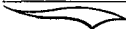


COMPLIMENTS OF . . .

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*WM. M. LIGGETT,*

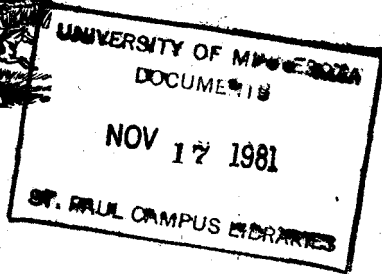
*CHAIRMAN.*

# ANNUAL REPORT

## Agricultural Experiment Station

University of Minnesota.

1893.



MINNEAPOLIS:  
HARRISON & SMITH, PRINTERS.  
1894.

# University of Minnesota.

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MINNEAPOLIS, MINN., January 1, 1894.

*To His Excellency, KNUTE NELSON, Governor of Minnesota:—*

I have the honor to transmit to you herewith the annual report of the Agricultural Experiment Station of the University of Minnesota, for 1893.

J. S. PILLSBURY,

*President Board of Regents.*

PUBLICATIONS OF THE MINNESOTA EXPERIMENT STATION, 1888-1893, INC.

- BULLETIN 1.—Jan., 1888. Russian Apples; Wheat; Potato Culture. Exhausted.  
BULLETIN 2.—April, 1888. Silos and Ensilage Corn, Varieties. Beets and other Roots, Varieties. Supply exhausted.  
BULLETIN 3.—Apples, Russian; Natural and artificial fertilization of plants; Rocky Mountain Locusts in Otter Tail county, 1888. Supply exhausted.  
BULLETIN 4.—Warming water for Milk Cows and for Steers; Fungus Diseases of Chinch Bugs and Locusts; Tuberculosis. Supply exhausted.  
BULLETIN 5.—Corn, Roots, Planting and Cultivating, Notes on Ears and Suckers; Russian Willows and Poplars, Propagation by Cuttings; Plums, native; Cabbages, Varieties; Potatoes, New Method of Cultivation. Wheat, Frosted and Rusted; Effects of Low Temperature on Plant Life. Supply exhausted.  
BULLETIN 6.—Wheat, Frosted, Rusted and Stack Burned. Supply exhausted.  
BULLETIN 7.—Soil Temperatures; Corn, varieties, Selection and Crossing; Butter; Green House Walls, Construction of; Potatoes, Varieties; Wheat, Chemistry of; Influence of Food on Growth of Skull and Teeth of Pigs. Supply exhausted.  
BULLETIN 8.—Silaging Clover; Manures, Sources of Home made; Wheat, By-Products of; Locusts in Otter Tail Co., in 1889. Supply exhausted.  
BULLETIN 9.—Willows and Poplars, Varieties, Insects Affecting. Exhausted.  
BULLETIN 10.—Onions on Plowed and Unplowed Land; Cabbage, Varieties; Plums Native, Killing Curculio on with London Purple, Rollingstone; Grapes, Bagging; Potatoes, Depth to Plant; Oak Caterpillars. Supply exhausted.  
BULLETIN 11.—Corn Pruning Roots; Deep vs. Shallow cultivation, Cross fertilization and selection; Peas beans, flax and other crops; Result, of seeding rusted frosted and frozen wheat of 1888. Supply exhausted.  
BULLETIN 12.—Meadows and Pastures in Minnesota; Cauliflower Seed, American grown; Preserving Vegetables in Carbonic acid gas—Circular Letter No. 2, Protection from Frost. Supply exhausted.  
BULLETIN 13.—Flax, Treatise on Culture of. Supply exhausted.  
BULLETIN 14.—Swine Feeding for Profit. Swine Breeding; Sugar Beets, Their Cultivation. The Process of Manufacture, Etc. Supply exhausted.  
BULLETIN 15.—Wheat; Comparison of Foreign and Native Varieties, Selection, Changing of seed. Supply exhausted.  
BULLETIN 16.—Sheep Scab; how to cure it.  
BULLETIN 17.—Migratory Locusts in Minnesota in 1891.  
BULLETIN 18.—Fruits: Notes on Strawberries and Raspberries, 1891; Sand Cherries; Buffalo Berry, and Russian Mulberry; Evergreens from seed; Summer propagation of hardy plants.  
BULLETIN 19.—Dehorning experiments: Cream raising by cold, deep setting, Cheese making—incorporating Cream into Cheese, etc. Babcock test and Churn. Supply exhausted.  
BULLETIN 20.—Fertilizers. Timothy, Improvement of. Rape Peas and Oats.  
BULLETIN 21.—Sugar Beets. Sorghum.  
BULLETIN 22.—Comparison of Corn; Barley; Corn and Shorts; Barley and Shorts; Shorts and Oilmeal; and Barley, Shorts and Oilmeal in the ration of growing pigs; Corn vs. Barley for fattening hogs; Cornmeal, Barley meal and a mixture of Barley meal and Oilmeal compared; wet vs. dry feed.  
BULLETIN 23.—Wheat: Milling and Baking tests; Co-operative tests with selected Seed Wheat; The Frit Fly. Report upon an insect injurious to Wheat. Exhausted.  
BULLETIN 24.—Ornamental and Timber Trees, Shrubs and Herbaceous Plants; Notes on hardiness and desirability. Supply exhausted.  
BULLETIN 25.—Small fruits: Notes from Trial Stations; Renewing old Strawberry Beds; Shading Strawberry Beds; Seedling Fruits; Analyses of Grapes; Spraying Grape Vines. Supply exhausted.  
BULLETIN 26.—Digestion Experiments on Milch cows, Pea Ensilage, Wheat Bran; on Pigs, Barley, Shorts, Barley, Corn and Shorts, Corn, Shorts, Corn and Bran, Peas and Bran, Peas, Bran.  
BULLETIN 27.—Feeding Stuffs, Composition of fodders, Wheat and Mill products. Dairy Products. Composition of Sugar beets.  
BULLETIN 28.—Insects; Popular Classification of; Their relation to Agriculture.  
BULLETIN 29.—Wheat; Heavy and light weight seed, vigor of growth of the plant; The draft of the wheat plant upon the soil in different stages of its growth.  
BULLETIN 30.—Soils; Composition of native and cultivated; Effects of continuous cultivation upon their fertility.  
BULLETIN 31.—Lambs; Practical Rations for; also Lambs vs. Wethers, for Fattening. Field Experiments in 1893; Oats, Corn, Wheat, Potatoes.  
BULLETIN 32.—Late Blight and rot of the Potato; Potato scab. Cross Fertilization of Grapes. Conservation of Moisture in the Soil. Fruits; Notes on varieties.

OTHER REPORTS OF THE EXPERIMENT STATION.

- All reports of the Agricultural Department of the University of Minnesota prior to the organization of the Experiment Station in 1888 are now out of print.  
SUPPLEMENT I OF THE BIENNIAL REPORT OF THE Board of Regents, 1888. Exhausted.  
BIENNIAL REPORT Minnesota Experiment Station 1890.  
BIENNIAL REPORT Minn. Exp. Station with Bulletins 19-25, bound 1892. Exhausted.  
ANNUAL REPORT OF THE Agricultural Experiment Station of the University of Minnesota for 1893, with bulletins 26-32 inclusive; also the following articles: A Digestion Flask for obtaining the acid solution in Soil Analyses; Humus Notes on the Grandeau Method of Determination; Soils, Analyses of. Bacteria in Their Relation to the Dairy. A Record of the Dairy Herd on the University Farm for 1892.

REPORT OF THE CHAIRMAN  
OF THE  
EXPERIMENT STATION CORPS.

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The Minnesota Experiment Station has, heretofore, published only bulletins and biennial reports, which were supplements to the biennial reports of the University of Minnesota, of which the Station is a part.

It has been deemed wise to print an annual report, which shall be a collection of most of our bulletins and other matter which is prepared by the Experiment Station. The Experiment Station has passed through many of the difficulties incident to pioneer work of scientific nature, and all accept the fact that the Minnesota Station is on a basis where it is very useful to our farmers, and also of assistance to our unsurpassed School of Agriculture, with which it is closely associated. A clear division of labor and the most harmonious action on the part of all connected with the Experiment Station prevails, and all are agreed that experiments hereafter shall be thorough rather than cover many lines. The corps of workers is not only earnest, but all have proven themselves well calculated to draw practical lessons from the work and to bring it before the people in the most popular way. In few states are agricultural newspapers and the publications of state agricultural societies so much toned up by their scientific agricultural workers as are those of Minnesota. The time has come when we can be proud of

our entire agricultural department, not forgetting the efficient work done by the scientists who teach botany, chemistry, physics, etc., to the college students. The admiration of other similar institutions will henceforth be directed not alone to our School of Agriculture, but to our unsurpassed entire scheme of agricultural education, including the Farmers' Institute and the University courses which reach every agricultural class.

The several heads of the divisions have submitted to me brief statements of the work of 1893 and work proposed for 1894. Mr. Boss, foreman in the agricultural division, has prepared material for bulletins of the work done in this division during the past year, and it is now in print. Besides tests of varieties of corn, oats, field peas, barley, potatoes, wheat, etc., he reports on methods of seeding cereal grains, and the depth for seeding peas, oats, potatoes, etc. He shows best results from deep spring plowing and finds profits of heavy oats for seed compared with lighter oats. Most excellent experiments with flax for fiber and seed are in progress. *Bromus inermis* or Austrian Brome is the most promising new grass.

Prof. Hays proposes for this division a practical study of field management by setting apart the various fields of the farm each year as distinct enterprises, and he has devised a simple, practical scheme of accounts by which the cost of each field can be recorded. One of the fields is to be set apart for about fifty small plats, each to be managed under a definite rotation. By combining the cost of operations as found in fields of practical size and the results in yields, keeping up fertility, in keeping the land clear of weeds, and in good mechanical condition suited to the various crops on these small plats, net profits of the different ways of farming each field can be compared. A system of State statistics of farm products, that we may have average values and not be compelled to use values obtained under the abnormally high prices of labor and land of the University Farm, is desired. It would greatly benefit our farmers if this work of finding most beneficial ways of managing fields and crops, as thoroughly suited to all conditions, could be duplicated

at a few other points representing other soils and climates of the State. By co-operating with the State Horticultural Society, the horticultural division has secured the use of lands in several parts of the State, mainly in the southeastern portion, on which to test the various varieties of garden, fruit and forest crops. This work is very popular with the horticulturists of the State and of great use to the State at large, especially to those farmers who are induced to raise more vegetables, fruits and trees. Arrangements have been partly perfected to do some agricultural experiment work on Mr. O. C. Gregg's farm, under the conditions of the drouthier climate prevailing in the southwestern part of the State. Here it is designed that not only horticultural crops will be tried, but that the production of field crops, the systems of cultivation, the management of fields and general farm management shall be made the prominent features of experiment. Governor Nelson has suggested that a like study of these important subjects as related to farming in the Red River Valley, should also be undertaken on a centrally located farm in that famous region. The improvement of wheat and other small cereals and the production by crossing and selection of new, early and large producing varieties suited to the northern part of the State, could also best be carried out here. In like manner the agricultural division of the Station should institute a line of experiments in some county on some of the sandier land to show the farmers there how to keep up the fertility of the lighter soils, which will stand for only a short time the one-crop wheat farming now prevailing on the cleared and even prairie, sandy lands. Horticultural experiments for the southwest, northwest and north central parts of the State could be done in connection with agricultural experiments in the localities above mentioned. The value to the School of having the professor of agriculture and the professor of horticulture given an opportunity to thus supervise the raising of crops and the management of lands in other parts of the State, than at the University Experiment Farm, would be considerable. Some of the young men now nearly ready to graduate in the advanced



agricultural course, could be drafted into the service of the State to conduct this work and a return rapidly come for the work of this department of the University, which so long was without fruits. The rapid increase of students in the School of Agriculture indicates that we will need to increase our force of teachers. The especial preparation these young men are gaining and the experience they would get working in summer at experimenting, would make of them valuable teachers to assist at our matchless School during the winter. Each could become a specialist in some line of the instruction. The trial of the varieties of wheat, corn, field peas, oats, barley, clover, timothy and other field crops has now become far advanced at this Station and warrants the distribution of those found best. Some of the Russian wheats, secured by this institution four or five years ago and grown four years in the Red River Valley, by Prof. Hays, promise to excel our own varieties of hard wheat in cash value per acre to the farmer. The best classes of field peas for our variable summer climate are pretty well known. Some good varieties of most classes of crops should be soon grown in quantities to be distributed. Some results from the cross-fertilizing and careful selecting of plants of various crops will a few years later, doubtless, be grown for distribution. So much of the University Farm will be needed for growing forage for the stock, which we must make a more prominent feature of Station and School, and also for cultural experiments, that it may be found wise by the Board to obtain the use of lands in the parts of the state where seeds could be best tested and grown for distribution. Many questions of tillage and of field management, also could better be worked out on three or four representative soils than on the University Farm alone. Some of the students in the advanced or College course in agriculture, have signified their desire to work on the University Farm and learn field experiment work.

Prof. Green makes mention in his report of the work and plans in the Division of Horticulture of the satisfactory development of the many varieties in the economic plantation in the division of horticulture; and the addition of others of economic importance; also of the fact that the horti-

cultural people manifest great interest in this work. He especially mentions experiments with quite a number of apples, grapes and raspberries which have fruited for the first time. Many crosses of the best varieties of strawberries, grapes and raspberries are very promising and success seems to have been reached in obtaining a hybrid between the sand cherry and the De Soto cherry. About 400 of our new seedling strawberries and 300 of raspberries are now fruited; a large number of which were deemed worthy of being shown at the World's Fair where they attracted attention for their good size and fine color, much to the aid of the State exhibit. Very interesting results have been reached in the study of the necessity of cross-fertilization of certain varieties of grapes in order to have them bear fruit. Fungicides to prevent leaf blight on strawberries, currants and gooseberries gave some good results; and by using Bordeaux mixture for leaf blight on potatoes an increase of yield per acre was secured. The value of mulching various horticultural crops has been tried with very favorable results. As elsewhere the crop of fruit, grapes excepted, was very light in 1893. The strawberry crop being composed of so many promising varieties elicited much favorable comment from the members of the State Horticultural Society at its summer or "Strawberry-harvest" meeting at the University Farm. The University Farm Campus has received considerable attention during the past year, several new roads have been laid in the wooded portion and about 85 cords of wood made by a much needed thinning out of trees. Variety tests with fruits, forest, ornamental plants and vegetables have been recognized as of such great importance by our horticulturists that they should be continued and extended. Improving varieties by selection is also promising so well that fruits now on hand will be carefully tested and new ones originated. Some of the students have been giving efficient service in helping the professor in this division. One bulletin has been issued during the year by this division and others are in course of preparation.

Dr. Luggler, of the Division of Entomology and Botany, issued a commendable bulletin of 72 pages which he and others in the State use as an entomological text book for classes. Much useful work has been done in the trial of new grasses and other forage plants, in nearly 600 plats, also in the collection of museum specimens of fodder plants. Two hundred of these in frames and three hundred in bundles were supplied to the State exhibit at Chicago, most of the expense having been paid by the World's Fair Commission. The Doctor filled 48 case-drawers with insects for the State's exhibit doing most of the work at night. He has also proved himself useful, as in former years, looking after invasions of grasshoppers, army worms and chinch bugs. Chinch-bug diseases have been spread, and during moist years or during favorable seasons prove effective, but in dry years will not always lessen the damage done by these insects. Part of the expense of the latter work was provided for by the Governor of the State. Numerous insects, injurious during the summer, have been studied and many useful collections of insects made. A collection of injurious weeds is also being made for the museum and an especially mounted set for use in the Farmer's Institute has been completed. An entomological collection for the same purpose has been started. The study of lettuce mold and lettuce rust has been completed and experiments with several diseases of cabbage, turnips and radishes are well advanced. Some work was done with respect to diseases of plums, apples, potatoes and tomatoes. During the next year chinch bugs will be very numerous in the State should a dry spring prevail, and everything possible should be done to destroy them. The one or more diseases known to kill these pests should be further experimented with and should be widely spread. It is intended to make a study of all insects proving especially active during the coming season and to continue the economic collection which is equalled by only a few collections in this country. The work of collecting new grasses for trial in this State will be continued and a number of plant diseases will be carefully studied. The agricultural museum is being made a prominent feature,

Dr. Lugger, of the Division of Entomology and Botany, issued a commendable bulletin of 72 pages which he and others in the State use as an entomological text book for classes. Much useful work has been done in the trial of new grasses and other forage plants, in nearly 600 plats, also in the collection of museum specimens of fodder plants. Two hundred of these in frames and three hundred in bundles were supplied to the State exhibit at Chicago, most of the expense having been paid by the World's Fair Commission. The Doctor filled 48 case-drawers with insects for the State's exhibit doing most of the work at night. He has also proved himself useful, as in former years, looking after invasions of grasshoppers, army worms and chinch bugs. Chinch-bug diseases have been spread, and during moist years or during favorable seasons prove effective, but in dry years will not always lessen the damage done by these insects. Part of the expense of the latter work was provided for by the Governor of the State. Numerous insects, injurious during the summer, have been studied and many useful collections of insects made. A collection of injurious weeds is also being made for the museum and an especially mounted set for use in the Farmer's Institute has been completed. An entomological collection for the same purpose has been started. The study of lettuce mold and lettuce rust has been completed and experiments with several diseases of cabbage, turnips and radishes are well advanced. Some work was done with respect to diseases of plums, apples, potatoes and tomatoes. During the next year chinch bugs will be very numerous in the State should a dry spring prevail, and everything possible should be done to destroy them. The one or more diseases known to kill these pests should be further experimented with and should be widely spread. It is intended to make a study of all insects proving especially active during the coming season and to continue the economic collection which is equalled by only a few collections in this country. The work of collecting new grasses for trial in this State will be continued and a number of plant diseases will be carefully studied. The agricultural museum is being made a prominent feature,

particular attention being made to getting complete collection of specimens of economic plants and of their seeds.

The Division of Agricultural Chemistry has prepared four bulletins. In bulletin No. 26 is reported some very valuable original data on the digestibility of pea ensilage and wheat bran when fed to milch cows, also the digestibility of several rations fed to pigs. These rations contained respectively corn, shorts, peas and bran when fed alone or when mixed. Bulletin No. 27 records analyses of numerous grains, by-products of grains, and the fodders, also numerous analyses of dairy products and some records of experiments in dairy manufacturing. A report is also given in this bulletin of the results of trials of sugar beet seed in various counties in the State. Bulletin No. 29 brings out some interesting facts showing the value of heavy seed wheat, also shows analyses of wheat plants at different stages of growth. Interesting facts are also brought out regarding the time during this period of growth when wheat takes most of its food from the soil. In bulletin No. 30 is given the results of work of soil analyses which show how rich soil loses its fertility by continuous cropping. Many analyses have been made at the request of farmers and one soil is analyzed from the farm of each member of the chemistry class in the School of Agriculture. Prof. Snyder has in hand for the ensuing year a study of the food values of the meats from the various animals and from several parts of the same animals, that we may know more of the values of our human food. In further study of wheat growing the cause of the lack of strength of straw will be sought. Soil analysis will be continued, and a study will be made of the management and care of the family well. A chemical study of the rotation of crops will be made, and experiments will be conducted to determine the chemical draught of our worst weeds, especially Russian Tumble Weed, on soils. Analyses of native grasses and other food materials in common use, of which little is known, will be made, and also analyses of other substances as requested by our farmers.

While the Division of Dairy Husbandry has been largely interested in bringing its school work into greater promi-

nence, not a little effort has been expended by Prof. T. L. Haecker in experiment work. A study of the cream-ability by gravity and churn-ability of the milk of individual cows at different periods of lactation was materially limited from the amount of work planned, by the abortion of several of the cows, apparently the result of breeding to a certain bull not before known to be diseased. Much data has been obtained with the remainder of the cows. Experiments in feeding were also materially injured by the outbreak of abortion. Experiments on the cost of production of dairy-bred calves have been very successfully prosecuted and the results of feeding skim-milk supplemented with ground flax seed have been satisfactory, proving this to be a very economical method. Many useful facts gathered by recording the weight and per cent of fat, by Babcock's method, at every milking of each of the cows will be published in a bulletin being prepared by Prof. Haecker. Experiments with many ways of making composite tests of milk in creameries have resulted in methods which are accurate and a saving in labor. Experiments are being carried on in this division comparing the value of timothy and wild hay for dairy cows, also corn, barley and wheat screenings; also field peas to take the place of expensive oil meal. In connection with the Dairy School some practical experiments in creaming milk and churning will be continued and a most useful line of experiments in making Swiss, brick, Primost and other fancy brands of cheese is being instituted.

In the newly organized Division of Animal Husbandry Prof. Shaw reports the purchase of twelve grade and native cattle which are placed in experiment to test the value of cattle of improved breeding as compared with natives or common western cattle; and to test the profit of a light proportion of meal as compared with heavier grain feeding; also to determine the practical profit of fattening cattle in winter in this State. Forty head of sheep are in experiment to compare protection from the cold with enforced exposure; protection and liberty; and protection with confinement; also to compare the profit from feeding a limited grain ration in the one case with a full grain ration in the other. Other animals

reared on the Farm and unsuitable for breeding are being fed to make cheap meats for the students. The following quotation is from the professor's report: "As it is my intention, with the approval of the Board, to go more extensively into experimenting with cattle, sheep and swine in the near future, I embrace this opportunity to mention that before this can be done a new sheep barn will be needed. I hope, therefore, that it may seem good to your Board to provide a model building for this purpose before the opening of the College next September. I trust that it may also seem good to your Board to furnish some additional, specimens of the pure breeds, as may be thought best, with which to illustrate the practical lectures on live stock in the class room. The surplus progeny from this and the dairy stock I would recommend to be sold at an annual sale."

A dozen beef animals and fifty grade sheep were purchased for feeding experiments.

Dr. Reynolds, the professor of Veterinary Science, proposes to make this Division of the Experiment Station useful to the live stock interests of the State by conducting some experiments with the more common and serious diseases of farm stock. Colic, enteritis, peritonitis and fistula have been selected for experiments in prevention and treatment. Recognizing the fact that our dairymen and producers of beef cattle must face the question of the control of tuberculosis, which is now being taken up by our medical men, the doctor proposes some preliminary studies of this disease throughout the State. He believes that the time has come when the general government, the states and the local boards of health everywhere should unite in an effort to lessen the mortality, both human and bovine, of this dreadful disease, consumption. To quote the Doctor's words, "It will be the hardest sanitary fight that civilization has ever faced, but it does not offer an impossible victory. It can be wiped out just as pleuro-pneumonia, foot and mouth disease, rinderpest and *Maladie du Coit*, among our domestic animals have been; as small-pox, diphtheria, yellow fever and scarlet fever among mankind soon will be. It does not seem wise to neglect this great question of tuberculosis of domestic animals until man-

kind is excited over the danger and the dairy and beef interests are injured, by a refusal to buy and eat." His plan is to test with tuberculin, several dairy herds in various portions of the State. The desire is to aid the owners of these herds in determining whether any of the animals which are used for milk, or those males and females to be used for breeders, have tuberculosis, and to instruct the owners in the use of tuberculin. Such testing will be very cheap and simple when this diagnostic agent is made on a larger scale, as it soon will be. For those who wish to found improved herds of cattle for sale as breeders it is especially important. Many of the facts regarding this dread disease are known, and this important agent, tuberculin, enables the Experiment Station to institute some experiments which later on may be extended to common practice in the State. The fact that ten per cent. of the human deaths in Minnesota are due to consumption, over half of which occur between the ages of 15 and 20 when the individual has passed the period of being an expense and has reached the earning age, makes the question of lessening this disease one of material as well as of general interest to the State. That this disease is contagious and may be transmitted by several methods, from man to man, from animals to man and from man to the lower animals is now definitely known. It is also known that in districts where bovine consumption is unusually common, human consumption is likewise more than commonly abundant. Both the meat and the milk from tuberculous animals are known to have an element of danger. The young animals may be born with the inherited predisposition toward tuberculous and may even be born with the bacilli or germs of tuberculosis already in their bodies. It is especially important that our full-blood stock be carefully inspected and that we breed only healthy males and females. It is not the intention to go largely into this work the first year as the means are not at hand and the quantity of tuberculin which the Bureau of Animal Industry at Washington will be able to furnish may be limited. The doctor desires to be useful to the farmers



in answering questions concerning various diseases of live stock, and also to make a general study of the relations of these diseases to human health.

### ADDED BUILDINGS AND EQUIPMENT.

During the year 1893 some very important improvements were made to our superior Station and School plant on the University Farm. A six inch water main nearly 2,500 feet long, costing over \$2,000, was laid connecting the 3,000 barrel water tanks with all buildings, serving both for water supply and for fire protection purposes. To cheapen the pumping of water and to provide a permanent large supply, a new eight inch well was drilled 280 feet deep at a cost of \$465. These two improvements, with hose attachments to hydrants, will complete a system of water works which should answer the larger developments sure to come on the Farm during the next decade or two. This system of pipes has been mapped on a carefully made drawing of the Farm.

Under an appropriation by the last legislature, a new building costing \$30,000 was erected. It was supplied with steam plant, shop equipments and furniture for offices and museums. It gives very much needed and satisfactory quarters for the large drill hall and gymnasium room, carpenter and blacksmith shops, draughting rooms, an agricultural museum, also office and lecture rooms and laboratories for the horticulturist, and for the entomologist and botanist.

The east wing of the barn was blown down in the early summer and has been rebuilt on an improved plan at a cost of \$2,600. By making a second floor in what was formerly a deep hay bay, ample room has been provided for the work and driving teams and for the wagons and buggies and for some farm implements. The part of the basement in the barn formerly used for horses has been converted into an apartment for experimenting in feeding beef cattle, and the east end of the basement formerly fitted up for sheep is now arranged with box stalls for stabling the cattle to be kept for illustrating lectures. Prof. Shaw's suggestion that we

erect a substantial sheep barn by the grove south of the large barn has been favorably considered.

A Meat House will be made by using the old clover silo building and making an addition to it for slaughter room. This will give a better opportunity for the instruction in slaughtering, cutting up and curing of all kinds of meats, including cattle, sheep, swine and poultry. The original or silo building will serve as an ice house and in one side of it a cooling room and a refrigerator are to be built. Meats can here be slaughtered and handled to good advantage and such products as sausage can be made. While it is designed mainly for purposes of instruction in the School and to assist in furnishing meats practically at cost to the students, it will be very useful in connection with feeding experiments. Mr. Boss, foreman of the Farm, gives the manual instruction and will soon become expert in slaughtering animals, which have been so fed in experiments, that a comparison of the meat must be made on the block. Where a chemical study of the carcass is desirable this expert assistance in killing will be valuable. So far as we know, Minnesota has taken the initiative in developing manual instruction for farm school students in the slaughter and care of meats.

Thirty acres of land adjoining the University Farm forming part of the State Fair Grounds, but used only for pasture, have been leased by the Station for \$75 per annum. This is a desirable arrangement as more forage will henceforth be needed for the increased number of live stock which both Station and School work will hereafter demand.

#### CHANGES IN STAFF.

The director of the Station, Prof. Clinton D. Smith, resigned Sept. 1st to take a position in Michigan Agricultural College. A change was made in the organization of the staff. No director was elected, but the chairman of the Agricultural Committee of the Board of Regents, Wm. M. Liggett, was made chairman of the Station Corps. Prof. W. M. Hays, who had been for two years professor of agriculture in the

North Dakota College, was elected to the professorship of agriculture and was made vice-chairman of the Station Corps. The division of Dairy Husbandry was created in the University including dairy stock and dairy manufacturing, and T. L. Haecker was promoted to the professorship in charge of this division in the College as well as in the Station work. A new Division of Animal Husbandry, to include meat producing live stock, was likewise created and Prof. Thos. Shaw, formerly professor of agriculture in Ontario Agricultural College, was elected as the professor in charge. Prof. Shaw is employed, also, to represent the Station and School in the Farmer's Institute throughout the State during several months in the year. Dr. Christopher Graham resigned the professorship of veterinary science at the end of the year to enter the practice of human medicine. Dr. M. H. Reynolds, veterinarian to the Minnesota Farmer's Institute, was elected to this place, and began his labors Sept. 15th.

Numerous additions have been made to the equipment of the several division laboratories; the apparatus for making Swiss, brick and other forms of fancy cheeses is especially worthy of notice. Other needed apparatus for the instruction and experiments in fancy cheese that the Station and School may continue to push this important work, first taken up by the Dairy School, should be secured. Some books and a large number of reports have been added to the library. A valuable subject card index of Experiment Station literature has been received from the office of Experiment Stations and Prof. Hays has well under way a supplementary index which includes all the best agricultural literature not found in the Station reports. A revision of the bulletin mailing list, now numbering nearly 15,000, is being made by entering all names in a card catalogue.

The general good will towards the Experiment Station now manifested on all hands has been emphasized by the courtesies received during the past year. The railroads of the State have gladly provided transportation whenever members of the staff needed to visit other parts of the State. As the various experimenters and teachers need to have wide

acquaintance with the State these courtesies are very highly appreciated.

I take this opportunity of expressing the thanks of the staff to the following named railroad companies: The Great Northern; Chicago, Milwaukee & St. Paul; Chicago, Minneapolis, St. Paul & Omaha; Chicago & Great Western; St. Paul & Duluth; Minneapolis, St. Paul & Sault Ste. Marie; and Northern Pacific.

Creamery supply companies have shown a great interest in the dairy division, and to all of the companies named below are due our hearty thanks for the various courtesies in the way of loans of separators and for assistance in other ways:

De Laval Separator Co., New York; Vermont Farm Machine Co., Bellows Falls, Vt.; P. M. Sharpless, West Chester, Pa.; Columbia Cream Separator Co., Avon, N. Y.; Cornish, Curtis & Greene Co., St. Paul; F. B. Fargo & Co., St. Paul; Genesee Salt Co., N. Y.; Chris Hanson's Laboratory, Little Falls, N. Y.; The Dairy Supply Co., Philadelphia, Pa.; Wells, Richardson & Co., Burlington, Vt.; Owatonna Manufacturing Co., Disbrow Churn and Worker, Owatonna, Minn.; Creamery Package Manufacturing Co., Mankato, Minn.

FINANCIAL REPORT.

The table below gives an account of the live stock on hand, various items of cost, value of produce, etc.

TABLE I.—Stock Products.

	On Hand Dec. 1, 1892.		Bred.		Purchased.		Feed.	Labor.	Animals Sold.	On Hand Jan. 1, 1894.		Animals Died.		
	No.	Value.	No.	Value.	No.	Value.	Value.	Value.	No.	Value.	No.	Value.	No.	Value.
Horses, .....	5	\$550 00	1	\$60 00	.....	.....	\$377 71	\$181 37	.....	6	\$540 00	.....	.....	
Sheep .....	68	408 00	7	35 00	50	\$153 38	127 72	127 36	61	\$269 13	56	.....	8	\$93 00
Fat cattle.....	.....	.....	.....	.....	8	283 80	.....	.....	.....	8	283 80	.....	.....	
Show cattle.....	8	\$20 00	5	175 00	.....	.....	.....	74 44	.....	.....	.....	.....	.....	
Dairy cattle	35	1517 00	14	.....	.....	.....	1,382 20	1,140 39	9	210 50	52	2,410 00	1	30 00
Swine.....	16	200 00	8	72 00	1	20 00	58 90	69 39	7	85 00	12	194 00	6	36 00

Table No. 2 gives an account of the various crops raised on the farm during the past year. A careful account has been kept of the seed, the labor and value of products. For the coming year each field will be counted as a distinct enterprise, and the accounts so kept that the value of each crop can be determined; also the cost of each crop and of each operation performed in producing the crop. Our system of farm accounts is being gradually changed so as not only to show the financial side of the whole farm in a general way, but also to have a direct connection with the various lines of experiment work being conducted. An effort is being made to gather statistics from our farmers, from our own fields and from the experiments in the rotation of crops that will eventually give us much practical data, that will prove useful to our farmers in the management of their fields and stock.

TABLE II.—Farm Products.

	On hand, Dec. 31, 1892.		PRODUCTION ON FIELDS.						DISTRIBUTION.						On hand, Jan. 1, 1894.		Acreage grown, 1893.	
			Seed.		Labor.		Total.		Bought.		Sold.		Fed.					
	Bu.	Value.	Bu.	Value.	Hrs.	Value.	Cost.	Bush.	Value.	Bu.	Value.	Bu.	Value.	Bush.	Value.	Bu.		Value.
Barley (E).....	506	\$243.00	25	\$10.00	340	\$47.32	\$57.32	18 T. S.	\$130.00					660	\$264.00	235	\$94.00	12.5
Wheat (O).....	214	142.35	3.5	2.10	60	8.08	10.18	20 bu in straw	86.00									
Wheat and Oats (H).....			20 W 12 O	12.00 3.60	257	35.78	51.38	102 W 7½ O. H. 5 T. S.	69.36 46.00 15.00			W. 311.5	\$177.17			38 W.	23.18	
Corn (A).....	1,200	600.00						253	91.08			15	4.55	288	103.68	1150	356.50	12.5
Ensilage (A).....	50 T	200.00	2	3 00	1182	186.85	189.85	88 T.	264.00					83 T.	249.00	55 T.		
Stover (A).....	30 T	60.00						7½ T.	21.75					10 T. x 20¼ T.	60.75	7¼ T.	21.75	
Oats, (Q) (P).....	1,039	352.00	60	18.00	1121	156.71	224.18	866 175 T.S.	225.16 52.50					1145	366.40	700	224.00	29.
Peas (N).....	40	20.00	3	3.50	407.5	57.24	60.74	30	30.00					1000 lbs	3.00	1500 lb	3.60	1.5
Vetches.....	1½ T	7.50	1	1.00						1 bu.	1.00			2 T.	12.00			.5
Millet.....	2 T	12.00																
Potatoes (B).....			40	24.00	643.5	97.02	121.02	597	68.65	40	24.00	480 5-6	213.27	69 1-6	13.83	47	9.40	3.
Grass plots (R).....					47	6.40	6.40					D. 26	13.00			4	2.00	4.
Flax.....	30	15.00																
Sugar Beets (K).....	18½ T	55.50	25 lbs	6 25	462.5	68.46	74.71	12¼ T.	36.75	25 lbs	6.25			25.75 T.	77.25	5 T.	15.00	1.5
Mangels (M).....	7½ T	22.50	10 lbs	2.50	318	45.77	48.27	14 T.	28.00	8 lbs	2.50			21½ T.	64.50			1.25
Timothy (D).....	46 T	414.00			304	43.10	43.10	17¼ T.	155.25					63¼ T.	569.25			14.
Clover and Timothy (F).....	24 T	168.00			212	30.58	30.58	25¼ T.	176.75					49¼	344.75			13.
Wheat and Oats (C).....			4 W 10 O	2.40 3.00				12 W. 197 O.	8.16 58.22							12 W. 197 O.	8.16 51.22	8.
Meadow (G).....					118	16.77	22.17	5 T. S.	15.00					5½ T.	39.17			
Wheat, Oats & Corn (J).....			1 W 2 O 2 qs C	.60 .60 .09	20	2.70	3.99	3 W. 9 O. 3 C.	2.04 2.34 1.08									1.5
Forage crops (N).....			3 lbs. 1 qt. 1 qt. C.P.	rape.30 soja.10 C.P. .10	407.5	57.24	57.74	Green manure.										.2
Rye.....			10	7.50						10	7.50							
Wool.....												154 lbs	25.02					
Straw.....												7 50 T	3.90			10 T.	30.00	

The letters in parenthesis represent the different fields.

T. S.—Tons of straw. T.—Tons. O.—Oats. W.—Wheat. C. P.—Cow pea. x—Destroyed. D.—Destroyed by storm.

Under act of congress we make our financial statement to the secretary of the treasury for the fiscal year ending June 30th, and below will be found the last report sent to the secretary of the treasury, also summary of our financial report for the thirteen months ending Dec. 31st, 1893. It has been decided in our farm books to hereafter make our financial year end with the 31st of December.

HON. JOHN G. CARLISLE, *Secretary of the Treasury, Washington, D. C.*

SIR:—We have the honor to submit herewith a report of the receipts and expenditures of the Experiment Station of the University of Minnesota, located at St. Anthony Park, Minn., for the year ending June 30th, 1893, in accordance with the Act of Congress approved March 23, 1887.

ACCOUNT WITH THE UNITED STATES GOVERNMENT.

To appropriation of U. S. Government for the year ending	
June 30, 1893.....	\$15,000.00
To amount furnished by the State.....	2,731.17
Total .....	<u>\$17,731.17</u>

CREDIT.

By amount paid for—	
Salaries of officers.....	\$6,570.76
“ “ employes.....	5,120.58
Freight, express and transportation.....	421.58
Postage and stationery.....	227.16
Printing.....	1,684.90
Scientific instruments.....	195.74
Chemical apparatus and supplies.....	265.52
General fittings.....	296.34
Tools and implements.....	221.27
Library.....	210.10
Miscellaneous.....	2,517.22
	<u>\$17,731.17</u>

We hereby certify that we have examined the above financial statement and find it correct.

J. S. PILLSBURY, *Prest. Board of Regents.*  
 J. E. WARE, *Treasurer.*

*Statement of Receipts and Disbursements of the Minnesota Agricultural Experiment Station for the Thirteen Months beginning December 1, 1892, and ending December 31, 1893, inclusive.*

	Disbursements.	Receipts	Net.
Agriculture .....	\$ 7,401.57	\$ 766.12	\$ 6,635.45
Horticulture.....	2,899.73	579.60	2,320.13
Chemistry.....	2,399.81	.....	2,399.81
Station .....	7,244.91	484.94	6,759.97
Entomology.....	1,738.42	.....	1,738.42
Total .....	\$21,684.44	\$1,830.66	\$19,853.78

The valuable plant belonging to the Department of Agriculture of the University is in most excellent condition.

Respectfully submitted,

WM. M. LIGGETT.