discreet as the preparatory work.

But the question will at once arise, 'Has the expense of nearly ten thousand dollars a mile proved wise as well as beneficial?' Good roads are, of course, good things, but do they pay? The answer may in part be found in the fact that the property in Union County has actually appreciated in value far more than the cost of the roads; and this is only in cases of sale or exchange, but upon tax levy.

Notwithstanding the fact that $300,000 worth of county bonds have been issued to build these roads, and the interest must be met annually, the tax-rate has not been increased in the county, or in any city in the county, in consequence of the extra interest, and it is but fair to say that the actual appreciation of property due to the increased values of lands bene-

fited by the improved roads meets the increased taxes already. And none of our roads have been completed for more than a year, and some parts of them only within the last month. As an advertising medium alone, they have been worth the cost; for they have brought country property into enviable prominence, have already caused the sale of many residential sites, have brought new wealth and new enterprise in the midst of us, have given direct impetus to building and improvements in every city and town touched by them. And as yet the benefits are only beginning to be realized. It is safe to say that the citizens and tax payers of Union county would not go permanently back to the old system, with its old roads, if they were paid many times the cost of the new roads."

Here Mr. Wilbur again interrupted me. "Why, I never heard of such roads before. I should like to see them. But don't you think that this is rather exaggerated?"

"So far as I know," I replied, "this is a true account. It is not an experiment either, for hundreds and thousands of such roads have been built during this century by the governments of France, England and Germany. It remains for us, the Americans, to decide whether we shall move on with this procession of national and state road-builders, or whether we will continue to navigate dirt roads, deprive our customers of good butter and apples for Christmas, lose heavily on barley, and forget how our neighbors look."

The University Student.

We had just left the dinner table when Milton Crosby came in. Milton is taking the middle course in Agriculture at our State University. He always was very fond of reading and believes that farmers as well as professional men may profit by reading the classics. So he takes in addition to his course in Agriculture, studies in English Literature under Prof. Freeman.

The conversation soon centered in Shep, Wilbur and Milton. Wilbur was now thoroughly interested in the road question. Milton also showed that he had given the subject some attention, and with great readiness quoted statements he had learned from the boys in the Engineering courses. He had also heard one of the Professors discuss country roads before the Farmers' Institutes.

It was half past one o'clock that afternoon when Mr. Wilbur shouted from without, "Team is ready for Rock River. Come on."

Miton and I took seats in Wilbur's buggy, and in a moment found ourselves on the road to Rock River, three and a half miles away. Milton was exceedingly cheerful, and delighted us with his vivid portrayal of student life at the University.

"Say, boys, I can't see distinctly, but isn't there something in the road yonder?" said Wilbur, soon after we had left the limits of Cedarville.

"Sure enough," shouted Milton, "there's somebody drowning; team, wagon and all."

Wilbur put the whip to his horses, but they could not be made to trot. Every step was accompanied by sounds like that of a suction pump. When at last we came within hearing distance of the unfortunate traveler, Milton shouted at the top of his voice, "How cam'st thou in this pickle, good friend?"

Dunsing, for this was the man's name, was too much chagrined to reply to Milton's classical lash. Like a good neighbor Mr. Wilbur hitched his team to Dunsing's, and after considerable shouting and cracking of whips, the wagon, loaded with ten bags of grain was finally drawn out of its miry bed.

"Just like you, Dunsing," said Wilbur, after the excitement was over, "stingy old fellow that you are. Why didn't you conclude to lose the seven cents on the barley, as well as I. Then this wouldn't have happened to you."

"It's not barley, it's wheat," grumbled Dunsing

"Well I should say the same about wheat."

Going to Mill.

"You would eh? Ate the last piece of bread this morning. My wife says she's got to have flour for breakfast to-morrow, and the children have been entreating me for the last three days to go to mill, so they might have biscuits."

In the meanwhile, Milton, from his perch on Wilbur's buggy seat, had meditated on the scene before him. The spirit of Prof. Freeman's literature class possessed him. With his face turned gravely towards me, his right hand directed to the miry slough into which Dunsing's wagon had been sinking, he quoted in slow and solemn tones from Bunyan, "Sir, wherefore, is it that this place is not mended that poor travellers might go thither with more security—His laborers, also, have, by the direction of His Majesty's surveyors, been for above these sixteen hundred years employed about this patch of ground, if perhaps it might have been mended; Yea, and to my knowledge, said he, here have been swallowed up at least twenty thousand cart-loads, yea, millions of wholesome instructions."

This incident marked an epoch in the evolution of Mr. Shep Wilbur's ideas about country roads. The bad plight Dunsing had been in, the wrangling of the poor horses, knee deep in the mire, Mrs. Dunsing's breakfast and the children's biscuits, Barry's butter, Radbourn's apples, Simmon's loss, and last, but not least, his own loss of fifty-six dollars in barley; all these worked effectively on his mind. Milton and I at once recognized in him a subject for conversion.

Loss by Poor Roads.

"Now Mr. Wilbur," resumed Milton, "had we had one of those New Jersey roads to drive on we might have been in Rock River soon after two o'clock, while here it is nearly four. Did you ever think about the loss of time, and losses sustained by wagons, harnesses and horses?"

"You know, Mr. Wilbur," continued Milton, "that our town has the best roads of any in the county, and yet they are impassable in many places during the spring. Then consider what we have done. The books of our town clerk show that there have been expended during the last ten years (1880-1890) the sum of $63,350, or an average of $6,335 annually. Considering the present wagon beds of our town, this sum would have built us from fifteen to twenty miles of a first class macadam."

We had now arrived in Rock River, and while he was tying his horses in front of Tucker's, Wilbur brought our conversation on roads to a close by saying; "Well, boys, if nobody else is there to do it, I will make a move for better roads at our next town meeting."

These accounts will, I trust, show a few of the weak and ridiculous points in our present road system. All pictures I have held up are taken from life, and were any excuse needed for their presentation, the truth would be the only excuse I would offer.

Further Losses.

Again, all flour shipped from the Rock River Mills, as you know, must be wheeled about one-half mile, on what is considered a first-class road. Yet the proprietor states that due to the bad condition of this half mile during rainy seasons, there is a direct loss in business of from two to three hundred dollars annually. When the road is good the team draws forty barrels; when fair, from twenty to twenty-five, and when poor only fifteen barrels. This same gentleman states that when country roads are poor farmers never load more than fifteen to twenty bushels of wheat; when fair, thirty-five to forty-five, and when they are good fifty-five to sixty bushels. These statements, coming, as they do, from a man who

has had years of experience and observation, carry great weight with them. It might be a profitable and instructive task for some farmer to calculate the direct loss sustained due to these extra trips to the mill. Then don't forget that a locomotive can haul a ton of wheat a mile more cheaply than a farmer can a bushel.

Again, men who have given the matter careful thought tell us that with improved roads there would be a saving of from ten to twenty-five per cent. in draft animals and vehicles. According to the census of 1890, the value of the horses and mules in the state of Wisconsin is $34,283,930. Taking the minimum of these estimates, ten per cent., or $3,428,393, is a sum sufficiently large to build 450 miles of a first-class telford or macadam road, with the additional gain of having fewer horses and mules to feed.

Inequality of Road Districts.

The inequality of road districting is another source of annoyance, and not seldom of injustice. I have in mind three districts, A, B an C. District A has within its limits more than half the gravel of the town, while districts B and C have none and in order to get any must draw every load through district A. Now, on the boundary between A and B is a long clayey hill, springey and wet. District B cannot grade the hill without improving the hill in A, for which the B's are much too selfish. The A's don't like to go beyond their limits to take the hill down, lest the pathmaster of B tell them to clear the premises. So this hill remains as it was thirty or forty years ago, while I can quote on good authority that people of district A say they don't know how to spend time in road work, as there is nothing to do.

Let the Cities Take the Lead.

Milton finds much fault with the streets of our cities. "For," says he, "as long as our cities do not show our farmers what a good highway is, they cannot be expected to build them in the country." For a farmer to see and drive on a first-class road is the best mode of persuasion. Furthermore, bad as the country roads are, not infrequently the farmers draw fair loads as far as the city limits, where they find themselves hopelessly wriggling in the mud. Milton thinks it pays for cities to build good streets, not only within the limits, but also a number of first-class highways radiating from the town, as an inducement to farmers to draw their produce to that city. Then, he thinks the state ought to build a few of the great roads joining the chief cities, by loans to be distributed in part to the whole state, partly to counties through which the roads run and partly to the towns.

Another Plan.

Mr. Councill has a plan which strikes me as excellent. He says: "Let our legislature pass an optional law for the general improvement of all highways. Then have the state give $500 or $1,000 bonus for ever mile of road thus built and accepted by the state road commission. In this way counties can vote upon it, and accept or reject as they see fit, by a two-thirds or four-fifths vote as the law shall provide. The incentive will then be for improvement and progress."

It matters little which plan we adopt, provided it is a reasonable one; but the first great thing to do is to begin, and begin at once. Let the farmers do all the road work they choose for reasonable pay, but let it be done intelligently under the direction of a competent person.

Ultimately we may work for a state system of road management similar to our school system. A state engineer, corresponding to our state superintendent; an engineer, working under directions of the state engineer, for each county or group of counties corresponding to our county superintendent. Then each district or town board, under supervision of the county engineer, can

carry on the work in the different towns according to local conditions, taking for their watchword this sentence from the old road builders, Mac Adam: "In every road I have been obliged to alter the mode of management according to the situation, and sometimes according to the finances."

THE COUNTRY ROAD PROBLEM.

HON. C. E. ESTABROOK, Madison, Wis.

Persons familiar with the subject of legislation know well the advantage of proceeding slowly and after due deliberation, and hence if the plan as here outlined is not as complete as some would have it, remember that it is a distinct step in advance, complete in itself, and is capable of easy extension if found to work well.

A Bad System.

The present system of paying highway taxes, figuratively designated as "working them out," is admittedly bad and can be easily remedied, but an attempt to make a change in this direction would undoubtedly meet with opposition, hence I have avoided discussing that subject, preferring to let the several propositions stand alone and be discussed and considered on their respective merits. The subject of good roads has received so much discussion in the public press lately, and there seems to be such a uniform concensus of opinion that something must be done in this direction, little more remains to be done than to devise some general plan which shall not only be feasible but generally acceptable. Good roads mean a great deal more than mere convenience. They mean more than saving money, which, however, is a matter of no small importance. They mean a more intimate relationship between the city and country people, to the mutual advantage of both. They mean that living in the country for six months of the year shall not be practical isolation.

Poor roads keep the farmer and his family at home at that season of the year when they have the most leisure, when time hangs heavily, when it could and would add to their enjoyment socially, and advantage educationally, if a frequent drive to the town or city, or a visit among the neighbors and friends living at a distance of a few miles, could be taken.

Advantages of Good Roads.

The longing of many young men and women to escape from the farm is largely traceable to the isolation caused by the mud embargoes. Good roads mean better prices for the farmers located a few miles away from the market town because the present condition of the highways compels the marketing of the products of such farms at the times when the roads are good and the market prices usually lowest. Good roads would permit the average purchaser of farm produce living in towns and cities to buy his stock of such articles at a lower price than at present.

Indeed it seems to me that no more important topic in a financial and social way has of late engaged the attention of the public. If, then, this subject is of such prime importance, the necessity of moving with great care will be apparent. As indicated above, it seems to me wisest to commence with a system of country roads branching out from the county towns, ultimately to extend

from county seat to county seat. The enterprise being of such general public interest to the people of the whole state, uniformity in plan and entire freedom from local influence in the selection of a route or the acceptance of work done being so important to the general success of the undertaking, the making of the plans and the surveys, and in a measure the general superintendence, should be under the direction of a state engineer, whose expenses should be borne by the state at large. Subject to the general supervision of the state engineer, the management of the improvement should be under the control of the county board or other county official within their respective counties.

The Expense--How Borne.

The expense, which will be considerable, should be borne by the county, the town, the land along which, or near which, the highway is built, in proportion to the benefit received, and the state. The county should be the principal factor in the enterprise, because otherwise the cities would not pay any portion of the expense. In addition to paying its portion of the county tax, each town should pay some additional sum toward defraying the expense of roads built through it, as its citizens will receive more direct benefit on account of such improvement. Every farm along which or near which a macadam or turnpike road is built will be increased in value, and for that reason the owner thereof should contribute toward paying the expense of such improvement. Lastly the state should set apart a certain portion of license money derived from the railway companies with which to pay each county, for example, the sum of $500 for each mile of macadam or turnpike road built within each county under the direction of the state engineer and according to plans made by that officer on highways leading from county town to county town.

The counties, of course, under this plan, would have to, as has been done in other states, issue bonds, running a long term of years, to raise the necessary money to carry on the improvement. It would not, however, be necessary for the present generation to pay the whole expense of such works. Those who are to use the highways in the future might very equitably be charged with bearing a portion of that burden.

Money can be borrowed at a low rate of interest, and the income to the county through the increased valuation of real estate would go a long way towards paying the interest of the indebtedness created for the purpose indicated.

ROADS FROM AN ENGINEER'S STANDPOINT.

PROF. C. B. WING, Madison, Wis.

The necessity for good roads is apparent to everyone who has given the matter thoughtful consideration. The best method of beginning the improvement, and the amount of money that can be economically spent in such improvement is a question that must be settled by a careful study of the conditions of the locality concerned. Economy and skill in construction must

be carefully looked after as in the management of any of the successful enterprises of the day.

How Much Are They Worth?

The problem to be first considered is usually this: How much can economically be spent in gaining the full use of the roads for all kinds of traffic during the three months of the year which the roads are at their worst?

Every community will, in a large measure, have to decide this question for itself. Much of the produce of farms within a radius of fifteen miles from a large city can be more readily transported to market by wagons than by railways. This is especially true of the perishable products of market gardens, etc. The value of the land from the suburban point of view is greatly advanced; in fact it is worth nothing for this purpose unless the roads are good for driving at all times. In New Jersey this increased value of the land has, in most cases, as evidenced by immediate sales, more than paid the first cost, interest and repairs, i. e., the tax rate has not been increased on account of the money borrowed to make the improvement. The increased valuation of the abutting property is sufficient to pay the expenses of interest on debt, sinking fund and repairs. This work has been going on for eight years, and is no longer an experiment. Money invested in hard, durable roads within a greater or less distance from a large city is sure to prove a profitable and economical investment for all concerned.

The Economy of Good Roads.

A more difficult problem is to determine how much can economically be done to improve our ordinary country highways which form a net work of communication between the smaller towns and villages throughout the country. The province of an engineer is not, as many suppose, simply to spend money, but is rather to obtain the best possible results when given a certain amount to expend. If, by a change of methods or an improvement of conditions, a saving in expenses will result, the engineer is the first to recognize it The great reductions in freight rates on our large railway systems are due in large measure to careful study of details. To Prof. Baker, of the Illinois State University, belongs the credit of first applying the same methods of study to common highways. If we can prove that bad roads actually cost the traveling public so many dollars per year, true economy would suggest that this amount of money be paid as interest on money borrowed to make the needed improvement. If properly managed a sinking fund could be formed that would eventually pay off the indebtedness, and the community have a good road during this time.

The following outline of the method of determining the cost of bad roads is identical, in some respects, with that given by Prof. Baker. The bulk of traffic on the roads leading to our smaller towns and villages where improvement is most needed is usually in one direction and consists of hauling produce to market. If we neglect the other traffic, which is variable in amount and hard to estimate in studying our problem, we are certainly on the safe side.

Careful Estimate.

The first thing to be ascertained is the amount of traffic that is likely to pass over the given road or roads under consideration. From the records of the shipping department of the railroads centering in the given town under consideration the number of carloads of produce shipped can be determined, and from the lists of the buyers a record can be obtained of the number of wagon loads, their average weight during different conditions of the road, and the average distance hauled. The power and endurance of horses has been made the subject of experiment, also the friction on road surfaces can be determined by direct experiment. The cost of

driver, team, wagon, feed, etc., must be determined for each locality by consulting those in position to know. In the vicinity of larger towns, where quite a large portion of the traffic is due to produce that is consumed without shipping, the same data could be obtained approximately by stationing an observer. We are now ready to determine the cost of hauling one ton one mile. If the necessary data has been carefully obtained, this estmate can be made reasonably exact.

To illustrate: Assume that the cost of hauling, as ascertained by the above methods, is $2.50 per day, that the average team hauls a load ten miles (this assumes that the team returns unloaded), and that the average load under the present condition of the roads is one ton. Dividing the cost of hauling per day by the distance hauled, and by the average load we have 25 cents as the cost of hauling per ton mile, or the cost of hauling one ton one mile. If this cost of hauling one ton one mile can be reduced by improving the roads, the amount of money saved in this way per year could be profitably and economically expended in paying interest on capital borrowed and invested in making the improvement. The community would be in the same condition financially, would have a better road, and more time to spend in developing and increasing the value of their land.

The principal defects of roads are:

a. Unnecessary lengths.
b. Long heavy grades.
c. Bad surface.

Unnecessary Lengths.

The shortest distance between the points to be connected, other things being equal, is theoretically the most economical location. Practically, however, conditions other than the mere cost of hauling determine the location, i. e., character of subsoil, nearness to surfacing material, avoidance of hills and swamps. Something, however, can usually be saved by shortening the road, especially if the amount of traffic is large. Assume that the cost per ton mile has been determined as above. This sum is made up of the cost of driving, feeding, wear and tear of horses, harness and wagon. Each of these items is affected to a greater or less degree by a saving in distance. The saving in time will be proportional to the saving in distance. The cost of feeding a team is greater when working than when not; therefore the cost of feeding above that required when not working varies directly with the distance. The expense for the driver and a certain portion of the wear and tear also varies with the distance.

To illustrate: Assuming the cost of hauling per ton mile be 25 cents, of which 4 cents is for feed, 10 for driver and 11 for wear and tear; from the above we have the part of the cost of hauling that varies directly with the distance, taking half the cost for feed and 20 per cent. of the wear and tear as varying directly with the distance, as 14 cents per mile. If the average load is one ton and the number of loads per year is 3,000, a saving in distance of one mile would mean a saving of $420 per year, which, with interest at 7 per cent., would represent a capital of $6,000. A common problem of this nature is putting the road across a section following the diagonal instead of going around the sides. This would result in a saving of .586 mile, or $246.12. This considering the rate of interest at 7 per cent., would represent a capital of $3,516. The land across the section giving good material, a better road could probably be constructed for this amount than is likely to exist at present. If the road is to be eventually macadamized, the saving in distance is all the more important.

Long, Heavy Grades.

A horse can exert nearly twice the force for a short distance that he can exert continuously, without unnecessary feed or danger of straining. From the result of experiment we find that a grade of one foot rise for

every twenty-five feet of horizontal distance, or two hundred and eleven feet of rise in one mile of horizontal distance, requires nearly twice the tractive effort, with ordinary road surfaces, that would be required if the road was level. Therefore short 4 per cent. grades, if not of too frequent occurrence, do not materially increase the cost of hauling as long as the roads are in their present average condition. These conclusions may be verified in any practical case by means of observation and experiment.

A long 4 per cent. grade, however, will have a marked effect upon the cost of hauling, since the load that might be drawn up the grade will be only half the load that might be drawn over the whole distance if the road were level. Making all allowance for the ease with which the lighter road can be drawn up the level portion, we may take the actual load drawn up the grade as three-fourths of the load that could be drawn if the road were level. Assuming the same data as before, the traffic being 3,000 tons, the average haul five miles, the number of loads per day two, the average weight of load one ton, and the cost of hauling $2.50 per day, we have the cost of hauling per ton mile 25 cents and per load $1.25. If the road were level the weight per load could be increased to one and one-third tons, or the number of loads required to haul 3,000 tons could be reduced from 3,000 to 2,500, a saving of 750 loads. Since it costs $1.25 per load for hauling, this means that the cost of a long 4 per cent. grade under a traffic of 3,000 loads per year is $937.50. This amount, with interest at 7 per cent., represents a capital of $13,393. And yet a grade is apparently the least objection to our present roads.

Bad Surface.

In no way is there a better opportunity for bringing in quick and sure returns than in improving the surface of our roads. Aside from the fact that by thus improving our roads, we can make a great saving in the expense of marketing our produce, comes the distinct advantage of having the roads for use all the time for purposes of pleasure driving and social communication. Considering the question entirely from the utilitarian standpoint, however, and only dealing with the heavy traffic, it can be proven that bad surface costs more than both of the other items together. The pay of the driver will vary with the resistance. The better the condition of the surface the less will be the resistance; the less the resistance the greater will be the load; the greater the load the sooner the produce will be marketed. Therefore the cost for driver and of feed will vary as the defects of the road surface.

The wear and tear on a good road will be only half as much as upon our average roads. From observation and experiment it has been determined that the average load is one-fifth less than it would be were the roads always as good as when in their best condition. To illustrate: Assume that the roads centering in a village have a traffic of 14,000 loads per year, that the cost of hauling is 25 cents per ton mile made up of 4 cents for feed, 10 cents for driver and 11 cents for wear and tear. By making the roads as good all the year around as when they are at their best these 14,000 loads could be hauled in 11,200 loads. The cost of hauling could be reduced to 4 cents for feed, 10 cents for driver and 5 cents for wear and tear, or a total of 20 cents per ton mile, a saving of 5 cents per ton mile, or a saving of 25 cents per load hauled, if the average haul is five miles. This would mean a saving of $6,300 per year, or with interest at 7 per cent. $90,000 could be borrowed and spent in improving the condition of the roads tributary to this village to merely bring them at all times up to their best condition.

Again, to make a general application: Assume a traffic on a certain stretch of road to be in their present condition 3,000 loads or 3,000 tons per year and the cost of hauling 25 cents per load

per mile. If by improving the surface of the road these same 3,000 tons can be hauled in 2,400 loads, and at the same time the cost of hauling can be reduced 5 cents per load per mile, an annual saving of $270 per mile of road improved would result, or with interest at 7 per cent. $3,857 could be spent per mile to bring this road to the same condition at all times that exist when it is at its best.

To summarize: With traffic of 3,000 tons per year, with the cost of hauling at $2.50 per day, the following sums can be spent in improvement, the community be no worse off financially, and have better roads:

$6,000 to save a mile of distance.

$13,393 to save a long grade of one to twenty-five miles.

$3,857 to surface a mile of road to be as good at all times of the year as when at its best.

These figures represent the cost of the produce traffic alone with traffic in only one direction. The actual cost includes all traffic and would be much greater. No account has been taken of the increased value of the land, the increased wealth of the community, and general growth that would naturally follow systematic road improvement.

Pathmaster's Picnics.

Having ascertained in any case the amount of money that can be profitably expended in making a needed improvement, the question is how to spend it in the most economical manner. The first thing is to prevent the waste of time, energy and money incident to the present system of "pathmaster's picnics."

Why are carpenters and blacksmiths employed? Many farmers are and more should be able in an emergency to do a fair job at either trade. The reason, then, is not so much lack of ability as the lack of skill necessary to do the work economically. Is road making, then, so easy a task that every man is capable of turning out a good job at will, and at the same time do the work economically? Manifestly this is not true, as the condition of the roads today illustrates. As much skill and careful study is needed in each locality as the cost of the improvement will warrant, and the more the improvement is needed the more time should be given to the study of local conditions and estimating the value of the improvement contemplated. Put the roads in charge of some one commissioner, who is to give all his time to the work and give bonds to the community for the faithful discharge of his duties.

Thorough Underdrainage.

In many localities it seems hopeless to attempt any improvement unless the amount of traffic will warrant the expense of a macadamized road. The task, however, is not quite as hopeless as would appear at first sight. Much can be accomplished by a proper use of the materials at hand. The real source of trouble in nearly every case is water. As much care should be taken to keep water away from a well constructed road as is taken to keep it out of the cellars of houses, or from leaking through the roof. If the road foundation receives as careful treatment as the cellar of a house and the surface the same attention that is given to the roof, the road problem will be solved for some localities. In every locality material can be found that if mixed in the proper proportions will pack firm and hard under traffic, if it can be thoroughly protected from rain. The first step, then, is to thoroughly underdrain, whether the road is to be eventually macadamized or not. Everyone has noticed that if a hill or grade occurs in a road the condition of the road surface is always much better than the condition of the surface of the level pieces adjoining it. This is sometimes due to a change in the character of the soil, but in the majority of cases is due to the fact that the water falling on the road is rapidly drained away and not allowed to soak in and destroy the road.

Wide Tires.

One authority on the subject of road draining claims that in prairie soil a good road can be obtained for eleven months in the year by simply putting in a good system of tile drainage, slightly rounding the road bed and sowing grass seed so that the roots may aid the drainage. If the road surface is to perform the service of a roof it must be protected from the action of narrow wagon wheels. A sharp turn is always in better condition than the straight portions of the road. A little thought shows at once that this is due to the fact that the front and rear wheels do not follow each other and therefore do not form ruts. A slight difference in the length of the front and rear axles of wagons with the use of wide tires would accomplish more for roads, considering the expense involved, than any other one thing.

It is hard to change a custom, and probably nothing but legislative action can introduce a change. This change need not prove a hardship to anyone, and the arguments against such action are comparatively unimportant.

Conclusions.

a. By careful study of local conditions determine the cost of bad roads.

b. Pay this cost as interest on capital borrowed for making the needed improvement.

c. Substitute the cash system of paying road tax for the labor system.

d. Thoroughly drain all roads and keep the drains always open.

e. Do away with narrow tires and axles of the same length.

f. Macadamize wherever the traffic will warrant after fulfilling the above conditions.

g. Keep the road as clean as you would the roof of a house, thus affording no chance for water to collect and destroy the surface.

Discussion.

Dr. Marsden: I fully accord with the sentiments expressed by the writers of these papers. I have no doubt they have satisfied you all that some change should be made in our present laws. I have watched the operation of those laws for the last fifty years, but they are not calculated to build roads. The laws were made more especially for road repairing, and have not resulted in building roads, as is very apparent. Not a mile has been built in the state of Wisconsin under the laws now in existence, so that the first step that should be taken should be to repeal all existing road laws and make new laws that are fitted to our present condition and circumstances in reference to highways under which roads can be built. It has been pointed out very clearly that the first step in the building of roads is to lay them out in such a way that no unnecessary labor will be performed in the future in bringing that strip of land into the condition of a road, by which I mean a track between the farmer's residence and his market place that will be level, that will be permanent, that will not yield when traveled upon by the heaviest domestic animals or the wheels of carriages that are transported over the roads; to build such a road that you can use it to the best advantage possible in using the machine that you have upon your farm which you call a wagon, in transporting the produce of your farms to the market; to build a road so that you can carry two tons one trip with the same horse power that you may lay out in carrying one ton. Of course, that road will be expensive, it will cost money, and the question is, are the farmers of Wisconsin prepared at this time to take hold and build such a road?

Get Out of the Rut!

It is not easy to get out of an old rut; we have been jogging along under the old system of road building that we have been habituated to, and we are not going to surrender it, perhaps, very easily, particularly those conservative farmers who want to move cautiously.

They don't know about this thing of paying the road tax in cash, turning it all over to the state and letting the state take charge of this thing, and appointing engineers to build roads. They are not quite satisfied as to how it is going to act. Now, I have found considerable fault with the road system of Wisconsin, and I believe that the fault finder should always be held responsible for suggesting a remedy. I do not want you to accept my theory as correct, but it is the best I know of, and it is that all money should be paid over to the state, the state take charge of the roads and build them. Now, that is a great subject to talk to; it is a long distance to go, and we can't expect it to come all at once. Most everything comes, we are told, by evolution; I think one of the great difficulties with our road district system is the difficulty of finding experienced men, skillful men, men who possess the necessary qualifications for building a road.

Abolish the Present System.

I think if we were to abolish the road district system and proceed at once to a town system, pay all our road taxes into the town treasury in cash, or in a certificate that you would perform good and faithful labor on the road when called upon by the proper authorities, that would be taking one step in the right direction; and then let the town board select a man to take charge of the roads in that town who is fully competent to carry on the work. The next step would be the county system, and ultimately you would come down to the correct principle which underlies the whole matter, and turn the whole thing over to the state because the highways are public ways. Every individual in the state is interested in the highways, whether he resides in the city, town, village or country, and it is absurd to place the burden upon the farming community of keeping these highways in repair, and all property in the state of Wisconsin, railroad property, every corporation, and even churches, should be taxed to support and build the public highway. Now, then, when you tax the people of the state, the state must assume the responsibility and take charge of the funds and expend them for the benefit of the general public.

Mr. Hutchinson: What material is there that we can use different from what we have now? We all know what our soil is, and we know the effect of rain and heat and frost upon it. We are willing to work, but with the kind of soil that we have what good does it do? In one year our roads find their level. Can we contrive to get any material that we can put on top of our roads that will stay there? I can see none, unless we can find gravel beds. Gravel put upon our roads will stay there, but can we find that? I don't know where it is in our district. Now and then there is a pit somewhere in the field, but the law has to be changed to allow the public to go in there. I know a gravel pit three miles from where I live, but it costs a good deal to draw that; it would cost five dollars a rod to draw it three miles. That will make a road that will last; but what money we have in our district will not complete more than twenty rods, and unless we can find some different material it is going to be a very difficult question for us to solve.

Mr. Dawson: Of course we should have to be governed by circumstances. Some counties would be unfortunate in not having material convenient for road work. When we first commenced to put these tracks in we met with a great deal of opposition as to width, depth and other things. We find now that a ten-foot track in marshy and sandy places, with a depth of ten to twelve inches of broken stone, or in place of that, we place a lower tier of stone without being broken; the object in doing that is to get a better bearing on the soft ground, and also it acts as a trench. Then, the top course is fine stone, and then a covering of earth. That in a very short time comes down

to a solid track. We have a large city in our county, and we found when we commenced agitating this matter, twelve or thirteen years ago, that the farmers in the county opposed it more than the city men. Mr. Linse was a member of the board at that time and was one of the men that opposed it. I believe I introduced the first resolution for permanent improvement in that county. I have seen wagons going over that road with a cord of rock weighing 60,000, and it is as good as it ever was. I have given this matter a good deal of thought. The law limits us to an appropriation of $8,000, and we could have raised last year $25,000 or $30,000 without a grumble if the law had allowed it. Now, as there is so much opposition to the changing of that law, let that law stand, let us get what money we can from the county, and then get what we can from the state and the nation. Let the people see that it is doing a good thing, that this money is economically expended, and we will get the money as fast as we want to use it.

Mr. Linse: It has been well illustrated tonight that our present system is a wrong one, and good suggestions have been thrown out how to better it. This thing is already done in a better way in some places. I will just read a little controversy I had in one of our local papers. I thought it was well to show that there are some parts of this state, even if we are a little way from civilization way up here in the north, that are doing a little something for the public good, and I will read this extract:

HIGHWAY TAXES AND WORK.

CHARLES LINSE, Shelby, Wis.

"Town of Shelby, Jan. 13, 1892.
"Editor West Salem Journal,

"Dear Sir:—Your request to give a sketch by what system and manner we apply our road taxes I am very glad to meet, as the road question is one of the most important of the day. Every thinking citizen knows that one of the great necessities to elevate a country is good roads. We farmers know that no money will return larger interest than the money properly spent to improve our roads, but every farmer knows also, or ought to know, that our present road work system as is practiced in most localities is a wrong one and his time or money is squandered by it in a most reckless way. Why such a state of things could be so long lasting is hard to explain. The only explanantion I can think of is that we farmers are so conservative. In many instances it would be of great benefit to us to ship off a little of this conservative nature. It would quite often add to our prosperity in these times of progress.

"Now I feel a little proud that the town of Shelby is the banner town in La Crosse county that has first abolished an old rotten system and put advanced ideas in operation, and if my boasting could create a little jealousy so as to make some of the other towns think they were just as good as the town of Shelby, then this would be one of the rare instances where jealousy ever did any good. I do not claim that we are already perfect in our system. We had to start in carefully in making changes. We could not dare to destroy at once all the idols of the good old times, and so we held yet to our road

districts and pathmasters; but the ice is broken and I hope that our boat will land at the shore of perfection before many years. I hope that in the near future we will have one man who will make it his study and profession to work and build our roads in a sytematic and scientific way and manner, instead of having a dozen or more so-called pathmasters, who will, each one to his own notion, quite often make very doubtful improvements.

"Our principal aim is to spend our money for permanent improvements. We have done away, as much as possible, with all this digging and rooting every spring and fall in our highways. The town board has the superintendence of all road improvements to be made. Such improvements consist principally in the building of macadam roads. If possible and practicable, we let the job to the lowest bidder. If such cannot be done, the town board fixes a price that will be paid for stone per cord in a certain locality, and also the price of breaking the same. This latter plan is very desirable in some localities, as it gives the single tax payer a chance to pay his taxes in work if he should choose to do so. In making the appropriations to the different roads two things are principally taken into consideration, namely: First, the necessity of the improvement in regard to the condition of the road, and second, the importance of such road. To benefit the most people (it is an impossibility to benefit all the people alike in one town) we must aim to first improve such roads as are traveled by the most people. It is a bad practice to squander the road funds all over the town in order to satisfy every kicker who thinks he ought to have an even share in every case. We must concentrate our means if we want to make permanent improvements. When we first adopted the present system the complaint was often made that the money was not evenly distributed and too much of it spent in one place, but people soon began to see that before a quarter of a century had passed every foot of our main roads would be of good hard macadam. And what have we accomplished in the past quarter of a century for all our time and money spent? I leave this an open question, hoping somebody from another part of the county can answer the same more satisfactorily than I could.

"Yours truly,
"Charles Linse."

RESOLUTION.

The following resolution was introduced by Mr. Dawson, who moved its adoption:

Resolved, By the citizens of Wisconsin, assembled at the Farmers' Institute at the city of Portage, March 16, 17-18, 1892, that we pledge ourselves to use all honorable means to create an interest for the improvement of public highways in our respective localities within the state, and further

Resolved, That we use our influence in securing local, state and national aid for the purpose of permanent road improvement.

Motion seconded and carried.

The Institute adjourned until 9:30 the next day.

MORNING SESSION—MARCH 18th.

DAIRY SESSION.

The Institute met at 9:30 a. m. Mr. Geo. Wylie in the chair.

PRAYER, BY REV. A. M. PILCHER.

"Oh, Thou Eternal God, we take Thy name upon our lips with the profoundest reverence, because Thou art God, and besides Thee there is none other. We desire to thank Thee for all Thy Providence and Thy bounty. We rejoice in the good land Thou hast given us, in these broad fields, these fertile plains, these hills and these rivers, and inland seas, and all the riches of our good land. We bless Thee, oh Lord, that Thou hast also provided food for our thought and for our spirits; we thank Thee for the peace that prevails in our borders; that we feel no alarm. Command Thy blessing upon this convention, bless the officers and all who are in attendance today. Give unto them wisdom in all their deliberations, that they may reach the most satisfactory conclusions, and establish principles and precepts that shall bear good fruit in the hearts and lives of those who are connected with them. Give them the fruits of their labor, and may their homes be blessed; may their wives and children be blessed, and may they increase in knowledge and in virtue and in righteousness while this life shall last, that in the world to come they may reign with Thee forever. Amen."

Supt. Morrison: While Mr. George is coming forward I want to say a word or two. I regret that we haven't five or six hundred farmers within eight or ten miles of Portage here this morning to hear Mr. George. He represents just that class of farmers, small farmers who are seeking for success, but who doubt in their own minds whether it will pay to go into the dairy business and I believe that the first thought that ever came to him of the dairy business was at a dairy convention held in Arcadia seven years ago. He is going to give you this morning his experience in rearing a herd of dairy cows. It was not all success, as he will tell you, for he had a great many failures and discouragements. Mr. Favill told you last night that nothing worth having comes easily in this world. I regard this subject of particular interest to the farmers of this locality, living on your light, sandy soil and trying to eke out a slender existence. If you would only go into the dairy business or some business that you would have lots of animal husbandry, then there would be some opportunity of benefiting yourselves, some chance of making a success, something that will bring in more money, and then we will have better homes, we can become better citizens, we will be better satisfied with ourselves and other people and things look brighter to us all around.

HOW I BRED A HERD OF JERSEY CATTLE.

F. A. GEORGE, Hale, Wis.

Some six or seven years ago the farmers of Trempealeau county found themselves engaged in an unequal warfare. With lands exhausted of their fertility, low prices and small yields of grain, debts increasing by reason thereof, it was indeed a hard problem to ponder over. To pay these old debts, and at the same time to restore the farm to a paying basis, as well as to meet current expenses, needed that no further mistakes be made.

In 1885 there was only one creamery and one cheese factory in existence, and they were poorly patronized. Still there were many farmers who were willing to do the best they could.

The first encouragement we received was a visit from the State Dairymen's Association in 1885, at Arcadia. The men who came there saw our condition and knew what advice to give. They stated our condition so correctly that the farmers present realized that the advice given would be safe to follow, and the result of the three days' meeting was that many a farmer went home encouraged to labor anew, and telling his neighbors, spread the good news that there was a chance of prosperity in the dairy business.

Next year came the Institutes, bringing more advice and encouragement, and every season since one or two meetings have been held in our county, and I am safe in saying that the benefit to Trempealeau county alone has exceeded the cost to the state for the whole Institute work, and to them should be given credit for a large share of our prosperity. Today we have twelve creameries in successful operation, and they have paid to the farmers $400,000 for cream for the year 1891.

The raising of horses, sheep and swine is also being carried on with success, and a general advancement in all directions is being made.

In my own case the struggle has been identical with many others, and while it has been up grade for a long time, the future looks bright. Each year since '85 we have made a little advance, and I give you the figures for the past three years, showing that we are on the right track, and also, I think, showing that the dairy business for capital and labor invested will pay better than any other branch of farming, provided that the farmer is a cow man. These figures are given to show the entire farm business:

	Cream sales.	Other sales.	Total.
1889....41 cows	$2,597	$1,008	$3,605
1890....39 cows	1,886	1,298	3,184
1891....40 cows	2,170	852	3,022
Total.....	$6,653	$3,158	$9,811

	Paid labor.	Paid feed.
1889, paid labor.....	$540	$800
1890.....	467	794
1891.....	263	641
Total	$1,270	$2,235

By deducting the expenses, $3,505 from the total receipts, $9,811, we have a net farm gain of $6,306.

I am very well aware that these statements do not make an unusual showing, but when I look back five or six years at least they are encouraging to me, and the fact that the farm is growing more valuable daily gives me confidence for the future.

We began with native cows and sought to improve with Jersey blood, and now have nearly one hundred head of high grade and full blood Jerseys which we have raised ourselves, with the exception of five or six. We save all the heifer calves, for one cannot

always tell how they may turn out. No man can rightfully claim to be a dairyman who does not try each year to raise the standard of his herd, and the killing of dairy heifer calves cannot be too strongly condemned.

Our way to raise a calf is to leave the cow and calf by themselves for 24 hours, only partially milking the cow. Then return her to her place in the barn and place the calf in a dry, warm place by itself for say twelve hours. When the cow is milked feed the calf at once, using a calf feeder, feed not to exceed three or four pounds three times daily, as long as the milk is unfit for use, which should be about a week. After two weeks add one-half sweet, warm skim milk, and at the age of one month all skim milk always feeding warm and sweet, and gradually increasing the quantity to twenty pounds a day Feed this milk with good clover hay and a bundle of unthreshed oats, if a September calf, till the following June, when they go onto pasture. Still continue the feeding of sweet, warm skim milk till they go back to their winter quarters as yearlings. Don't rob a fine calf of its drink of milk to feed it to a hog, even if it is one of George Wylie's best.

I can add nothing farther that will be new to you unless it is to say that farmers do not know the value of skim milk as a food for farm stock as well as they should. For colts, calves, poultry and hogs it will, if fed properly, go a long way towards economical production, and on this line more than any other we can control the products of the farm.

Discussion.

Mr. Bloor: How many acres in your farm?

Mr. George: The farm is 240 acres, with about fifty or sixty acres in hay, about forty in wild marsh, and the balance in tillable land.

Question: What is the value of the land?

Mr. George: I paid fifteen dollars per acre for the land twelve years ago. Land is selling for about twenty-five dollars per acre in farms in that neighborhood. I wouldn't sell at that, but if I should sell at that price it pays a good bit of it.

The Chairman: How much has this system of farming improved your land per acre in fertility?

Mr. George: It has really made the farm; the farm before was not paying at all, but constantly running behind.

Mr. Bloor: Made the farm and made the man, or helped the man?

Mr. George: It has helped the man a good deal.

Question: How is it that you make your expenses so low?

Mr. George: We do a great deal of our work ourselves.

Mr. Allan: What is the average number of cows you milk during the season?

Mr. George: Forty-one in 1889, thirty-nine in 1890 and forty in 1891.

Mr. Robinson: How do you teach your calves to drink?

Mr. George: I use a calf feeder. Put the milk in a pail and have a little rubber tube running into the calf's mouth.

Question: Do you carry on other branches of farming?

Mr. George: We sell horses and such as that, but the main business is cream. We make no butter, but sell our cream at the public creamery.

Mr. Hayes: The point is that you have good cows that make lots of cream and they are well fed.

Mr. Noyes: What do your cows average per annum in butter?

Mr. George: I haven't that in figures here, but last year (our herd is quite young, most of them my own raising) it was 260 pounds; 284 pounds was the largest yield I ever had.

The Chairman: Why do you only partially milk your cow for the first twenty-four hours?

Mr. George: I have been advised to do so by old, experienced dairymen, claiming there is less danger to the cow; I mean leaving a little milk in the bag

when she is fresh. The calf would not naturally take it all. I have understood that it has a tendency away from milk fever.

The Chairman: Have you succeeded in making your cows do better?

Mr. George: The highest I ever reached was 284 pounds. They were very large and well matured shorthorn and native cows. I am getting more for the feed given than I got before.

Question: Tell us how you feed those cows.

Mr. George: We try to have them come in in September and October, and as soon as they become ready for full feed we give them from thirty to forty pounds of ensilage per day with what good clover hay they will eat, and in lieu of the clover hay we have unthreshed oats. We never thresh our oats. That is the feed, with perhaps six to eight pounds of bran during the day, or else oil meal on the ensilage.

Question: What does your cream bring you an inch?

Mr. George: Since November we have had a co-operative creamery, and we have received twenty-three cents a pound for an inch of cream, that is, net to the farmer.

Mr. Favill: Do you cut your sheaf oats?

Mr. George: No, I don't; just feed them in bundles; they eat the straw and everything nearly all up. We have just about enough left to take out and bed our horses. We cut that as green as we can with the binder, and bind as loosely as possible, setting them up in shocks and feeding that way.

Question: Do you raise your cows or buy them?

Mr. George: Always raise them.

Question: How do you select your heifer calves?

Mr. George: We raise them all. I haven't got far enough along in the business to tell whether a calf is going to make a good cow until she gets in milk.

Question: Have you applied the Babcock test to your cows?

Mr. George: No, sir; the only way I have of testing the cows is taking the money that comes back from the cream and dividing it by the number of cows. I have not tested the cows individually, except in churning out each individual cow's milk.

Question: Do you find a wide difference when you do that?

Mr. George: The cows being all Jerseys, there is not the wide difference that other people claim to find in their herds.

Mr. Thayer: From your herd of cows does it furnish you with fertilizers enough to keep your farm up in good shape on that sandy land?

Mr. George: It is going that way very fast. Of course we haven't it as rich as we would like it, but it is improving very fast.

Question: Do you buy any feeds?

Mr. George: About 2,000 pounds of shorts and oil meal last year.

Question: How much oil meal do you feed per day per cow?

Mr. George: Two or three pounds. Some of our creamery proprietors have an idea that much oil meal has a detrimental effect on the keeping qualities of butter.

Mr. Bloor: Does the creamery man find fault with your cream on account of your ensilage?

Mr. George: No, sir.

Mr. Emerton: This winter I mixed oil meal with bran to try and make my cows give as rich milk as possible, and I experimented with the oil meal till I thought that the cows gave lumpy milk, and I discontinued the oil meal and stopped, but the flavor of the butter wasn't out. It was ropy milk.

Mr. Dawson: Mr. George, what does your oil meal cost you a ton delivered at the station?

Mr. George: Twenty-three dollars a ton.

Mr. Dawson: We have found a good deal better results by feeding corn meal than oil meal, and much better butter.

A stranger: This oil meal is ground, isn't it?

Mr. George: Yes; it is the same as

linseed meal; it is pressed oil cake; the oil is taken from it. I never have fed linseed meal.

The Chairman: Have you had any experience with this ground linseed, Mr. Adams?

Mr. Adams: I never tried it very extensively; a little this winter, mixing it with ground corn and oats. I did not feed it with very satisfactory results.

Mr. Favill: I understand, Mr. George, that you feed your calves until they are a year old. Now, are you sure you would not get more money out of the skim milk you feed them, feeding it to some fine hogs than to those calves, and let the calves eat grass?

Mr. George: I think I am sure.

Mr. Hatch: Have you found in your experience that calves that come from good cows are more apt to make in turn good cows?

Mr. George: I haven't had experience enough in breeding to answer that question.

The Chairman: Mr. Goodrich, do you find that calves from extra good cows make the best cows? Is there anything in pedigree?

Mr. Goodrich: I think there is, though with common stock there is occasionally a remarkably good cow that will crop out, but her descendants will not come up to that standard, as I have found by experience. Some years ago I had a high grade shorthorn cow that was a remarkably good one. None of her heifers ever came up to that standard, but they were better than those that preceded the remarkably good cow, and the longer I have bred by selecting the best and raising the best the fewer blanks I draw.

Mr. Bloor: Have you tried clover in the silo?

Mr. George: No, sir; we are all well satisfied with corn ensilage and shall go right on and fill again.

Question: How many acres of corn, on your light soil, does it take to support this number of cows?

Mr. George: We had about twenty-three acres last year, and we filled about 200 tons of ensilage from that land.

Mr. Emerton: Do you feed hay with your sheaf oats and silage?

Mr. George: No; feed the sheaf oats in place of the hay.

Question: And leave the straw in front of the cow long enough for her to eat it up?

Mr. Emerton: There is very little straw left; they will eat most all of it.

Mr. Thorp: Mr. Chairman, I want to explain something that happened yesday when Mr. Bloor asked me about how much clover I got from an acre. I said about eight loads of about one and one-half tons to the load. I understand there has an impression gone out that I had eight loads of dry clover hay, made to the acre, and I want to correct that. There were eight loads of green clover, just mowed and raked, running about a ton and a half to the load.

Mr. Goodrich: Mr. George, how do you feed your cows in the summer?

Mr. George: If the pasture is real good we don't feed grain. You will see by the figures that I gave you that last year was the least money received, and that was the year we discontinued feeding grain in the summer.

Question: Do you think you can pay for the grain that you feed in the summer on pasture?

Mr. George: Yes; I think we have always done it.

Question: What kind of grass have you?

Mr. George: We have timothy, clover and red top, and then this blue grass comes into the old pasture. We have a good deal of low land. We feed our corn ensilage while milking.

Question: Did you ever discover that it made any difference in the flavor of the milk in the time of feeding the ensilage, whether before or after milking?

Mr. George: No; we always feed it during milking.

Question: I would like to ask Mr. Thorp that same question?

Mr. Thorp: Yes; I think I did notice a difference.

Mr. Hodgson: If you have a full pasture, do you think it pays to feed grain; don't you think it would be cheaper to soil your cows?

Mr. George: With us labor is the highest thing in the market; it is a good deal easier to go down town and buy a load of bran than it is to soil.

Mr. Hodgson: The difference, of course, all depends upon the price of the land. With us, where land is worth $100 an acre, we can't afford to keep twenty-five acres of pasture where six acres would do the same work; therefore we prefer soiling.

Mr. York: How do you keep your sheaf oats without loss from mice?

Mr. George: Stacking outside the barn in stacks, you will not be troubled at all with mice.

Mr. Goodrich: If you want my opinion, I have had some experience on this question of feeding grain on pasture. I am sure I got well paid for the grain that I fed on pasture, even if the pasture was good. I am perfectly convinced that my cows held out better, and in the course of a year I made a profit.

Mr. Chadwick: Would you consider it cheaper to feed grain or hire pasture?

Mr. Goodrich: I don't care how good a pasture is, it pays. If you would give me a pasture I would feed grain, not a large but a small amount. My cows come in in the winter in better condition and give more milk.

Mr. Thorp: Wouldn't they be somewhere near the barn about milking time, too, if you fed grain?

Mr. Goodrich: That is another thing. Nobody has to go after my cows from the pasture; they are always around when they ought to be.

Question: Would you recommend feeding bran on pasture?

Mr. Goodrich: I would; I do it myself, so of course I couldn't advise anything different. The amount of bran or bran and oats that they have in summer is about half what I feed them in winter, four or five pounds a day, unless the pasture is short and the cows are in a large flow of milk; then I give them just as much as I would in the winter time.

Mr. Ames: Would the price of bran have anything to do with the amount of feed you would give them?

Mr. Goodrich: It has not yet been so high but I have fed them all I wanted them to have. I would not pay as high a price for bran in connection with pasturing as I would with some other feed. It makes a good deal of difference what kind of feed I have to feed with bran, but if I can't get nitrogenous food that will balance up the ensilage or corn ration I would pay a pretty good price.

Question: How high would you go?

Mr. Goodrich: How much would you pay for potatoes if you couldn't get any? I know a man who paid sixty dollars a bushel for potatoes, and he said it paid him, too. He could get flour for a great deal less, but because it balanced up his ration and made him feel good and he was wealthy it paid him.

Mr. York: Three years ago this summer my cows had splendid pasture and I quit feeding bran, and thought it was just as well. Before I quit feeding the bran my cows averaged a pound of butter a day, and the next week after I quit feeding they shrunk down so that I figured the bran only cost me about two-thirds of what I lost in butter. Let me say, here is a good point. The farmers are humbugged on this bran question to a great extent. The majority of them go to buy bran, and they try to get fine, heavy bran. There is where they miss it. Fine, heavy bran is not worth within two or three dollars a ton as much as the coarse grade of bran for cows. Never buy bran for your cows that will go forty to forty-five pounds to a two bushel bag. If you will order your bran from the mill you can get it every time without any trouble at all.

Mr. Favill: How many of you gentlemen would work your horses through the summer, just giving them grass and nothing else? You don't do it. You give them in addition to the grass all

they want of some kind of grain. Now, the horse that is plowing is not doing any heavier work than the cow that is giving a full mess of milk, and grass alone is not strong enough feed for her, though it may make her give a large flow of milk. Just for the time you wouldn't notice very much difference in the way your horse acted, but you know the horse is pulling, you are using up his strength, and he wants something stronger to keep him up. It is just so with the cow. I am satisfied it pays for the feed as we go along, and then it pays another profit in keeping up the strength of the cow and having her in condition for her work later on in the season.

Mr. Kingman: There is another point that has not been drawn out. I am firmly of the opinion that the buying of bran is valuable for the manurial qualities that are left on the farm. It goes a long ways towards paying for the bran.

The Chairman: We have had some very good points brought out in this discussion. Mr. George has shown you that the first thing is to acquire knowledge, and then use it as he has done. He has shown you how he keeps his cows and what the profits are, proving that there is a profit right on that sandy farm, a direct profit which goes to his pocket, and an indirect profit, which we presume is just as large, that goes to his farm, so that he is increasing his capital in two ways. He is raising his cows, and has a herd that he says produces 260 pounds of butter per year. I think every intelligent dairyman will agree with Mr. George that by raising and selecting his own cows there is a good deal of profit.

Mr. Ames: I would like to ask Mr. George one question. Don't your oats mould when you cut and tie them up in that way that you told us of?

Mr. George: No, sir; I have never been troubled. I cut them with a binder and set them in long shocks. I wait until they are in the dough before I cut them, and then, of course, use care in shocking. Put it up in small bundles loosely, and it will come out all right.

The Babcock Test.

Mr. C. H. Everett gave a practical demonstration of the workings of the Babcock test, exhibiting the bottles, the Pipette, and other parts of the machine and worked out several tests, explaning the process as he went along.

Mr. Thayer I understand that these machines are quite expensive, so that it is almost within the range of any farmer, or club of farmers to have one at very little expense. I wish you would explain how that occurs.

The Chairman: As I understand it it is just because Dr. Babcock was so open hearted that instead of patenting this machine, as most every man does, he gave it to the people of the state of Wisconsin and to the world, and that it why it is so inexpensive.

Mr. Thayer—I understand that the royalties that might have been obtained on this machine, if patented, are worth half a million dollars at least.

Mr. Everett: Let us take two cows, each giving six thousand pounds of milk a year, one a three per cent. cow and the other a five per cent. cow, and find the difference between the net profit of each. The three per cent. cow will produce 196 pounds of butter in the year, and the five per cent. cow 333 pounds; if the butter sells for an average price of twenty cents a pound, one cow earns $39.20 and the other $66.60. Allowing $30.00 cost of keep in each case, we have a net profit of 36.60 for the five per cent cow, against $9.20 for the three per cent cow, or a difference of $27.40 in favor of the better cow. There is a big field for the Babcock test, and a still harder task to convince our farmers of the importance of investing $10.00 to save hundreds. The Babcock test gives the dairyman a clear understanding of his business, in picking out the unprofitable cows, in determining the value of different feeds, in forcing a cow to give her full capacity of butter production, and in finding the fat left in the skimmed milk and buttermilk.

IS IT JUST TO PAY FOR MILK ACCORDING TO THE BUTTER FAT?

DR. S. M. BABCOCK, Madison, Wis.

In the early days of dairying, it was customary to guage the extent of a man's dairy business by the number of cows which he had, taking no account of the amount or quality of milk produced, but when the co-operative system of dairying was introduced, it became necessary to have some better standard than this for the apportionment of dividends in the factory. The standard which was adopted was the most natural one, being simply the weight of milk which each patron delivered at the factory. At that time nearly all of the cows in any given locality, especially in central New York, where the factory system originated, were from practically the same stock, they were fed and cared for in practically the same way, and there was very little difference in the quality of milk from different herds, so that this system, when it was first introduced, did very little injustice to any one. But the system really put a bounty upon dishonesty, and after a little while some of the patrons began to water and skim their milk. Of course patrons were, when detected, severely punished, either by fine or by being compelled to keep their milk at home, but at best the method was the cause of much trouble and dissatisfaction.

Quantity, Not Quality.

If this had been the only difficulty, there probably would have been no great injustice done by apportioning the dividends according to the weight of the milk delivered. It soon became evident, however, to a large number, and especially the more intelligent of the patrons, that they might increase their income very materially, in a perfectly legitimate and honest way, by breeding and selecting their animals for quantity of milk, no attention being given to the quality. The result of this movement was that the relative value of milk from different herds changed very rapidly. For, as I have already said, nearly all of the cows in the dairy regions at this time, were from common stock, there being hardly any full blooded animals among them, and there certainly were no herds that represented the well known dairy breeds. But shortly after the establishment of the factory system there were introduced animals from those breeds which produced large quantities of milk, and the whole system of breeding was towards cows giving a large quantity of milk irrespective of its quality.

A Wide Variation.

The consequence of this was, that in a very few years the quality of milk from different herds would vary from below three per cent. up to over four per cent., and as the weights of milk brought by different patrons no longer represented the relative values of those milks, this system of making dividends became unjust. Those patrons having the better grade of animals soon discovered that they were not obtaining as much from their cows when they took their milk to a factory as they did when they worked the milk up at home. In consequence of this dissatisfaction arose, and many withdrew from the factories. Of course the withdrawal of the better class of milk from a factory decreased the yield per 100lbs. and reduced the income of those who had been taking the poorer

milks, and there was consequently a great deal of fault found with the manager of the factory, for all the trouble of this kind was attributed to his carelessness. Complaints of this nature made to the manager of a factory naturally induced him to use every means by which to increase the quantity of his cheese or butter. This tended to injure the quality of the product and depressed prices all around. These complications increased each year until the whole factory system was threatened with destruction owing to the great dissatisfaction that arose. There was really no remedy possible under the system of pooling, as the tendency was always away from the better milk and toward the poorer milk.

Composition of Milk.

In order that you may better understand the remedy proposed for this trouble, I wish to consider briefly the composition of milk, and show that the amount of fat in milk is a legitimate and a proper measure of its value. For this purpose I shall consider that milk is made up of only two constituents, one of those I shall call the milk serum, which is an aqueous solution of all of the solids of milk except the fat and the other is the butter fat. I make this division first because it is a natural division, the serum and fat being simply mixed together and not chemically combined, and second, because it enables us to consider the money value of the two constituents separately. The value of the serum and fat in milk have much the same relation to each other as have the values of straw and wheat in a stack of unthreshed grain,—the serum of the milk representing the straw and the fat representing the cleaned grain.

Butter Fat.

Butter fat, at present prices in the creameries of Wisconsin is worth about thirty cents a pound, while the milk serum, or, what is practically the same thing, separator skim milk, is worth at the creameries from ten to fifteen cents per hundred pounds; butter fat is therefore worth about two hundred times as much, pound for pound, as is the milk serum. Perhaps the difference between the price of the wheat and the straw would be somewhat greater than is represented here, but the principle is exactly the same. The value of the grain which the unthreshed wheat contains measures the value of the stack, the value of the straw making very little difference, and it is just so in regard to the serum and butter fat in the milk. This is more evident when the relative amounts of butter fat and serum are considered. The butter fat in the milk varies from under three per cent. up to about seven per cent., and in individual cows we find a much greater range than this, it being from below two per cent. up to about ten per cent., so that at thirty cents per pound the value of the butter fat in one hundred pounds of milk may range from about sixty cents up to the neighborhood of three dollars. With the milk serum there is a difference between the richest and the poorest milk of not more than five or six pounds in 100 lbs. of milk, which at a value of fifteen cents per hundred pounds would be worth something less than one cent.

Looking at it in this light and bearing in mind that while the value of the butter fat from 100lbs. of milk may vary more than two dollars, the value of the milk serum does not vary more than one cent, you will readily see that milk serum plays a very insignificant part in determining the value of milk.

The application of this principle to the valuation of milk for butter production is evident to all, as fat is the chief constituent of butter, and there has been but little question at any time regarding the justice of paying for milk at creameries upon the basis of the fat delivered. With cheese factories, however, the case is not so clear, as butter fat does not enter so largely into the composition of cheese, and today the

most important question, and the one asked oftener than any other is, "Does the butter fat in milk measure its value for cheese?"

Value of Cheese Depends on the Butter Fat.

In considering this question, I wish first to call your attention to the amount and market value of cheese made from different grades of milk, ranging from the closest skim milk, containing only about one-tenth of one per cent. of fat, up to the richest milk likely to be received at any factory. Beginning with the poorest, we find a yield of about six pounds of cheese per one hundred pounds of milk, the value of which at the present time in the large markets is just about three cents per pound, making the value of the cheese made from one hundred pounds of closely skimmed milk about eighteen cents. As skim milk is generally considered worth about fifteen cents per 100 pounds at the creamery, this leaves only three cents for manufacturing and marketing the cheese from 100 pounds of such milk. If skim milk be rated at only ten cents per 100 pounds, which is the lowest price that I have known in Wisconsin, there would still be only eight cents remaining to pay for making and marketing six pounds of poor cheese, which is no credit to the maker or to the locality from which it comes.

Now I do not believe that there is a cheese maker in the state of Wisconsin who has had any experience, that would make a pound of skim cheese for less than two cents. The regular price in all the factories of the state for the manufacture of full cream cheese, which requires but little more than half as much milk for a pound of cheese, is a cent and a half per pound. Even at the latter price there is not enough extra obtained for the skim cheese to pay for the making, to say nothing about the cost of getting the cheese to market. We would conclude, then, that skim milk is worth more for feeding purposes to the farmer at home than can be realized for it in the markets of the world after paying for having it manufactured into cheese.

Price of Cheese Governed by the Butter Fat.

In order to compare prices, I wish next to consider the yield and value of cheese made from milk of about 4.5 per cent. of fat, which is as rich as the mixed milk at any factory in this state is likely to be at any season of the year. Such milk, when properly handled, will make at least eleven pounds of cheese from one hundred pounds of milk instead of six pounds, as is the case with closely skimmed milk. The price in the New York market for the best grade of full cream cheese, such as would be made from the milk considered, was during the past week, twelve and one-half cents per pound, which amounts to one dollar and thirty-seven cents for 100 pounds of this milk, against eighteen cents for 100 pounds of closely skimmed milk, a difference of one dollar and nineteen cents in favor of the richer milk. This difference is entirely due to the difference in fat found in the two milks, as the slight variations in the other constituents of the milk have practically no influence upon the value of the milk, or the cheese that is made from it. An inspection of the prices current in all of the large markets shows that the price of cheese varies very nearly in direct proportion to the fat which the cheese contains. During the past week the price of American cheese in New York has ranged from three cents per pound for the poorest skim up to twelve and one-half cents for the best full cream. The poorest grade of full cream cheese has brought nine and three-fourths cents, while the best skim has sold for ten and one-half cents per pound. I believe that this wide range in prices is almost entirely due to the amount of fat contained in the milk from which these cheese were made. In justification of this belief I would refer you to the market quotations for cheese in Montreal and Toronto, where only full cream cheese are sold, the manufacture

of skim cheese of all grades being prohibited in Canada. In the markets mentioned there was during the past week a difference of only one cent per pound between the highest and the lowest quotations for cheese, and this fairly represents the range in these markets throughout the season. Now, it is claimed that the great range in prices on the New York and Chicago markets is chiefly caused by difference in the skill of the makers. If this were true there should be nearly as wide a range in Canada as in this country, as there are undoubtedly just as poor cheese makers there as here. I believe that the real difference has its origin in the quality of milk from which the cheese is made, and this varies much more in this country than it does in Canada. One reason for this wide variation in the quality of full cream cheese in this country is that much of the cheese made here from part skimmed milk is put upon the market as full cream cheese. A good illustration of this is afforded in the Wisconsin standard cheese, which is not quoted upon any of the large markets outside of the state. This means either that the Wisconsin standard cheese are sold for full cream cheese, or for skim cheese, and between the two there is little doubt that the consumer buys them for full cream cheese.

A Brand of Deception.

The name "Wisconsin Standard Cheese," which is stamped upon them, aids in this deception, as it is accepted by the majority of people, even in this state, as a guarantee that the cheese is made from whole milk. The inevitable consequence of this is that Wisconsin is fast earning the reputation of making a low grade of full cream cheese, and I believe this is one of the reasons why Wisconsin full cream cheese commands a less price than Canadian cheese. Undoubtedly some of the cheese made in Wisconsin are of as good quality as the Canadian cheese, but the general average, taking into consideration only the "standard" and "full cream" brands, both of which are sold to the consumer as full cream cheese, is lower. This operates against those who are making a high grade cheese and in favor of those who are making a standard cheese, as the former does not get as much as he deserves, while the latter gets more. It is exactly the same principle as was involved in the old system of pooling milk in factories, where the patron who brought rich milk suffered a loss on account of the poor milk of his neighbors. I believe that it is the fictitious value given to partly skimmed cheese in this way that makes its manufacture more profitable than the manufacture of either full cream cheese or of butter alone.

Skim Cheese.

Inasmuch as skim cheese is a proper article of food and its manufacture a legitimate business, the question is: How can it be done without injuring the dairy interests? We find that our present law is by no means satisfactory in this regard, and I believe that the whole matter could be properly adjusted if, instead of branding the cheese "Full Cream," "Standard" and "Skim Cheese," the law should direct that cheese shall be branded with the per cent. of fat which the milk from which it was made contained. It is impractical to brand a cheese with the per cent. of fat which it contains, as the analysis of cheese is a difficult matter, which can only be accomplished by chemists with well equipped laboratories. On the other hand the per cent. of fat in milk can be determined by every factory man, and it is already done in many of the factories. If we cause cheese to be branded with the per cent. of fat which the milk contains, it will show the relative value of the material which is put into the cheese. Of course there will be a difference in the skill of the makers, which will affect the quality of the cheese, but that should never amount to more than a cent or two a pound, as it does not in

Canada from one year's end to the other.

Sold Upon Its Merits.

The cheese could then be sold upon its merits and strict justice done to everycne. When this is accomplished I believe that the money value of milk, for cheese as well as butter, will be found to be nearly in direct proportion to the fat which it contains. Of course there will still be times when, owing to supply and demand, butter will pay better than cheese, and other times when the manufacture of cheese will be most profitable; but such fluctuations will soon adjust themselves, as is the case in other lines of trade. Just so long as butter fat represents the value of milk for butter production it will determine the price which must be paid for it when manufactured into cheese, or into any other product whatever. You cannot go into the open market and buy mahogany any cheaper for one use than for another. It makes no difference whether you wish to use it for fire wood or for a piano case, you have to pay just the same price for it. The use you put it to has no relation to its money value in the open market; that is always determined by the supply and demand. You cannot go into the northern part of this state and buy any of their valuable iron ore to macadamize your roads with unless you pay just as much for it as the ore is worth for the manufacture of iron. It is just so in our dairy products. Taking the whole season, the average price of dairy products, including milk, butter and the different grades of cheese, is nearly in proportion to the fat which they contain, and because fat is the one constiuent of milk which imparts market value to dairy products, it seems to me that its quantity furnishes the only just standard for adjusting prices between patrons at the factories. I will not detain you by further discussion of this subject, but if you have any questions to ask I shall be most happy to try and answer them.

Discussion.

Mr. Kingman: In raising cream by the gravity system, is there a difference in the quality of the cream that first rises and that that last rises for butter making?

Dr. Babcock: There may be in one respect. The cream which rises first contains more of the larger globules than that which rises later, and if they were churned under identically the same conditions the yield, when referred to the butter fat in the cream, would probably be somewhat greater from that portion which contained the most large globules, as it would churn more easily, and should churn somewhat more efficiently, but so far as the quality of butter is concerned, I do not think there is one bit of difference. There might be a difference in the yield if they were churned separately, and exactly in the same way, but I believe it is possible to churn the cream containing the small globules and get just as efficient churning as where the globules are large. I have not tried the experiment directly, but it has been tried and the results have been as I say. There were some experiments made by Prof. Arnold some ten or fifteen years ago which seemed to indicate that there was a decided difference in the quality of the cream which rose last, but I believe that Prof. Arnold's results were due to other causes than the quality of fat in the globules. For instance, they had no means of separating cream at that time except by the gravity process, and the smaller globules were left to stand for a good many hours longer with the milk, and it was probably the change which took place in the milk due to the longer setting and to the development of taints which affected the butter, and not anything inherent in the butter fat itself.

Mr. Kingman: In relation to our law of branding cheese, wouldn't it be a better suggestion to brand the man that skims the milk than to brand the cheese?

Mr. Babcock: I think it would.

Mr. Convey: I would like to ask if violent shaking of a sample of milk admits of the opportunity of taking a correct sample? I have an idea that more or less air will permeate the milk.

Dr. Babcock: Certainly, if the milk be shaken hard, especially if it be very cold and be shaken vigorously in a closed vessel it is apt to hold particles of air, and the measured sample would contain less milk on account of the air bubbles; but there is no trouble in taking a sample if the milk be poured gently several times. It had better be poured than shaken violently.

Mr. Convey: Is the method of taking samples of cream in test bottles and churning in those bottles a correct or the best way to determine the butter fat in cream, that is, the ordinary test bottles that are used in gathered cream factories?

Dr. Babcock: The oil test system has been the means, I believe, of making the gathered cream system possible. The quality of cream varied so much that it was absolutely essential to find some method by which the quality could be measured even approximately. The method has served the purpose, although it is not very accurate and does not always give satisfactory results. The Babcock test is used in some of the eastern factories, especially in the states of Connecticut and Maine, and when properly conducted is as applicable to cream as to milk. It is only necessary to take the samples before the cream becomes very thick, but there is no more danger of getting a poor sample of cream for this test than there is of getting a poor sample of cream for the old oil test. Anybody who is competent to take a sample for the one can take a sample for the other. The test will then give the true amount of fat in the cream. In gathered cream factories there are often samples of cream which refuse to churn at all. All such samples would be shown in their true value by the Babcock test.

Mr. Convey: How are we to determine whether the sulphuric acid is of proper strength?

Dr. Babcock: The proper way would be to have a hydrometer for heavy liquids with which you could determine the specific gravity of the sulphuric acid. The specific gravity should range from 1.82 to 1.83, but in case you do not have a hydrometer that is graduated in this way you can judge from the appearance of the test whether the acid is of the proper strength. In making a test when the acid is mixed up with the milk, if it does not heat up very decidedly the acid is too weak. If in continuing or completing the test there is collected under the column of fat a mass of curdy, flocculent matter, that is also evidence that the acid is not of sufficient strength. There should be no sediment in the fat. If there is it is almost proof positive that the acid is too weak, or that sufficient quantities have not been used. If the acid is only slightly too weak the difficulty may be overcome by adding a little more until the curdy matter disappears in the test. If the acid is very decidedly too weak, you will not be able to make a good test, even with large quantities. The acid should be very near to the proper strength. If it is too strong it will be shown by a decided blackening, not only of the milk but of the fat. When the fat separates it will be of a dark color, sometimes as dark as the liquids in the bottom of the bottle. That shows you that the acid is too strong, and you need not use so much of it in that case. Do not try to dilute it; there is danger in adding water to strong acid, as the heat generated is apt to convert a portion of the water into steam, and the bubbles of steam are liable to throw the acid out into one's face or upon his clothes. If the acid is too strong, content yourself with using a little less; do not fill the acid up quite to the mark. It will give you an equally good test. A little more acid should be used than is sufficient to dissolve the casein in the milk.

Mr. Convey: Does the temperature of the contents of the bottles affect the reading?

Dr. Babcock: Theoretically it will, but in the short column of fat, which you have so long as the temperature is sufficient to keep the fat melted it will make no practical difference.

Mr. Convey: Does the cow producing a large quantity of milk, with a low per cent. of butter fat, produce as cheaply as the cow giving the same amount of fat with less milk?

Dr. Babcock: I think you had better let Mr. Goodrich answer that.

Mr. Goodrich: I think the cow that produces rich milk produces the butter fat at less cost, for the reason that I believe it takes as much food to produce a pound of caseine, or milk sugar, as a pound of butter fat, and I prefer to have my feed worked up by a machine that will make as large a portion as possible into the more profitable product. I want to ask a question of the professor. Which is the most just and practical way of taking samples of milk delivered by patrons to the factory?

Dr. Babcock: This a question that comes up very often, and always in factories where the test is first introduced. When the milk is brought into the factory, each patron's milk is poured into the weigh can, and that is where the samples must be taken. In experiments which I have made I find that mixing the milk in the can with a long-handled dipper and taking a sample from that is entirely satisfactory. There are other methods which give good results. That used in the Fort Atkinson creamery is by making a small opening in the bottom of the conductor pipe, which runs from the weigh can to the receiving vat. A portion of the milk escapes all the time from this opening, and you can get a good sample from that.

Mr. Sampson: Will it pay to make cheese out of five per cent. milk? Can I, with four per cent. milk, afford to pool with my neighbor, who has five per cent. milk?

Dr. Babcock: I think you can. I think the value of your four per cent. milk would be increased in proportion to the amount of milk which he brought. I think certainly up to five per cent. the amount of fat in the milk shows the relative value of milk for cheese production. I do not wish to say that there is not a point beyond which it will not pay to make cheese. I do not believe that rich cream will pay to make into cheese, but that has nothing to do with the relative values of different milks. If your milk, when pooled, is too rich to make cheese, you ought to make butter, and the best practice throughout Wisconsin and throughout the United States is to have your factory equipped so as to make cheese or butter according to the demands of the market; but I believe the best interests of all concerned demand that you do not make butter and cheese together.

Mr. Sampson: Did I understand the gentleman to say that it is proper to skim sometimes?

Dr. Babcock: No, I didn't say anything of the kind. I said that up to five per cent., or up to any point where milk is pooled at the factory, I believe it would make cheese.

Question: What is your judgment of the limit?

Dr. Babcock: I don't know where the limit is; I never have seen it too rich yet. Experiments are being tried all over the country today at five or six experiment stations. Milk containing considerably more than six per cent. fat has been made into cheese, and the judgment of those who made it is that up to the point they have tried, the butter fat has actually measured its value for cheese production.

Question: Have you any data in regard to the difference in the markets in the United States before this three per cent. law was passed?

Dr. Babcock: I have not looked that

up. We have always made cheese on that plan in the United States. There never has been a time that milk varying from under three per cent. fat up to something over four per cent. has not been manufactured in the United States. There never has been a time when a considerable portion of the milk used for making cheese has not been skimmed either at the factory or by our system of breeding, and I believe that this explains the wide variation in prices in our markets. Otherwise, why is it that in Canada, where no skimming is allowed, we never find so great variations?

Mr. George: From reports sent out from Madison they point to Canada as very much ahead of us in dairy knowledge.

Mr. Babcock: Not at all. I believe that we make some just as good cheese and even better cheese in Wisconsin than is made in Canada, but I do not believe that our cheese averages as good as the Canadian. I believe that better cheese could be made here than in Canada if it were not for the skimming done in this country, because on the average our milk is better than theirs.

Mr. Favill: In view of what you said to us about the variations in the price of cheese, from the poor cheese to the good cheese, I want to know what kind of cheese you would recommend us of Wisconsin to make, whether we shall continue to make all these good, bad and indifferent, or whether we should strive to make only one, and what that should be?

Mr. Babcock: I believe that the best interests of Wisconsin would be only to make full cream cheese, and where the conditions are not such that this would pay, to make nothing but butter. I do not believe that our best interests are in making this variety of product.

Mr. Jones: I would like to ask a question of interest to every farmer in this locality. We have a new process introduced in our midst that claims to take out from twelve to thirteen and upwards pounds of butter from one hundred pounds of milk. If this man is a benefactor we want to know it. If he is a fraud we want to know it. Is this butter or something else?

Dr. Babcock: In his method of manufacturing doesn't he first ask for a certain quantity of butter, which he wishes to incorporate with that milk?

Mr. Jones: I know nothing about it. I kept my hands off until I found out what it was like.

A Member: I know he does do that.

Dr. Babcock: The same thing has been brought up before the public periodically for the last twenty years. More than twenty years ago, when I was on a dairy farm in New York, a gentleman came along with a patent powder which he had prepared, claiming to make a pound of butter from two quarts of milk, and of course I naturally wanted to see him do it. He asked for one pound of butter to start with, which was furnished, and two quarts of milk. The butter was melted, placed in a churn, and the whole, butter and milk, mixed thoroughly together. After this was accomplished he put his powder into the churn and the whole was churned for a few minutes, until the butter came in a lump and was taken out and weighed, and he actually had two pounds of butter, or something that looked like it. It was for a long time a mystery to me how this was accomplished. After I was associated with the Geneva station I tried to get some of this powder and analyze it. I also tried a good many experiments to see if I could not do the same thing from my own knowledge. I used a preparation of alum and certain acids, tartaric and other acids, and I found that when they were used in certain proportions and under certain conditions, I got identically the results claimed by that gentleman. Afterwards I succeeded in obtaining a little of that powder which he had sold to some farmer, and examined it. I found that it was principally pepsin, and on trying experiments I found pep-

sin did exactly the same thing, that is, it served to precipitate the caseine in the milk, cemented it together, and when fresh and properly colored it had much the appearance of butter. Such butter will keep a little while, but is as much cheese as butter, and in a short time developes a cheesy flavor. It is not really butter, but a very rich cheese. I think that all preparations of the kind do exactly the same thing.

Mr. Jones: Then does he simply bring back the pound that he puts in, or does he get something else?

Dr. Babcock: He gets back the pound he puts in and with that butter, is the butter that was in the milk, mingled with the caseine which the milk contained, and a good deal of water. He put into that milk something like five or six pounds of butter fat to the one hundred, and with the four pounds of butter fat in the milk and the two or three pounds of caseine made up the amount which he claimed.

Mr. Everett: A question has been asked me many times about which I am quite clear in my own mind, but many farmers are not, and it is something like this: A cow giving forty pounds of three per cent. milk, and another cow giving twenty pounds of six per cent. milk, which is the more valuable for butter and cheese of the two cows?

Dr. Babcock: The cow giving the largest amount of butter in the least milk is always the most valuable for butter production, that is self-evident. The richer the milk the more profitably it can be made into butter. Now, within limits, up to as far as it has been experimented on, the same thing in true of cheese.

Mr. Hill: In reference to the comparative merits of this milk test and the churn test, in testing samples of milk at a co-operative factory. You spoke about samples that could not be churned so as to bring butter. Now, suppose I send fifty inches of cream to the factory and the sample of it won't churn. We take that sample home and find that it contains twenty per cent. more or less butter fat, but it won't churn after being properly ripened at the factory. Now, ought I to receive anything for that?

Dr. Babcock: If Mr. Hill took home his whole batch of cream, treated it properly and churned it, I think that he would get a fairly good batch of butter from that cream. The failure of the oil test is almost always due to the condition of the cream in the test bottle.

Mr. Emerton: I would like to ask the professor is it possible to make a false butter that will keep. I have been at work with my family for fifteen years trying to get a knowledge of properly making butter, getting a high flavor to it and placing it on the market, and if I can accomplish that by some patent process and still have merchantable butter, I have put out ten years and lots of labor that has been unnecessary. Is it possible for us, as farmers, to buy such a receipt?

Dr. Babcock: It is possible for you to buy it, but I think you will pay extremely high for it. The rule in such cases is, that the quality of butter is so depreciated that it always reacts. This has been tried in several places. I know a place in New York where butter was made by one of those systems, and while they succeeded in selling one or two lots of it, it was afterwards refused, and it simply resulted in going back to the old methods. All experiments of this kind have been entirely disastrous.

Prof. Short: I have met a great many creamery men throughout the state who have said that you cannot put rich milk into cheese without a large loss on it. I would like to ask how much loss there is in five and six per cent. fat?

Dr. Babcock: We have made a good many experiments in this line. We have worked with milk up to over six per cent. fat, and we have found, without exception, when the milk was in the same condition, that the relative

loss referred to, the fat, is very much less from rich milks than from poor milks. For instance, with three per cent. milk we found three-tenths per cent. of fat lost in the whey. When we increased the fat in the milk up to six per cent., instead of having double the amount of loss, we have only had about one-half greater. Of course, absolutely the amount of fat loss from rich milk is more, but it is not so great when compared with the amount of fat in the milk.

Prof. Wing: Can the average farmer use the Babcock test?

Dr. Babcock: I have during the last two years probably received one thousand letters regarding the use of the Babcock test from farmers and persons who have had no experience in this line. While I have had letters from a few that had difficulty with the test, I think that after correcting them in regard to the use of it, every one has succeeded. I have yet to learn of a person who has failed to make the test if he has followed the directions carefully.

The Chairman: How many farmers in this audience have used the Babcock test in their dairies? I see nine hands up. Now, how many of you have found it impractical? Not one. How many have found it perfectly practical? Nine hands up again.

Question: What does the apparatus cost?

Dr. Babcock: In proportion to the capacity for bottles. I think the lowest price for a four-bottle test has been six or seven dollars; for a ten to fifteen bottle test it is, I think, about ten dollars, and up to a fifty-bottle test it is not over thirty or forty dollars.

The Chairman: How often would the farmer need to test his cows to get an idea of their working qualities?

Dr. Babcock: A man can keep track of his cows by testing them once a month. If he will test them for two or three days at a time he need not test them more than once or twice in the season.

The Chairman: Wouldn't it be practical for a club of farmers in a neighborhood to buy one of these?

Dr. Babcock: I think it would as far as their own cows are concerned.

Prof. Short: I want to ask your opinion of this new separator called the Berigan?

Dr. Babcock: Before answering I would like to read the claims that are made for this machine. "The claims of the separator are as follows: 1st, its simple construction; no part is liable to wear out, and it should last for years without repair under ordinary use." Now, a description of this separator and the principle upon which it is worked was given two or three weeks ago in Hoard's Dairyman. It is simply an apparatus in which the milk is placed, in which it is subjected to air pressure over the surface for four or five minutes. The milk is then drawn out into a regular cream vat and allowed to cream. The claim is made that machines having a capacity of five gallons will skim at least sixty gallons per hour. That is, a certain quantity of milk can be run through it every five minutes. Of course it is simple, it is nothing only a tight box into which air is pumped, so that the first claim is all right; that is, its simple construction and there are no parts liable to wear out. The second is, "it requires no skilled labor to be operated." I believe this is also true. Anyone who can work a pump handle can work the apparatus to that extent. Third, "it can be used in any climate." No "ice, heat or refrigerator, and no water for setting." I think that is also true. The same thing is true of any of the systems of setting; you can use any of them without ice, but the efficiency is greatly reduced by so doing, and the same is true of this. We have made a good many experiments with regard to this same principle at the experiment station. In every case, without exception, we have found that the cream from milk subjected to pressure has been less than that from

the ordinary deep setting can. There is considerable loss in efficiency by subjecting the milk to the different manipulations. "No oil, belting pulleys, shafting or other appliances are needed, except those furnished by us." That looked at first as if it were true, but it is not if the capacity of the machine is considered. They furnish you the separator and one cream vat, which holds five gallons of milk. If you are going to cream sixty gallons an hour you have to have twelve of those vats, and if you only take the apparatus which they send, it will have a capacity of about five gallons in twelve to fourteen hours, as this time is required for the cream to separate, instead of sixty gallons in one hour; the difference is just about in those proportions. Of course, that is one of the wildest claims that they have made. "It is far the cheapest separator for its capacity that has ever been made." Now, you have to buy at least as much capacity in cans or vats for creaming the milk as you would if you got a Cooley creamer or any other gravity system. You have to have just as much capacity aside from the machine, which costs fifty dollars, as for another system of gravity creaming. "The cream is not whipped or churned as in the centrifugal machine, and is ready for delivery from twelve to twenty-four hours ahead of all deep setting methods." The fisrt part of that claim is true; the cream is not whipped; you can get just as good quality of cream from the separator as from any of the gravity systems; but so far as the cream being ready for delivery from twelve to twenty-four hours sooner, that is simply false. In all of our experiments we found that by testing the skim milk from hour to hour that the creaming with the simple Cooley can has been ahead of it every time without exception. "Cream raised by this method is more easily kept sweet." That also not true. "Less labor is required by this method than by any other, etc." That also is not true. The labor required is very much greater; you have more pieces of apparatus to use, you have to pump in the air, close it up, and everything of that kind. Those are the principal claims made by the separator, and from my point of view I will only say that I believe this separator and its claims are entirely wrong, in other words it is a fraud. It is as great a fraud as the patent butter.

Mr. Morrison: This separator is largely advertised; the advertisers are paying out thousands of dollars just to hoodwink the farmers.

Question: What do you consider a fair percentage of fat in milk delivered at the factory?

Dr. Babcock: About 3.6.

Mr. Sampson: I believe that to the farmers here this information received just now on these two points, this patent butter and this separator, will be worth a good deal more than each one's share of the tax to support our experiment station.

Mr. Odell: I want to ask Dr. Babcock a question. A few days ago, in the alleged leading dairy county of Wisconsin, I heard a cheese maker, who pretended to understand his business say, emphatically, that he could make just as good cheese from two and one-half per cent. milk, and just as much of it, as he could from milk containing five per cent. butter fat. Now, what do you think of the abilities of that cheese maker?

The Chairman: Put him along with this separator.

Dr. Babcock: I think he would be about in the same line. Any cheese maker that couldn't succeed in making a good deal more cheese from five per cent. milk than from three or four per cent. milk better go to studying; he don't understand his business.

The Chairman: I heard the same thing, and I heard this question put to him, whether he had used the Babcock test in his factory, and he said no; nor could he give any authority for his statement.

Mr. Morrison: Should the law which

prohibits the delivery of milk of less than three per cent. fat to factories and families be repealed?

Dr. Babcock: I don't think it should. I believe that some law of this kind is necessary, although it plays no part whatever in those factories where milk is received and paid for by the amount of butter fat which it contains.

Mr. Adams: I would like to have a statement go on record here from the doctor whether, in his opinion, the quality of milk delivered at our cheese factories throughout the state is apt to be so rich that it is a serious question as to whether the fat can be incorporated in the cheese?

Dr. Babcock: I do not believe that there is a cheese factory in Wisconsin which receives milk so rich that the fat cannot be profitably incorporated in the cheese.

Mr. Thayer: I understand that you recommend that no milk should be skimmed for the cheese factory, that you recommend that all milk, either for the creamery or cheese factory, should be tested and sold on its merits, and that the quality of cheese should be determined and branded accordingly to the test of the milk making that cheese?

Dr. Babcock: As I understand your question those are exactly my views.

The Chairman: In closing this discussion I will simply say that, from what you have heard here from Mr. Everett and Dr. Babcock and from what you have seen of the workings of the test, we must conclude that this test is a good thing for private dairymen. With this test and a pair of scales he can test each individual cow and know whether she gives him enough butter through the year to pay for her keep or not, and he can tell which cows are profitable ones for him to keep and which he should sell, and a community may have one of these tests to answer the purpose of say half a dozen farmers. While we were at one of the leading dairy centers of this state a few weeks ago, holding an institute, one of the leading farmers gave us a talk, declaring the condition of things in regard to cheese making, telling how the quality of the milk in that particular locality had gone down, and with it the quality of the cheese, and he deplored the fact that that locality was losing its reputation as a center for the production of first-class cheese; and yet, right in that locality, when the question of using the Babcock test in cheese factories was raised some of these men who had not used it made the wild statement that a pound of caseine was worth as much as butter fat, which was very promptly contradicted by a cheese buyer who was present, who said he had an offer of a contract to buy skim cheese for a year, this cheese to be made by one of the best makers of the county, and sold to him at an average price of three cents a pound, which, he said, would not mean more than one and one-half cents for the caseine of the cheese.

Prof. Short: I have had a little experience right in that county. I know the county. Last November I was up there and saw the milk from two factories, about 6,000 pounds apiece. One of them ran 4.2 and the cheese maker was using the test. The other ran 3.2 and the cheese maker had a test but did not use it.

The Chairman: It may be true that they have been pooling their milk so long in that district that they had bred cows for poor milk.

IS IT PRACTICAL TO USE THE SEPARATOR ON THE FARM?

C. P. GOODRICH, Fort Atkinson, Wis.

In other words, is it more profitable to use the separator on the farm to obtain the cream from milk than to use any of the gravity methods? I answer, it is if we can get an increase in the value of the product without a corresponding increase in the cost of obtaining it? To answer intelligently we must do some figuring and have some facts on which to base our figures. We have tested samples of skim milk with the Babcock milk test at the different institutes held in all parts of the state of Wisconsin during the past winter, amounting in all to over one hundred tests of skim milk, set in both pans and cans.

Loss in Skim Milk.

The loss of butter fat left in the skim milk has ranged from three-tenths of one per cent. to one and six-tenths per cent. In barely one instance it was less than three-tenths, being but one-tenth with milk set in a shallow pan, and in one instance it was two and four-tenths per cent. with milk set in a deep can for twenty-four hours in cold air instead of ice water and skimmed from the top. The average of these tests showed a loss of a trifle over eight-tenths of one per cent. In my own dairy I made a great many tests. I believe I have been able to get as exhaustive creaming as I have ever known done by any gravity process, and yet the average loss with me was one-third of a pound of butter to one hundred pounds of milk. I have also tested the skim milk from the farm separator many times, and invariably when the milk was run through warm from the cow there was hardly a trace of butter fat left as shown by the Babcock test, unless the separator was run at too slow speed.

Will it Pay?

Now, we will see what a first-class dairyman will gain by the use of the separator. His cows will give 6,000 pounds of milk per cow a year. A gain of one-third of a pound to the 100 pounds of milk will be twenty pounds of butter a year each, which, at twenty-five cents per pound, will be five dollars per cow. From ten cows he would save fifty dollars and from twenty cows one hundred dollars. Now, we will take the case of a little lower grade of a dairyman. His cows may give an average of 5,000 pounds each. If he has the loss shown by the average of our tests, that is, eight-tenths of one per cent., his loss will be forty pounds of butter per cow, which, at twenty cents per pound, will be $8 per cow, or $80 on ten cows, or $160 on twenty cows. We now take the case of a still poorer grade of a dairyman. His cows will probably not give over 4,000 pounds of milk each. That kind of a dairyman will not set his milk in the best manner. He will not put up ice, he will not pump even half well water enough, and his loss will no doubt be as much as the highest shown by our tests this winter, that is, fully one and one-half pounds of butter to the 100 pounds of milk, or 60 pounds to the cow, which, at fifteen cents a pound, all I expect that kind of a dairyman to get, will be $9 per cow, or $90 for ten cows, or $180 for twenty cows. This can be saved by the use of the separator. Will it pay?

Baby Separator.

The machine most commonly used is the Baby Separator. There are other

hand separators, probably just as good, which can be run either by hand or some other power. The separator will cost not to exceed $125. To turn it by hand, of course, takes time; about one hour to 300 pounds of milk. But it does away with the necessity of putting up ice, getting ice out of the ice house and putting it into the tank; for the cream, only about one-fifth of the bulk of the whole milk, needs to be cooled down to only about 60 degrees, which can easily be done in this latitude with good well water without ice. It also does away with setting and skimming the cans of milk, and if it is run through warm from the cow, as it should be, does away with warming the skim milk to feed calves and pigs. It is the opinion of those who have run the separator by hand that this saving will nearly, if not quite, compensate for the time taken to turn by hand; but it can be run by any power that will keep a reasonably steady motion, and have power enough to run a sixty-gallon churn. A tread power with a governor works very nicely. I have my separator up in the barn conveniently near the cows. It is run by my two-horse tread power, which I have in my barn for the purpose of running a feed cutter. When separating milk I use a bull weighing perhaps 500 pounds. The milk vat to the separator holds some twelve or fourteen gallons, and after we have commenced milking and have the vat partly filled the machine is started. It needs no attention, and five minutes after the milking is done the separating is done. The cream is run into some shot-gun cans and the skim milk into a barrel hung on wheels. The calves are immediately fed what they need of the warm, new skim milk and the rest is wheeled away to the pigs. The cream is carried to the house and properly cared for. We save considerable work as well as butter, as we do not have to carry all the milk to the milk house and do not have to warm the skim milk and carry it back to the calves. We do not have to go out of the barn from the time we go in to do the milking till we are through and are ready to go into the house with the cream.

Profitable Machines.

I am often asked if the machine is durable. Mine has run since the 19th of last August and shows no sign of wearing out yet. It is a light machine, and, when run with a heavy animal or strong power, the belt should be very light and loose to avoid the danger of straining the machine, should the power start off too fast in speeding up. The pulley on the separator should be placed on the lower shaft —the one which gears into the spindle —and not on the crank shaft. My son has been running one of these Separators for fifteen months in a large dairy. A few days ago I asked him to tell me what trouble and expense it had been to him, and if it showed signs of wearing out. He wrote me that it had been no extra expense except for oil and a couple of rubber rings that had been carelessly spoiled and cost him but a trifle. He said that the spiral gear on the spindle had worn a very little, but apparently no more than it was six months ago. That now the grooves and cogs had become fitted to each other and run so smoothly that the wear was so slight, he could see no reason why it would not last for many years. When my son first got this Separator to try he found by actual trial that he could make three-fourths of a pound of butter from 100 pounds of skim milk which had been set in cans in cold water. From his dairy of forty cows he made a gain of five pounds of butter a day, which at twenty-five cents, the price he had contracted it for by the year, made $1.25 a day. He paid $125 for his Separator had saved enough in cash in 100 days to pay for it. He now has his machine, and is probably $400 in cash ahead, besides, and also has saved considerable work.

Practicable and Profitable.

In looking the ground all over I cannot escape the conviction that it is both practicable and profitable for any private dairyman who has ten or more cows, to use a Separator. But I would advise any owner of cows to first get a Babcock tester—that he needs anyway—and test his skim milk, and see what he is losing, then take a Separator on trial—any dealer ought to give him that privilege—and see what he can save by it, and then do his own figuring.

I am aware that it is not a very discreet thing for a man to set himself up for a prophet, but I will just this once venture to prophesy. I predict that within five years such a thing as setting milk for creaming (except where a man has a few cows) in cans or pans will be a thing of the past, and that almost all of the milk in the country used for butter making will be treated with some kind of a centrifugal machine, either on the farm or at the creamery.

Discussion.

Question: Did you test milk where cans was left standing in cold air?

Mr. Goodrich:—Yes, sir. One man had Jersey cows, and the whole milk tested nearly six per cent. He set most of his milk in cans set in cold water, and the amount of butter fat left in the skim milk was seven-tenths of one per cent. He set another can at the same time in cold air, the temperature being about at the freezing point. After twenty-four hours this can was skimmed from the top, and two and four-tenths per cent of butter fat was found to be in the skim milk. Part of this loss may have been due to bad skimming. A good deal of poor skimming is done, especially when skimmed from the top. If any man will use a Babcock tester on his gravity creamed skimmed milk it will make him miserable, for certainly if he has any sense, he will feel unhappy when he finds he is feeding lots of thirty per cent. butter to pigs. But I want to make that man unhappy. The worse he feels the better I like it. If I can only make him feel bad enough it will do him good; will drive him into making some means of preventing such a great waste.

A Member: It is not all lost; you talk as though it was. The calves get what butter fat is left and it does them good.

Mr. Goodrich: I have heard men try to console themselves in that way before, and it makes me out of patience with you and them. Just think of it. Good butter is now worth thirty cents a pound, and a pound of oil meal put in the skimmed milk will do the calf as much good as a pound of butter. I mean that it will do as much or more in promoting growth and building up the frame of the calf, and that is just what we want to do for calves that are being raised for the dairy, and they are the only calves a dairyman should raise. A pound of oil meal costs a little more than a cent. If a man can be content to sell thirty cent butter for a cent, well—let him go, there is no use in talking to him any more.

Question: Is there any advantage in having a separator of greater capacity than the one you spoke of on an ordinary farm?

Mr. Goodrich: Not unless you have more than five milkers. If I had so many cows that more than five milkers were needed I would get a larger machine.

Question: Can you or any other good judge tell the difference between separator butter and butter made by the common process?

Mr. Goodrich: I do not think anyone can tell the difference if the cream be properly handled.

Question: Does it do any harm after you have started the separator to stop it and start it again?

Mr. Goodrich: It does no harm provided you do not stop too long. Be-

fore you stop shut off the feed, and when you start let the bowl get up to full speed before you start the feed again.

Question: Does it do any harm to let the separator run when the supply of milk has given out so that none is being fed in?

Mr. Goodrich: Yes, if it runs too long—say five minutes or more—the continued force will make the cream so thick that it can hardly run out, and if continued long enough, the cream in the bowl will be churned into butter and packed in pretty solid.

Question: What is the expense of a two-horse tread power?

Mr. Goodrich: About $100. Sometimes not more than $85.

Question: Would not a small sweep-power do as well?

Mr. Goodrich: No, not one horse in a hundred would keep even speed enough, and with any horse it would be necessary, on a sweep power, to have an attendant to prevent danger from sudden starts.

John Hodgson: Is it advisable to put the separator in the barn?

Mr. Goodrich: Yes, why not?

John Hodgson: Will not the milk take on odors from the stable?

Mr. Goodrich: That was a question that was in my mind, and over which I thought a long time. I saw that it was going to save me much work, and so I did it. The fact is, the milk is not in the barn much longer than it would be if we were to bring it directly to the dairy house. It runs right into the vat and in that way is quickly covered. Now I am going to say something about odors in milk that may not agree with some scientific persons. It is my opinion that when milk is warm—up to 90 or 96 degrees—as it is while in the barn, it will take on no odors from the surrounding air if the air is considerably colder. The vapor and odors are passinng off of the milk instead of going into it. If cold milk was put into a warm stable, there is no doubt that the milk would rapidly take on the stable odors. Am I right in these opinions, Dr. Babcock?

Dr. Babcock: You are correct.

Question: How about the skim milk from the separator?

Mr. Goodrich: It is just as good as any skim milk can be; it is warm and new and has the smell of warm new milk, and the calves don't seem to know the difference.

Question: Do you ripen the cream?

Mr. Goodrich: We do. Immediately after separating, the cream is well aired by dipping or pouring from one can to another, then it is cooled down to about 60 degrees, in summer by setting the cans in cold water, and in winter by setting them in a cold room. It is held at that temperature as nearly as may be, till it is ripened. If it will not ripen soon enough to suit in this way we add a little ripened cream from the previous churning, and after about sixteen hours it will be right for the churn.

Question: Is there any method by which you can tell the proper acidity of your cream for churning?

Mr. Goodrich: There is no practicable method that I know of except by the taste and the thickness of the cream. Soon after it begins to thicken it is about right. It takes practice and careful observation to learn this point to a nicety.

Question: Is it not a great deal of trouble to train a bull to run a power?

Mr. Goodrich: Mine learned to tread it so that it required no attention, in about fifteen minutes.

Question: Is it not too hard work for him?

Mr. Goodrich: No, it is just moderate exercise. The power does not need to be elevated much.

Question: Would not an oil or gasoline engine be preferable to a tread power?

Mr. Goodrich: If you have an engine of course you can use it for that purpose if you wish. I know of one man who bought a new engine for the purpose of running a baby separator,

but it looks to me like poor economy. In the first place an engine would cost much more than a tread power. Besides that, it costs something for fuel, and it takes a little time to get up steam. Then, if you run it in the barn there is danger from fire. On a tread power for running a baby separator you may use any domestic animal on the farm of the weight of 500 pounds or upwards. It may be a colt or steer —even if not more than a year old—or a pony or a horse weighing 1500 pounds. The governor can be set so as to regulate the speed. But the bull, I insist, is the proper animal to use as he needs the exercise, it keeps him gentle, and he is always there, or should be.

Question: Does feeding ensilage damage the cream or butter?

Mr. Goodrich: It does not unless the ensilage is damaged; that is, mouldy or partly rotten. I have had several years' experience with feeding it and am satisfied that for winter feed there is nothing that will make better flavored butter than good ensilage. Damaged, mouldy or musty food of any kind, or bad flavored weeds or vegetables fed to a cow have an injurious effect upon her product. If you don't believe it feed a cow on onions or leeks, and then see if you can eat her milk or butter without making a wry face.

Question: Do you believe in making sweet cream butter?

Mr. Goodrich: I certainly should make it if my customers preferred it and would pay more for it; but as they do not prefer it—and I think that is the case with the majority of customers—I do not make it as a rule. I have churned sweet cream a few times. I found it took longer to churn and it was difficult to get as exhaustive churning. It is claimed that if it is churned at a temperature low enough, 50 or below, you will get as much butter as with ripened cream. Well, that may be so; try it for yourselves; it may be that you will succeed better than I did.

Question: Will more butter be left in the butter milk if the cream is not all ripened alike?

Mr. Goodrich: There will. I found once on testing some butter milk that it contained 7.3 per cent of butter fat. The cream was from three milkings, two of which were ripened and the other was sweet. There were 24 pounds of butter churned and the Babcock tester showed that butter fat enough remained in the butter milk to make 12 pounds more. That showed, I think, conclusively, that the sweet cream produced no butter in that instance. No doubt that butter milk could have been churned again and the butter recovered, but it was not done in this case. This is an extreme case, but there is always more or less loss when the cream is unevenly ripened.

Question: What part of the butter fat is lost in the skim milk?

Mr. Goodrich: With gravity creaming all the way from 6 to 25 per cent, and sometimes even more than that. With the separator there need not be more than 1 per cent. of loss.

Question: How small dairy could I have and still make it pay to buy a separator?

Mr. Goodrich: Ten good cows if you take good care of them, and get a good price, say 25 cents net the year round for your butter.

Question: How is it best to run the separator?

Mr. Goodrich: You can run it by hand if you wish. Some say a dog power is good, but I should expect the dog to run off and hide about milking time instead of running the separator. I like my way that I have described to you better than any other I have seen.

Question: Do you feed your cows grain in the summer time?

Mr. Goodrich: I do; a ration of bran usually 6 or 8 pounds a day, no matter how good the grass is, if the cows are in full flow of milk.

Question: Did not our mothers and grandmothers make just as good butter 50 years ago as is made now, and without this fuss and talk and expensive fixings?

Mr. Goodrich: Sometimes they did if the weather was just right and the maker happened to guess just right as to temperature, etc. But I do know that a greater per cent. of the butter made then was poor and very poor I can almost taste now, some of the poor butter I ate when a boy. It was not my mother, of course, who made it, but it was another boy's mother. Such butter as some people then used to take down with apparent relish could hardly be sold at all for butter now.

Question: What do you call a good cow?

Mr. Goodrich: A mature cow that with good care and feed will not produce 300 pounds of butter a year, I don't mean to keep. I want she should give milk rich in butter fat. I don't want to have her spend her food and energies in putting caseine, milk sugar and water in her milk in any greater proportion than is absolutely necessary; for they are substances of very little money value. I want her to make as great a proportion as possible of her food into a valuable product; namely butter fat. If she is a small averaged sized cow and gives rich milk and the 300 pounds of butter a year she probably does it on a good fair ration. Then she is a good cow. If she is a large cow and takes a large amount of food she ought to produce more to be a good cow. The mark I have set before me is to have a herd of cows not one of which will give milk testing less than 5 per cent of butter fat. My whole herd average rather more than that now, but some run less. I am weeding out those that give milk testing less than 5 per cent and filling their places with heifers as I raise them, they in turn to undergo the sorting process.

The Institute adjourned to meet at 1 o'clock p. m.

AFTERNOON SESSION—MARCH 18th.

SHEEP SESSION.

The Institute met at 1:30 p. m. Mr. Geo. McKerrow in the chair.

SHEEP BREEDING IN WISCONSIN.

PROF. J. A. CRAIG, Madison, Wis.

Sheep are easily changed even in their most fixed qualities by the agencies of nature. The best management that can be given them is that which is natural, and to be so it is required that they be under the play of these agencies the greater part of the year. They live close to the soil. The height of the land and the aspect of it divides our breeds of sheep into the low land breeds, the down breeds, the upland breeds and the mountain breeds. The breeds of the low lands are large framed and heavy, being fit for feeding on the bottom lands; the breeds of the downs are smaller and of better quality and are able to do well for themselves on rolling and broken pasture lands, while the breeds of the mountain are so active and robust that they can live under the hardest conditions if they are given the run of a mountain side. But change any of these from the conditions of the homes they were fitted for, to others opposed to their sheep nature, and disease and degeneration rapidly follow.

Our Conditions Suit the Most Profitable Sheep.

It is a significant fact that the breeds that are the best suited for the level and rolling lands of our state are the sheep that in the most profitable ways meet the demand of the American market. In addition to the other requirements for healthy sheep life, the cheapest sheep foods can be produced—clover, corn fodder, rape, roots and the desirable grains. The climate is dry and thereto may be credited our freedom from foot rot. With water our state has been freely supplied. It is commonly thought that sheep do not require water. This idea has been the cause of many troubles. The sheep have very large, salivary glands and so are liable to withstand drouth, yet they always require pure and fresh water, more especially when the ewes are suckling their lambs.

Why Our Conditions Should be More Fully Utilized.

There are many reasons why the farmers of Wisconsin should more fully utilize their facilities for sheep breeding. First, there is hardly a farm but would be benefited by having some sheep upon it. The flock will keep the farm free from weeds, for the sheep has a full bill of fare and its gouge-like teeth and hard pad in the upper part of the mouth enables it to browse on more fibrous herbage than other farm animals. The manure from sheep is worth from two to three times as much as that from cattle, horses or pigs. It does not lose its value, for it does not ferment. Second, the cheapest crop that can be used for feeding is good pasture, and it cannot be disputed but

that the sheep, with its divided upper lip and peculiar teeth, will get more from pasture and make more profitable use of it than any other farm animal. Third, the care that sheep require when rightly managed is demanded at seasons when other work does not press, and at all times the labor of attending to them is easy. Fourth, the amount of investment and the risk is light. The chief risk is due to dogs. If a small wire corral is made and the sheep allowed to go into it each night this risk is removed. Sheep do not require expensive buildings to protect them. Dryness is their chief need. The cold they can resist, as their normal temperature is 102 degrees, Fahr., and their fleeces assist them in retaining their body heat. Fifth, the main reason why our conditions should be more fully utilized is the direct profit there is in breeding mutton sheep. A shepherd can make from 25 per cent. to 50 per cent. on his investment in mutton sheep according to his skill. A good breeding ewe can produce enough wool to pay for keeping her. A ewe can be kept in thrifty condition, being fed such coarse fodders as straw, clover hay and corn fodder, with one-half pound of grain daily when she requires it, at a cost of one cent per day, during the period of most expensive feeding. To pay for her keep she needs to produce no more than 10 pounds of good wool, and that a mutton ewe can do. In addition to the wool the returns from a ewe will be at least one lamb—the average of the mutton breeds is nearer one and one-half. From the facts derived from our experimental work it is safe to say that, charging foods at market prices, mutton can be put on the market on foot for at least three cents per pound. Such mutton as can be furnished at that cost will sell for six cents, and the sheep should weigh 150 pounds. Here is a profit of $4.50 from a sheep under the most moderate circumstances. I have known ewes of mutton breeding to produce each year a clear profit of $10 to $15 and they are being used to supply the mutton market. In addition to the market for mutton there is the lamb trade, and that, successfully supplied, yields enhanced profits.

Using Our Conditions and Circumstances Most Profitably.

To use our conditions to the most profitable advantage the western sheep breeder must give his attention to mutton sheep. With the growth of our cities and the gathering of laborers in our manufacturing centers the consumption of mutton is bound to increase. The force of such industry must come from animal food, and none will compare with mutton for purity and palatability, cheapness and nourishment. Our markets at present are such that the most profitable market to supply is that which is open to our lambs and mutton. It will not pay the sheep breeders of such a state as ours to select and breed their sheep for the sole purpose of selling wool. The wool market is fickle. The cloth that is worn by the people originates the demand for different kinds of wool, and as the cloth that is worn is directed by the fashions, the wool that will sell the best at one time may be the slowest and cheapest the next. As matters stand the wool that brings the best paying price is combing wool, and that may be grown on the best mutton sheep. As we can produce combing wool better than it can be grown in other countries, the market for such wools will continue active and steady. Second, to make mutton the cheapest to both producer and consumer the sheep must be of mutton breeding. They must have behind them the heredity that fixes the qualities of flavor, texture and large proportion of edible meat. We hear a great deal about Canadian mutton and the large demand there is for it in the Eastern States. It can be credited to the fact that Canadian farmers made mutton their first object and wool their second. The common sheep of that country are descendants of the imported mutton breeds, such as the Leicester and Cotswold,

and on descendants of these they are now using the downs. Because of this thousands of lambs, even against a high tariff, go into the New England States, and an unsatisfied demand exists there for them. With such foundation stock they can make money selling their lambs at less than four dollars per head. Their conditions for sheep breeding do not equal ours, yet because they are pursuing the right course in this particular they find it profitable. Third, it is better in most cases to sell fat sheep before they become more than a year old. Quick fattening lowers the cost of production. A lamb will return for that which is given it fully double the value that a shearling wether will.

Founding a Flock.

To establish a flock from common ewes secure the help of a pure bred ram of any of the mutton breeds that have qualities suitable for your conditions. In a ram for this purpose mutton form is demanded. He should be heavy headed, thick necked, broad chested, but nowhere coarse. Over the shoulder should be full and broad. The back should be straight and the loin wide and thick. The ribs should spring out strongly from the center of the body. Such a sheep is thriftier than one that is flat sided. It is very desirable in a mutton ram to be deep and broad between the hind legs or twist so as to furnish a plump leg of mutton. The legs should be short, the bone clean, and the hair upon them fine. A ram, to get good lambs, must have a strong constitution. The evidences of this, besides the points of form before mentioned, are activity, a pink tinted skin, and a sound lustrous fleece covering the belly as thickly as the back. The fleece shoulld be dense and even and made of fibres that have a good length, fineness and strength. The best ewe for mutton breeding is strong in frame and of fine quality. A ewe that has a distinct feminine appearance is kindest to her lambs and makes the best breeder. She should be close to the ground, with straight back, well arched ribs, and broad loin and strong, square-shaped hind quarters. Uniformity in the ewes of a flock is desirable, for it is a profitable quality of lambs and wethers as those that are uniform please the butcher better.

Management of Ewes.

A great many of the diseases that kill mature ewes are brought on by their poor condition in the fall. They have not the disease resisting vitality of those that are well nourished. And moreover the cause of weak and dead lambs is due to the same fact. It is best to feed the ewes a half pound of oats each day to get them in thrifty condition. The ewes should be served by the ram so that they will lamb early in April, that the lambs may be made strong before they go out to pasture. Breeding ewes need be fed only twice daily. For a daily ration they will each require two pounds of coarse fodder, either hay, corn fodder or straw, and three pounds of silage or roots, and one-fouth of a pound of grain, preferably oats in the fall and bran before and after lambing. At all times they should be supplied with salt. Strong lambs and many of them can only be obtained by feeding the ewes well.

Care of Lambs.

The lambs should be taught to eat ground grain as soon as possible. The best mixture I have tried is two parts bran, one part cornmeal, and one part of oilmeal. From the result of two years' experimenting with lambs before weaning, I have found it to pay to feed grain. During the third week they will eat about one-fourth of a pound each, and when between three and four months old they will eat about one-half pound. At the time of weaning and as long as grain is fed afterwards, the cornmeal may be dropped out of the ration. Castrate the bucks between the third and fourth weeks and dock them a few days later. A piece of clover aftermath is excellent

for them when weaned. In preparing lambs for winter feeding it is advisable to give them only good pasture after they have been well weaned and before they are put in the sheds. When brought in feed them lightly and carefully for three weeks. A good fattening ration can be made from clover hay or cut corn fodder and silage, or roots with a grain mixture consisting of oats, corn and oilmeal. Begin with the oats, then add the corn, and as the fattening goes on increase the corn and lessen the quantity of oats. Finish fattening the wethers with a mixture of these grains in the proportion of two parts corn, one part oats and one part oilmeal. A good daily ration is three pounds of cut corn fodder or clover hay, three pounds roots or silage, and grain varying in quantity from one-half pound at the beginning of the fattening to three pounds or over when finished. Fattening sheep should be fed often, and if more than a pound of grain is being fed daily, divide it into at least two feeds. Wethers of fair quality will gain on such a ration from two and one-half to three pounds each week.

Discussion.

Question: What do you recommend for sheep in place of pasturage when the pastures dry up?

Prof. Craig: Rape is the best crop that I can recommend. It yields enormous quantities of feed and sheep, both old and young, are very fond of it. Clover aftermath is excellent. Rye pasture is also good. Green corn fodder is another food commonly available for this purpose and sheep like it when it is cut up for them.

Question: We have sometimes heard men advocate a general purpose cow—you seem to be advocating a general purpose sheep?

Prof. Craig: In the first place there is no likeness in these instances. A dairy cow is opposite in temperament to a beef cow; the one is called nervous, the other lymphatic. When two points are opposite to each other you cannot go towards one without going away from the other. I am advocating the breeding of sheep that will, in the most ways, be profitable under our state conditions. The wool and mutton a sheep will produce will depend upon its nature as fixed by the breeding of it and the conditions it has been under. The mutton sheep under their native conditions have, because of their breeding and environment, produced a class of wool known as combing. Owing to the changes in our wool markets of recent years this class of wool has become the most profitable. If we feed and care for sheep we are fattening as they should be cared for to make the most profit from their mutton we also supply the very best conditions to produce the best wool in the combing class. The fibre will be strong, long and fine, and those three qualities are the leading ones in the manufacturer's view and he will be more anxious to secure them than any other. These qualities can be obtained in the fleece of a mutton sheep without detracting from its mutton form. I consider that mutton should be the first object, wool second. With the conditions we have here I believe that it would be profitable to rear mutton sheep supposing their fleece was not worth the shearing.

Question: Is it possible to keep mutton sheep in as large flocks as merinos?

Prof. Craig: When on the fields, if given sufficient range, it is possible to keep any number of mutton sheep in a flock. When in the shed I do not consider it good practice to keep any kind of sheep in larger groups than fifty.

Question: What is your manner of treatment of a lamb that is dropped on a very cold day?

Prof. Craig: We have a place fitted in our sheep shed for lambing pens. We know when our ewes are going to lamb within a day or so, as we have the dates of service all recorded. When a ewe is due to lamb we put her in one of these small pens where she is warm and quiet. When the lamb comes it does not know that it is cold and we

have no trouble in that respect. It would be desirable to have the ewe lick the lamb dry as soon as possible and thus warm it. To hasten this sprinkle some salt over the lamb. The ewe could be assisted by drying the lamb with a wisp of straw.

A Member: I usually take it inside the house and keep it warm.

Question: What has been your experience with turning lambs on clover pasture?

Prof. Craig: You cannot give lambs that have just been weaned better pasture than that—the clover aftermath. Fresh sprcuts of clover will very likely cause sheep to bloat, especially the yearlings and older sheep. Sheep will bloat very quickly if allowed to eat newly grown sprouts. In turning them on pea stubble they will sometimes get enough of the newly grown peas that are sprouting to cause this trouble.

Question: Why is Australian wool better than that raised in this country?

Prof. Craig: From those who have studied sheep farming in Australia I learn that the high quality of the wool produced there is due, in a large measure, to the excellent natural conditions that exist there. In addition, a very rigid system of selection is carried on in breeding their sheep. Again they observe great care in putting up their wool in the best manner. About a century ago a colony of convicts was established in Australia. To support this colony a few inferior and hairy sheep were brought from India. These sheep improved so under the conditions there that it was at once seen that Australia was destined to be a remarkably good ccuntry for the production of wool. It was found that Merinos brought from Spain produced wool of a finer quality under Australian conditions than they did in their native land. Their seasons are not so broken as ours, hence the wool is more even in the calibre of the fibre and for that reason has few weak spots. They are very careful in their selection of rams and their mating. In the preparation of wool for market the poorer parts are not put in with the best wool of the fleece.

Question: Should lambs dropped in the spring be bred the following fall?

Prof. Craig: No, I think not. A ewe lamb at that age is immature and if she is bred so early it is likely to check her growth. I believe that if the breeding is delayed until the next year she will make a more vigorous ewe, and that is the kind that drops strong lambs and continues useful for a long time.

Question: How often should a ram be changed?

Prof. Craig: A ram, unless he is an exceedingly good one, should not be bred to any of his get. So it will depend upon what is done with the lambs. If a considerable number of the get of the ram is taken into the breeding flock each year a new ram could be used with them and the old one retained for the older ewes if he was a satisfactory breeder. Where the ewe lambs are kept to take the place of the ewes culled out from the breeding flock a ram could be used only two years.

Question: Are twins profitable?

Prof. Craig: It altogether depends upon the ewe that has them. In a group of ewes and lambs that were on experiment we had one ewe that had twins. These during a period of ten weeks gained a total of 54 pounds. Another ewe had a lamb from the same sire, and this under the same management and fed as the other ewe and her twins, only gained 19 3-4 pounds during the ten weeks. The difference was chiefly due to the excellence of the ewe that had the twins. In selecting the ewe lambs to go into the breeding flock we keep this quality of fecundity in view. A preference is shown for good ewe lambs that have been twins, for they are likely to retain and transmit that merit.

Question: What is the best cure for foot rot?

Prof. Craig: A good remedy for mild cases is copper sulphate or blue stone. Dissolve as much of it as you can in

water and then thicken the solution so that it may be applied as a dressing with red or white chalk. Pare the foot thoroughly, cutting away all diseased portions and the edges of the hoof that turn in against the sole of the foot. For cases that are severe close paring and the application of butter of antimony is best. The best preventive is to go over the feet of the sheep every fall, and in the instance of Merinos also every spring, and trim all loose parts away and particularly those layers which double in on the bottom of the foot.

Question: Should corn and oats be ground for sheep?

Prof. Craig: We have not conducted any experiments bearing on that point, but I may say that in all our fattening work we have always fed these grains unground and I hardly think that it would have paid to grind them. For young lambs, however, before they are weaned, they should be ground. The ground corn is liked by young lambs, but the oats are not relished so much by them as bran.

Question: Can sheep be safely dipped in winter?

Prof. Craig: I think not. They would suffer severely from the cold when wet. The best plan I have found to get rid of ticks on sheep in winter is to take about a cupful of hot dip—any of the prepared dips or tobacco solution—and pour it along the neck and back of the sheep. A nice dry day should be chosen for it and only a small quantity of the warm fluid should be used. I have tried this to kill the ticks on wethers we would sometimes get early in the winter to fatten. The ewes should be dipped after shearing, or in the fall, and the lambs two weeks after the ewes are shorn in the spring.

Question: Shall we pay more attention to the quality of mutton? Is there any difference in the prices paid for sheep owing to variations in that feature?

Prof. Craig: There is a decided difference in the prices paid if the sheep differ in quality as a whole. The fat sheep with fine bone and well fleshed in the most valuable parts, thereby giving less waste, will bring more money than one the opposite in character. But there is not much distinction made as yet by buyers in the quality of mutton. It is advisable for the breeder to keep this in mind, however, for the higher the quality of the mutton becomes the greater will be the demand for it. This fact accounts for the ready sale of Canadian mutton in the New England markets.

Question: Is it true that the wool from a flock that has been well fed is stronger than that from a flock that has received a poor ration?

Prof. Craig: The fleece from the sheep that had been well fed would be stronger, for it would be sounder. I have noticed that difference in fattening sheep more than in breeding ewes. The greatest differences, however, would be in the weights of the fleeces. I know of instances where breeding ewes have lost two pounds per head a year in the weights of their fleeces because they had not received grain as formerly. The strongest effect of good feeding is upon the weight of the fleece, and that in turn seems to be influenced most by the increased length of the fibre and greater amount of yolk. The latter feature is closely associated with the strength.

Question: Has the yolk any value?

Prof. Craig: Only for what it indicates. It tells that the wool has been well nourished and that gives the fibre strength. The yolk should not be so abundant as to be present in flakes. It should be well distributed and leave the fibres free.

Question: Speaking of a ram, do you consider that a well developed neck or scrag indicates that a ram will be prepotent as a sire?

Prof. Craig: I am inclined to believe that it does. I have noticed in breeding stock that if animals of either sex have the appearances of being of the opposite sex they are very often indifferent

breeders. I would always look for and value highly male character in the sire and female character in the dam.

Question: It is conceded that the Merinos have qualities that are not possessed by other sheep—a closeness of fleeces and the peculiarity that will permit large numbers of them to be kept in a flock; therefore, in crossing with Merinos would we not get a herding quality in the offspring that we would not get in any other cross? Another question I would like to ask is, how long would that quality last?

Prof. Craig: The Merinos have a disposition to herd that is not so strongly characteristic of other sheep. The breeds of mutton sheep may, I believe, be kept in flocks large enough to suit the requirements of our state. In crossing, the peculiar disposition of the Merinos is affected and so far as I have observed the third cross of a Shopshire upon a Merino foundation would obliterate nearly all the qualities of the Merino with the exception of a certain fineness of wool.

Question: Then would you recommend the keeping of any other sheep besides the Merinos if the farmer had to keep his sheep in large flocks?

Prof. Craig: When on the pasture you can keep the lighter breeds of mutton sheep in flocks of large size, but it is better for them and any sheep to be kept in as small lots as it is convenient to do. When thousands run together the Merino would do the best.

Mr. Ames: I want to notice one fact; it is not the largest sheep that brings the most money. We have the American Merinos and we have been breeding them up to a good marketable size.

Question: How large are your sheep?

Mr. Ames: They average 110 pounds.

A Member: I used a fine-wooled buck on my flock until I had my sheep as fine in wool as possible, and then I got a full-blooded Southdown ram, and the use of him almost ruined my flock. They became so that there was hardly any wool upon them.

Mr. Ames: We have been using an Oxford Down Ram with satisfaction. We did not use him on our best ewes but retained them for our fine wooled ram. We took this course because there was a demand for two kinds of sheep.

Mr. Sampson: We raised fine-wooled sheep for many years. Some of my neighbors have been spoiling their sheep in the way a previous speaker has indicated and they have been making money at it for years, and I am doing the same thing myself. When we were using Merino rams they did not make money for us and we made up our minds to use a full-blood Oxford Down. If you breed from an Oxford you can sell your lambs in the fall if you wish to, or you may fatten them further during the winter. I think I can get more lambs from my flock. If you are breeding Merinos the lambs require much more care and attention. I get a much greater percentage of lambs from the Oxford I am using than I did from the use of Merino rams.

Question: What do you get for your lambs?

Mr. Sampson: I sold my lambs this spring for four dollars per hundred.

Mr. Brewer: The ram described by the speaker on this topic does not exactly come up to the one I have in mind. I emphasize the development of the fore quarter more than has been done. On this wool question I wish to

If it can be planned so as to have a readily tell how the animal has been wintered.

Mr. McKerrow: In the main I agree to the points given on the desirable qualities of a ram. If we are going to make mutton we must have a good ram with a strong constitution. I want a ram with a large head and girth, for in the latter region lie the vital organs. A ram should have a strong neck, good sized head, and should be compact, short-legged and even in build. He must have movement in him, and I do not object to him being able to knock a man down. Good mutton quality should be a prominent feature. I should

choose a lamb with well sprung ribs. Such a ram will be an impressive sire and will get lambs that will sell on the market for the best prices, for they will have the best mutton in the best places.

Prof. Craig: At the Experiment Station we have been conducting some experiments in cross breeding and so far as our experience in breeding the Shropshire to the Merino has given excellent results. The work was begun with Merino ewes of common type, and these were bred to pure-bred Shropshire rams of good mutton form. The ewes had been bred solely for wool. They averaged in weight 120 pounds, and they gave an average clip of 9.3 pounds for the last two years. They yielded a good fleece, but it was not long enough to meet the demands of the most profitable wool market. The first crosses from these ewes by a Shropshire ram are excellent sheep of better mutton, form and more profitable fleeces than their Merino parents. They weigh in fair condition 140 pounds, and they are compact, round-ribbed and well fleshed. The average of the fleeces during two years has been 9.5 pounds, and it has sold for six cents per pound more than that of the Merino fleeces. This fact is due to the increased length of the fibre, which has also retained much of the Merino fineness and softness. The second cross lambs, from a Shropshire ram and these first cross Shrop-Merino ewes have approached more to the Shropshire in appearance. As lambs they have shown six-tenths of a pound less than the average of the first cross ewes. From the results obtained it is clear that in four successive crosses of typical Shropshire rams on common Merino ewes progeny will result that will very closely resemble the Shropshire in their most profitable qualities.

ADAPTATION OF BREEDS.

GEO. McKERROW, Sussex, Wis.

This subject, as it relates to sheep, has been given but little thought by the average American flock master. The Merino has thriven fairly well in nearly all sections of the country, and has been a very useful breed in the past, and in many sections may continue to hold its own against all newcomers in the future. Nearly all intelligent breeders are agreed, however, that the time has arrived in many localities which calls for the improved English mutton breeds to supply our markets with early lamb and choice mutton chop. These find ready sale at profitable prices to the grower, and also give the best of satisfaction to the consumer, thereby opening up a larger market for the same class of goods. Therefore, the question of what breed we select for a particular locality or a certain purpose is well worth our careful consideration.

The Mountain Breeds.

If we look across the sea to Great Britain we find many well defined breeds suited to the peculiar conditions of soil, climate and grasses in the particular sections in which they are developed, and also suited to the purpose for which they are intended, viz., mutton production. In the mountainous districts of northern England and Scotland, where heather is the principal forage plant, we find the black-faced sheep, that seems to thrive on this plant the year round and the conditions here produce a mutton noted for its venison-like flavor and a coarse,

light fleece. The Cheviot, whose home is at a lower altitude, where a better class of herbage abounds, have been tried on these heather-covered ranges where the black-face has thriven, and they have been found wanting. The Cheviot has a better mutton form, being broader on back, loin and rump, and fuller in the thigh, with a much finer and better fleece.

The Lowland Breeds.

As we go southward the country becomes richer and lower and the growth of vegetation richer and ranker, and we find the larger, heavier fleeced breeds. On the border in both Scotland and England is the Border Leicester, differing to some extent from the sheep of the same name and general characteristics found farther to the southward. Among the oldest and most largely disseminated breeds found in the rich, agricultural sections are the Cotswolds, Lincolns, Leicester and Romney Marsh among the long wools, and the Southdowns, Hampshires and Horned Dorsets in the middle wools. Some of these are said to have been improved by a dash of Cotswold, Leicester or Southdown blood. The newer breeds, such as Shropshire and Oxfordshire. that have been more recently improved or developed, have been brought to their present perfection for certain localities by a system of careful crossing, selection and feeding, and have proved to be ahead of the old breeds for certain localities and purposes. The Romney Marsh sheep seem to be specially adapted to a small district of reclaimed marsh land, upon which other breeds do not appear to thrive.

Select Sheep Adapted to Your Locality.

If we are to gain anything from the experience of our English cousins across the sea, we must begin to investigate the adaptation of our own localities to the different mutton breeds we are bringing across the ocean. In the early importations of sheep it was mainly the long wools that were brought over, and, after a trial in some localities, they were pronounced a failure, while in other sections they did well. The Southdown came among the first, and it was found to adapt itself well to most localities; but in those days, when there was a profit in raising wool, the objection was a lack of fleece. Prof. Craig, of the Wisconsin Agricultural Experiment Station, tells me that in a section of eastern Canada he found the Leicester equal, if not superior, to their imported ancestors, while the Shropshires seemed to have deteriorated very much. I have seen cases where the Leicester did poorly and the Shropshire did well. I have seen sheep of these different breeds doing poorly in certain localities, and when moved a few miles away they have improved rapidly. The most important question for each one to solve is, which breed is best adapted to any particular farm, location and surroundings? And I know of no way to judge other than by actual trial of the different breeds, or by securing a breed that has thriven in England or in this country under conditions similar to those we have. If we have a rich soil that grows an abundance of grasses and want an early maturing animal, then the Oxford, the Hampshire, or even some of the long wools may suit us, while if our lands are hilly or our pastures scant, with more range, the Shropshires, Southdown or Cheviot may suit us better. If the location is exposed and our flocks are subject to wind and storm, then a close coat that keeps the skin well protected seems quite essential. If early lambs are wanted, then a breed that is both prolific and good milkers must be chosen. If distance from market and cheapness of land make wool an important factor, then a breed must be chosen that can turn a good proportion of their feed into this product.

It may be that new breeds will be developed in this country by crossing and improving existing breeds until we Americans will have American mutton breeds better for our purposes than

those we are now paying high prices for. If the American breeder can produce the fastest trotting horse, the best hog and heaviest fleeced fine wool sheep, why not the best mutton sheep? We often hear our breeders and importers complaining that certain breeds of sheep lose bone and size in general when bred a few generations in this country. This may to some extent be true, yet from my experience in this line I think this loss of size can be overcome by liberal feeding the first year of the animal's life, and in the case of the largest breeds this refining is often a benefit, making them easier and better feeders and making them better adapted to securing the most and best product for the least outlay of feed and care.

It now seems to be the aim of the best English breeders to breed for quality in preference to quantity, and the judges at our American shows will do well to make a note of this in making their awards. If the readers of this will commence a study of the thrift of the different breeds that come under their observation and their adaptation to the purpose for which they are used, and select and breed accordingly, the object of this article will be attained.

Discussion.

Question: Do you think that the improved mutton sheep will be able to transmit their inherited qualities to their progeny reared in this country?

Mr. McKerrow: I do not think that the English mutton sheep will hold all their individual breed qualities in our climate, which varies so much from that of England, but I do think that the changes will not be material where the flocks are properly bred and fed. I believe, also, that the change in such flocks will the better fit them for the conditions here.

Question: What precautions would you advise a new beginner to take to retain or develop these qualities in his flock?

Mr. McKerrow: The beginner in the breeding of these English sheep must be a good, systematic and careful feeder, so managing his flock as to offset, as far as possible, the sudden extremes of heat and cold that are a drawback on the rapid and early development of these breeds. An occasional use of an imported sire may be useful in this direction, but I would not depend altogether on him.

Question: Will it pay to pasture horses in your sheep pasture to keep down the rough herbage?

Mr. McKerrow: Yes, sir; I sometimes pasture draft horses in my sheep pasture for that purpose.

Question: In feeding silage what portion is eaten and what part is left?

Mr. McKerrow: I have a neighbor who last winter wintered his flock of one hundred grade Cotswolds on eight pounds of silage and what straw the sheep could eat. His flock came out looking well, but the yield of lambs was not satisfactory. So he will change his feed another season.

Question: Was that result due to the feeding of ensilage or because the ration was not well balanced?

Mr. McKerrow: It was due probably to the fact that the ration was not well balanced, for both the straw and silage are of a carbonaceous composition.

Question: Did not the flock that was fed ensilage and straw and that that did not give a good yield of lambs lack exercise?

Mr. McKerrow: No, sir; the flock had all the exercise that was necessary.

Question: Do you think that the sheep is an animal that will adapt himself to more localities than any other?

Mr. McKerrow: Yes, I do.

Question: Is it not true that if we breed sheep for mutton we need not look for a heavy fleece?

Mr. McKerrow: Yes, sir, to a great extent. Sheep are inclined to turn their food into wool in cold countries. Some men have told me that in far southern countries they do not get the heavy fleeces that they could in the north. So, also, a gentleman in England says

that his flock, in England, does not come up to the same average as the same sheep in this country, where it is colder.

Mr. Morrison: Is it possible to take our grade American Merinos and by continually crossing with Hampshire Downs get a good mutton sheep?

Mr. McKerrow: Yes, sir; I think that that has been done.

Question: What has been you experience—is the first cross the best, or the second or the third?

Mr. McKerrow: I believe that when we are breeding towards mutton—when we are breeding towards the Shropshires—the more crosses we have the more mutton we will get.

A Member: When we cross those mutton sheep with the coarse-wooled sheep they go back faster than they do with the fine. When you have about four or five crosses you will find it hard to tell the difference. When you cross with fine wool they will go back quickly to the fine wool.

Mr. Ames: We have been crossing with an Oxford Down and have had no trouble, but did not secure as many lambs as with the fine.

Mr. Sampson: One of my neighbors tried that and he said that he used new milk for feeding the lambs.

Mr. Hatch: Do you not think that there are circumstances where the Merinos, if properly fed and properly cared for, will develop the desired qualities?

Mr. McKerrow: Well, I think that perhaps they will. I have heard a great deal about these mutton Merino sheep, and they have been sent here and I have seen them, and we have seen the mutton qualities, but I have not seen the mutton.

A Farmer: If a man has a good flock of Merinos that will do the best for him, let him keep them.

Mr. McKerrow: I say so, too, if they are the best sheep for him. Now, for the production of milk in ewes feed clover hay, bran, oats, some roots, silage, or succulence of some kind. If you have good clover hay only, you can feed them some oilmeal with it, though roots and silage are better.

Question: Is it not true that one of the sources of failure in crossing the Merinos with mutton sheep is that the men used to Merinos do not feed the mutton grades enough?

Answer: Yes, sir; they should be well fed.

Mr. Noyes: Would you consider it possible to keep a flock of 100 of these grade mutton sheep in one flock through the summer?

Mr. McKerrow: Yes, sir; we keep 200 mutton sheep in one flock through the summer.

Question: You think it better in the summer than in the winter?

Mr. McKerrow: Yes, for in the winter each sheep has to look out for its own feed, and I would divide them into flocks of not more than fifty each.

Question: Then does that not answer the question as to sheep on large farms?

Mr. McKerrow: Yes; I have no trouble with 300 in the pasture in the summer when there is enough feed.

Question: Do you think that you can keep three hundred together in a grass pasture?

Mr. McKerrow: Yes, sir.

FARM MANAGEMENT OF MUTTON SHEEP.

A. O. FOX, Oregon, Wis.

Without discussing the merits of the various breeds as to which are the best mutton producers, the title of my subject leads to the question: How may we so breed and manage a mutton flock as to get the largest net return on the capital in the shortest possible time? It has been well said in speaking of horse feeding that, to begin with, we must have a good colt, or all our work and feed would be of no avail. If we are to produce Shorthorns of deep flesh and early maturity, we must breed our calves right to start with and feed them right to the finish. Now, if we are to produce a high selling sheep at an early age, we must have a good, strong, hearty, well-bred lamb to begin with. To accomplish this we must take good care of our ewes long before the lambs are born. A successful lamb crop depends largely upon the early fall and winter management of the ewes, as well as upon the health and vigor of the ram.

Select the Best Ewes Each Fall.

First, as to the selection of the ewes for breeding. Every flockmaster should sort his ewes early in the fall before breeding time. All ewes with unsound mouths or injured bags and bad coats should be put by themselves and immediately fed off for market upon grass. The remainder of the flock may then be divided into two bunches—the reserves, which are to be kept for breeding, and the sale lot, which may be sold for store sheep or fed for market with the wethers, as the case may justify. The sale lot should be put on good pasture and should be early placed on grain ration. My choice of fall feed is shock corn fed upon the ground in the pasture, but whatever grain is cheapest in the market will usually answer the purpose to feed. Do not drive the sheep up to the yards to be fed but, if possible, send the team to the field with a load of shock corn or such other feed as you may be using. This gives the sheep the least disturbance and enables them to go quietly to feeding on the pastures again after they have eaten the shock corn. Do not house the sheep nights. If dogs are troublesome make a corrall on some elevated stony knoll in the field, using barbed wire—about ten wires—set so close that the dogs cannot get between. Then kill a sheep and open it, tie a rope to it and drag it around the outside of the corrall several times, being careful that the fresh cut parts rub the ground so as to make a good trail for the dogs. On this trail drive several short stakes, and at each stake put at night a chunk of mutton wih a little seasoning in it. Each morning take up for the day such pieces as the dogs may not have eaten. Continue this course till the dogs get tired of it. I have followed a similar plan and found it to work well.

Fattening for Market.

If it can be planned so as to have a patch of turnips, or rape, or rye, or any similar succulent feed adjoining the pasture where the sheep are fed, so much the better. Fence off a small strip of turnip patch with portable slat or wire fence and let the sheep go in and help themselves.

If these sheep are not finished off for market upon the pastures by grain feeding while on grass, they ought to have at least one feed of meal a day during the winter in addition to the shock corn or other dry grain, to keep their stomachs and bowels in a healthy condition. I like a mixture of oil cake and bran

best for this, but cornmeal and bran will do. Where the flock is not too large and a crop of turnips has been raised, there is nothing better to keep the sheep in fine, sappy condition than these. Where large flocks of several thousand are fatted upon corn, screenings and the like, hopper racks are often used, allowing the sheep a constant supply of feed before them. This may do under some conditions, but for small flocks on the farm I think there are more economical methods. Sheep being fattened for market in winter will bear much closer confinement and warmer quarters than ewes intended for breeding purposes, yet care should be used to afford plenty of fresh air and good ventilation, and if a fancy article of mutton is to be made, beware of too much dry feed.

Close Confinement Causes Weak Lambs.

Now, as to the management of the reserve flock of breeding ewes. I suppose there are many who will not agree with me, but I have handled large flocks of breeding ewes for many years, and I am firm in the conviction that every day which they spend in the confinement of a barn, house or enclosed shed is against their welfare. Do not misunderstand me on this point; I do not wish to be understood as advocating turning your ewes out promiscuously on the prairie without ample provision for necessary shelter, but I wish you to bear it in mind that I am speaking of how best to raise a large crop of strong lambs and that every endeavor should be made to give the ewes free and abundant range with the least possible housing. The greatest desideratum is a heavy lamb crop. My favorite plan, therefore, in Wisconsin is to set aside a small reserve feed of blue grass in June, so that in December the grass lays over the fields in large, dense tufts, on the inner portions of which are to be found generous bites of fresh, green grass. This grass keeps in this condition all winter. When the tame pastures begin to fail late in the fall I turn the breeding ewes upon this reserve blue grass. They stay by it as close as though it were a patch of turnips. This grass does not die down like tame grass nor freeze, and the ewes get constant exercise picking over these green tufts for the tender morsels within. I aim to keep my ewes on this until the very latest possible moment, taking care to have them brought down to the buildings and carefully divided up and placed in dry, airy quarters before lambing. This year my ewes kept nicely upon the blue grass without grain until the middle of January, after which we fed them some hay and a small ration of oats twice a day until about March 1st, when they were all brought down to our sheep barns for lambing. I never allow my reserve ewes to be yarded or housed until lambing time is close at hand. This in brief is my favorite plan for handling a flock of mutton brood ewes when a heavy lamb crop is the prime consideration. Ewes wintered in this way rarely have any fevers or milk troubles. They are then in proper health and condition to bear generous rations of the best of feeds, and they will suckle their lambs well from start to finish.

Grain Feeding Lambs Gives the Greatest Gains.

Now, having our lamb, the next thing is to grow him as quickly as possible into a marketable article. I prefer a lamb dropped in March to any other. They will outstrip the later lambs in the dry, hot weather of August and September. After the lambs are three weeks old they will begin to pick at the hay and grain with their dams. This should be encouraged by making a separate feeding place for the lambs at one end of the sheep house, to which they may run at will through several open spaces large enough to allow the lambs to pass but not large enough to admit any of the grown sheep. In this pen or trap put little troughs, kept supplied with rations of bran and oilcake or crushed oats. The lambs will soon take their regular rations here and will begin to show it

on their backs. This should be kept up until the flock is well started on good, strong pasture.

Keep the Brood Ewes in Good Condition

There should be no diminution in the quantity of hay or grain fed to the brood ewes until they have been some time on the pasture and that the pasture has got strong and able to sustain them; otherwise the ewes and lambs are liable to lose in condition very rapidly. On being turned out to grass there is no doubt but the first grass they receive is very beneficial to them on account of the cooling, alterative effect it has on the system, but the mistake should not be made of allowing the ewes to rely upon this for their sustenance at a time when it is little better than water itself. As the season advances and the flock of ewes and lambs have been turned out upon the pastures permanently, there is perhaps no condition upon which their thrift and prosperity depends more than that of frequently changing them from one kind of pasture to another.

Constant Change is Conducive to Thrift.

No matter how large the field is or how small the flock, there is absolutely nothing so conducive to the thrift and health of the sheep as change. Nothing so delights a sheep after having spent a week or two upon a prairie pasture as to be turned over into a brush or timber lot to pick up the many tidbits which the horses and cattle would scorn to look at, but which is the sheep's delight to pick from among the bushes and shrubs in the woods. By carefully sowing a little common salt over these bushy places in the woods it is marvelous to observe the renovating effect that may be produced by a flock of sheep in reducing to cleanliness and order a wilderness of bushes and weeds. As soon as the haying season is over and the meadows have been cut the flock may then be removed to the tender aftermath of timothy and clover, which springs up a fortnight after the fields have been cut. This short, sweet bite is the best and sweetest in the world for the lambs, and is so tender and juicy as to be very easily digested. A pasture of old, long grass should always be avoided for the ewes and lambs, and in fact for all kinds of sheep. This long grass holds too much dampness about the roots and affords convenient harbors for the insects which produce pin-worms, so common among and so disastrous to lambs in wet seasons.

Lambs in Clover.

When my first clover is cut, about July 1st, I usually wean all lambs at that time, except, possibly, a few late comers. The weaned lambs are put upon this short clover stubble immediately, before the clover has started. They become accustomed to the clover before it has much growth, and danger is thus avoided. While on this clover the lambs are given a small grain ration, composed principally of oats—sometimes a little oilcake with it—but oats is usually the most satisfactory while on clover. The brood ewes are sorted from the lambs and put upon the dryer, tougher grasses for their fall feed. I keep my lambs upon my hay aftermath lands until the rye is well started. They are then dipped and turned upon the rye and remain there until put into winter quarters about January 1st. I put my lambs up for winter nearly two months before the brood ewes are taken up. Lambs managed in this way will go into winter quarters in a thick, sappy condition, with great vigor and wonderful possibilities of growth with judicious feeding through the winter. They are in proper form either to be pushed immediately forward for early market or kept over to be sheared and marketed off grass or to remain to take the place of the last year's breeding flock, and form the nucleus for a new and better breeding flock than the one of the year before.

SHEEP FOR PROFIT.

D. S. SMITH, Belleville, Wis.

Years ago we used to think there was nothing like the old, fine wool sheep, as they were called. During the years of the war their product brought a good price, and helped many a poor farmer to pay his debts. But years later, whether for political reasons or otherwise, wool alone did not pay; so the mutton sheep was demanded—a sheep that would clip a fair fleece of wool and also dress a good carcass. There are several breeds of these, all of more or less repute, but as our experience has been with the Shropshires and its grades, what we have to say will be directed briefly to the management of sheep of that breed for mutton and wool.

If we were to start in the business of raising sheep for profit, we would procure a few ewes of as large frame as possible, breed them to a pure bred male of the same breed, so as to have the lamb crop no later than April. Ewes should be well cared for in the fall and go into winter quarters in good condition.

Food for Ewes.

We feed shock corn for a grain ration and all the clover hay they will eat up clean, up to about two months of the expected lamb crop. Then commence feeding bran and oats mixed in small quantities at first, but generally increase the bran and oats and decrease the shock corn so that at about two weeks before the crop you have them on bran and oats—about one pint each morning and evening with all the clover hay they will eat up clean. A change to straw or other kinds of hay is good and eaten with a relish.

Water and Salt Required.

Keep their sheds well bedded, a chunk of rock salt within their reach, and plenty of good, clean drinking water. Give them the run of a good sized yard, or better, a few hours in the fields or pasture when the snow is not too deep. It does the ewes lots of good and we think makes stronger lambs. Good shelter, that can be closed up in stormy weather and cold nights, should be provided, and see to it that the sheep are under it, and especially during a cold, wet storm.

Attention at Lambing Time.

Be on hand at lambing time, and see that each lamb is on its feet and partaking of a good square meal before you leave it. Generally, if all is right, that is all that is necessary unless you put them in a small place by themselves a few days. If by good luck or otherwise we have more lambs than the ewes can care for at the etime, we have what we call a lamb feeder. It is made something like a coffee pot, with a snout made so that a common rubber nipple will fit over the end, and with a handle to carry it. After feeding them a few times they will learn to be on hand when they hear you coming. By feeding them a few days in this way ,or until the ewes gain sufficient in their milk, or the lambs otherwise disposed of, they get no setback, as they otherwise would. The ewes now should have even better care than before, if possible, and should be fed on such foods as will cause them to give plenty of milk, and also to hold their own flesh as much as possible.

Make the Lambs Grow.

From now on everything should be done to make these lambs grow. A small place in the shed should be assigned so that the lambs can go in and

learn to eat. Ground oats with a very little salt mixed in is good feed for them to learn to eat. After they have learned to eat gradually increase the feed until you give them all they will take. The feed trough should be looked after each day and kept clean, and fresh feed provided. If any is left, clean it out before putting in new feed.

The Wool.

Before turning the ewes to pasture they should be tagged. The taggings are now cleaner than they will be and more of them can be saved. If rightly done it saves lots of work at shearing time. When the fleeces are taken off, roll them up with the inside out in just as neat and nice a manner as possible, with twine enough around it to hold it in shape. Pack it away where it will keep clean and nice, and when the price suits you let it go.

Killing the Ticks.

Now look after the ticks; they will sap the life out of the lambs if allowed to live. We use a tank made for the purpose large enough to hold one sheep. Two men, and a boy to hold the sheep's head from going under the liquid, can do the work; putting them in, back down, holding them in about one-half minute; then lift them out upon a rack arranged to run the extra juice back into the tank. There are several commercial dips on the market, and I suppose good ones, but we have always used some home-grown tobacco juice, seasoned with crude carbolic acid, so as to kill a tick in about one-half minute; if very bad, they should be dipped again in about two or three weeks.

Weaning the Lambs.

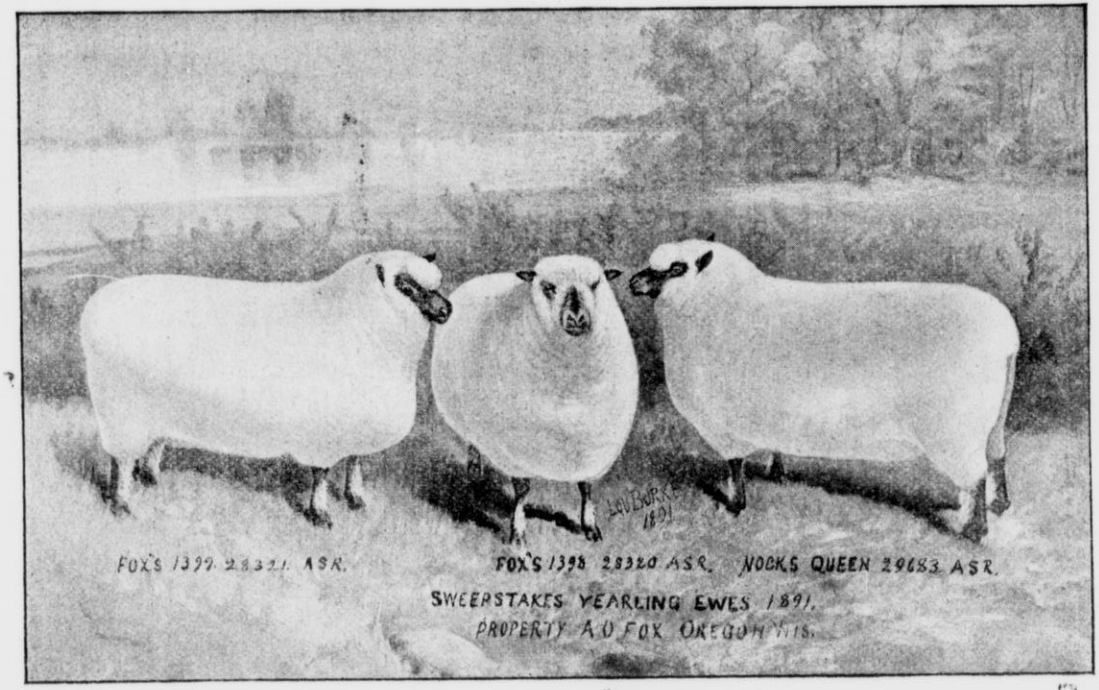
About the first of September the lambs should be weaned and each flock turned into as good feed as possible, especially the lambs, so as not to allow their growth to be checked. A clover field, with a nice fresh start, is a good place, and better, if there is a cornfield adjoining for them to run through. They will not injure the corn, compared with the gain they will make, even after it is in the shock.

Preparing Lambs for Market.

As soon as the feed begins to get short in the fall, get them in, separate those you wish to fed from the balance and work them into a grain ration of bran, oats and a little shelled corn, increasing the corn and decreasing the bran until you have them eating two-thirds oats and one-third corn, all they will take up clean. As the time approaches to market them gradually change to clear corn. You should aim to put these lambs on the market when they would likely be in the largest demand and bring the greatest price, making mutton the main effort, but putting as much wool on their backs as possible. There is, perhaps, no other product on the farm of the meat kind that has fluctuated so little in price or upon which we can calculate the price with the same degree of certainty as upon good mutton. But everybody does not make a success of sheep husbandry. It seems to require more or less natural ability. The brighter and keener this ability is made by experience and educational advantages the better it will serve its owner.

An Investment that Pays a Dividend Twice a Year.

In conclusion, if there are those who think of starting a flock, first ask yourselves, "Can I like the business?" If you hate the sight of sheep, that should end all further thought in that direction, but if you can like it and can see pleasure and comfort in a good flock of sheep, procure a few of the breed you fancy and take good care of them. Do not winter them on straw and the south wind, for that will not make good mutton or wool. Breed them to a pure-bred male of the same breed, so that each year your increase will be a little better than the year before, and you will find that you have an investment that will pay you a good dividend, at least twice a year.



TRIO OF YEARLING SHROPSHIRE EWES.—Sweepstakes winners over all Down breeds at the Minnesota State Fair and Dakota State Fair, 1891. Also winners of American Shropshire Association silver plate. Property of A. O. Fox, Oregon, Wis.

PROFITABLE SHEEP FARMING.

A. SILVER, Belleville, Wis.

The sheep we have on our farm at present are mostly cross-bred. They are the result of crossing a pure-bred Shropshire ram on high-graded Merino ewes. Most of them are one-half and one-third blood Shropshires of Merino descent on the dam's side. With these we have twenty very high graded Shropshire ewes, the result of from seven to nine consecutive crosses with a pure-bred Shopshire ram. These all shear about the same, their fleeces varying from twelve to sixteen pounds of strong wool per head. These weights are from ewes that are rearing lambs each year. This wool in the market grades as medium. The low-graded Shropshire ewes are hearty sheep, weighing about 150 pounds, and they take on flesh very much faster than the Merino. Besides these grades we have a small flock of full-blooded Shropshires. During the last four years, with wool at 25 cents per pound, they have proved to be a powerful adjunct in raising the average profit from the whole flock.

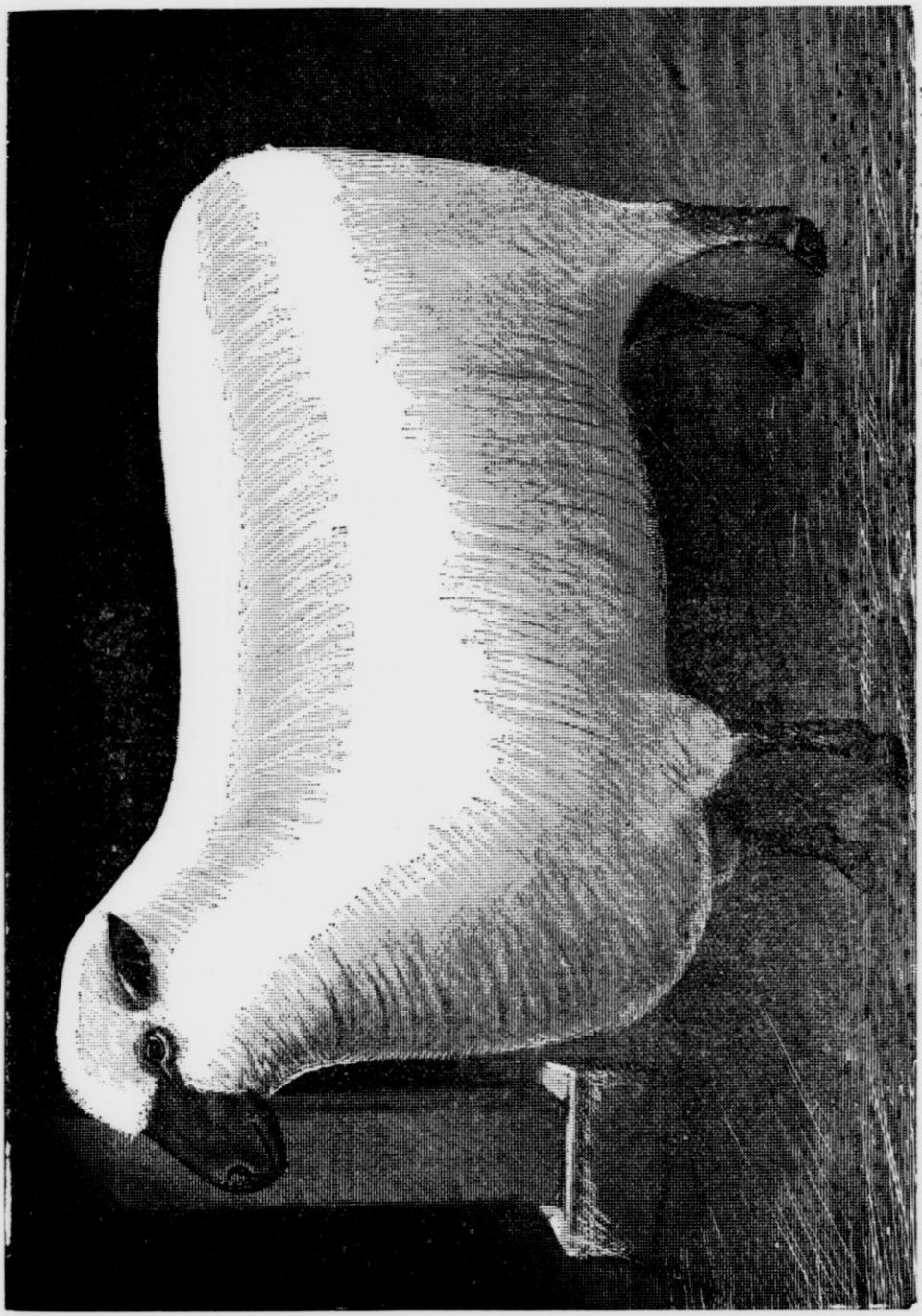
I commenced four years ago this winter with five full-blooded Shropshire ewes. At the end of the year I received from these ewes (allowing three dollars per head for the cost of keeping them) sixty-three dollars, or twelve dollars and sixty cents per head. This amounted to seven per cent. on my investment. The value of the manure is neglected in this estimate and the prices obtained for ram lambs and the inferior ewes were but moderate. The profits the last three years have been equal to those of the first.

Ten Months' Grain Feeding Profitable.

The care I give my sheep consists chiefly in keeping them out of the storms and giving them something to eat the whole year. I believe profits are more readily and safely realized by feeding a little grain ten months of the year. I have my lambs come in February and March, and I readily get three dollars and fifty cents to four dollars per head for the low grade wether lambs in September. My method of feeding ewes is to give them when fresh in milk a generous supply of bran and oats and a little oilmeal with some mangels or turnips at noon and plenty of clover hay. They receive this until the grass starts, and then I discontinue the oilmeal and most of the bran. As soon as the grass is good I feed only once a day until about the first of June, when I drop the grain ration entirely for two months and then commence feeding it again about the first of August. I then feed about a pint of oats and bran per head and continue it through the fall and winter. The sheep are always kept in good condition, dry weather and drouth notwithstanding. I have never fed the breeding flock I have now any corn, nor do I think it advisable to make this food a part of the grain ration of breeding ewes.

Experience With Lambs.

My experience with the young lambs of this breeding has been very satisfactory. They have been vigorous and their gain is very rapid. We have about twenty of these now, from one to ten days old, and they are doing splendidly. My mode of caring for newly born lambs varies with the weather. The prime essential in caring for the ordinary lamb is to get it warm so that it may become plump once, and then all trouble is over. If the



DORCHESTER LADY. OXFORD DOWN EWE.—Winner of 1st prize at the Royal Show in June, 1891; also winner at the leading American Shows of 1891 and 1892. Property of Geo. McKerrow, Sussex, Wis.

weather is cold, I take a piece of woolen blanket and wrap the lamb up tight, leaving only its head free. In ten minutes it will be warmed and prepared to do for itself. If necessary to take it into the house, do not set it down by the fire, but warm it gradually. Then put a light blanket over it securely, and take it out to the shed and assist it to suck. It will then lie down. In the course of a couple of hours I again visit it and assist it again, and usually the blanket may be taken off. If the lamb shivers I would keep the blanket on it. As soon as the oldest lambs show a disposition to eat grain, arrange a trough for them where the old sheep can not get at it and they will soon learn to eat bran and oats or any other kind of grain. Give the ewes, also, plenty to eat, and at the end of six months you will have lambs weighing 100 pounds.

A PAIR OF COTSWOLD SHEEP.

SWEEPSTAKES. GOLDFINDER, 3037.

SWEEPSTAKES WINNERS OF 1890.— From Anoka flock, the property of George Harding & Son, Waukesha, Wis.

SHEEP SHEDS AND THEIR EQUIPMENT.

PROF. JOHN A. CRAIG, Madison, Wis.

It is the nature of a sheep to dislike dampness. In the pasture field they will fold at night always on the high and dry elevations. In selecting the site of a sheep shed these facts should determine the choice of a site that is drained and dry through the year. Dryness is one of the essentials of a good foundation for a healthy shed.

Second only to this in importance is the ventilation. Warm, close sheds mean the downfall of the sheep that are folded in them. A sheep is warm in body as its blood temperature is high and then the nature of the fleece is such as to be very retentive of the body's heat. The cause of the most failures to keep sheep profitably has resulted from housing them in warm, close buildings.

Ventilation and Sunlight.

Connected with the question of ventilation is the size of the shed. The amount of room required by a sheep will vary considerably, ranging from ten square feet for the Merino and Southdown to fifteen square feet for the larger breeds, including the Cotswolds and larger Downs. It is not advisable to crowd breeding ewes into a small area. The crowding is most injurious when it results from restricted room at the feeding rack and when it occurs through narrow doors. A breeding ewe weighing 150 pounds will require fully one and one-quarter feet of space at the fodder rack.

A desirable attribute of a shed is the entrance of sunlight. This particularly encourages the growth of the lambs, and it is to them that the shed will do the most good. To further the entrance of sunlight the windows may be higher than they are wide, which will materially assist in diffusing the rays over the greatest amount of inside space.

In addition to these things, a shed should be large enough to supply storage for sufficient fodder to feed the sheep while they must be sheltered. Estimating that a ton of hay requires 500 cubic feet, and that a sheep will not eat over three pounds of hay per day, it would require about 125 cubic feet of space to contain the hay needed to maintain a sheep during six months. There should also be room available for a root cellar and for the storage of straw.

Consider the Comfort of the Lambs.

For the comfort of the lambs and lambing ewes an apartment should be provided with small pens for them. This room should be made warm and well lighted and the partitions removable, so that when not in use during the fall and winter it could be used as a ram pen. This room is a necessity, for it is almost impossible to rear lambs with any degree of success unless the ewe may be put in a quiet place by herself a day or so previous to lambing and permitted to attend to her lamb undisturbed by others for the course of three or four days. The lamb will escape the buffets it would get from other ewes, and it would in many other ways be more comfortable. These pens are of use, also, for sick or injured sheep.

Another room should be opposite to these pens to serve the purpose of a shepherd's room, as well as supplying a shearing floor and a granary. It would be best to have a stove in this room so that it would afford some com-

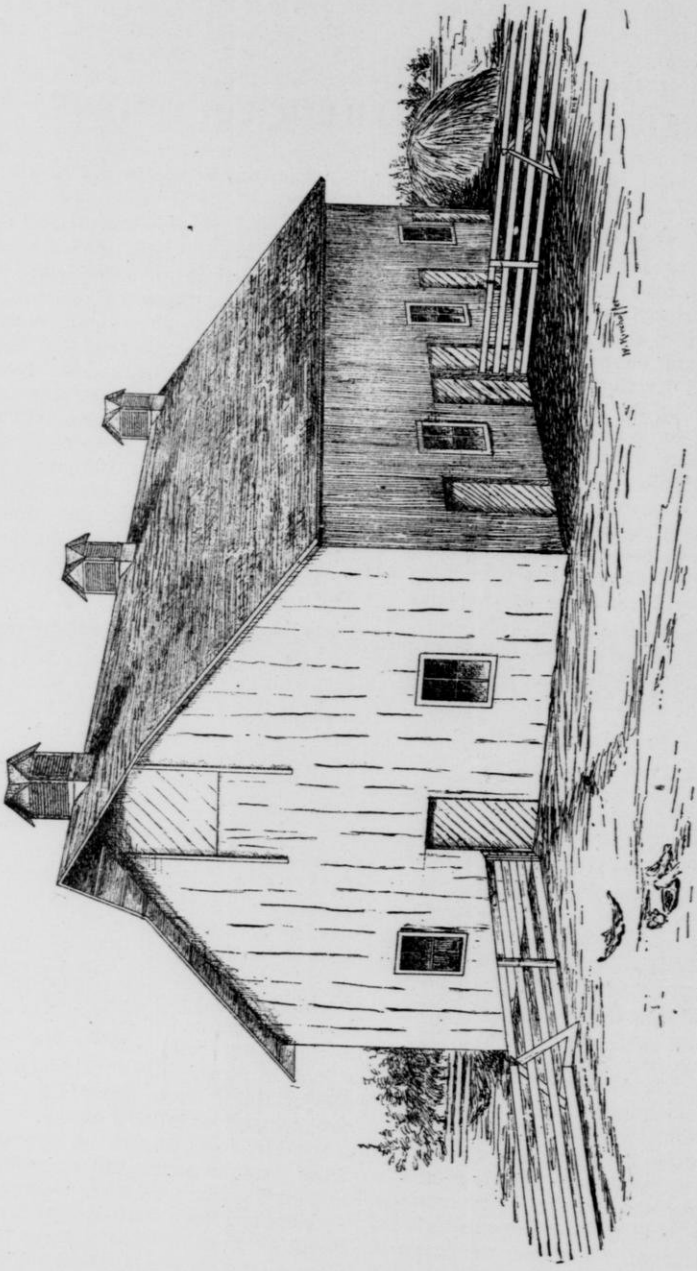


Fig. I.—Perspective View of Sheep Shed, Built on First Plan.

fort to the shepherd when he is forced to spend a night caring for lambing ewes or sick sheep. A stove would also be of value for the purpose of warming a weak lamb or heating milk to feed the lambs that require it.

It is manifestly impossible to submit a plan that will conform to all conditions. I have prepared two plans, differing from each other considerably, and offering some ideas that might be used in building a sheep shed under any circumstances.

Description of the First Plan.

The first plan (Figures I, II, III) represents a building 40 feet wide and 60 feet long. It has two stories, the first being nine feet high and the upper one six feet from the floor to the eaves. The studding are 16 feet long. It is advisable to make the height of the ceiling of the lower story nine feet to secure the best results in ventilation. The sills are 6x8 inches, resting preferably on a wall, and if put on posts they should be heavier. The ground of the inside, as well as that outside, should come close to the sills so that no obstruction is offered by the sills to the free passage of the sheep through the doors. The doors are all four feet wide and those that are used for the sheep are sliding. The windows are three feet wide and four feet high. In the

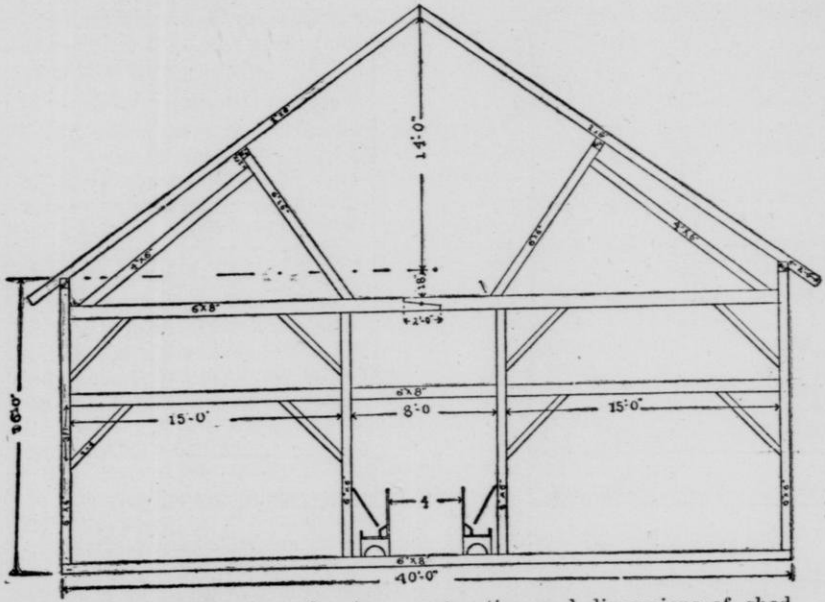


Fig. II.—End Elevation, showing construction and dimensions of shed built on the first plan.

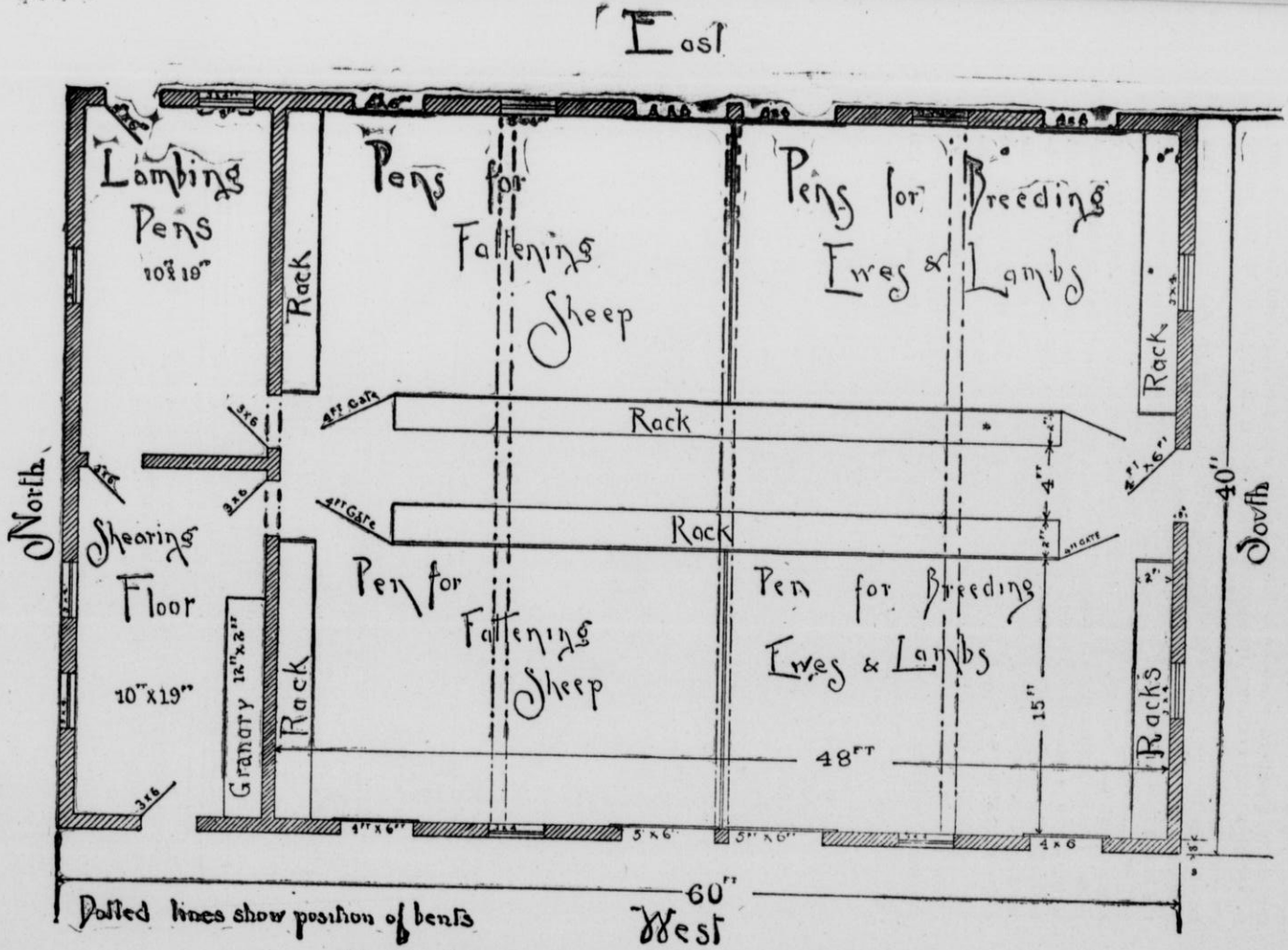


Fig. III.—Ground Floor of First Plan, showing divisions, etc.

center of the sheep apartment there are double doors ten feet wide. When both are opened and the center post removed a wagon can be used to remove the manure from the pens.

Arrangements for Feeding.

The arrangement below has been adjusted so as to give the sheep the smallest amount of space and yet have easily accessible feed racks that would give sufficient room to the sheep for feeding. The feed racks are all permanent, for there is no necessity for their removal, and they form a wall for the passage way which runs through the center. In this way it is easy to put hay in them, and as will be shown later, it is very easy to put grain into the troughs in front of them. As will be seen in the ground plan there are two chutes at each end, down which the hay is thrown from the loft. From where it falls it is easily distributed into all the racks. At the ends of the racks are small gates which open into the very pens.

Pen Division of Lower Floor.

The lower story is divided into four pens, each of which will hold at least 25 large sheep. It would be well to retain the pens at the south end for the use of breeding ewes and their lambs, and the other two for fattening sheep. The doors and windows have been arranged so that these pens may be again divided. This will be advantageous when the ewes lamb, and it becomes advisable to divide them up into small lots with the lambs of equal ages in each. The partitions between the pens are all movable.

The loft above is given altogether to the storage of fodder and straw, with the exception of a small apartment above the shepherd's room which makes a place for the storage of wool. A stairway leads up to it from the shepherd's room. The loft is reached from the sheep fold below by means of two ladders, one at each end where the chutes are situated.

Ventilation is provided for by shafts which run from both sides under the roof to the cupolas on top. These shafts are made of inch boards and run from three different points on each side of the fold. There is a square opening at the lower end with a cover that by being pushed in regulates the size of the opening. In addition, the hay chutes are open and these materially assist in furthering the ventilation.

The hay is taken into the loft through an end door with a hay fork. Otherwise it would be better to take it in through a door situated above the double doors of the lower story.

Estimates of Building on Material for First Plan.

An estimate for the material required in this building includes:

12 pieces 16 feet x 6x6 inches for posts.
12 pieces 14 feet x 6x6 inches for posts.
4 pieces 32 feet x 6x8 inches for sills.
6 pieces 20 feet x 6x8 inches for sills.
6 pieces 22 feet x 6x8 inches for sills.
2 pieces 32 feet x 6x6 inches for plates.
4 pieces 30 feet x 6x6 inches for plates.
6 pieces 22 feet x 6x6 inches for beams.
6 pieces 20 feet x 6x6 inches for beams.
6 pieces 8 feet x 6x8 inches for beams.
12 pieces 16 feet x 6x8 inches for beams.
12 pieces 12 feet x 6x6 inches for purlin supports.
12 pieces 14 feet x 4x6 inches for purlin braces.
66 pieces 28 feet x 2x6 inches for rafters.
16 pieces 16 feet x 4x4 inches for small braces.
12 pieces 12 feet x 4x4 inches for girts.
4 pieces 10 feet x 4x4 inches for girts.
4 pieces 14 feet x 4x4 inches for girts.

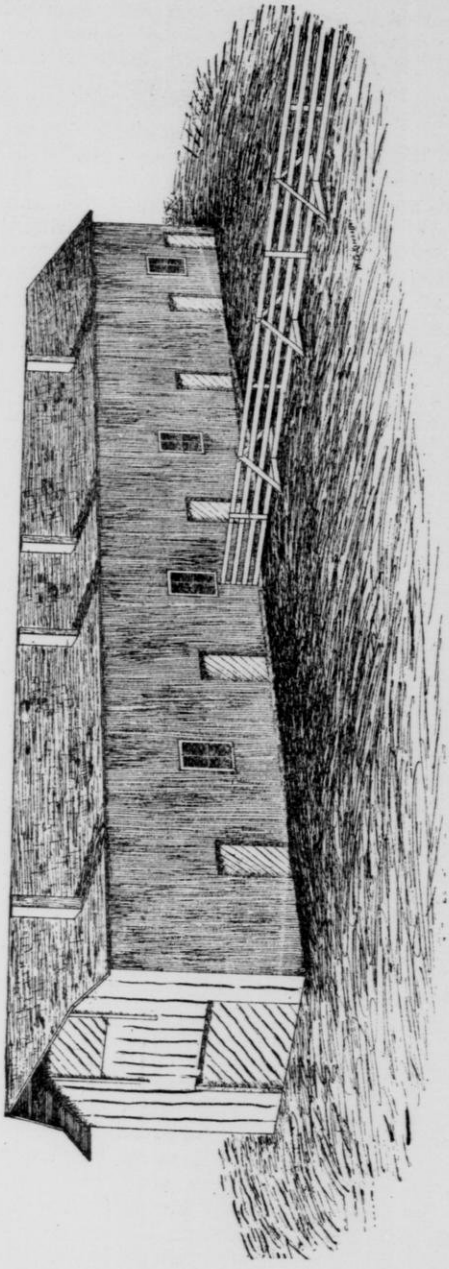


Fig. IV.—Perspective View of Sheep Shed Built on Second Plan.

8 pieces 16 feet x 4x4 inches for girts.
4 pieces 8 feet x 4x4 inches for girts.
7 pieces 16 feet x 4x4 inches for braces.
16 pieces 16 feet x 2x4 for odds and ends.
87 pieces 12 feet x 2x10 inches for floor joice.
59 pieces 10 feet x 2x10 inches for floor joice.
29 pieces 14 feet x 2x10 inches for floor joice.
3,200 square feet roofing, including window casing.
2,800 square feet flooring.
3,340 square feet 8-inch matched siding.
1,200 square feet for lining of pens.
1,400 square feet boarding, 12x1 inch for feeding racks.
300 feet for ventilators, 12x1 inch.
23,000 shingles.
5 window sash, 4x3 feet.
Rough estimate of cost, $900.

Description of Second Plan.

The plan of this shed (Figures IV, V, VI) is made oblong, being 125 feet long and 18 feet wide. At the end is the shepherd's room and next to it the lambing pens. The racks are arranged along the passage, with the exception of a double rack, so as to make the partition between the two pens. This shed will hold 100 of the very largest kind of sheep. The passage running the length of the building is three feet wide and the grain and fodder can nearly all be fed from it. The studding used are 16 feet long, giving nine feet below and six of a wall above. The upper part is used for the storage of fodder, excepting a small space reserved for a wool room. Ventilation is secured by means of shafts running from about one foot from the ground of the lower story up and out of the roof.

The sliding doors are four feet wide and six feet high. The windows are three feet wide and four feet high. The pens may be made smaller by means of partitions. The building runs east and west and the yards face towards the south.

Statement of Material for Building on Second Plan.

18 pieces 16 feet x 6x6 inch posts.
9 pieces 14 feet x 6x6 inch posts.
9 pieces 18 feet x 6x6 inch beams.
18 pieces 10 feet x 6x6 inch beams.
9 pieces 18 feet x 6x8 inch sills.
12 pieces 20 feet x 6x8 inch sills.
2 pieces 18 feet x 6x8 inch sills.
24 pieces 20 feet x 6x6 inch plates.
4 pieces 18 feet x 6x6 inch plates.
18 pieces 16 feet x 6x6 inch purlin supports.
18 pieces 8 feet x 4x6 inch purlin braces.
130 pieces 14 feet x 2x6 inch rafters.
12 pieces 16 feet x 4x4 inch small braces.
11 pieces 16 feet x 4x4 inch small braces.
8 pieces 10 feet x 4x4 inch girts.
28 pieces 16 feet x 4x4 inch girts.
4 pieces 14 feet x 4x4 inch girts.
20 pieces 16 feet x 2x4 inch odds and ends.
104 pieces 16 feet x 10x2 inch floor joice.
26 pieces 14 feet x 10x2 inch floor joice.
2,772 square feet flooring.
3,250 square feet roofing.
23,400 shingles.
4,576 square feet 8 inch siding.
9 window sash, 4x3 feet.
936 square feet boarding for pens, etc.
500 square feet boarding for window casing, cornice, etc.
1,400 square feet boarding for feeding racks.
Rough estimate of cost, $900.

Comparison of These Plans.

The plans shown have different merits. The first plan seems to me to have the greatest number. In favor of the second plan are the facts that it might be built easier, as it is simpler; and in some instances cheaper, because the timbers required for it are shorter. The

form that the second plan takes, however, is unfavorable for enclosing the greatest amount of space with the least wall. The first plan, being 60x40 feet, has 200 feet of wall, which encloses 2,400 square feet, while the second plan, being 125x18 feet, encloses only 2,250 feet and requires to do it 286 feet of wall. There is also a saving of inside room in the first plan compared with the other. It will be seen by the arrangement of the first story that in the first plan there is a saving of space through the arrangement of feeding racks along a central alley. By having the sheep on both sides of the alleyway and racks separating them there is a saving of one half in the alley room required. It is also easier to feed the sheep in the first plan than it is in the second. The leading merit of the second plan, aside from the ease and cheapness of construction, is the ex-

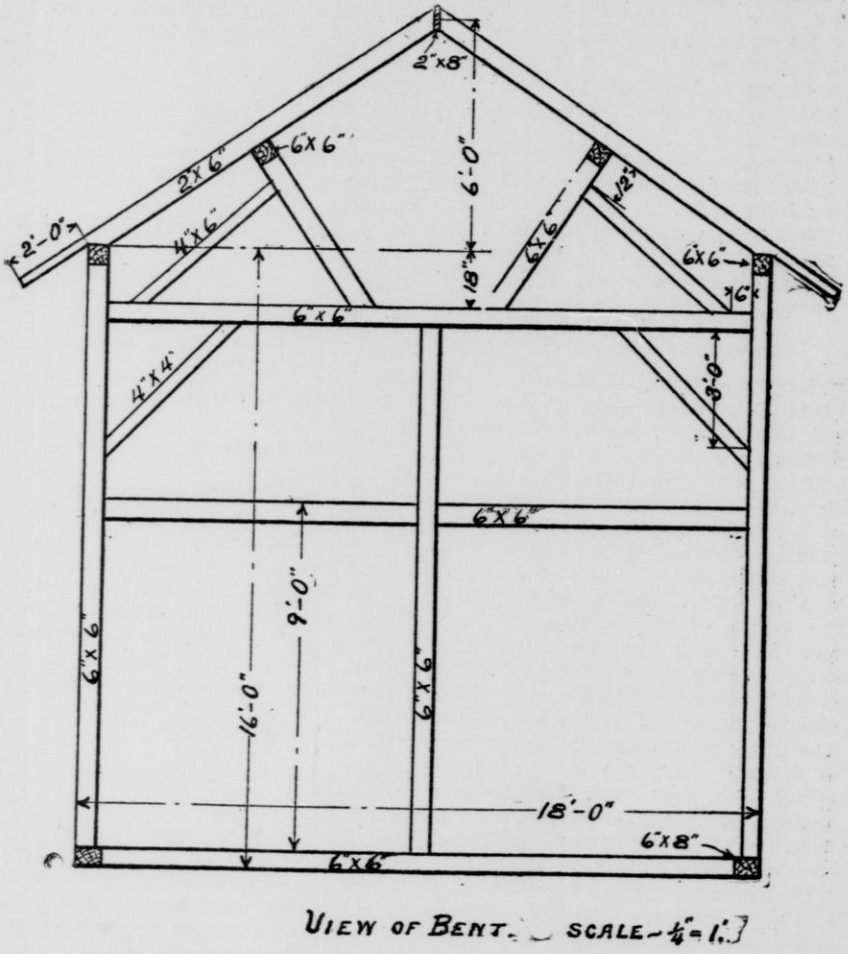


Fig. V.— End Elevation of Shed Built on Second Plan.

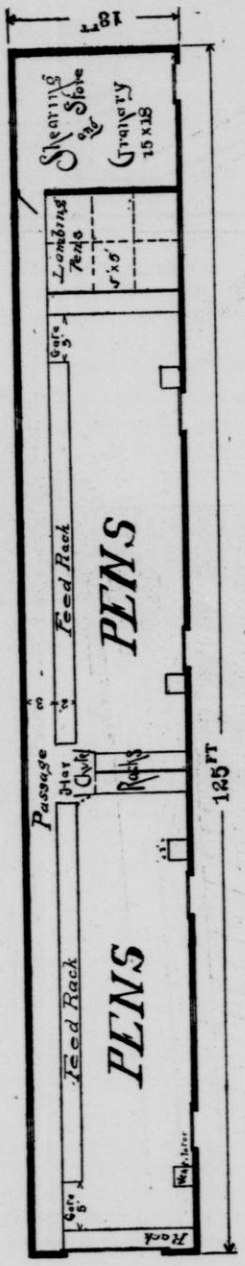


Fig. VI.—Showing Ground Floor of Second Plan, Showing Pens, etc.

posure that may be given it. All the sheep are given an abundance of sunlight, if it is given a southeastern aspect, and they would be equally well sheltered from the prevailing winds. The choice between these plans or modifications of them will be settled in most cases by peculiar requirements.

Feeding Racks.

A good rack is an agent assisting, not only in the saving of feed, but also of time. It should be so constructed as to prevent the sheep from wasting the fodder, and it should also be of such a form as to permit of the best arrangement for easy and rapid feeding of the sheep. The dust and chaff should be prevented from getting into the fleeces of the sheep that feed from it, thereby making the fleece more valuable and the trouble of shearing less.

Rack for Inside Feeding.

There is a vast variety of designs for sheep racks, but in this article only those considered the best of the designs required will be described. The rack shown in figures VII and VIII is especially suited for inside feeding, as it is a combination of a fodder rack and grain trough. When arranged along the alley the grain can easily be put into the trough from the alley by running it through the opening with a scoop. If the racks are cleaned daily, as they should be, the hay will not impede this. The peculiar features of this rack can be seen from the sketches. The outlet at the bottom of the rack may be easily regulated in size as the strip (A in sketch) to which the boards forming the front are attached is fastened to the end of the rack with screw nails. For hay, straw or cut corn fodder an opening of three inches is sufficient. There is a slanting casing put in the corner to assist the descent of the fodder. The trough (B) in front catches the hay and is also useful for feeding grain. It is one foot wide with a strip three inches wide running along the front. The bottom of the trough

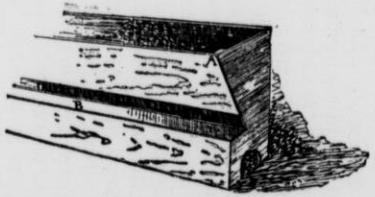


Fig. VII.— Perceptive View of Rack for Inside Feeding.

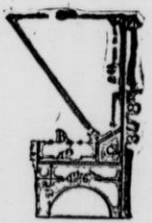


Fig. VIII.— Cross Section of Rack for Inside Feeding.

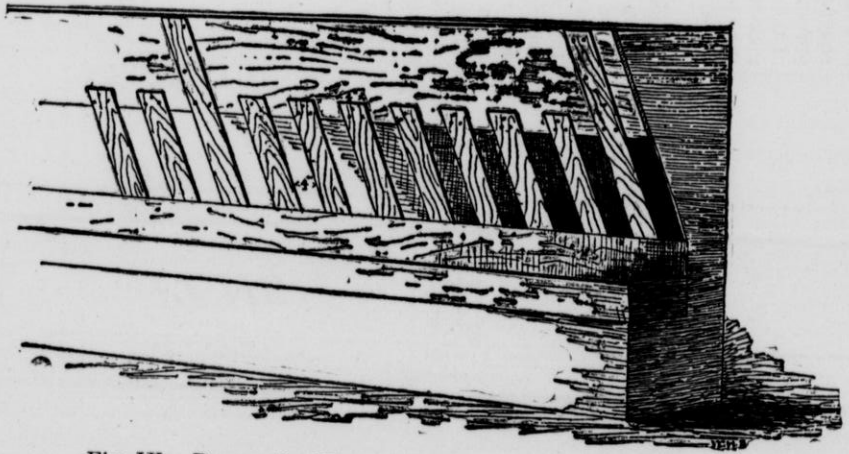


Fig. IX.—Perspective View of Rack for Outside Feeding.

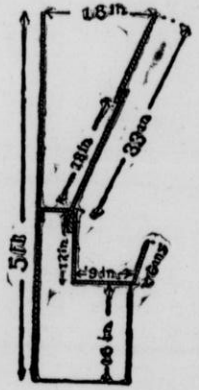


Fig. X.—Cross Section of Rack for Outside Feeding.

stands one foot from the ground. The sheep have difficulty in putting their feet into such a trough, as the projecting sides prevent them from doing this, and they cannot upset it. This rack can be made solely of inch boards and be sufficiently strong.

In the plans of sheds given these racks extend along the alleyway and sides. In the second plan a double rack forms a partition between the two pens. With the exception of that and another rack at the end, the rest of the racks are permanently placed. In the first plan they are built on the posts that support the upper floor.

Rack f r Outside Feeding.

For feeding breeding ewes in the yards or in an open shed a rack similar to that shown in figures IX and X would be useful. It is copied after a rack designed by Mr. A. O. Fox, of Oregon, Wis. The sketch shows it as it would appear attached to the wall of an open shed, such as would serve a useful purpose in sheltering sheep from the wind and giving them a run in the open air. This rack has a small trough nine inches wide to catch the hay that falls out as the sheep are feeding. The slats are placed high so that ordinary sized Shropshire sheep can nicely reach the fodder. It is twelve inches from the bottom of the trough to the beginning of the slats. The slats are four inches wide and one and one-half feet long. The spaces between them are four inches in width. The front above the slats is closely boarded. In a rack that would be used for yard feeding the board front should be made into a drop door for the entrance of fodder. For that purpose a roof would need to be put on the rack to protect the fodder.

Lamb Creeps.

In the practice of those who have made profit in feeding sheep the feeding of grain to lambs is a leading feature. To do this with the most effect on the lambs it is best to fit a part of the pen for that purpose. The simplest but by no means the best way of making a lamb creep is to take two narrow strips long enough to reach across the corner of the pen and strong enough to firmly hold the narrow upright pieces that should be nailed to them about one foot apart. This will usually prevent the older sheep from getting into the lambs' feeding apartment. The sketch shown in figure XII illustrates a valuable design for this purpose. I am indebted to Mr. William Watson, of Turlington, Neb., for a knowledge of this creep. It can readily be seen from the illustration how the size of the opening may be easily changed by shifting the peg at A. By doing that the sliding frame, B, is moved and that throws the upright rollers, D, closer or farther apart. The frame work of the creep is made of light, flat iron strips. The upright and the horizontal rollers are made of hardwood about two inches in diameter. The creep is three feet four inches high and four feet six inches wide. The stationary, upright rollers are one foot apart and two feet long. The illustration shows the creep opened as wide as possible. The two end strips of iron are extended so that the creep may be readily driven into the ground, and by running a board partition from either side it is easy to separate a small apartment for the lambs either in the shed or in the fields.

For holding grain for lambs a special trough is required. It is required of such a trough that it be so constructed as to keep the lambs from putting their feet into it and thereby spoiling the food. The illustration shown in figure XI indicates that this has been overcome. A light strip 5 inches wide runs along the top about eight inches above the bottom of the trough. As the lambs become larger this strip is shifted higher by moving the pegs at the end.

Dipping Vats.

There are two insects that give sheep serious trouble. The one is known as the tick and the other causes the dis-

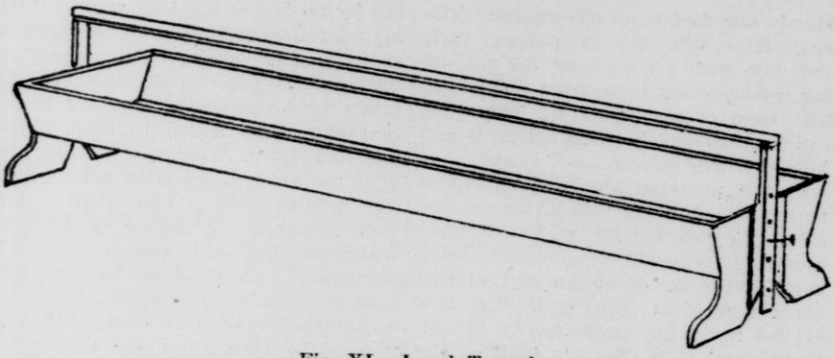


Fig. XI.—Lamb Trough.

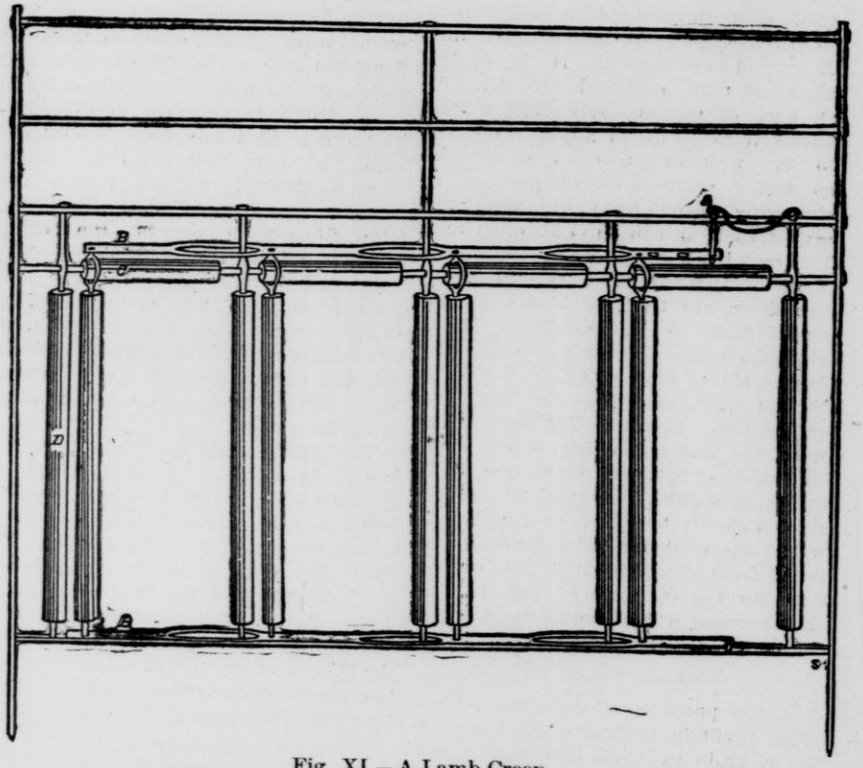


Fig. XI.—A Lamb Creep.

A. Pig for shift sliding frame.
B. Sliding frame.
C. Horizontal rollers.
D. Upright rollers.

ease called scab. To combat these effectively, dipping is essential, and for proper dipping special constructions are required.

In managing a small flock it is easy to rid them of ticks and keep them so by shearing the old sheep early in the spring and then dipping the lambs after they have been with their shorn dams about a week. In this way the ticks can be kept out of a small flock effectively.

A Dip for Lambs.

For dipping the lambs under this management the small vat shown in figure XIII taken from an Australian handbook will meet all requirements. It is made of two-inch material. The part, A, that holds the dipping fluid, measures four feet on the upper side, which is longest, and three feet six inches along the lower. It is two feet deep. One end slopes from the bottom towards the draining board, which is attached to that end. The latter is about three feet long. The lamb, being young and small, is easily turned into the dip by two persons, and after being thoroughly dipped, it is held on the draining board while the dip is pressed out and drains into the bath. This size is convenient for the treatment of about fifty lambs. Rather than increase its size much more it would be better to adopt the practice of changing the dipping fluid a few times, thereby giving the lambs a cleaner dip, and at the same time not making the apparatus of an awkward size.

Dipping Vat for Large Sheep.

For a flock numbering over fifty it would be best to construct a large dipping vat like that illustrated in figures XIV and XV. In a large flock of breeding ewes, where new additions are constantly being made, or where sheep for fattening are annually purchased, this construction is a necessity to overcome the attacks of ticks and the scab.

The plan submitted, both in arrangement and dimensions, is suited for dipping a flock of about 200 ewes or less. The ground plan shows the arrangement of the yards and the other peculiar features of the plan. The catching pens assist greatly in dipping the sheep. They are 10x10 feet, being large enough to hold the same number of sheep as the draining pens. The sheep are gathered in the corner of the large yard and driven into the catching pens. From there they easily pass on to the dip, as each lot is required. The angles of the sides of the catching pens have been cut away so as to give the sheep no opportunity of crowding in the corners.

The Construction of the Tank.

The dip, or tank, is twelve feet long, four and one-quarter feet deep, twenty inches wide at the top and six inches wide at the bottom. That width is suitable for ordinary size Shropshires weighing about 150 pounds. At the entrance to the dip a board about one and a half feet long is extended into the dip at a sharp angle. This helps to check the splashing of the water and plunges the sheep into the bath. The dip is sunk two feet below the ground level, which would leave its walls project two and one-fourth feet above the level of the ground. At both ends of the dip a short side-board is put in between them and the ends of the pens. This is to prevent the waste of the dipping fluid by splashing. As the sheep leaves the dip it walks up a sloping way, to which narrow strips have been nailed to give it a foothold. This should begin at least six feet from the exit of the dip and should have strips nailed to it every seven inches. The material forming the dip should be two-inch match boards.

The Draining Pens.

The draining pens are each twelve feet long and four and one-half feet wide. The frame work is built on heavy posts, sunk so as to give a fall of one foot from the upper end where the sheep go out, to the lower end where they enter the draining pen. At

Fig. XIII.— A Dipping Vat for Lambs.

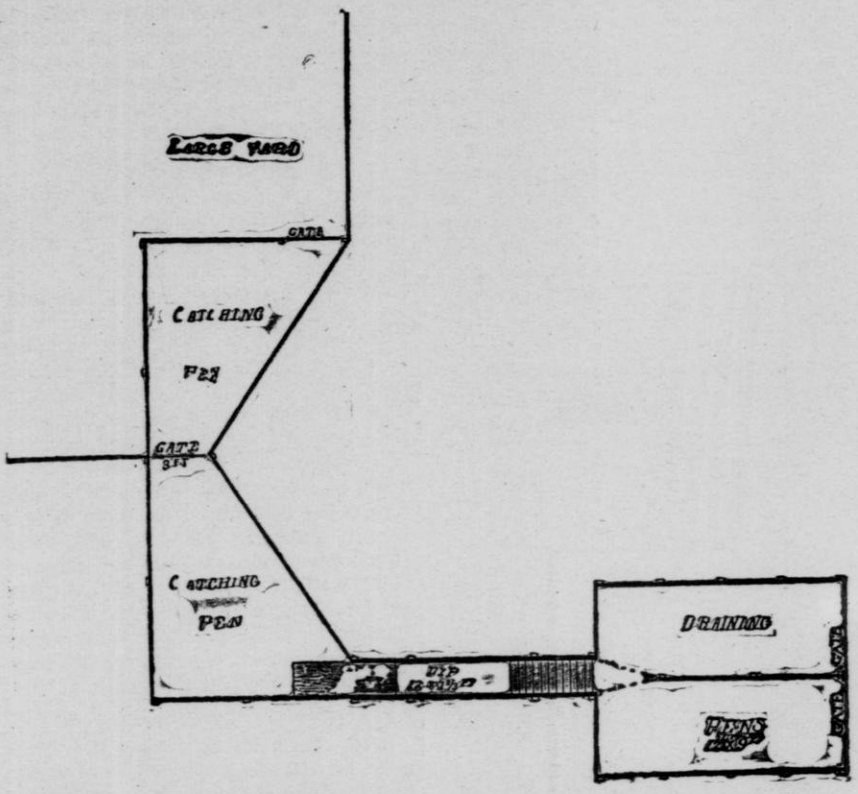


Fig. XIV – Ground Plan of Dipping Vat showing arrangement of dipping tanks, yards and pens.

the entrance to these pens there is a swinging gate three feet wide, which can be used to turn the sheep into either pen when the other is filled. From the outer edges of these pens to the center there is a slight fall of four inches towards the center. A drain two inches long and one inch deep carries drip from the sheep down the center into the dipping vat. At the ends of the draining pens there are two gates, through which the sheep pass out when they have become sufficiently dry. As a protection to the draining pens and the dipping vat it is a good plan to put a roof over them. A cover should at least be provided for the dipping vat.

In the dipping vat there is a guage marked off on the wall, indicating the amount of fluid there is in the vat. This is very useful, as it does away with the necessity of constantly measuring the depth of the fluid in the tank to form an estimate of the amount of it.

Notes on Dipping Sheep.

Sheep may be safely dipped in the spring, summer or fall. To improve the wool the latter is the best time. It is then long enough to receive full benefit

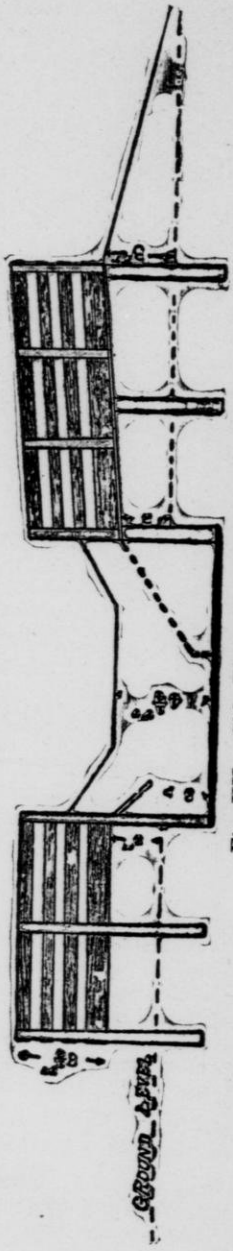


Fig. XV.—Side Elevation of Dipping Vat.

from the dipping fluid and the fleece is more likely to remain clean. When dipping a large flock at such a season, when the nights are cold, it is advisable to stop the dipping in time for the last sheep to dry before sunset.

The Dipping Fluid.

There are many good dips on the market. It would be saying too much to state that they are all good. If dispatch is an item of importance, a prepared dip that only requires the addition of water will be preferable to a home-made dip. The best dipping fluid should not only kill the insects that cause so much trouble but also the eggs of those insects and at the same time improve the lustre and condition of the wool. Of the dips that may be made on most farms the following mixture is the best that I know of, as it is equally effective for scab and ticks. It consists of tobacco fluid and sulphur, and is a slight modification of that given by Dr. Cooper in the work "Animal Parasites of Sheep." For each sheep, according to its size, it will require from one quart to one gallon of dipping fluid.

Preparation of the Dipping Fluid.

With the latter as a basis, it will require for 100 sheep 100 gallons of water, and to make that strong enough to kill ticks and the scab it will require the addition of all the fluid that can be extracted from 25 pounds of tobacco. The tobacco should be thoroughly steeped and boiled so as to get all the strength out of it. To this mixture 10 pounds of sulphur should be added. The sulphur should be mixed separately in a pail of hot water, and after being thoroughly stirred should be added to the dip. If tobacco stems are used, at least three times the weight mentioned should be steeped. A dipping fluid like this, and most of the prepared dips, are much more effective if they are used warm. It may run from 100 Fahr. to 110 Fahr. without doing the least harm to the sheep and yet aid very much in destroying the ticks and scab. In cases of scab it is always well

to give the sheep affected a second dipping in about two weeks after the first. When the first dipping takes place the egg may not be killed and the second dipping at the period stated would be effective in killing these, for they would then be hatched.

Attention to the Sheep.

The sheep should not be hurried, for they might become overheated. If driven some distance and likely to be thirsty they should be given access to water. Their distress might force them to drink some of the dip. In short baths the sheep should be checked to keep them in the dip a sufficient length of time. They should be at least one minute in the bath for the fluid to be most effective. It is best in destroying the scab to keep them in the fluid two minutes. By examining the fleeces of the first sheep that passes through and noting the degree of saturation a correct estimate can be made of the time required for any sheep to receive the full benefit of the dip.

The fluid in the bath should be stirred at intervals to keep it mixed. This will add to the effectiveness of any dip. The dipping vat should be cleaned out after being used. By keeping the other parts of the dipping apparatus free from filth the chances of infection of other sheep are removed.

It is advisable to have the draining pens under a roof. It gives comfort to the sheep and has an effect in protecting their fleeces. If the sheep are compelled to bear with the heat of a strong sun while they are in the draining pens the fleece will be more or less injuriously affected.

FATTENING SHEEP FOR MARKET.

W. H. COLE, Waterloo, Wis.

The fertility of the farm is the one thing that should be kept constantly in view. Many point to the worn out condition of the Eastern States to help us realize the necessity of keeping up the condition of our farms, but the contrast in the older portions of our own state between the farms that have had their fertility carefully preserved and those that have been neglected is sufficiently marked without going farther.

Professor Roberts, of Cornell University, finds, by repeated experiments, that the sheep is the most valuable of all domestic animals in keeping up the producing capacity of a farm; so if we have $100 worth of hay and grain and can increase the value of a flock of sheep by feeding it to them, equal to the price of the grain and hay, we have a round profit from their stables.

The Demand for Mutton is Increasing.

The consumption of mutton is largely on the increase, and the price of good, fat sheep has more than held its own with other meat producing animals. Particularly has this been true of lambs and young sheep, and we wish to increase the demand we must do so by the production of a better article. People are fast learning the difference between a rich, juicy chop and a dry, tasteless one, and are willing to pay their money for a good article. This being the case, we would do well to heed the injunction, "Feed my sheep; feed my lambs," and our depleted acres admonish us to "Gather up the fragments that nothing be lost." If we feed judiciously, save economically, the profits will take care of themselves.

There is Profit in Fat Lambs.

An experience of over twenty years in fattening sheep convinces me that it pays to have a regular system, to be followed as nearly as possible in both feeding and marketing. First, I believe that one who is near large cities can get the most profit from fat lambs from two to three months old, if he gets them to market early in the season. The next most profitable age is from six months to one year old, and there will always be market for ripe sheep of mature age.

Sheep Must Have Dry Quarters.

About half of those I have known who have attempted to fatten sheep have made a failure of it by not complying with the natural wants of the animal. They must have dry, comfortable quarters, with as little commotion near them as possible; clean, dry troughs to feed in; clean water; racks to feed hay in, where they cannot get into it with their feet. It is next to impossible to fatten a poor sheep in cold weather. They need at least to be in good condition in the fall. I find nothing better for this than a stubble field with a good growth of young clover. In the absence of clover I cannot see why a field of turnips, and perhaps rape, would not be good.

Feed for Fattening Sheep.

As winter approaches put them in nights and feed them a little good hay and grain, gradually increasing their grain until you get them up to full feed. For coarse feed I like a variety, feeding each kind at a stated time each day. For grain I like mixed feed better than all one kind. I know of nothing better than corn and oats fed whole, two feeds each day; first feed in the morning one hour after sunrise and the second at night before dark. Feed at the rate of one and one-half pounds to 100 pounds of live weight of the animal, each day. Sheep kept quiet, handled in this way, will put on flesh very rapidly.

Discussion.

Question: How do you use the manure from your sheep?

Mr. Cole: I draw it immediately from the sheds and spread it evenly over the ground in which I am going to plant corn.

Question: When fattening your sheep in the sheds how many do you consider it is best to have in a bunch?

Mr. Cole: I usually have from one hundred to one hundred and ten, but the fewer there are the better if there are no disturbing influences.

Question: What kind of coarse fodder do you think is best for fattening wethers?

Mr. Cole: First, clover hay; second, bright, clean cornstalks; third, timothy hay; fourth, marsh hay or straw. In practice I feed two or three kinds of these each day, each kind at a stated time.

Question: Do you consider it profitable to grind corn or oats for fattening sheep?

Mr. Cole: Not for young sheep. I sometimes grind it for old sheep. With ground feed you must have your surroundings very nice and clean or they will spoil their food and refuse to eat.

Question: Do you feed coarse fodder cut or uncut?

Mr. Cole: Uncut.

Question: Have you not fed wethers that are being fattened more than twice a day?

Mr. Cole: I never feed them grain but twice a day, coarse feed three times a day, the same kind but once a day.

Question: How much can you add to the weight of a sheep in four months?

Mr. Cole: If the sheep are matured and have run in small flocks with nice surroundings and are very fat, it is good care and feed that will make them hold their own during the winter. But where they are taken from large flocks and are in fair flesh, they can be made to gain from sixteen to twenty-five pounds in four months.

Question: In what condition do you want sheep when you commence to feed them?

Mr. Cole: I like them in the flesh and, if possible, their previous feeding should have been upon succulent food for a month or two in the fall. This I consider very important.

BREEDING AND FEEDING SHEEP FOR MUTTON.

JOHN WILSON, Belleville, Wis.

It is not necessary to lay out money with a lavish hand to begin the breeding of sheep for mutton; any breed that has size and vigor will do. Then mate them with a pure bred sire of any of the mutton breeds. My preference is the Shropshire. Each year keep all of your best ewe lambs and in a few years you will have sheep that if they are well fattened will bring the top price provided that you infuse new and pure blood each year into them.

Breeding.

There are a great many farmers having a small flock of sheep who each year keep a lamb of their own breeding at the head of their flock, and if you remonstrate with them or advise them to do better, they will laugh at you and say that there is no difference in breeds. This is a mistake. There should be neither money nor expense considered in the selection each year of a strong, vigorous, pure blooded lamb, as this means in the end one-half of your flock. I am aware that there is a great deal of injustice done by over-reaching people to sell their stock, calling anything that has a black face, pure bred. My advice is to deal with none but the best breeders, then you will not be swindled, as they have their reputation at stake. But as I am only an amateur at breeding, I will leave the subject and tell you what little I know about feeding.

Sheep require as little care as any other farm stock, but this care must be timely. The sheep that you are to feed for mutton should have abundant pasture or a field of rye to run on in the fall. Increase the quantity of food by degrees, so that by cold weather you will have them on full feed; also at night put some clover in their racks so that the change from grass to dry feed will be gradual.

Most Profitable to Feed Lambs.

A great many may ask at what age is best to feed for profit. My advice is to feed lambs for ten months, as a sheep that old is worth one dollar per hundred more than a sheep of any other age. In the next place you don't have to pay any tax on the lamb, as he is too young the first season and he is fed and sold long before assessing begins the next year. I have had no difficulty in making my lambs weigh 115 pounds, at nine months old and have sold them the last five years at six cents ,per pound. I would advise feeders to try and get and get carload lots, as together they sell better, and if the price offered is not satisfactory you may become your own shipper.

In feeding lambs I always feed oats and corn; 2 of oats to 1 of corn by measure. When the lambs are weaned in the fall, put them on good tender pasture, nothing better than stubble fields if there is a growth of clover, or else a field of rye. Put some troughs in the place and learn them to eat in the early fall. Put little in at first, increase

by degrees so that by winter you will have them on full feed. You must be careful in damp weather to keep their grain troughs clean and feed less, or some will get off their feed and lose more in a day than you could put on in a week. Also keep your yards well bedded, as filth of any kind is bad for sheep. Provide good comfortable quarters, with salt at all times within their reach. Have your barns or sheds so arranged that there will be at all times plenty of pure water, and you will be surprised to see how much they will drink when there is no wind to turn the windmill and you will have to pump for them.

Feeding Wethers.

In feeding lambs that are being fattened the best way is to have a yard to feed grain in, then they are not in your way. Leading into this yard have a wide gate, through which they will rush out at once, and while they are eating their grain fill their racks with clover hay and they are again out of your way. I think it best to feed but twice a day. Do not feed more than they will eat up clean. Try and feed about the same time each day. As they will be expecting it, they will let you know if you are not punctual. Provide plenty of racks so there will be no crowding, and if many are kept together, divide them, putting all the large ones by themselves. In this way the smaller sheep will do better. Try and keep them quiet; don't surprise them suddenly, and always speak kindly to them. Don't allow strange boys to annoy them, and above all, keep them in out of storms, especially sleet or rain. It is far better to let them miss a meal than to get wet in winter. This applies to all sheep, as it is the great secret of having heavy wool.

Cull and Fatten the Old Sheep

In feeding aged sheep, I find it best,to feed but twice a day. Give them a bountiful feed of grain early in the morning, and while they are out eating it, fill their racks with hay. I find this the most convenient way, as they are not in your way, which will expedite your work. I have never fed anything to aged sheep but shock corn and well saved clover hay. I find by pursuing this plan that I can keep my stock or breeding sheep in splendid condition by just letting them glean after the fatten sheep. I consider it almost an impossibility to fat sheep without having abundance of well saved clover hay, and corn fodder stands next to it. But it is a good plan to give a variety of feed, as stock of any kind like a change, and sheep are no exception to the rule. Every man that owns a flock of sheep, no matter how small, should every year pick out all that shows signs of loss of vigor or teeth and fatten them off and not wait for them to die of old age. Do not delay this because they have been good breeders and have cut big fleeces of wool, for it is to be remembered that it cannot last long at the farthese, as sheep are a short-lived animal. By the time they are six years old they will begin to show signs of age, and in a great many cases their teeth will begin to drop out.
last long at the farthest, as sheep are a short-lived animal and by the time they are six years old they will begin to show signs of age, and in a great many cases their teeth will begin to drop out.

Care Necessary to Success.

In feeding and breeding sheep, the flock-master ought to be a careful person, one who loves his business and always has a kind word for them. It is not often that you can depend on the average hired man. It will not amount to much if you do not give it your best care and attention. In other words, give plenty to eat and see that they have water and salt, good beds and shelter. It is not best to have their barns too warm. Provide good ventilation. If possible the buildirgs should be given a southern aspect so as to secure all the available sunlight, and if they cannot be arranged so, provide a wind-break to protect them from strong

winds. One thing I nearly forgot, that is, in regard to vermin or ticks, as it is nearly impossible to fatten sheep that have them. My plan is to dip the lambs in tobacco water in from four to eight days after shearing; then again in the early fall so as to be sure that they are all killed.

Time to Sell.

The best time to sell sheep that have been fattened, in my experience, is about the first of March. Then all or most of the half fattened stock have been sold. I am aware that this year is a hard one on feeders, as grain is so dear and meats of all kinds so cheap. But as we have had the best of it the last few years, we should be satisfied, for we know to a certainty that this state of affairs will not happen next year, and as sheep are largely fattened on clover and as there is an unlimited supply, what are we to do with it but feed it out? And there is no other stock that will do better on it than sheep.

I have tried almost all kinds of farming and find that I can make the most by keeping sheep. In comparison with dairying it is not near so confining. The man who keeps sheep is sure of two crops every year, a crop of lambs and a crop of mutton, paying as well as a harvest of wool. I find the men who have stuck to the business the last ten years, in my locality, are not troubled with that unnecessary appendage to their farms called mortgages.

Discussion.

Prof. Craig: In the first statements made in presenting this subject, Mr. Wilson suggests a line of thought that will be uppermost in the minds of those about to begin sheep farming. These facts justify me in adding emphasis and suggestion to what he has said regarding the purchasing of sheep. It is easy to muddle the novice with a variety of advice and to get away from the possibility of doing that I wish to offer the following hints as the most valuable and concise that occur to me. First: Study your farm conditions and learn exactly what sheep will thrive best upon it. Second: If you are not able to purchase even a small flock of pure bred or high graded sheep, then put all you can advantageously in a pure bred ram and after that do the best you can in buying ewes. Start right, even if upon a small scale. The sheep will rapidly increase. Third: In purchasing a ram get one fully developed, strong in bone, straight shaped, and thoroughly typical of his breed and sex. I have always had an intuitive liking for the lamb that will leave a group of his fellows in the field and boldly front you. Fourth: Do not purchase sheep that you have to trust in for proper development. It is only the experienced breeder who can forecast development. Fifth: Never take an ill-doing sheep, even if it is cheap, with the expectation that it will become all right. Sixth: In selecting sheep, if possible handle them so that you may know how much of their form is due to themselves and how much to the shears. Seventh: Select as critically as you can to a chosen type. Uniformity is a cheap feature for you to buy and yet a valuable one in a flock. Eighth: There is no sheep that embodies perfection in sheep qualities. Judging between different sheep is a checking of weaknesses and a balancing of qualities. Be inclined towards the sheep that appears to be better every time it catches your eye. Ninth: The purchaser will find it to his interests to select from field sheep and thereby shun those that have been fitted for show. Tenth: The best time to buy is usually in the fall. Provision may be made with the seller to have the ewes served by a ram of different breeding from the one you buy and thereby you add another season's use to the ram of your flock.

SHEEP IN WISCONSIN'S AGRICULTURE.

W. L. AMES, Oregon, Wis.

Perhaps "Sheep Out of Wisconsin Agriculture" would be more in keeping with the facts and conditions as they exist today than the heading of this paper. But with the beef and pork industries, horticulture, dairying and other agricultural lines as well represented as they have been and are sure to be here, the sheep, the farmers' best friend and ally, should not pass unnoticed. Very appropriately has their tribe been designated "The golden hoof," for if the sheep are fairly and considerately handled and given equitable advantages with other rural undertakings, the harvest and income will truly be "golden."

For the welfare of Wisconsin's agricultural interests there should be not less than 2,000,000 sheep in this state, where there are now only 800,000. If sheep were given more attention in our farming there would be fewer failures, no complaints of impoverished lands, and a more prosperous producing class in our state. Not a state in the Union enjoys a higher reputation for the advanced state of her agriculture than does Wisconsin. Not that she has not her share of shiftless, thoughtless, aimless citizens, but because certain of her subjects, some in one direction and some in others, are taking up and following closely and studiously those lines of agriculture for which she seems so admirably adapted, and they are developing those lines to such an eminence of success that they are attracting world-wide attention. Not to this class of readers would I address my few thoughts today, but rather to that class who, apparently putting forth their best efforts year after year to plow uplands and lowlands for a few expensive bushels of grain, and yet after all this hard work they cannot make ends meet. We plow, but do not work at that alone. We long ago struck up a sort of partnership with the sheep, and have found no other line of animal industry that would return us two dollars for every one invested. At the same time we witnessed the operations of many who seemed to be struggling fully as hard as we were, and who seemed to be getting only about 99 cents for every 100 invested, they never having allied themselves with the sheep. All this, with many other observations, has indicated to us that their tracks are "golden," and that there is a place for sheep in Wisconsin agriculture.

No Lands Too Valuable for Sheep.

We are liable to acquire false notions, one of which may be that our land is too valuable and high priced on which to raise sheep. The falsity of this in the minds of some land owners cannot be more easily aired and exploded than by an incident that occurred not long since, so near that the surroundings were perfectly familiar. An elderly farmer, whose idea of farming had been from first to last to plow, plow, plow, and whose crops during those same years had cost him all they came to and oftentimes just a little more, was murmuring that he must close up his farm operations in some way. Some one suggested renting his farm, to which he replied: "Oh, I can never do that; rented farms are liable to get run down. No, that risk is too great; I cannot think of that." In the midst of a group of tenant farmers not long after, it was suggested by an outsider that some of them apply for renting purposes to the above mentioned owner, to which, however, the at once

unanimous response was, "Oh, my, that wouldn't pay; that farm is too badly run down already." The least tenable reason against the extension of sheep husbandry is that which says that Wisconsin farms are too valuable and too high priced for us to give sheep a place in our farming operations and connections. With us, at least, conviction to the contrary has come by experience. In making our present farm of nearly 400 acres one of the best producing and easily worked in our locality, and that, too, out of parcels of land that at one time had been abandoned to weeds by their grain-farmer owners, we have relied upon sheep. It has been by no means idle, though, in yielding an income during the years of recuperation, for on these lands during the period of rest from plowing and mixing, our sheep yielded us a much better income from the same lands than their former owners had received from them by grain raising, and that, too, with no outlay in cultivating. After a lapse of five years they were again ready for profitable cropping, and with a repeated mixture of this kind of management they have continued ever ready to serve us when called upon.

Instances of Profitable Investment in Sheep

Are sheep partial to us? Not in the least. I just note in the Western Rural a man buying a piece of hill and impoverished land for $3,000, $1,000 down and the other $2,000 to be paid in two years. He pastured this land entirely with 225 sheep, renting adjoining lands to procure their winter keeping. At the end of two years his sheep had paid $1,560 of the $2,000, and he had his original number left. A neighbor but recently started in the sheep line, sold seven-month-old wether lambs in November for $5 per head, thus just replacing money that he had paid for the same number of Oxford-Merino yearling ewes after shearing. In this way, and within a couple of years, he is acquiring a good start in a profitable industry. It is profitable because living on it costs us the least; it does the most towards keeping the farm free of foul weeds; it taxes the soil least, and in turn strengthens it most; it is the least confining to follow; it gives us the least trouble; still further, the animals to be cared for are the most quiet, contented and easily handled; they keep the farm in the best producing condition, and the dollars that come to us from them are the easiest earned of any that we handle during the year.

While the above mentioned operations with sheep may be considered exceptions, they are by no means exceptions as to what might be done. Our home farm is surrounded on nearly all sides by lands upon which sheep would act with equal favor to what they have on our own, but still the proprietors of these lands continue to plow them year after year, perhaps thinking them too valuable and too high priced for supporting sheep.

While we would not depart too widely from our subject, simply for the sake of comparison, let us for a moment consider the "Hog in Wisconsin Agriculture." That it finds a place there is abundant evidence by the glutted markets of October, November and December. We have become so used to feeding the whole year's corn crop to make three-cent pork that we have come to think that it is one of the things that must be. Yet where is the man who will contend that he has gotten the price out of his pork the past season? But, say we, "It is against our principles to sell grain; it must be fed out on the farm." This as an agricultural principle is all right, but remember that our whole farm crop fed to hogs in the usual manner as well be dumped in the ditch by the roadside, as far as any fertility returning to the land is concerned.

What Sheep Have Done in Improving Farms.

But what of this relative to the sheep business? Well, simply this: In our personal case we made $60 land out of

$25 land, by folding our arms and looking on as far as our labor in that particular operation was concerned, while our sheep did the business, besides paying us a good cash rent and interest. They did the same in the $2,000 mortgage instance. In the selling of lambs at $5 per head at seven months old, we find nothing more remarkable than the fact that the pasture lands upon which they were fed returned their owner upwards of $25 per acre, and twice as much as the average grain farmer's acre returned him, besides having to plow, cultivate, sow and harvest it himself. Note this: Pork is made from cash grains, while the sheep product is made principally on pasture.

We believe in the grand future development of Wisconsin's agriculture. Among the gradual changes that are being made, diversity is one of them, and in that diversity sheep are coming more to the front and their economy as a farm animal and appendage more fully appreciated.

Comparison Shows that it Costs Nothing to Produce Wool.

The products from sheep are not produced in sufficient quantities to meet the home demand. One of them it can be proved by comparison it costs nothing to produce. As to the last statement the following will make it clear. How about the horse's heavy coat in the spring? Why, we curry it off in wads, and it drops into his bedding and simply goes with that material. Seeing the cattle's old, heavy coats adorning the ends of the fence rails and corners in spring is simply an indication that the bovine race is coming out healthy and vigorous. The covering of the hog is scarcely worth mentioning. Then, while we make no account of these items against a horse and cow, why should we against the sheep? But in so considering, the product as a blessing to man will not be considered in the least. Then while we may truthfully consider that a pound of delicious mutton can be produced as cheaply as a pound of beef, and fully as cheap as a pound of pork, then we have the wool product clear. To the thoughtful, systematic, reasoning farmer, who will give a portion of his yearly attention to this same unappreciated sheep, there appears practical possibilities, double incomes, profits direct and indirect, satisfactions, aye, and even pleasures that come not from the handling of any other farm animal, or the following of any other farm labor.

In the discussion of breeds, it is not my purpose to enter at this time and place, still it may not be out of place to say that the sheep whose acquaintance I have familiarly made; which I have continually had in mind while preparing this paper; the one that has returned us the before mentioned extra dollar for every one invested; the one that keeps our fence corners and wood lots clean and presentable; the one that annihilated our patch of Canada thistles; the one that we have developed from a two-pound fleece and fifty pound carcass of 35 years ago to a ten-pound fleece of delaine wool and 120 pound carcass today; the sheep, with which as a basis, you may breed profitably in almost any direction; and the sheep without which we would scarcely know how to farm, will, I think, come under that class of useful animals commonly called to day "American Merinos."

Stocking a Farm With Sheep.

Let the narration of an incident be my conclusion. Not long since I was talking about sheep to a man, who admitted that my arguments were convincing and home indications the same, as far as sheep were concerned. "But then," said he, "your fields are clear of burr plants, your fences good, and your acres productive, but your neighbors cannot do with sheep what you can." "But it is our sheep that have annihilated the burrs," I said. "They require less fencing with us than any other line of stock, and they have been the most potent factor in bringing about these fertile acres." As grain is most prof-

fitable when fed to a poor, healthy animal, so sheep, pastured on grain-impoverished lands will return to the average farmer the greatest profit. "But to illustrate a little further," said I. "Here is a farm of 160 acres, one of those that have been growing grain, once virgin and fertile, but now, while the grain farmer owner may still think it is too high priced to devote any portion of it to sheep, renters consider it too badly run down for them to try to farm it. What would you do with it if it was yours, put sheep on it?" "I think I should," said I. "Well, how many?" "Oh, 200, with some other stock." "How much pasture, grain and hay land for the 200?" "Well, on an average 40 acres of pasture, 20 acres of hay, 10 acres oats and 10 acres corn." "Let's see," said he, "forty, sixty, eighty acres for the 200 sheep; but what would you do with the other eighty acres?" "Well, my friend, said I, after a moment's reflection, "I should do what I think would be also greatly to the advantage of a multitude of other farmers in the State of Wisconsin to do on their similarly impoverished and upland acres, and that would be to put on more sheep."

SHORT STATEMENTS ABOUT SHEEP.

A SUMMARY OF THE SHEEP SESSION.

If the reader has read the preceding papers he will feel the need of a summary of the best facts so that he may retain and use them with most effect. This has urged the writer to group under their proper divisions the most helpful statements and suggestive thoughts that spring from a study of the work of this session.

Claims Made for Sheep.

1. They are profitable. Instances are given where breeding ewes have yielded a profit of $12.60 per head; where fat lambs, made to weigh 115 pounds at nine months of age, have sold for six cents per pound, during the last five years; where a breeding ewe has given annually a profit of ten to fifteen dollars; where a farm was bought for three thousand dollars, with one thousand dollars down and the rest to be paid in two years, and during that time the sheep paid fifteen hundred dollars and the original number remained; where they have made land worth sixty dollars an acre for that worth about twenty-five.

2. They weaken the soil least and strengthen it most.

3. They are enemies of weeds.

4. The care they need is required when other farm operations are slack.

5. The amount of investment need not be large.

6. The returns are quick and many.

7. They are the quietest and easiest handled of all farm stock.

8. Other farm products are made more largely from cash grains, while those from the sheep are made principally from pasture.

9. There is no other product of the farm that has fluctuated so slightly in value as good mutton.

10. By comparison wool costs nothing, for does not the horse and cow in shedding their coats waste what the sheep saves?

Hints for Beginners.

11. Study your farm conditions so as to be able to select sheep suitable for your locality.

12. There is no breed adapted for all conditions.

13. There are so many breeds that it is easy to choose sheep adapted for any locality.

14. Of all things use a pure bred ram.

15. It is possible to begin with grade American Merinos and by consecutive crossing with Shropshires or Oxfords get good mutton sheep.

16. A source of failure in crossing the Merino with mutton sheep has been that the shepherd used to Merinos did not feed the crosses sufficient.

Management of the Flock.

17. The ewes should be in fleshy condition in the fall. Feed one-half pound of oats daily until they become so.

18. A grain-fed flock will yield two pound per head more wool than one poorly fed.

19. All ewes with unsound mouths, injured udders and bad coats should be fed for market.

20. Select those ewes to remain in the flock that have been the most prolific and the best milkers.

21. Breed your ewes to a pure bred male of the same breed so that each year the increase will be better than the year before.

22. Ewe lambs should not be bred until they are eighteen months old.

23. A good daily ration for a breeding ewe is two pounds of clover hay or corn fodder, three pounds of silage or roots, and one-quarter of a pound of

oats in early winter, changed to one-quarter of a pound of bran in spring.

24. Supply ewes with salt and clean drinking water at all times.

25. Do not keep more than fifty ewes in a single pen.

26. Breeding ewes should have exercise and should not be confined in warm, close buildings.

27. Before being put on pasture the ewes should be tagged.

28. There should be no decrease in the quantity of hay and grain fed to the ewes until they have been on pasture for some time.

29. The thrift of the ewes and lambs depends on change of pasture in summer.

30. Give the flock, including the lambs, the aftermath of timothy and clover.

31. Dip the ewes for ticks and scab.

32. An effective home made dip for 100 sheep is 100 gallons of water, the juice from 25 pounds of tobacco, and 10 pounds sulphur.

33. For scab, dip the sheep again after two weeks' interval.

33. See when dipping that the sheep are not overheated or thirsty.

35. They should be at least one minute in the bath.

36. Keep the fluid stirred.

Treatment of Lambs.

37. A lamb dropped in March will outstrip the later lambs during the hot weather of August and September.

38. Keep a service record so that you know when the lambs will be dropped.

39. Provide lambing pens for comfort of ewes and safety of lambs.

40. Be on hand at lambing time to see that each lamb is on its feet and feeding.

41. Teach the lambs to eat a mixture of two parts bran and one part oil meal by weight as early as possible.

42. Arrange a lamb creep and trough for the lambs.

43. The lambs should be castrated when from three to four weeks old and docked a few days later.

44. About two weeks after the ewes have been shorn dip the lambs.

45. Wean the lambs when three and a half to four months old.

46. Clover aftermath is the best pasture for lambs that have been weaned.

How to Fatten Sheep.

47. Wethers that have been fed some grain before the time of winter feeding will be heartier feeders than those that have not.

48. Rape or rye are excellent crops for fall feeding.

49. Be sure and have the wethers free from ticks before beginning to fatten them.

50. A good daily ration for fattening is 3 lbs. clover hay or corn fodder, 3 lbs. of roots or silage, one-half pound of oats beginning, increased to 3 lbs. of oats, corn and oil meal at finish.

51. Wethers of good breeding will gain from two and a half to three and a half pounds per week on such a ration.

52. Feed a variety of fodders.

53. Feed them often all they will eat eagerly.

54. Keep the feed troughs clean.

55. See that they are dry and quiet in their pens.

56. Do not keep more than 25 in a single pen.

57. Be careful in damp weather to keep the grain troughs clean and feed slightly less.

58. Feed them at the same time each day.

59. Keep them out of storms.

60. If near a large city, fattening lambs from two to three months old will give the greatest profit, especially if put on the market early in the season.

61. The next most profitable age to market them is from six months to one year.

62. About the first of March is considered the best time to market fat sheep, for before this the half fatted stock have been sold.

Property of H. A. BRIGGS, Elkhorn, Wis.

AFTERNOON SESSION—MARCH 18th.

COOKING SCHOOL SESSION.

Conducted by MISS M. L. CLARKE, Principal of the Milwaukee Cooking School.

At 1 o'clock on the afternoon of Friday, March 18, several hundred ladies with a fair sprinkling of gentlemen assembled at the Armory building immediately across from where the Institute was holding its last session, to take a lesson in cooking from Miss M. L. Clarke, of the Milwaukee cooking School. The stage was occupied by a gasoline stove with oven, and everything complete; by a kitchen table, with various utensils and by Miss Clarke, and a couple of youthful assistants, all wearing spotless white aprons and caps.

Miss Clarke was introduced to the convention by Superintendent Morrison, who spoke as follows:

I take pleasure in introducing to you this afternoon, Miss Clarke, of Milwaukee, the Principal of the Cooking School. For some time I have desired to have one or two sessions of each Institute devoted to cooking. It is an art, and I think the day will come when our State University will have a course in domestic economy. An educated cook, knowing what she has to prepare for a given meal, can tell to a minute at what hour she can serve it; she will know how and when to prepare each dish in its regular time and sequence, so as to save herself all unnecessary hurry, and her chemical knowledge will enable her to make various changes and combinations in her dishes, that will be a constant source of pleasure to her family. So, let not the woman of culture, refinement and education feel that she is wasting her advantages if she is called to preside over the cooking, for no branch of our lives is so important, and you should no longer be willing to trust it to ignorant and irresponsible people. Let our daughters acquire the knowledge as an art, and feel proud of their accomplishment.

The proceedings of this session will be reported by the stenographer present and issued in the annual bulletin.

Miss Clarke: It is a little embarrassing to undertake to teach bread-making to an audience of bread-makers. Most of you are practical housekeepers and have worked for many years with intelligence and care. But the Milwaukee Cooking School is a sort of exchange, and every housekeeper who comes to us, no matter what she may take away with her, is sure to leave some valuable information. Some good results are sure to follow such a collection and accumulation of thought and skill.

The bread that we shall present to you this afternoon was set, of course, this morning. We have allowed four hours time for it to rise. At half past eight o'clock this morning I began sifting and measuring the flour, putting the yeast to rise, scalding and cooling the milk, and making the preparations that were necessary. It was finished and put into this buttered crock at nine o'clock, and as it is now a few minutes after one, it has been rising

just about the necessary time, four hours. The recipe is as follows:

White Bread.

1 cup of milk, scalded and cooled to 60 degrees; 1 cup water; 1-2 ounce compressed yeast dissolved in 1-2 cup of water with one teaspoonful of sugar. Set it in a warm place till well frothed (about ten minutes). Mix yeast, milk, water and one teaspoonful salt well together. Beat in flour enough to make a stiff dough, about six cups. Knead hard for thirty minutes and then let it rise for about four hours at a temperature of 60 to 65 degrees. When it has doubled its bulk it may be shaped into rolls or biscuit. Bake in an oven where the temperature is about 400 degrees, and they should take from 45 to 60 minutes, according to size.

We are going to shape this bread into three forms. After many experiments we have found that the best size for a pan is ten inches long, four inches deep, and from three and a half to four inches wide at the top. A larger loaf than this does not bake through until the outside crust is hard, and somewhat dry. A smaller loaf does not give a well shaped slice of bread for the table. The pan should be made of Russia iron, they bake more evenly. A bread pan should never be greased, and rarely washed, and if the bread is properly kneaded it will not stick to the pan. As the rolls take the longest to rise I will shape them first, and as it is a little cold here I will cut it quickly into strips, lay them in the pan, and get them into a warmer place. I hope you will notice the directions in the recipe, that the bread should be set at a temperature of not over 60 degrees and never be allowed to go much beyond that, 70 is the outside limit. I hope you all have at home little milk thermometers; they are very useful in the kitchen as well as in the dairy.

A Lady: Why is it that the bread never sticks to the pan without the pan being greased?

Miss Clarke: Warm the pan until it is a little hotter than you can bear to touch. Have ready a bit of common laundry wax, or yellow beeswax wrapped in a piece of clean linen, and rub that over the surface of the pan. Enough wax will come through the cloth to make a glazed surface, and nothing will adhere to it. All the pan needs when it comes out of the oven is to be rubbed off quickly with a coarse towel.

Question: Would it act as well for cake?

Miss Clarke: I think it would, though I like better to protect my cake with tissue paper. Let your pan be just half full. Now we have the rolls and the bread, and we will make what is known as finger rolls, which are especially adapted for breakfast. Take a bit of dough as large as an English walnut, roll gently on the board with the palm of the hand until about four inches long and of an even thickness; lay closely in the pan, brushing soft butter between each. These will now be taken out to put to rise with a linen cloth spread on them, and I will take the opportunity to say that if you want your bread a little shorter, you may take a pint of new milk and if you wish it still more crispy and short there is no law against your putting in a tablespoonful of melted butter. The forms into which this dough can be made are legion, but you can plan them out yourself, having the foundation to go upon. The setting of the fresh sponge, we shall leave until quite the end of our lesson.

While these are rising we want to make ready some other dishes. Now, I wonder if I dare talk to you in regard to the cooking of potatoes. Some people put the potatoes in cold water and allow them to come to a boil; others think that they should be dropped into boiling water, and it seems to me that the advocates of both methods have something reasonable to say in that respect. At this time of the year when potatoes are wilted by lying in the cellar the vegetable fibre

is tough. I believe the plan that will be most satisfactory will be to pare the potatoes and put them into cold water, let them lie for several hours, until they have re-absorbed the water which has been evaporated; until they are crisp and tender and ready for quick cooking. Then drop them into boiling salted water and let them cook for twenty minutes to half an hour until they are tender as new potatoes in the fall. You will see then that the water you pour away from them will be perfectly clear. Every bit of the starch will be held in the potato. I think you will find that where potatoes have been allowed to boil unevenly, when you pour off the water, it will be thick, almost ropy with starch that is taken from the potato, and you lose just that much. I have had put on the stove here, enough water to cover our quantity of potatoes. They were pared this morning soon after nine o'clock, and they have been soaking in cold water ever since, until they are crisp and tender.

Question: What do you put between your finger rolls?

Miss Clarke: I put a little bit of melted buter so that when the rolls are baked, they will cleave apart easily and freely. Now that our potatoes are on to boil., I will give you a recipe for a dish of eggs, which I think is not very much known.

Egg Timbale.

The ingredients are six eggs, 1 1-2 cups of milk, 1 teaspoonful salt, 1 saltspoonful measured level of pepper, 1 teaspoonful chopped parsley (if you can get it), 15 drops of onion juice. Beat your eggs smooth; mix them well with the milk and add the seasoning; pour the mixture into buttered dishes, (you may use cups and serve one to each individual, or you may use these little pudding dishes,) and bake until set, about twenty minutes. Watch it as you would the baking of custard, and apply the same test that you would to custard to see when it is done. These may be served plain or with tomato sauce or with cream sauce. In breaking your eggs, I want to give a little word of caution, and that is, you will find the white of the egg adheres very closely to the shell, and a little brush with your finger will make the addition of the white of one whole egg in a dozen eggs.

A question that I am often asked is, "How do you know how much is a teaspoonful, and a tablespoonful?" Allow me to refer you to the table of equivalents in the Star Crystal Cook Book. A teaspoonful is just as exact a measure as an inch or a foot. A teaspoonful is 60 drops of distilled water at a temperature of 60 degrees dropped in a minute, one drop to each second. Three teaspoonfuls make a tablespoonful, just a half ounce in liquid measure. Sixteen of the tablespoonfuls will give you a cup, half a pint of liquid measure. When we are measuring dry materials, the teaspoonful should be rounded just as much above the edge of the spoon as the bowl is rounded below, which, of course, is a little more than a liquid spoonful, but it weighs just about the same. It is a great comfort to know that a tablespoonful of butter, packed down solidly, is just an ounce. Please remember that the three S's, salt, soda and spice are measured level; sugar, butter, flour and all such materials are measured rounding, and of course all lumps should be crushed in sugar and salt.

Miss Clarke proceeded to beat the eggs vigorously with an egg beater, suggesting at the same time that the revolving whips of the egg beater should be held as nearly horizontal as possible. The salt was then added and next came the onion juice, which was extracted from the onion by slicing off a little bit with the grain of the fibre and pressing the onion against a grater. Fifteen drops were thus added to the mixture.

Miss Clarke: I could not secure the parsley at your local markets, but there

should be added one teaspoonful of parsley chopped as fine as possible, and then thoroughly mixed, so that it will flavor your dish all through. I might as well confess frankly that it is more for looks than for the taste.

The egg timbale was poured into a buttered dish, set into hot water in the oven to bake.

Boiling Eggs.

The matter of boiling eggs seems to be a perfectly simple one, and yet it is most cruelly abused. An egg that is to be served as a soft egg, should never be boiled under any circumstances; it should be treated by the process known in cook books as "coddling." For six eggs allow a vessel that will hold two quarts of water. In cooking your eggs fill nearly full with boiling water, set them one side and cover them; let them stand for ten minutes for a medium softness, if you wish to have them very soft, so that the white will run, you may take them up in eight minutes, and if you wish to have them firm, what is called a "four minute boil" you may take them up in twelve minutes. We shall not cook six eggs to-day, but only two. In the ordinary way of cooking a boiled egg there is a coating next to the shell that is not only hard and indigestible, but prevents the heat from reaching the inner part of the white and the yolk, so that we often see them raw, when there is a hard, tough rim just inside the shell. We have often seen boiled eggs in a glass when there would be some of the albumen that would not be coagulated, and unless one likes raw egg, it is not an appetizing way to serve them. We will try it with these two eggs, and I will ask one of the ladies to call time on me, so that I may go on with something else. A hard boiled egg is nicer if it is dropped into cold water and set on the stove and allowed to come to a boil without being covered except with the water, and allowed to cook ten minutes after it begins to simmer. You remember the Frenchman who laid aside the white of the hard boiled egg and said, "You can't expect me to eat the feathers of the chicken."

Omelet.

I will now prepare an omelet according to receipe No. 2, which you will find in the Star Crystal Cook Book. As I told you before, if you want to get the best results in beating the whites of eggs with a Dover beater, hold it as nearly horizontal as possible. It makes a world of difference in the result. This pan is made of rolled steel, stamped into shape; it has been in use for six years and grows smoother every year. Pans to be used for omelets should never be used for frying meats; they should be kept perfectly clean, rubbed thoroughly inside and out. After they have been used they should be washed as clean as you can make them with soap and sapolio; then take a handful of common salt and polish them. Keep your omelet pan for just such uses, for making scrambled eggs and sauces of different kinds; it heats evenly, and is not subject to quick changes. In handling your omelet, it must be turned and balanced, especially if the bottom is not perfectly level, so that it may brown evenly on all parts of the bottom. If the fire is not too fierce, you may venture to hold the pan directly over, moving it so that all parts shall brown equally. While I am doing this I will give you the proportions; for each egg allow 1 salt spoonful of salt, a dust of pepper, and one tablespoonful of some liquid, usually milk or cream, or if you wish to use chicken with it, you may use a tablespoonful of chicken broth or any of the other many possible additions, but the proportions do not vary. Having the whites beaten dry, carry a little of the foam over to the yolks to help them beat up white and fluffy; add the seasoning to the yolks, and after they have been beaten thoroughly, the liquid to the yolks. Lastly fold this mixture into the beaten whites, cutting and

folding till nearly all has been taken up by the whites. Our omelet is now brown at the bottom and partly cooked through, and I will set it into the oven to dry off the top. You see by the recipe that this omelet has been turned into an omelet pan, in which has been melted a teaspoonful of butter for every two eggs. Do not try to make more than four eggs into an omelet at once. Make four and then another four if necessary, but four eggs makes as much as you can handle at once.

I will now send our potatoes to the back room to be drained, which should be done thoroughly. The kettle should be tilted at least three times, then the cover taken off, give them a shake, and they will come out dry and mealy.

To know when an omelet is done, take a palette knife and make a little cut into it; if the knife comes out dry the omelet is cooked enough. If it comes out sticky, it should be cooked a little longer. Our potatoes seem to be all right, dry and a little broken, perfect as a Wisconsin potato should be.

Question: Why do we find potatoes turning black after they have been peeled?

Miss Clarke: If you will put them into cold water immediately after peeling, enough to cover them thoroughly, they will keep a pearly whiteness unless they have been damaged in some way.

Question: We sometimes find when stopping at a hotel that we have wet, soggy and dark-colored potatoes. We would like to know what is the trouble?

Miss Clarke: Never in Portage; but in other places I have found potatoes of that kind. There are three reasons for that; one is that the potato is not pared and soaked in plenty of cold water for two, four, six or eight hours before they are cooked. The second reason is that they are allowed to stand without boiling. Starch has a great affinity for warm water, and as soon as thoroughly hydrated it becomes pasty, and there is no possibility of bringing it out again to its proper condition. Starch, when it is cooked as it should be, ought to behave very much like popcorn, every grain breaks open and shows the dry granules within. If these are allowed to stand in hot water after breaking they absorb the water, and the consequence is soggy potatoes instead of dry, mealy ones. The same holds true in baking a potato. The instant the baked potato is soft it should be pinched and cracked to let the steam escape; otherwise the starch in the potato absorbs the steam and we get a pasty potato. If potatoes are cooked, as they sometimes are, before the meat is ready, put them in a warm place and put a towel over them that will keep them warm and not keep in the steam. They can be kept good in that way for twenty minutes or half an hour.

Cooking of Beef-Steak.

I will say first that a beefsteak should never be cooked in a frying pan, provided there is any other way to cook it. The perfection of cooking is to expose the meat directly to the action of the fire, and the improved patterns of gasoline ranges have a row of burners underneath, throwing a strong reflection down; you can put your meat under, and it is broiled just as perfectly as it could be over a fire of coal or charcoal. We have not a stove of that pattern, and as we cannot broil it over the fire, our only resource is to lay it on a smoking hot iron surface in the shape of a frying pan. Please do not put in any fat. We do not want a fried steak, but what is called a pan broil.

As each dish was cooked during the course of the demonstration it was cut up, or divided into small bits, and passed around through the audience, each lady having an opportunity to test the merits of the viand. At this point the boiled eggs were sent out and examined by the ladies. The tea rolls were brought in and pronounced ready for the oven.

Question: Was there any milk put in the glass with those eggs?

Miss Clarke: No; that is the white of the eggs, perfectly soft, yet perfectly set, and perfectly digestible, as much so as milk would be.

I want you to see the two forms of steak that we have here. The popular form is known as "porterhouse steak," cut from the loin, and with a large portion of the tenderloin, very delicate and tender, but containing little nourishment. It is one of the muscles that seems to be used for padding and not for work, and as a consequence it is little fed by the blood of the animal. For nutritive purposes the sirloin steak has twice its value. This other steak is what is known as the sirloin, cut well up toward the rump, and full of nutritive juices gained in connection with the great muscles that are used in working. This muscle, from a well fed ox, ought to be the most nutritious part of the body. Of course there are muscles in the fore quarter that are more used, but they are hard, dry and stringy; they are used so much that they have become tough and are fit only for stews and soups, braised meat, pot roasts and boiled meat, not for steaks or roasts. May I answer a question beforehand that I know will be asked? "Would you ever pound steak?" I never would. I would go without meat six days in the week if on Sunday I might have a steak that is good to eat without being pounded, for I do not want a piece of meat from which the life juice has been expressed by pounding. There are plenty of other ways of cooking tough and stringy portions of meat, rendering them at once palatable and digestible, but do not try to use them for steaks. These steaks should never be washed. Wet a clean cloth in cold water and with it sponge the surface carefully, to take off the dust that may be on it from sawing the bones. There is in every sirloin steak a tough end, and it is not worth while to try to broil a piece like that. Take it off and use it for something else. Cut off the suet, also, remove the extra fat, and this little piece of fat will serve to lightly run over the surface of our pan. The steak should be allowed to sear thoroughly on one side, then turned and seared on the other side, and after that it should be turned every ten seconds until it is cooked.

Coffee.

We are now ready to put together our coffee. We have selected from your local grocer a mixture of one-third Mocha and two-thirds of old government Java. He gets it freshly burned from the larger dealers, and grinds it himself when it is called for. This was freshly ground this morning. We have here a cupful, enough to make three large cups of coffee. For that we will select the largest egg we can find, and break it, shell and all, into the coffee. The lime of the shell is slightly soluble in hot water, and it helps very much in clearing the coffee. To this amount of coffee you may add a scant quart of freshly boiling water; let it boil up as quickly as possible three times, giving the coffee pot a vigorous shake between each boiling, so that the foam may be sent down, then set to one side and allow it to steep ten minutes at least; it does no harm if it steeps twenty minutes or half an hour. Another way of making coffee, if you have not a thoroughly responsible person in your kitchen, is what is known as drip or French coffee. I have brought a very small coffee pot, just to show the pattern. A little cotton bag hangs on a flexible wire, fitting exactly into the rim. For every cup of coffee allow a heaping teaspoonful of pulverized coffee. It is not sufficient to say finely ground; the coffee must be fine as dust. This coffee pot holds two cups. Put your coffee into the bag and pour through it two cupfuls, not allowing the water at any time to overflow the bag. It is ready for use as soon as the last of the water has filtered through. While I do not consider this perfect coffee, still, if you have a poor cook, you can have at least drinkable

coffee by making it this way, as it can be done at the table. In making our coffee the coffee pot must be thoroughly scalded, and the coffee will be better if made of soft water. Let me caution you if you cannot have cream to serve it with boiling milk.

The steak and potatoes were here put upon a dish, garnished, cut up in small pieces and carried through the audience for testing.

Question: When do you season your meat?

Miss Clarke: When it is taken up.

Question: Do you put butter over it?

Miss Clarke: No; just salt, no pepper; the steak is rich enough with its own juices, not to need butter.

Question: Do you ever put pepper on it?

Miss Clarke: Not on steak. A boiled egg needs pepper, as do some vegetables.

Question: Is it true that cooking pepper makes it rank?

Miss Clarke: Undoubtedly so.

Question: Why didn't it with the omelet?

Miss Clarke: Because it is cooking so short a time, and with less heat than meat requires. It will not seriously injure the flavor of the pepper to be cooked in anything that is cooked as lightly as an egg.

Question: Don't you lose the good flavor of the coffee when you leave the coffee pot open?

Miss Clarke: I will refer that question to you as it is passed around; we do not let it boil any length of time, only to boil up quickly, and I hardly dare take my eyes off it.

Question: Where do you get the pulverized coffee?

Miss Clarke: It is sent out by a firm in Chicago. Your local grocer will be able to supply you if there is a demand for it. We now come to our last new dish, and that will be tea. I would like to give you three different kinds of tea. One is known as English breakfast tea; its specific name is Congo, a heavy tea, containing a very small amount of alkaloids in proportion to other kinds. It has a great deal of body and should be treated exactly like coffee. Make it with boiling water, using a heaping teaspoonful to each cup of water; let it stand almost at the boiling point; if it even simmers a little no harm is done. It should steep for a good ten minutes, and then treat it, please, as you would a breakfast cup of coffee—pour it into a well heated cup and give it a generous allowance of cream or boiling milk and I think you will find it three-quarters of your breakfast. It is not a "nervous" tea; you may drink a cup of it at supper and you will find that you will sleep as soundly as though you had had a glass of milk. The second variety is a popular new tea, known as uncolored Japan. The question is often asked if it is safe to let tea stand to steep? You will find the statement in many cook books that long steeping extracts the tannin. Tannin is one of the most soluble of all known substances, and every atom of tannin in tea is thoroughly dissolved within ten seconds after the hot water is poured upon it; but if your tea is made in tin, the tannin will act on the tin, forming tannic acid, an extremely poisonous compound. The danger is not in the tannin but in the alkaloids which are extracted by long steeping. Oolong tea should be served in five minutes; Souchong, Himalaya, and other English breakfast teas require from ten to fifteen minutes' time. We have our teapots freshly scalded and boiling, and we will put the tea to steep.

At this point the bread was taken out of the oven and Miss Clarke was asked,

Question: How do you know when the bread is done?

Miss Clarke: When you can lay your hand on the bottom of the loaf without burning it. If the bread is so damp that steam comes out you cannot hold your hand on the loaf, and you may know that it is still dough. A paper has been handed in containing some questions which I am very glad to answer.

Questions: Do you put potatoes in hot or cold water? Do you pour water over the potatoes? Do you put salt in while cooking? We have found the most satisfactory method to cook them in boiling hot water. By far the best method is to have the kettle on the stove with the water boiling in it; drop the potatoes in and they come to a boil again with the least possible delay. Do that rather than pour the boiling water on them, as it cools the water to pour it through the air. Salt should be allowed in the proportion of one tablespoonful to every quart of water, and the water should be deep enough to stand at least one inch above the top of the potatoes.

Question: Is not the coffee made after the recipe given us too strong for ordinary family use?

Miss Clarke: Every one must be guided by her own judgment in the matter. There is no law against adding all the water you want.

This concluded the afternoon Cooking lesson, but before the audience was dismissed Superintendent Morrison announced that, as Miss Clarke would remain in the city until the next day, her services had been secured and an evening session would be given, to which all were cordially invited.

The program, as nearly as Miss Clarke could give it upon so short a notice, would consist of Fish Balls, Lyonnaise Potatoes, Chocolate, Setting Bread (by request), Potato Salad.

The evening session was called to order at 7:30 by Miss Clarke, who proceeded with the bill of fare, as announced at the close of the afternoon session.

Potato Salad.

Bake or boil potatoes according to the directions already given. Dice them when cold, and for each quart allow one cucumber, one cup of diced celery, and once the measure of the following dressing.

Salad Dressing (Boiled.)

Cook one teaspoonful of flour in one teaspoonful butter for two minutes. Pour into it slowly one-half cup of boiling hot vinegar, beating smooth with a wooden spoon. Cook five minutes; then pour into it one egg and one and one-half teaspoonful each of salt, sugar, mustard, and one-half saltspoonful cayenne, all beaten smooth. Cook one minute and set away to cool. Thin this with thick, sour cream when ready to use. This is particularly nice for cold slaw, and should be poured hot over the chopped cabbage.

Potato Salad No. 2.

Boil the potatoes and when cold slice very thin. For a small salad of about a pint of potatoes take the yolks of two eggs and two tablespoonfuls of good cider vinegar. Upon the beaten yolks pour the vinegar boiling; place the bowl containing them in a kettle of boiling water and stir with a wooden spoon till it thickens stiff; to it then add a teaspoonful butter, mixing well. When cold add one teaspoonful cayenne pepper and salt (mixed in the proportion of 6 parts salt to 1 of pepper), and one-half teaspoonful mustard mixed in cold water that has been boiled; enough onion to suit your taste (onion is as essential to this salad as celery is to chicken salad); one cup of cream just commencing to turn sour; a little more vinegar, and something green and fresh; sliced cucumbers in their season, green cabbage, pepper grass or a few celery leaves. Pour this over the potatoes, stirring as little as possible. These ingredients mixed in proper proportion will give a salad equal to the chicken salad.

Asparagus Omelette.

Boil six stalks of asparagus; drain and cut them into small pieces about as large as peas. Dissolve half a teaspoonful of flour into a little cold water. Melt an ounce of butter, whisk the flour into it, and when smooth, add pepper, salt and the asparagus. Make an omelette of four eggs according to Miss Clarke's directions and before completing the fold add the asparagus, turn it deftly out on a hot dish and serve.

Miss Clarke then gave the following directions for making fish balls:

Fish Balls.

Cut salt codfish into slices about a quarter of an inch thick, removing every bone. Do not shred it, but cut it across the grain with a sharp knife. Put potatoes and fish on to boil and let them cook until the potatoes are tender. Then drain off every drop of water and beat all fine with a potato masher, using about half the bulk of fish as of potato. To one quart of this mixture add one saltspoonful pepper, and if too fresh, add salt to taste. Then add two eggs, beaten light. When boiling the potatoes for fish balls take them up the instant they are done. They will soak the fat in which they are afterwards cooked if allowed to remain in the boiling water. Drop this fish ball mixture by tablespoonfuls into hot fat and take out when nicely browned to drain on brown paper.

Question: How do you tell when lard is hot enough?

Miss Clarke: When a slice of raw potato, dropped into it, will rise quickly to the top the lard is hot enough for fish balls.

Lyonnaise Potatoes.

In preparing lyonnaise potatoes, cut cold boiled potatoes into half inch dice and for two quarts of potato put four tablespoonfuls of butter and one-half an onion, shredded, into a sauce pan, and allow them to cook until they have commenced to turn yellow. Then turn the potatoes into the pan, seasoning with one level teaspoonful salt and a dust of white pepper. When nicely browned they are ready for the table.

Chocolate.

Scrape two ounces of unsweetened chocolate; add to this one-fourth of a cup of sugar, and one heaping teaspoonful of cornstarch. Put this into a granite saucepan or the top of a double boiler and stir it over hot water until mixed. Then add slowly one pint of boiling water and cook ten minutes, stirring often. Add to this one pint of hot milk and set it back on the stove where it will keep hot. At serving time pour it boiling hot into one egg, beaten to a cream. It is necessary for the proper cooking of the cornstarch to let it boil ten minutes after the boiling water has been added.

At the request of many ladies who attended the afternoon session Miss Clarke gave her method of setting bread.

After taking one cup of scalded milk and one cup water, she asked some of the older housekeepers present to try the temperature of the mixture, which had been cooled to 60 degrees. They each said that in her opinion it was too cold. She then explained that in using compressed yeast a much lower temperature was needed than for home-made yeast, and it should never be warmer than 60 degrees. She then added ingredients as per recipe given during the afternoon lesson, recommending that the sponge be well beaten, as it is less work in the end, for it will not require so much kneading afterwards.

Question: How long do you knead bread?

Miss Clarke: It is hardly possible to give time. Mrs. Lincoln, of whom I first learned in Boston, kneaded her bread about twenty minutes, and some who have had less practice require thirty minutes. The kneading of bread serves two purposes; first, to make sure that every atom of flour is brought in contact with the yeast, and second, to develop the gluten of the flour.

Question: How do you know when bread is kneaded enough?

Miss Clarke: The old test of putting the finger through the dough to the table is good. If the finger comes out clean the dough is well kneaded. Others use the better test that when it crackles and is full of bubbles it is kneaded enough.

Question: What is it best to set the sponge in?

Miss Clarke: A thick crock is better than anything else, as it will maintain a more even temperature.

Question: Do you sift the flour for bread?

Miss Clarke: I always sift all flour, then dip it into the measure, pouring lightly so that it will not pack.

Doughnuts.

It has been the fashion lately to cry out against the popular use of doughnuts as unhygienic and a source of dyspepsia. That is a question for the doctors and dyspeptics to settle between them, but meantime everybody is eating doughnuts with coffee for breakfast, and we will see to it that they (the doughnuts) shall be as wholesome as possible.

Try these two rules:

For each pint of thin sour cream allow one pint of light brown sugar, one teaspoon salt, one-half teaspoon extract of lemon and five well beaten eggs. Mix these together and let them stand while measuring four pints of flour (measure after sifting once). Mix with this four teaspoonfuls of baking powder and sift all together four times. Dissolve one level teaspoonful of bi-carbonate of soda in one tablespoonful of hot water, stir it into the cream and sugar and mix in the flour as quickly as possible. Work with the hand or a wooden spoon until perfectly smooth.

Have a board well floured and the fat heating. Roll only a large spoonful at first, kneading as little as possible. Cut into rings with an open cutter. Mix the trimmings with another spoonful; work it slightly till well floured and roll again. Roll and cut all out before frying, as that will take the entire time of one person. Remember that the fat should be hot enough for the dough to rise to the top while you can count ten. Drain them first in a wire basket and then on brown paper. A flat egg-beater (the five cent size) is an excellent thing to turn and lift them. Never use a fork, as the slightest prick allows the hot fat to penetrate.

A mixture of one-half or one-third clarified dripping or beef fat is much better than all lard to fry in. If sour milk is used, add one-half cup melted butter; or buttermilk may be used with more or less shortening, according to its richness.

Raised Doughnuts.

One pint milk scalded and cooled, one cup sugar, one saltspoonful salt, one-half cup butter, two-thirds cup yeast, one egg, one-half a nutmeg. Flour to knead like bread but rather soft. Rise six to eight hours, then roll and cut in shape, rise again and fry.

Note: The cream for doughnuts should not be the rick, thick cream that comes from setting milk in pans. If that is to be used, dilute with one cup sour milk.

DOMESTIC ECONOMY.

MRS. J. A. CLARK, Waterloo, Wis.

Fruit for Breakfast.

I will confess that I dread breakfast most of any meal during the day. It is not quite so hard to prepare an appetizing meal for a man who has been up and about for an hour or two doing his chores, and brings his appetite with him when he comes in, but for the brain-workers it is more difficult. For such I would provide, first, fruit of some kind. In melon season, nothing is better than musk-melons. If these are properly started in the hot-bed, the season is a long one, and we can have them each morning for many weeks. In fall, winter or spring, a baked sweet apple with plenty of cream on it is delicious.

Cream---Bacon---Eggs.

Cream, unless our farmer happens to sell his milk to the cheese factory, is one of the things he should be lavish of, and is one of the greatest of edible luxuries. After this, bacon and fried eggs are another of the farmer's specialties. These, with buckwheat cakes and maple syrup, coffee and plenty of cream, make a good farmer's breakfast, and nearly all raised on your own farm.

Maple Syrup.

The only extravagance about this meal is the maple syrup. I was fortunate enough last year to get pure Vermont sugar at ten cents a pound. If you read, as I suppose you all do, the reports of the Experiment Station, you will see that certain of the foods excel in certain elements, and are valuable accordingly, namely, some in albuminoids, others in carbohydrates, protein, etc. You doubtless understand all this, or if you do not, Prof. Henry can easily make it clear to you.

Chemists have demonstrated, that in filling certain of the requirements of the human body, a pound of sugar is equal to three pounds of beef; so you see that sugar is about the cheapest food you can get. Honey, if you have it, makes a good substitute for maple syrup at this meal.

Broil Your Beef-Steak.

Beef-steak may be substituted for bacon, only do not fry your beef. There are kind-hearted people who will not eat flesh, because the animal has been killed. I do not go as far as that, but when a steer has been killed and his flesh fried in the pan, there has been an additional murder committed, besides the original killing of the beef. I do draw the line at that crime. Broil your steak, on a gridiron or wire toaster over the coals. Cook it rare, serve on a hot platter with salt, pepper and butter on it, and you have your steak as it should be.

Fried Potatoes---Toast---Cheese.

Fried potatoes and nicely browned toast go well with beef-steak, and milk toast, and scrambled eggs are a temptation to a flagging appetite. Dutch or Cottage cheese, eaten with cream, is a favorite dish at our house.

Soups.

In killing a beef you have to take the good and the poor, and in no way can you utilize the poor beef so well as in soups. The French, our greatest cooks, excel in this respect. A recent article in the New York Tribune on this subject closes as follows:

"It is so good and cheap, it is a part of the daily food of rich and poor. A soup supplies the place of the stimu-

lents, to which too many workingmen in this country are driven, by food which is so greasy and poorly prepared that it is of little or no food value, and fails to supply the waste of tissues caused by daily work. The good table of a good housewife does more for temperance than a thousand eloquent homilies by a thousand wise men."

Vegetables.

I would recommend the using of a greater variety of vegetables. Try one or two new kinds every year. Not every farmer raises "Brussels' Sprouts," but I think all should. They are a kind of a glorified cabbage, without the objectionable feature of that vegetable.

Puddings and Pies---Cake.

Puddings and pies are a good thing to have, especially puddings, and salads are a great addition to any table. Cake is a vanity, and the only kinds called for in a farmer's family are a plain cake with ice-cream, and a wedding cake when the girls get married.

An Abundance of Good Things.

The ordinary every-day farmer has at his command a continued abundance of good things in the eating line. At our house, just now, we are picking the first fruits of our hot-bed, in the shape of deliciously tender radishes. Next week we will have lettuce, and shortly spinach and beet greens. It is astonishing with what little trouble and expense these things are grown. A half-day's work of our man, at a time when his work is of no account, prepares the hot-bed. The only other expense, except the original charge for sash and box, is the seed and an occasional broken glass.

Ice.

So with our ice. It is the one crop in this country that never fails, and it is harvested when there is nothing else doing. At an annual expense that is not noticeable, it gives us an enjoyment that we otherwise would not have for half a year. I will acknowledge one drawback to these luxuries. Before we had ice, once or twice in the course of the season we would go to the village restaurant and buy a dish of ice-cream. I confess that this, under these circumstances, tasted much more delicious to us than much better ice-cream does now, when taken more commonly at home.

Celery.

In those days, before we had celery all winter long, we used to go to the garden of an old German friend of ours who was so fortunate as to have lettuce fit to eat about the first of June, and none that I ever raised equaled that, flavored, as it was, with a six months' abstinence from a fresh vegetable diet. Nature gives its compensation, though I hardly think it pays to go without six months for the sake of acquiring an additional zest to our appetites.

Woman's Special Province.

To provide this food and have the proper arrangement of our domestic affairs is woman's special province. Her education should tend to this. Her business in life is to make some one happy, and to do this, she must have a thorough understanding of the needs and requirements of domestic management.

A Farmer's Wife's Education.

I believe in the highest education for woman. There is no danger of any one knowing too much or being too accomplished, but this higher education, especially for a farmer's wife and daughter, must be built on a solid foundation of practical every-day household knowledge. It can detract nothing from the attraction of a farmer's house, if his daughters are good musicians. If they know Latin and Greek, it will do no harm, but rather be a distinction than otherwise in their later days. But, in addition to this, if they are to be farmer's wives, they must know how to take care of a slaughtered hog. They must understand souse, and comprehend

cheese, and have a realizing sense of the merits of spare-ribs and pickled pigs' feet, and all the mystery of sausage. In the education of our daughters we make a great mistake if we neglect these things.

Mothers Favor Their Daughters.

There is a tendncy on the part of some mothers to favor their daughters at their own expense. They will wash the dishes rather than have these young ladies soil their hands; they will take care of the milk and make the butter while the girls sit in the parlor and practice on the piano. This is wrong to both of these parties—to the mother, in that she sacrifices herself to one who is under obligation to her, and to the child, because by thus taking her duties from her, you make her selfish, and render the work that must eventually—if she marries and has a family—come doubly hard. How will her children fare without a mother competent to either help or teach them? is the question that should be asked. I do not think there is much of this, but yet every one must have noticed instances.

Conveniences.

Mr. Morrison, when he wrote me in regard to my subject said: "Even the simple matter of making a delicious cup of coffee is a sealed secret to the great majority of ladies. It seems to me," he says, "that there is about as much stupidity in this direction as can be found in any of the callings of life."

I gather from these remarks of our excellent superintendent, that in the course of his perigrinations through the state this winter with his institutes, he has put up at the country hotels rather than with the farmers, and I am sure that there he has made a mistake. I can well understand his complaint, if he has tried the hotels; but let me recommend to him another year the hospitalities of the farmers. I think he would find that he had improved on his quarters, and that the farmers and farmers' wives would maintain the reputation, that I think they have, of being bountiful and tasteful providers to the best of their ability. I say here, to the best of their ability, and I say it in reference to the farmers' wives. For it is a fact that, in the march of improvement, the great advance in machinery, inventions, and in all conveniences and comfort their means of doing things have not advanced as have other things on the farm. I regret that this is so, for I believe that the truest domestic economy consists in furnishing conveniences for the wife and housekeeper, so that she may economize her own strength.

Arrangement of the House.

First, the house should be so arranged that she can perform her various duties without too many useless steps. In many houses the cellar is under the "upright," and the kitchen in the farthest end of the "L." The well is apt to be on one side of the house, the cistern pump on the other, and the woodpile far away. Properly, the inside cellar steps should lead directly from the kitchen—and there should be outside stairs for the carrying in of vegetables in the fall, and for milk in the summer, if the milk is kept at home.

The Sink.

Every farmer's kitchen should be furnished with a sink, into which both hard and soft water should be brought by pumps. It is not always convenient to have the well water thus brought, but there is no reason why the cistern water should not be. This sink should connect with a drain for the carrying away of waste water. If water must be brought into the house in pails, it surely is too much to ask that it be carried out in the same manner and thrown on the ground to make a spot offensive to sight and smell, and a breeding place for flies. At one end of the sink a long, broad shelf makes a good place to put dishes as they are wiped, and under this should be drawers for dish-wipers and kitchen aprons, and a cupboard for tea-pot and coffee-pot,

tea canister and coffee mill, and under the sink a place for pots and kettles.

The Wood-Box.

A wood-box built in the partition between kitchen and wood-shed, opening directly behind the cook stove on the kitchen side, and so arranged that it can be filled from the wood-shed, is a great convenience and saves many steps and much dirt.

The Cooking Room.

A small room on one side of the kitchen to be used as a cooking room is another labor-saver. In this a large flour chest, with partitions, can hold flour, corn meal and rye meal. If of the right height, it makes a good place to rest the molding board upon, while in use. Over it are rows of shelves for spices of all kinds, boxes of raisins and currants, sago and rice and other groceries; near by the sugar bucket, molasses jug, lard jar, baking tins, pie plates—in fact, all and everything that one needs to use in the making of bread, pies and cake, should be in this one room, where it could be reached with scarcely a step.

Cupboard for Dishes.

The cupboard for dishes, built between dining room and kitchen, with door in either room, will be found a great convenience. Underneath the cupboard, drawers should be placed for storing table-cloths, napkins and extra knives, forks and spoons.

The Sewing Room.

A most desirable room is one which could be used in summer for a sewing room, large enough to contain sewing machine, cutting table, work basket, lap board, a low, easy rocker and an old-fashioned lounge, where the tired mother can take her afternoon nap. If she has such a place, where all her making and mending can be reached at a moment's notice, the time for the nap is much more easily found than it otherwise would be.

Bed-Rooms.

Bed rooms on the lower floor are a necessity in a house where children are reared. My summer bed room has an outside door, which I find a convenience and a luxury.

The Living Room.

The room for rest and recreation should be on the south side of the house, into which the sun can shine all through the long winter. It should have a coal stove, or a good wood base burner, and a fire night and day, a little less than eight months of the year. This room should be made as pleasant as one's means will allow. There is no need for costly furniture, but let it be comfortable in every way—light, warm, a place where the children can play on the floor, and the older people rest in easy rocking chairs, with pictures, if you can afford them; books, by all means; playthings for the smaller children, games for the older ones—a room hard to keep in order, perhaps, but one that the children will remember with pleasant recollections all their lives through.

Tack Puller---Carpet Sweeper.

There are many things for lightening the labor of women, which many of you may have, and others never have heard of. There are no agents to go around and sell them, probably, because their cost is so small that they could not live on the commission they would get. Many a woman this coming spring will get down on the floor and pull tacks from the carpet with a screw-driver or a butcher-knife, when there is a little tool made for this purpose, costing twenty-five cents, called "Little Jack, the Giant Tack Puller," which not only pulls the tacks from the floor, but from the carpet. Any small child can use it, and it saves its cost in tacks every two years. A carpet-stretcher, costing seventy-five cents, brings the carpet easily to its place, and saves a great many times its cost in lame arms and aching

shoulders every year. A carpet-sweeper is as much ahead of the ordinary broom as the ordinary broom is ahead of the hemlock ones I remember seeing one of our neighbors use when I was a child.

The Sewing Machine.

Every one has a sewing machine, but I doubt if any of us ever have our sewing as well done as our mothers had before sewing machines were invented.

The Washing Machine---Ironing.

If any one has a washing machine worth the house room it occupies I wish she would let me know of it. A folding ironing board is very well for children's clothes, skirts, shirts, etc., but I had a little table made, two feet wide, four feet long, set on castors, which is easily moved, and is much better for ironing sheets and long table cloths. The uses to which this little table is put are innumerable, and it is astonishing how much the burdens of life are saved by placing many things on little wheels. Few women are so constituted as to be able to lift much, but their ability to push things is something wonderful.

Truck for Moving Stoves.

Speaking of wheels reminds me to say, that with five pieces of 2x4, thirty inches long, and a set of castors costing a dollar, we have a frame upon which we put our coal stove, when not in use, and a woman or child can push it from one end of the house to the wood-shed, and by means of this device the taking down and setting up of the coal stove becomes an easy matter. Most men can lift a good deal, but I notice that few of them seem to enjoy carrying around a coal stove.

Cleaning Vegetables.

Every one has an apple parer, and I have tried potato parers, but always return to my little knife. If potatoes are well cleaned with a brush, the paring is an easy matter. The various brushes now made for cleaning vegetables are good things to have, and an ordinary scrub-brush for wood-work does the work much better than can be done with a cloth, and is not nearly as hard on hands and arms.

Folding Dish-Rack.

A folding dish-rack, costing twenty-five cents, is for sale at crockery stores. By using this only half the towels are needed that are required when the dishes are drained in the ordinary manner. A wire dish-cloth for kettles and tins is a necessity in every kitchen.

The Lightning Chopper.

For the making of mince pies, plum and hasty puddings, and various other things, many people use the ordinary wooden bowl and a chopping knife; but there is a machine called the "Lightning Chopper," which makes play of these otherwise laborious tasks. The knife is carried up and down, in a revolving pail, by means of a crank, and is so easily worked that a small child can use it. It costs about five dollars and is, apparently, indestructible. Mine, after the use of many years, seems as good as new, and has been worth fully the cost of it each year that I have had it. It does not make quite as much noise as a threshing machine, but enough to delight the children, and to let the farmer know, if he is within easy distance, when he may expect something fine for dinner. A lemon squeezer and a potato masher are also convenient articles, and cost but little money.

Necessary Tools.

Many things about the house are often destroyed for want of a skilfully driven nail, or a well turned screw. It is said that a woman cannot drive a nail, but how can you expect her to if she has only a flat-iron to drive it with? I well remember the first shelf I put up. My tools were a wood-saw, a butcher-knife and a disabled monkey-wrench. I know more now than I did then, and have a saw, hammer, screw-driver, chisel, two gimlets, a box of screws of all sizes, nails of all lengths, tacks, linen twine, and many other handy and use-

ful things, in a cupboard in my kitchen. I find these a great convenience, as do also the men folks, judging from the number of times they come to the house to ask if they can borrow some of these things, taking care to explain that theirs are laid away under the snow, or in some other equally inaccessible place. They are always careful to return them, and recognize them as belonging entirely to me, and you know it is a comfort to a woman to be absolute owner of something, if it is only a saw or a hammer.

Reserve Supplies.

There are many other branches of domestic economy which I have hardly time to touch upon. The importance of keeping a good supply of reserves can not be too strongly urged. My mother used to say that sheets and table-cloths should never be worn out, but when about half worn new ones should be purchased and the old ones laid away for extra occasions. Unexpected and long-continued company often cause us to need large supplies of table linen, and when sickness comes, there can hardly be too much bedding.

Plan Systematically.

Eternal vigilance must be the price of good house-keeping, but eternal drudgery need not be. If we will systematically plan our work; if we will intelligently plan our houses, life will be much easier for many of us. I know many women complain that they cannot rebuild their houses, and cannot procure the conveniences they desire; but I believe that if a woman knows what she wants, and will make her husband know that she knows, in nine cases out of ten she will get it. It is always well to submit to the inevitable with grace and philosophy; but we don't want to get into the habit of accepting as inevitable things which might be changed by a little persistance on our part.

Too Much Work.

It is said of America, by a recent visitor, that here every one works, and it is also said that work without ceasing is making this country one of the most prosperous, but one of the most unbeautiful countries imaginable. No one here has time to be idle; yet it is only in idleness and leisure that the beautiful can be developed, either in the brain or by the hand. We, the farmers' wives, as a class, are true to our work. We will not only do our duty ourselves but we will bring up our daughters to take our places in the next generation. Nature has done her share in giving us a beautiful state. In no other country does the sun shine on a lovelier landscape. Can we then be blamed if we wish to make our homes beautiful and fit for the situation in which we find them placed? To do this we should have leisure, and if by defects in our domestic arrangements we are compelled to spend the time in useless labor which is needed for giving us a higher education and a greater beauty in our surroundings, it is a crime on the part of those whose duty it is to provide for us and for whom we perform our unfailing share.

Buy Your Wife Labor-Savers.

Let the farmer, when he congratulates himself that by his wind-mill he has saved himself the labor of pumping water for his stock; that by his binder, he now does not have to sweat in the harvest-field; that by his hay-loader and horse-fork, and mower, and self-dumping rake, he has freed the hay field of its terrors,—let him, I say, when he contemplates all this labor-saving machinery, use equal energy and wisdom in providing smaller labor-saving implements for his wife, and I will promise, on her part, that she will do her duty, not only in providing for the wants of the house, but also in making a farmer's home what it should be—a place of refreshment, a home where culture and comfort dwell, where elegance and beauty are cultivated, a fit dwelling for that best specimen of humanity, the Wisconsin farmer.

MISCELLANEOUS PAPERS.

POULTRY ON THE FARM.

MRS. W. B. MOREHOUSE, Belleville, Wis.

Poultry raising is an industry, the importance of which must not be overlooked in connection with other farm industries.

It has been said that France is the only nation that recognizes the poultry and egg trade as a source of wealth to its people, it being encouraged and protected there as any other business. Shall we, the people of the United States, fall behind her in the appreciation of any good thing? We must surely realize that our nation is consuming more poultry and eggs each year and the demand is steadily increasing. But some will say cannot this poultry business be overdone. In 1889 there were imported $2,418,976 worth of eggs. Now with that demand to meet, and the World's Fair before us, I do not think prices will decline right away, or that we farmers of today need be afraid to keep a small flock of hens and to make from them the greatest profit which we are able to obtain.

Right here I like the words of Fanny Field. She says: "A good many farmers who know well enough that poultry raising pays are afraid to keep more than a dozen or so of fowls for fear that this poultry business will soon be overdone and prices for poultry and eggs fall way below the cost of raising. Now you need not worry a bit about that. Croakers have talked that way ever since Mrs. Noah insisted on taking her favorite hen into the ark. I have no doubt that but Noah, or some of the boys, told her that after the shower there would be no market for eggs and chickens, and besides, they didn't believe the old hen was worth saving, after all. But Mrs. Noah had her way, as women generally do, and I have never heard of a time from that day to this when good poultry or fresh eggs had to be given away because there was no paying market for them, and I don't believe anyone else has.

In the same year, 1889, the United States Department of Agriculture at Washington, after a careful and thorough investigation, estimated the annual value of the poultry product at $190,000,000. This includes both eggs and poultry sent to market, as well as that which is consumed by producers. Now, taking it as a whole, I think this is a very low estimate, if we were to take pencil and paper and sit down to compute the probable amount of eggs and poultry used in the 9,000,000 or more families in the United States, the large hotels, restaurants, confectionary establishments, medical and chemical uses. Add to this the sales of fancy fowls and eggs and the value of stock carried over and I think it would swell this amount to gigantic proportions. These figures, though small, are astonishing to many of us. Why? Simply because we have not carefully investigated for ourselves. The question then comes to us, how shall we supply this demand and have a pleasant as well as a profitable employment? We know that it must be profitable, although I presume that the men will insist that the hen will eat her head off every year. To make it a pleasant one we must

first estimate the amount of time and labor we have to expend in it. If it is for market eggs, then choose that variety of fowls best adapted for egg production, the Leghorns, Houdan or Polish, and study carefully some good work, telling all about how to manage them, how to build the houses or fix over the ones we have already, suitable for this branch of the industry. If we choose the spring chicken business, then we will select some of the large breeds either in their purity or in the first results of good crossing. Mr. P. H. Jacobs tells us the whits or brown Leghorn male crossed with Brahma, Cochin, Wyandotte, Leghorn, Dorking or Plymouth Rock hens, make excellent boilers. For choice quality broilers use Pit Game male and Dorking hens. The Houdan crosses on large hens produce fine broilers. The Wyandotte and Plymouth Rock males are excellent. The best results in hatching is when the Leghorn male is used. Mr. M. K. Boyer, the noted broiler man of Hammonton, N. J., prefers the thoroughbred. He says, "We have been enabled to grow plump birds in less time than those who have used eggs from common fowls; besides, later in the season, we could pick out the best marked birds to be used, or disposed of as breeders, at good prices. The spring chicken, or broiler, means an early bird, but chicks in January or February, how are we to get them? The old hen will not sit when we want her to, and this independence on her part may be fatal to the interest of her owner. It is a serious drawback. It is then that the incubator, that great big hen with wings always outspread and always in proper place, can be brought into service and made to do duty at a time when nothing else will take its place. The hen will always be a necessity, for she must lay the eggs, but she cannot be controlled in the matter of incubation as can the incubator. The incubator and brooder are more serviceable in the winter time for hatching and raising chicks, and the hen may be used in the spring and summer if preferred. We have decided to use the incubator, and now for the eggs. Whatever variety the flock may be there are certain things pertaining to it which must be carefully attended to. Incubators sometimes fail to hatch for reasons that pertain to hens; that is, eggs from fowls lacking in vigor will not hatch under hens, or in incubators; eggs from immature pullets, overfat hens, or from yards in which the cockerel is too young, or from stock inbred too much, will not hatch, nor will eggs hatch that have been chilled in severe cold weather, or have been kept too long. Imperfections of eggs in size, shape and shell also cause failure. Therefore it is to our own interest to raise our own eggs and not depend upon buying here and there, but thoughtfully look after the flock, feeding for eggs which we must have, giving them comfortable quarters in which there is plenty of room, warm mash for breakfast, into which we will put the refuse vegetables cooked and seasoned with salt and pepper as for ourselves, good sound grain in variety and not too much corn, scattering it in the dry litter of the house for them to scratch for; in short, we must supply them, so far as we can, with such as they would pick up in summer when they have full range; clover hay for grass, bits of meat for bugs, broken flint and shells for grit, plenty of fresh water with the chill taken off, and milk once a day if we have it. We will now place the eggs in the incubator and let it do its work, watching it the while. I will not explain my way of caring for the chicks, fearing it would be too lengthy. I think all incubator manufacturers send out with their machines their way of feeding and caring for the chicks after hatched. Later on in the season will come tufkeys, geese, ducks, etc., one or all, as our time, strength and proper facilities will allow us, being cautious not to undertake more than we can do well.

But you say, "There must be a great

deal of work about raising poultry in this way." I can only say this in reply, that the man, woman or child who goes into the poultry business with the idea of making a great deal of money without a great amount of labor will be left in the rear. A good many of the masculine gender tell us that it will do very well for women and children but very few men will so lower their dignity as to actually become a poultry keeper. Of course they know that a good many men are making money in the business, yet they argue that such must have a screw loose somewhere—something wrong in their general make-up—else they would occupy a more exalted position and would not spend their time fussing with a lot of hens. But when it comes to the actual reason for not doing so, it is because they have not the requisite amount of patience and gentleness, as well as eternal vigilance. Let me say that, without doubt, it requires as much common sense and judgment, just as much "gumption" and calculation to manage a poultry farm successfully as it does to manage a sheep ranch, a dairy farm, or a magnificent banking institution. Success or failure in poultry keeping does not depend entirely upon any one thing, but upon the many little things which men dislike so much to do, and which make women more especially fitted for the work. Remember that poultry keeping has more than a money value for we farmers and parents; the children, instead of being a hindrance, can be taught to help in many ways. If we interest the boys in the management of it, they thereby learn many of the principles that underlie the successful breeding of stock, fitting them, when older, the better to manage cattle and horses. And the girls are not to be one bit behind the boys, for each will learn to think and manage for herself—will learn to like farm life bettter and will acquire business habits and habits of system and economy, that will be of incalculable value to them in the future. These interests, once awakened, cannot slumber, and as they grow older their assistance becomes much more valuable than any help we can hire.

I would now like to call your attention to my own work in the past two years, though small compared with what can be done. I commenced operations by buying twelve light Brama pullets and three cockerels. I then penned the pullets with one male, leaving the two remaining males to run with the barnyard flock of various colors. In the spring I saved the eggs from this pen for hatching purposes, from which I saved fifty-two pullets for my own use the following fall, when I again bought two hens and four pullets, making a total of seventy Brahmas to begin the year of '91. During this year these chickens save laid 7,236 eggs, making an average of 103 eggs each, with twenty-six eggs remaining. Besides this 240 chickens were hatched by them, the rearing of which consumed no small portion of their time, while seven hens were used for hatching turkey eggs and three of them to rear the little ones, which I think is a good average for the Brahmas and which a good many will tell you are good for nothing for eggs. With the use of an incubator I hatched 780 chickens in all, raising about 640. From those seventy hens I have realized $295 and some cents. Cost of feed, $75. I will not count labor, for you know a woman's time is not worth anything, which leaves a net profit of $220, or $3.14 2-7 per hen. I will add to this the stock of turkeys, valued at $20. I have realized from them $106.42. Cost of feed, $25; incidentals, $4.42; total expense, $29.42; net profit, $77. Now, sister farmers, let us do what we can with the poultry. We will be healthier, happier and perhaps richer; though it be small at first it will gradually but surely return us more each year as we better learn how to manage it, and we will keep careful account of all grain used, allowing market price for it and crediting all sales made, so that at the end of the year

our better half cannot tell us that if that corn had been fed to the pigs it would have returned something.

But I have heard of men who invested more money in feeding hogs than they could buy the meat at retail. They do not like to figure the cost of swine, but poultry has all the blunt to bear.

Discussion.

Prof. Henry: How long after eggs are put in the incubator before you can tell those that are not fertile?

Mrs. Morehouse: It takes from a week to ten days. One more used to it will tell much sooner.

Question: Do you remove the eggs as soon as you see that they are not going to hatch?

Mrs. Morehouse: Always.

Question: Can you make any use of them?

Mrs. Morehouse: We use them to feed the young chicks, feeding them raw, mixed with their other feed.

Mr. Cole: What age do hens lay best?

Mrs. Morehouse: Pullets and hens, one year old.

Question: Are the eggs from young hens as good for hatching purposes as from those older?

Mrs. Morehouse: No; chicks are much stronger from the eggs of hens two years old and over.

Question: Do you think spring pullets are better layers than hens a year a year or two old?

Answer: I do; if pullets are hatched in April or earlier they should be laying the first of October. I have had hens hatched in the spring average 200 eggs apiece by the first of December the following year. The best profit you get from poultry you will get from well balanced rations. I bake johnny cake for my chicks; I make them of bran and meal and moisten them with milk. They will lay better than old ones will.

Question: You think that water does them harm?

If they could have pure water it would be all right, but if not, it is sufficient drink for them to have their feed damp. If out in rainy or wet weather the extra water they get on their bodies does them harm.

Question: Do you find the profit greater in selling eggs than fowl?

Answer: We think the eggs much more profitable. As we have them here it costs more to keep the fowl than the egg.

Question: Can we raise the fowl for profit?

Answer: I think we can, but not very large profits here.

Question: Do you believe in the general purpose hen?

Answer: Yes, sir, I do. I believe in the hen that will lay at six months and produce her 200 eggs in the year. The Plymouth Rock is the fowl for market. The larger the fowl the more it will bring.

HYGIENE FOR OUR HOMES.

E. J. SMITH, M. D., Port Washington, Wis.

The Emperor of China pays his doctor only while he (the Emperor) is in heolth. When his majesty is indisposed the physician's pay stops, only to commence again when his royal highness is able to resume his place at the table We have been taught that our almond-eyed brothers have not advanced in civilization for hundreds of years, but I think that here is a lesson from semi-civilization worth our time to consider.

Can any of my hearers imagine the royal physician sitting around waiting for his highness to get sick, or complaining of its being distressingly healthy? I think not. His interests lie in a different direction: First, to see that his charge be surrounded by the very best hygienic conditions; secondly, should sickness overtake him, that he be equipped with the best approved methods to restore him to health, that he may again be placed on the pay roll. Scientific researches in pathology and disease, and the quickest and best ways of restoring to health the admirable ways of nature, marks our phenomenal progress in civilization as a nation. The science of surgery and art of medicine have kept abreast with the progress of our times. In these branches we are the peers, if not the leaders, of civilization.

Every part of the human anatomy has been successfully invaded by the surgeon's knife against pathological processes. The bone setter who straightened crooked bones by main strength and stupidity, and then held them together with a small lumber yard and a clothes line, the home-made herb doctor with medicine by the gallon and pills as large as hickory nuts, are things of the past.

Thanks to chemistry, the sufferings of fifty years ago are known no more.

And why? A reward awaits the successful laborer. Not fame alone, but wealth. Certain it is that a few philanthropic minds are so devoted that they labor on, regardless of the financial part of their reward; but the vast majority of workers in all callings are laboring for a competency, knowing full well that fame and honor can be more gracefully carried where the pangs of hunger and want are not felt.

Treating Diseases.

Nine-tenths of our work as physicians is treating disease. We are called, in most cases, when outraged nature refuses further to carry on her physiological processes; and with a complete or partial recovery, or a consignment to mother earth of our charge, our attention ceases. The public demands this, and pays us for it; and in most cases while about such work, if we sniff foul air or notice untidy surroundings and speak of them, we are informed that we are over nice; and so we follow on, with the support and approval of the public, overlooking the cause and treating effects.

The old saying that an ounce of preventive is worth a pound of cure, is so full of truth and so pat to the subject in question that it could only have originated with some level-headed hygienist. It is not only worth pounds of cure, but if faithfully observed in hygienic laws, healthful surroundings, and proper dress, is of financial value, and will go far in securing God's greatest blessing—health. It should be a physician's province to prevent disease, as much, if not more, than to treat it.

Sanitary Surroundings.

It has been my experience in an active general practice of fourteen years that 95 per cent. of the heads of families are prompt in providing medical attendants for their families, and are cheerful in paying bills for such work. It is also my experience that not more than 5 per cent. of them ever think of consulting a physician, or anyone competent to give such advice, in regard to their sanitary surroundings. Now I firmly believe that 25 per cent. of the diseases we are called on to treat can be successfully prevented if proper regard be paid to sanitary laws and surroundings. If the above assertions are correct, and I think the success with which epidemics are combated and controlled in places where efficient sanitary boards are supported will bear me out. Think of the suffering, the anxiety, and even valuable lives, that could be spared by a little timely prevention. The necessity for state boards of health are recognized, and the legislatures of the different states have been petitioned for appropriations for the establishment and support of such boards; and most of the states have state boards, but all of them are hampered by niggardly appropriations, the salaries for the officers being so small that it is impossible for them to devote their time to the work, but are obliged to associate the office with their practice in order to make a living in keeping with their position. One of our most prominent writers on therapeutics, in speaking of typhoid fever, says: "It is a preventable disease, but unfortunately the physician is called on to treat the disease more than to prevent it, consequently the treatment occupies the more prominent place."

Local Health Boa l

The law provides for the establishment of local boards of health in townships and villages, and calls upon the supervisors and aldermen to organize a board of health, and advises that a physician be appointed, or some one competent to fill the position, and recommends that a liberal appropriation be made for the compensation of the duties of the office. But nine-tenths of the boards of supervisors seem to think their duties properly performed in that line with the naming of a person, fit or unfit. The unfortunate person so named is furnished with instructions and blanks by the secretary of the state board. The blanks are conveniently arranged, but lengthy, and require a careful investigation by the local officer of the sanitary condition of the territory under his care, in order to give correct and intelligent answers, such as will be of assistance in compiling the annual report of the state. All this is expected gratis. I believe in being loyal and doing the bidding of your country, but it is so much easier to be cheerfully loyal when you are paid well for it. Much has been done, even in this loose way, to improve our sanitary surroundings; but how much more good might be accomplished if the work were placed in careful, competent hands, who could afford, for proper compensation, to give the matter time and attention; to keep in their libraries the latest works on the subject. If anything is worth doing it is worth doing well, and work well done is worthy of a reward. A competent person should be appointed whose duties should be, not to wait until a report comes of a contagious disease, and then proceed to post a notice naming the disease and instituting a quarantine, to be governed by the families' and attendants' inclinations to obey orders, but to start out about the first of May and quarantine the festive microbe before he gets in his deadly work. I would recommend a yearly inspection of every dwelling and surroundings and a report made, with power vested in the officer to enforce such sanitary changes as he may deem necessary. Now this might seem impracticable to some of my hearers, but with the proper blanks and one familiar with the work a township could be covered in a week.

By such a plan much could be accomplished; unsanitary conditions could be discovered and changes ordered; an interest would be created among the people that would develop into action, and pride would be taken in the work.

Contageous Diseases.

All cases of contageous diseases should be strictly quarantined, allowing no one to leave the premises that lives in the house with the patient. When there are not sufficient attendants in the family see that proper attendants are provided, also some one to go on errands. Persons with contageous diseases should never be put into carpeted rooms, and everything but necessary bedding and chairs of the plainest make should be removed. The excretions should be deeply buried or burned. After recovery the bedding, unless burned, should be buried for two or three weeks, the walls whitewashed, and woodworks thoroughly scrubbed with antiseptic solutions. Where strict quarantine measures are adopted with the first cases of contageous diseases the second will not come. All cases of typhoid fever should be carefully investigated and the cause found, if possible, for if it is a preventable disease, as is considered by the authorities, much good may be accomplished by a little timely interference. Faulty or impure water supply has long been considered the most fruitful source of typhoid troubles. Artesian water is the safest water—is the ideal water for family use. Spring water, while popularly believed to be superior to well water, I always look on with suspicion, especially where it bubbles from the side of a hill below residences and farm buildings. An instance illustrative of this point are the number of typhoid cases we have had in this city the past three or four years. Four years ago last fall I attended nine cases of typhoid fever in the "Six Houses"—the six houses alike and in a row near the depot. The next season a case appeared forty rods southeast of there at the foot of the hill, and the disease has continued to follow the foot of the hill, until now, it is nearly half a mile from where the first cases occurred; but still at the foot of the same hill I now have three cases under my care from the same source, making about thirty-three cases in all.

Disinfectants.

Now what a careful burning of all the excretions from the first cases on the hill, a clearing away of all decaying vegetable matter at the foot of the hill, and boiling the water for drinking purposes by the people there living, might have prevented, I will leave my hearers to judge. The fact that the first cases occurred on an elevation, and each succeeding case occurred on a lower level and in a direct and natural line of drainage, argues strongly for the infiltration theory; certain it is that microbes have clung to something more constant than the atmosphere. The excretions of typhoids should be freely disinfected with bichloride of mercury solution, thrown into the vessels used, and then buried, not under a shovelful of dirt, but dropped into a hole at least a foot and a half deep, most conveniently made with a ground auger, such as is used for sinking post holes, and a spot of ground selected well away from and below the water supply.

It is very seldom that we see an extensive epidemic of typhoid fever in the country, for the reason that the atmosphere is not the favorite mode for the conveyance of the microbe; and residences are usually so isolated, long stretches of pure earth intervening between habitations, that its cradle is virtually its grave. But the poison seldom exhausts itself until all the members of the household have suffered from its embrace.

Instances are often pointed out to me that would seem to disprove the filth theory of disease; but let me assure you that the soil is there that would bear a thousand fold if the seed were but scattered.

Building Homes.

In erecting residences great care should be exercised to select grounds that can be well drained, natural drainage preferable. The outbuildings should not be nearer than ten rods from the house and on a level of at least two feet below the bottom of the cellar of the house. The well for household purposes should be above the level of the house and also a good distance from the out... ...ngs. The privy vault should be on the opposite side of the house from the well, and on a plain lower than the house, if possible, unless the privy can be placed on a lower level than the house, and in a line of drainage away from the house and well. It is better to have a strong, well made box, convenient for moving, so that a team of horses can easily handle it; then at intervals of a few months it can be drawn to the fields and emptied.

A Semi-Annual Renovation.

A yearly, and better, a semi-annual cleaning of our premises is just as necessary as house cleaning; the more thorough the work is done the better the chances for health. All decaying vegetable matter should be carefully collected and burned, cellars cleaned of every particle of vegetables not in a perfect state of preservation; the wall and woodwork whitewashed, and fresh lime sprinkled over the floor or placed in dishes about the room. The privy vault should be well disinfected with plenty of lime, or a solution of sulphate of iron, four pounds dissolved in about a pailful of warm water.

The practice of having a goose pond near the house with a solid clay bottom where surface water can accumulate, for the geese to wash in, pigs to wallow in, and cows to drink from, is an excellent plan, and will make more fat geese, unwholesome milk and butter and develop more microbes than any system I know of, and should be practiced, when possible, for the benefit of our profession, for as a profession we are poor and need help.

Diphtheria.

We had something of an epidemic of diphtheria in this city a few years ago. People became frightened, the schools were closed and a general cleaning out ordered. I was invited by one of the school board to inspect the school buildings. We had had considerable rain, and the basement of the school house, used as a primary department for the little ones, was damp and musty. The basement is from five to eight feet below the outbuildings, the vaults being earth vaults. I suggested, in a modest way, that it would be a good plan to fill the vaults with lime, and make new ones at a safer distance. One of the board silenced me by saying, "The outbuildings have been in the same position for twenty years and our death rate is small." I could have told him of more cases of bowel and sore throats from that cause than any physician in the country could boast of, but his argument silenced me at once; and the same arrangements still exist, a disgrace to our city, an unsightly, unhealthy blemish to our otherwise beautiful school grounds.

Wells, where there is any depth of water in them, should be pumped dry, if possible, in the spring and once during the summer. Dwellings should be well supplied with fresh, pure air in the mild and warm seasons of the year. There is usually little danger from that source, but in late fall and winter we are apt to keep our dwellings too close; a thorough airing should be given our rooms every alternate day, and sleeping rooms and bedding should be thrown open for two hours every morning.

Fresh Air, Good Ventilation.

Our homes should always be well supplied with fresh air, but at social gatherings in particular, care should be exercised to provide free ventilation. People generally seem to forget that the air of a room adequate for the family is greatly inadequate when the number is many times increased. They want the rooms warm and comfortable for

the guests when they come, and after being out in the cold a temperature of 80 to 85 degrees is not uncomfortable. But after the air of the room at that temperature is breathed by a room full of people for half an hour it becomes stifling; everyone is in a perspiration; someone complains; a window is raised or a door thrown open, and the result is that someone takes cold; and if they patiently worry through the evening, many leave with throbbing temples to pass a restless night.

Always make provision for fresh air and maintain the temperature of the room by a suitable fire.

Consumption.

Another matter to which I wish to call your attention is consumption. It has long been considered a hereditary disease. I believe that many lives have been sacrificed through our ignorance of the pathology of the disease. Thanks to the untiring labors of Koch, it has been demonstrated that the disease is caused by a bacilli, that it in a measure is contageous, that the microbe can be received and will flourish in any part of the body as well as the lungs; that the frequency of lung tuberculosis (commonly called consumption) is in all probability due to the favorable location of the lungs, the bacilla being carried with the air breathed into the lungs, and find lodgment.

A tendency to the disease may be inherited. We are all aware that some persons will take a contageous disease much easier than others. Where persons with inherited tendencies or with a minimum resistance are brought in contact with the disease they are almost sure to take it. In this way I have seen whole families carried off with the terrible disease. It has been found by experience that some of the lower animals will take the disease. Advantage from this knowledge is often taken by physicians, and when the diagnosis of the case is doubtful between simple and tubercular troubles, a little of the sputa is injected into the abdominal cavity of a cat or rabbit; if tubercular, the disease is communicated to the animal, experimented on, the changes in the peritoneum being so marked and characteristic as not to need the assistance of the microscope. As soon as tuberculosis makes its appearance in a person he should be given a well ventilated, well lighted room. None of the family, especially the younger members, should be allowed to sleep in the same room. For the expectoration cuspidors should be provided containing a strong solution of bichloride of mercury. The expectoration should be burned or buried. This I wish to emphasize, for I believe as firmly in the contageousness of tuberculosis as in the contageousness of diphtheria. While many seem exempt, and frequent contact with the disease seems necessary to communicate it, every one of you can remember instances when a member of the same family is carried off with the disease, and in most instances the ones that are together most.

The pioneers of this, as of any new country, were of a healthy, hardy, robust class. They rose early, breathed the pure morning air, labored hard, ate plain, substantial food and slept the sleep of the just.

Civilization and wealth, with its coddling, corrupting influences, has brought a different state of affairs; pampered appetites, gorged, sluggish circulation and unseasonable hours, with their attending evils. On the other hand we have the poorly clad, scantily fed in our over-crowded habitations. With us the latter is but little seen, but the same influences are at work even here. The necessity for more strict sanitary laws becomes every year more apparent, and liberal investments in that direction I think, will yield a good return.

PASTURAGE AND STEER FEEDING.

JOHN McCARTHY, Morrisonville, Wis.

I have been engaged in this business a number of years. I have always been guided in my operations by the much valued advice and example of experienced men who have made this business a success. Those men followed in the beaten track. Their system of pasturing was the ordinary one—good grass and plenty of it, good care and strict attention to business. This system, although successful in the past when land could be bought at a low figure, I consider the ordinary farmer, on land worth from $50 to $60 an acre, cannot successfully adopt. This business system has gone west, and we must either follow the business west or find some better system. You will ask how it is that Smith, Brown or Robertson make it pay on $50 or $60 land. I will ask you how business men in cities pay from $500 to $1,000 a foot for a business location. Their superior business qualifications enable them to do so; and farmer Jones, he pays the fright. I would consider that a man had very little aptitude for business that could pay $50 or $60 an acre for land to business on. But we cannot all be business men. It would soon be like a town out west, where for want of business the barbers shaved each other. We want a system that the ordinary farmer can adopt. Our agricultural college and experiment station can give us its valuable assistance, and it is using its best endeavors to promote our welfare. It is out of the question for individuals to do much testing or experimenting. One thing I would suggest—we must raise better stock. The scrub must go, or he will bankrupt the man who raises him. The feeder and shipper may get out all right, but Jones, he pays the freight. We want steers that will mature early and weigh more at two years old than scrubs at four years old, and sell for the highest market price. This class of stock will always find a market at paying figures. They can always be sold to feeders at fancy prices and only require the same amount of care and use much less feed than scrubs. I would not buy anything else to pasture or winter feed but this class of stock if I could get them. But this class of stock are scarce and hard to find in Wisconsin. We are way below Iowa, Kansas, Nebraska and other newer western states in the quality of our cattle. This should not be the case, but it is. As I buy all my stock for both pasturing and feeding, I must be posted on the market at all times. The Daily Drover's Journal fills the bill in this respect. You must use your own judgment when to buy and sell to the best advantage. For winter feeding I like stock as fat on the grass as I can get them. Beef in the fall is generally low, so that it is cheaper to buy fat than to put it on with grain. Besides you have the advantage of being ready for an early market if prices are good, and only having to feed a short time ensures a profit. I have to make the best selections I can from the stock offered. I prefer square, bony built steers for feeders. I am strongly in favor of either polled or dehorned cattle. I was prejudiced against them on the start until experience taught me better. They require less shed room, less racks and feeding troughs, are quieter and safer to handle for men, and safer for your hogs and horses.

INDEX.

BENEFITS

—OF—

FARMERS' INSTITUTES.

The Farmers' Institutes are Sources from Which Knowledge Can be Drawn.

They stimulate a pride and respect for farming.

They bring farmers together in closer social relations.

They make public the latest discoveries in Agriculture.

They give the farmers of the State an opportunity to meet men who have made their business a science as well as an art.

They are banks for the deposit of experience, that may become the common property of all.

They are the organized friends of good crops and good prices.

They teach the duties of home and citizenship.

They tend to keep a fair portion of the BEST boys upon the farm.

They energize and fertilize local thought and arouse attention.

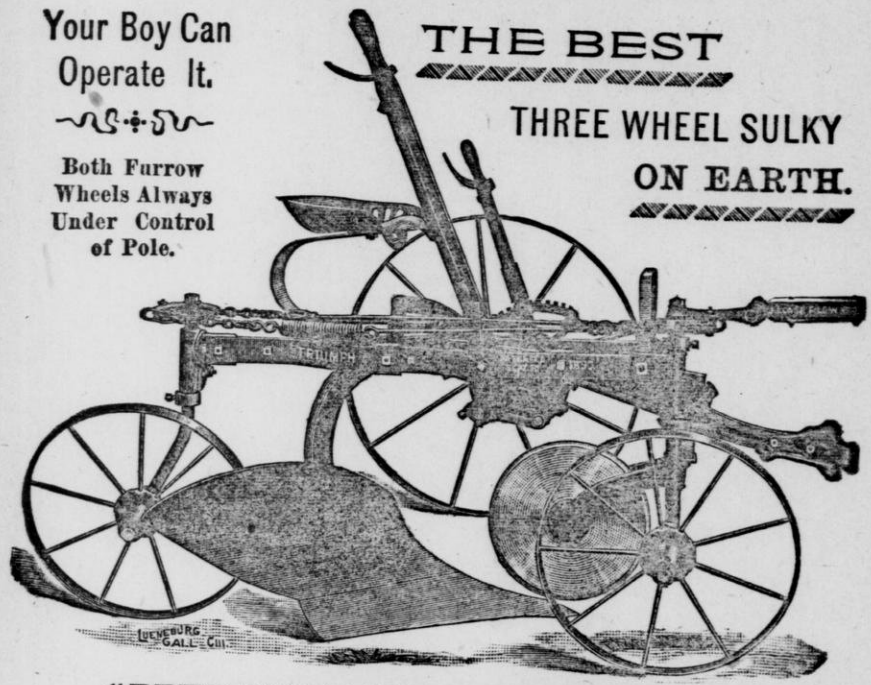
They cost less than a SINGLE cigar to each farmer of the State.

TRIUMPH.

Your Boy Can Operate It.

Both Furrow Wheels Always Under Control of Pole.

THE BEST THREE WHEEL SULKY ON EARTH.



READ WHAT THE FARMERS SAY.

ST. MARK, Kan., Oct. 12, '92.

J. I. CASE PLOW WORKS, Racine, Wis.—GENTLEMEN: As we were in need of two more Sulky Plows, we bought of your agent this fall one of your Triumph Sulky Plows on trial, on the condition that if it gave satisfaction we would buy another one. As we are running two of these kind now, it will be proof to you that we are well satisfied. They will not jump out of hard ground, and in point of light draft surpass any other Plow.

Yours respectfully, PETER BRAENET.

WORDS OF PRAISE.

MONROE CITY, June 30, '92.

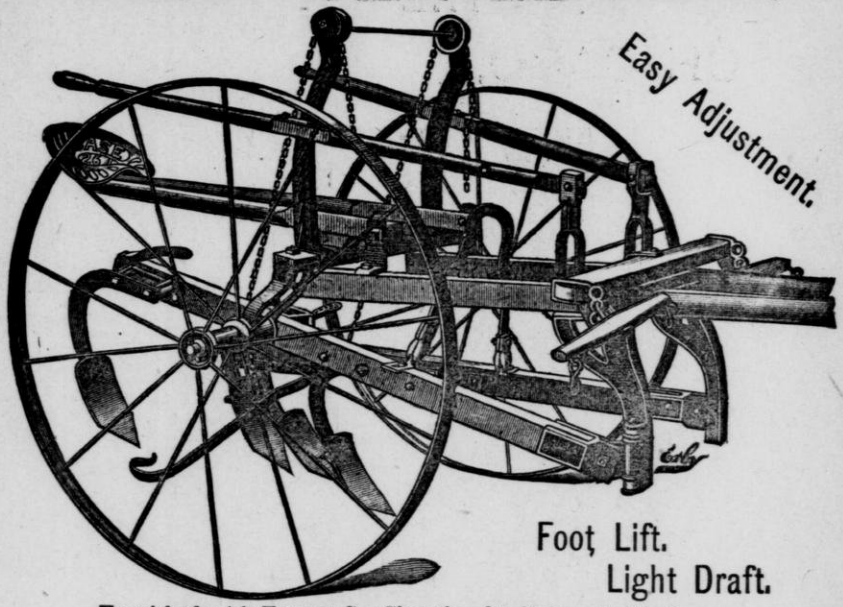
We, the undersigned, have seen to-day two horses pull a 16-inch Triumph Sulky Plow on Samuel North's farm, and we consider it the lightest draft and easiest handled sulky we ever saw, and turns a square corner to perfection. In fact, we consider it a lighter draft than a Walking Plow of the same size. A boy could operate it with ease.

JAMES SCOTT, LOID H. REDMAN,
SAM NORTH, JOHN WARD.

☞The proof of the pudding is chewing the string, and seeing is believing. So try one yourself and be convinced. Order from your nearest agent, or address for further information the sole manufacturers,

J. I. CASE PLOW WORKS, Racine, Wis.

"OLD RELIABLE."

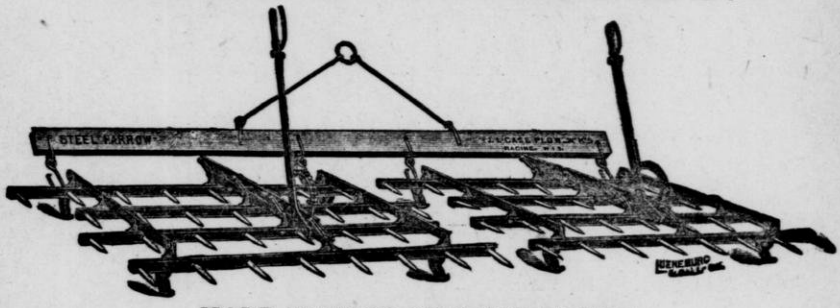


Easy Adjustment.

Foot Lift.
Light Draft.

Furnished with Four or Six Shovels, also Spring Teeth Gangs.

LEVER HARROWS.



MADE IN WOOD OR STEEL FRAME.

Points.

Cross bars all on top.
With double center bars.
Makes the Harrow strong and rigid.
Teeth changed to any angle.
Shoe runners.
Nothing under tooth bars to clog.
Will last a life time.

We first introduced Lever Harrows into general use, and have kept the LEAD by constant improvements. BEWARE OF CHEAP IMITATIONS.

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J. I. CASE PLOW WORKS, Racine, Wis.

A GREAT RAILWAY.

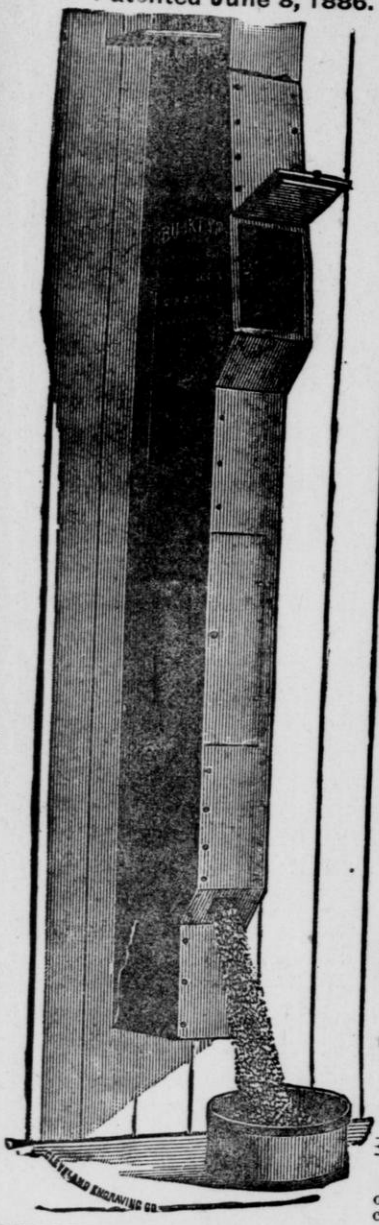
The Chicago Milwaukee & St. Paul Railway Company now operates over sixty-one hundred miles of thoroughly equipped road in Illinois, Wisconsin, Northern Michigan, Minnesota, Iowa, Missouri, South and North Dakota. Each recurring year its lines are extended in all directions to meet the necessities of the rapidly populating sections of country west, northwest and southwest of Chicago, and to furnish a market for the products of the greatest agricultural and stock raising districts of the world. In Illinois it operates 317 miles of track; in Wisconsin 1,636 miles; in Northern Michigan 96 miles; in Iowa 1,551 miles; in Minnesota 1,115 miles; in South Dakota 1,092 miles; in North Dakota 118 miles; in Missouri 140 miles; and the end is not yet. It has terminals in such large cities as Chicago, Milwaukee, La Crosse, St. Paul, Minneapolis, Fargo, Sioux City, Council Bluffs, Omaha and Kansas City, and St. Joseph Mo., and along its lines are hundreds of large and small thriving cities, towns and villages. Manufacturing interests are cultivated, and all branches of trade find encouragement. The Railway Company has a just appreciation of the value of its patrons, and its magnificient earnings are the result of the good business tact which characterizes the management of its affairs.

The popularity of the line is attested by the fact that notwithstanding the strongest kind of competition of old and new lines. the Chicago Milwaukee & St. Paul Railway continues to carry the greater proportion of all the business between Chicago, Milwaukee, St. Paul and Minneapolis. It is the best patronized route between Chicago, Council Bluffs and Omaha and to and from all points in Wisconsin, Minnesota, Dakota and Iowa, and its Kansas City and St. Joseph line has taken equal rank with the older lines leading to and from the Southwest.

On all its through lines of travel the Chicago, Milwaukee & St. Paul Railway runs the most perfectly equipped trains of Sleeping, Parlor and Dining Cars and Coaches. The through trains on all its lines are systematically heated by steam. No effort is spared to furnish the best accomodations for the least money, and, in addition, patrons of the road are sure of courteous treatment from its employes.

Kasper's Self-Acting Oats Cleaner

Patented June 8, 1886.



Over Eleven Thousand (11,000) Cleaners now in use. This Cleaner will remove a

BUSHEL OF DUST, DIRT AND IMPURITIES

From every twenty-five to thirty bushels of the best white oats.

Not one quart of oats can be drawn without being cleaned.

This is the most perfect grain purifier ever known.

Cannot get out of order, and will last for years. No power necessary.

Saves sickness among horses, money, time and trouble.

Farmers should use them to remove weed seeds, dust and impurities before planting grain.

The oats are cleaned as they pass through the cleaner.

All private, livery, boarding and teaming stables and stock farms should have one.

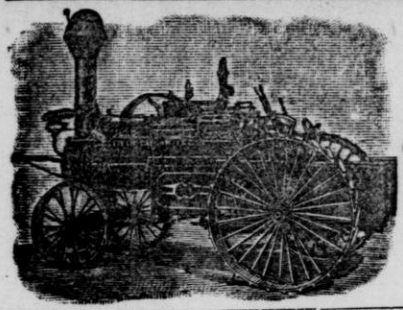
Cleaners are shipped ready to put up, which any one can easily do.

I will send my Cleaner on two weeks' trial, and if not satisfactory, Cleaner can be returned to me.

☞Please send for Descriptive Circular and Price List, which describes the Cleaners fully and contains hundreds of names and testimonials of prominent horse owners who are using this Cleaner and who would not be without them.

THOS. WHITFIELD,
Owner and Manufacturer,
369 Wabash Ave., Chicago, Ill.

☞Any party making or using any infringement of the above Oats Cleaning Device, will be prosecuted to the extent of the law.



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Are guaranteed the **Most Durable** in the market, consequently the **cheapest.** They are standards by which all other makes are measured. Write for testimonials and pamphlets to

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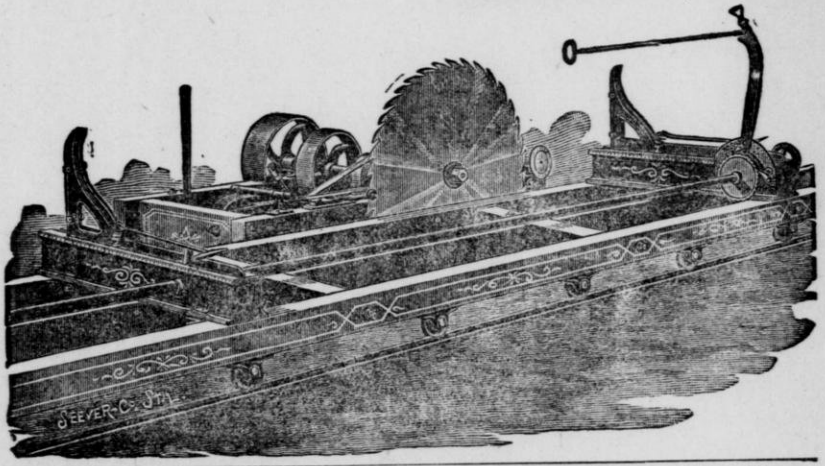

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THE BEST FEED CUTTER SOLD.

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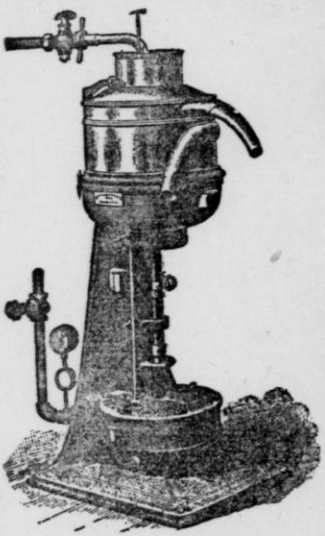

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Specialties: **Butter, Eggs and Cheese.** Have the largest store and the best facilities in this line of trade in the city. Catalogues and market reports mailed on application.

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——Has at present about fifty head of——

Imported and Wisconsin Bred Registered Percheron Mares and Stallions On Hand For Sale Without Reserve

Of the best of quality and breeding, mostly blacks. New importation arrived July 15th, 1892, of the best of breeding and quality to be found in France, and the records of the late Lacrosse, Interstate, Minnesota State, and Wisconsin State fairs will show that I have the choicest selection of Percherons exhibited this year in the Northwest. Prices reasonable and terms liberal. Come and examine my stock before you buy, and I think that it will be money in your pocket. Catalogue ready about Dec. 1st, 1892. Send for one. Address,

H. A. BRIGGS, ELKHORN.

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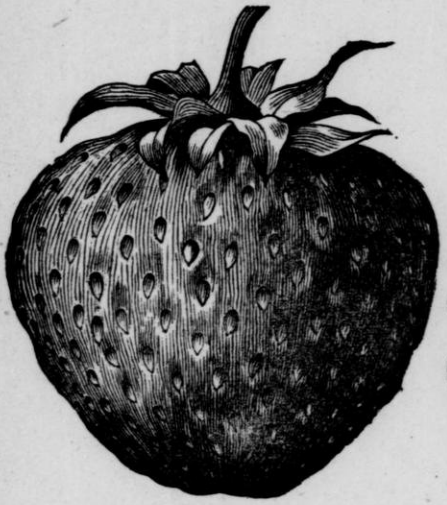
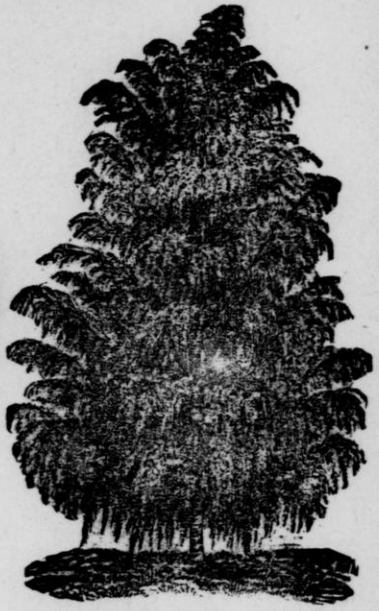


Jessie.



Cut Leaf Weeping Birch.

FRUITS.

Strawberries, Raspberries, Dewberries, Blackberries, Currants, Gooseberries, Grapes, Apples, Crab Apples, Plums, Cherries, Pears, Apricots, Sweet Chestnut, Asparagus, Pie Plant, Potatoes, Etc.

Shade and Ornamental.

Cut-Leaved Weeping Birch, Horse Chestnut, Catalpa, Rose Tree, Norway, Maple, Weeping Mulberry, Hydrangea, Yucca, Purple Fringe, Clematis, Honey-Suckle, Gladiolas, Roses, Evergreens, Linden, Etc.

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Great Care Given Cultivating. Everything Strictly First Class.

Any questions cheerfully answered. Please state what grade of stock you want and all particulars, and I will see that you get it.

Yours very truly,

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At the head of the herd is the bull RIOTER KEDIVE POGIS No. 23132. One of the best bred bulls in the west. He is a grand-son of PRINCESS 2d No. 8046, with a butter record of 46 lbs. 12 oz. of butter in 7 days (official test), the largest weekly butter record of any cow living or dead. Princess 2d is half sister to TORMENTOR 3533, the NOTED TENNESSEE bull, who has a list of 28 daughters with weekly records of from 14 to 27 pounds of butter each. Kedive is also a grand-son of BLACK PRINCE of LINDEN, whose dam is a full sister to Stoke Pogis 3d, the best bull known to the Jersey world, having 27 daughters with records of 14 to 36 pounds of butter in 7 days. On the dam side Kedive is a double great grand-son of Stoke Pogis 3d. In every direction Rioter Kedive Pogis traces to some of the best blood known to the Jersey world.

In purchasing the foundation for this herd some 15 years ago, no time or expense was spared in procuring cows of the greatest dairy merit, and by careful selection ever since that time, this herd has become one of the best herds in the west, and a prize winning herd wherever shown. Nearly all the leading families of Jerseys are represented in this herd.

The mature cows of this herd are making from 400 to 500 pounds of butter each per year on good ordinary feed. No force tests have ever been made.

A few animals of both sexes always for sale.

☞**Prices reasonable and satisfaction guaranteed. No Catalogue. Write for what you want.** Address,

R. S. KINGMAN,

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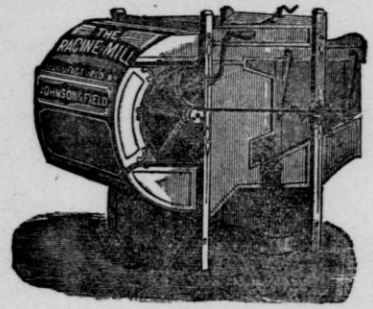

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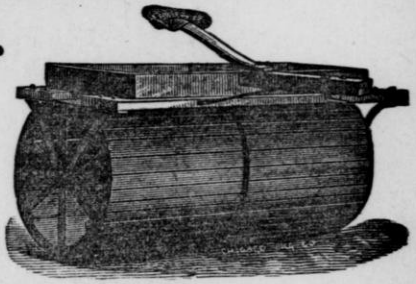
THE BEST, CHEAPEST AND STRONGEST LAND ROLLERS IN THE MARKET.



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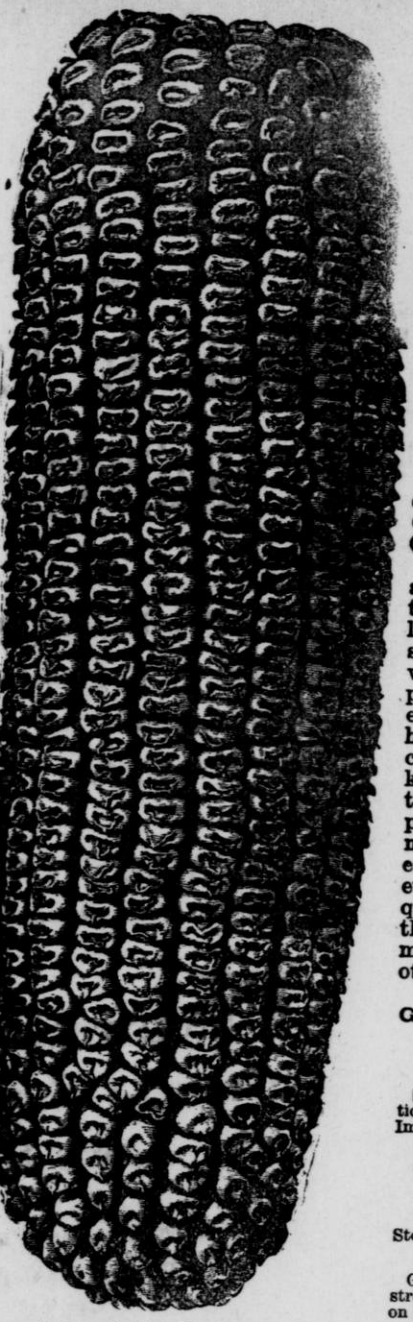

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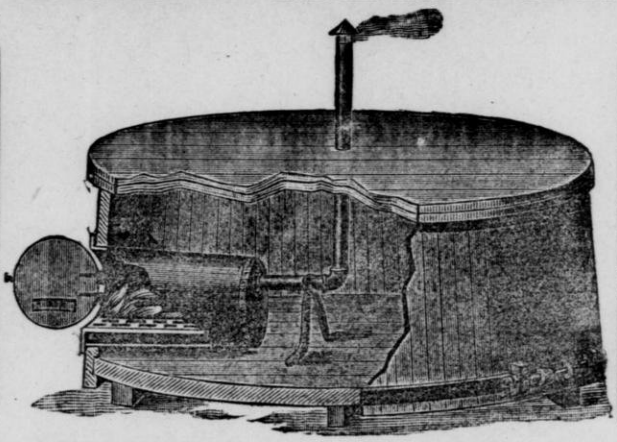

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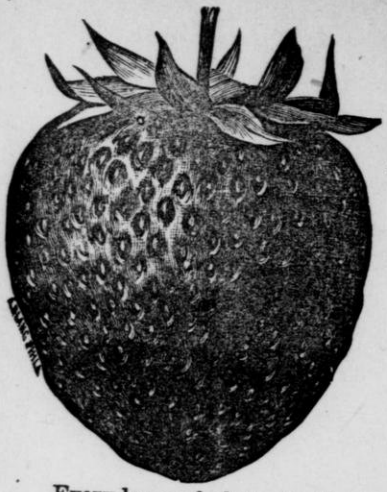

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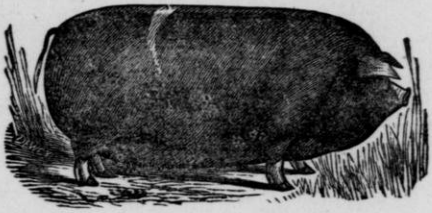

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