REPORT OF THE DIRECTOR

Brookings, South Dakota,
August 27, 1914.

Dr. George L. Brown, Acting President,
College.

Dear Sir:

I have the honor to make the following report of the South Dakota Agricultural Experiment Station for the fiscal year ending June 30th, 1914:

ORGANIZATION

At the beginning of the year the funds were apportioned for investigations and experiments in the following departments: Agronomy, Animal Husbandry, Chemistry, Dairy Husbandry and Horticulture. The chief of each department is also professor of the subject in the college. His salary is paid in proportion to the time he is occupied in Station and teaching work. The state appropriates annually for four different substations or demonstration farms located at Highmore, Eureka, Cottonwood and Vivian.

THE WORK

Because of the limited funds furnished by the government for the support of this Station the number of investigations and experiments are necessarily limited. By using the entire thirty thousand dollars in five departments more effective work can be secured than by scattering this federal fund over eight or ten departments. The policy of the Station is to do valuable work and to do this an investigator must not be handicapped for the lack of funds. From the number of letters on matters that do not pertain to experiment station
work it is quite evident that many people are ignorant as to the purpose of the experiment station supported by the government in this state. It is not an institution for the purpose of police duty in the state but an institution for the purpose of ascertaining new facts and informing the people of these facts. The police duty belongs to the state organization. I will admit there are many lines on which experiments could be conducted in addition to those now being considered but it must be remembered that the financial support governs the number of experiments to be undertaken. When the present experiments and investigations are completed then others will be considered.

BLACKLEG VACCINE

During the past year there were 33,670 doses of government blackleg vaccine distributed from this Station. We are appointed as collaborator for the distribution of blackleg vaccine. This is over 12,000 doses more than was sent out one year ago showing that there is an increased activity in the preservation of the health of the cattle in this state. This increased activity is undoubtedly caused by the unusual value of cattle in the market.

PUBLICATIONS

There were five bulletins printed and distributed during the year on the following subjects: No. 146, Some Varieties and Strains of Wheat and Their Yields in South Dakota; No. 147, Effect of Alkali Water on Dairy cows; No. 148, Corn Silage and Mill Products for Steers; No. 149, Some Varieties and Strains of Oats and Their Yields in South Dakota; No. 150, Weeds. The four first mentioned were printed on the federal funds and the last one on the state funds. The state furnishes one thousand dollars with which to print bulletins of a popular nature. There were 170,869 bulletins sent out during the year. There were 3,672 requests received for bulletins and there were 6,058 letters mailed carrying postage
from the office of the Director of the Experiment Station and Professor of Animal Husbandry. There were 30,000 copies of each bulletin printed at a cost of $12.35 per page delivered in Brookings. There are about 24,000 names on our regular mailing list. We exchange publications with other institutions and publishers of magazines in other states, but we do not add the names of non-residents to our regular mailing list. There are 106 American and 155 foreign publications that we have on our exchange list. These publications are used by members of the Station staff and are also consulted by students of the institution. The bulletins of this Station are requested from people all over the world.

SUMMARY OF CONTENTS OF BULLETINS

Bulletin No. 146. *Some Varieties and Strains of Wheat and Their Yields in South Dakota*, by the Agronomy Department. As the title indicates this is the result of a study of the different varieties of wheat. The bulletin contains eight illustrations of wheat so that the reader can identify varieties. It also includes several tables for the purpose of ready comparison. The varieties on trial, as to yield, have ranked as follows:

1. Kubanka and Arnautka Durum.
2. Bearded Fife.
3. Bluestem and Beardless Fife.

Bulletin No. 147. *Effect of Alkali Water on Dairy Cows*, by the Dairy Husbandry Department. In certain sections of South Dakota the water is charged with soluble minerals and in some of the vicinities cows become "alkalied." Many thought the water was the cause of the trouble, hence this investigation. The water was shipped from the semi-arid section to Brookings and fed to dairy cows.

"1. The drinking of alkali water by the cows did not produce what is known as the "alkali disease" nor even the slightest indication of it. The feces became soft when the cows first started drinking the water, but soon resumed a normal texture. Considering that the strongest alkali well
water was used, it is reasonable to conclude that the alkali disease of cows is not produced from drinking alkali water.

"This conclusion does not include water which at times collects in partially dried up ponds. Such water is usually very strong and cows should not be permitted to become so thirsty as to force them to drink it.

"2. The post-mortem examination and analyses of the vital organs of the cows in these experiments revealed nothing abnormal.

"3. The principal mineral in the alkali water is sodium sulphate. Most of this mineral, or about three-fourths of it, is eliminated through the kidneys.

"4. Cows fed on alkali water voided more urine than did the cows receiving normal water, even though they drank less water. The urine was increased from 114.6 to 151.4 pounds during the ten day periods by reason of drinking alkali water. This increase in urine output took place in spite of a decrease of 148 pounds in the amount of water drank during the same period.

"5: The per cent of ash constituents in the urine is increased by feeding alkali water to the cows. This together with the other above mentioned facts indicates that the kidneys of cows drinking alkali water have an increased amount of work to perform."


1. The results show that all of the steers made good gains while receiving corn silage as the sole roughage ration.

2. Oil meal, dried distilled grains and cottonseed meal are valuable feeds to mix with corn silage for the economical production of a pound of gain. The results show that their relative value ranks in the order mentioned above.

3. The largest gains and the most uniform gains were made by steers in lot that received oil meal and corn silage. The average daily gain compares favorably with the gains made by steers of a similar age receiving a full feed of corn and oil meal. However, the latter was a much more expensive ration.
4. The steers receiving oil meal consumed an average of ten pounds more of corn silage per head daily than those receiving cottonseed meal and silage and also made a larger and a cheaper gain than steers in other lots.

5. The results of this experiment show that the dried distilled grains feed was not as valuable as oil meal to mix with silage, but more valuable than cottonseed meal. The gains were larger and more uniform than those that received cottonseed meal. Fewer pounds of silage and dried distilled feed were required for a pound of gain than with lot that received silage and cottonseed meal.

6. Corn silage and shelled corn does not make the best ration, it all being too carbonaceous. The steers in lot receiving oats and silage made larger and more uniform gains than those that received shelled corn.

Bulletin No. 149. Some Varieties and Strains of Oats and Their Yields in South Dakota, by the Agronomy Department. The largest yields of grain at Brookings have been secured from Sixty-day, Swedish Select and North Finnish Black, in order named. At the Sub-Station at Highmore the best results were secured with Swedish Select, Sixty-day and Red Algerian. Yields at other Sub-Stations in the state do not justify conclusions. This bulletin includes the history of the leading varieties, pictures showing details of each and tables of yields so ready comparisons can be made.

Bulletin No. 150. Weeds, by the consulting botanist, is a pamphlet of 78 pages. This bulletin was printed by the Station to fill the demand for information along this line. It is profusely illustrated so that anyone can detect weeds from description given.

ANIMAL HUSBANDRY DEPARTMENT

The work in this department was confined entirely to feeding experiments as follows:

(1) Kaoliang grain to pigs. This grain was grown in the semi-arid region of South Dakota and shipped to the feeding station at Brookings, fed to pigs to determine its
value as compared to corn for the production of a pound of pork. The results of this experiment will be published in bulletin form sometime during the present year.

(2) Soudan Grass to lambs. It was desired to learn something of the feeding value of this new imported variety of grass as compared to the feeding value of Bromus inermis.

(3) Hogging down corn. Many inquires are received as to the value of the different varieties of corn for this purpose. It is also desired to find the value of rape sowed in corn after the last cultivation for hogs in the process of hogging down the corn. After the second year’s trial the results will be published.

(4) The value of silage as a sole roughage ration when fed with grain to steers. This is a continuation of the experiment outlined a few years ago on the subject of feeding silage to steers for the economical production of a pound of gain. Excellent results were received from this experiment and will be printed sometime this year.

(5) The establishment of a new breed of sheep by the use of a new breed recently imported from Siberia. These sheep were received too late to secure results from breeding this year. This is the only breed of sheep in the United States that do not have tails and as far as we know these are the only representatives of this breed in the United States. The object of this experiment will be to develop a breed of sheep better adapted to the severe snow storms and blizzards of our range country. An effort will be made to select for tailless sheep as the tail on a sheep is of no value. The extreme length of wool on this new breed is another character that will be sought after and at the same time mutton characters will be kept in mind.

I enclose herein and make a part of this report, reports from the various departments that give a more detailed statement of work in each department.

Respectfully submitted,

JAMES W. WILSON,
Director and Animal Husbandman.
AGRICULTURAL EXPERIMENT STATION

AMERICAN PUBLICATIONS

American Breeder, Kansas City, Mo.
American Food Journal, Chicago, Ill.
American Hay, Flour and Feed, New York City.
American Hereford Journal, Kansas City, Mo.
American Miller, Chicago, Ill.
American Poultry Advocate, Syracuse, N. Y.
American Sheep Breeder and Wool Grower, Chicago, Ill.
American Sugar Industry, Chicago, Ill.
American Swineherd, Chicago, Ill.
Better Fruit, Hood River, Ore.
Carlson's Breeders' Review, Norfolk, Neb.
Carlson's Rural Review, Norfolk, Neb.
Chicago Daily Farmers' and Drovers' Journal, Union Stock Yards, Chicago, Ill.
Cincinnati Weekly Inquirer, Cincinnati, Ohio.
College Farmer, Columbia, Mo.
Colman's Rural World, St. Louis, Mo.
Commercial Fertilizer, Atlanta, Ga.
Connecticut Farmer, New Haven, Conn.
Corn, Waterloo, Iowa.
Crop Reporter, Department of Agriculture, Washington, D. C.
Daily Drovers' Journal-Stockman, South Omaha, Neb.
Dairy Record, St. Paul, Minn.
Dakota Farmer, Aberdeen, S. Dak.
Denni Hlasatel, Chicago, Ill.
Deutsch-Americanische Farmer, Lincoln, Neb.
Du Pont Magazine, Wilmington, Del.
Elgin Dairy Report, Elgin, Ill.
Farm and Fireside, Springfield, Ohio.
Farm and Real Estate Journal, Traer, Iowa.
Farm Engineering, Springfield, Ohio.
Farmer and Breeder, Sioux City, Iowa.
Farmers' Digest, Columbia, Pa.
Farmers' Guide, Huntington, Ind.
Farmers' Wife, St. Paul, Minn.
Farmer, The, St. Paul, Minn.
Farm Life and Agricultural Epitomist, Chicago, Ill.
Farm Press, Chicago, Ill.
Farm Progress, St. Louis, Mo.
Farm, Stock and Home, Minneapolis, Minn.
Farm World, Augusta, Me.
Field and Farm, Denver, Colo.
Field, The, New York City.
Flour and Feed, Milwaukee, Wis.
Fruit Grower and Farmer, St. Joseph, Mo.
Furrow, The, Minneapolis, Minn.
Garden Magazine, Garden City, N. Y.
Gentlewoman, The, New York City.
Good Poultry, Sandwich, Mich.
Guernsey Breeder's Journal, Peterboro, N. H.
Hampshire Advocate and Live Stock and Poultry Record, Peoria, Ill.
Hartford Herald, Hartford, S. Dak.
Harvester World, Chicago, Ill.
Hoard's Dairyman, Fort Atkinson, Wis.
Holstein-Friesian World, Ithaca, N. Y.
Hospodar, Omaha, Neb.
Hospodarsky Listy, Chicago, Ill.
Indian School Journal, Chilocco, Okla.
Interior Index, Interior, S. Dak.
Jersey Bulletin and Dairy World, Indianapolis, Ind.
Jewish Farmer, New York City.
Kansas Farmer, Topeka, Kansas.
Kimball's Dairy Farmer, Waterloo, Iowa.
Lebanon Independent, Lebanon, S. Dak.
Lincoln Freie Presse, Lincoln, Neb.
Little Farms Magazine, Los Angeles, Cal.
Long Island Agronomist, Medford, N. Y.
Magazine of Mysteries, New York City.
AGRICULTURAL EXPERIMENT STATION

Market Growers' Journal, Louisville, Ky.
National Farmer, St. Louis, Mo.
National Farmer, Winona, Minn.
National Stockman and Farmer, Chicago, Ill.
National Wool Grower, Salt Lake City, Utah.
Northwestern Agriculturist, Minneapolis, Minn.
Northwest Farmstead, Minneapolis, Minn.
Nut Grower, Waycross, Ga.
Oklahoma Farm Journal, Oklahoma City, Okla.
Omaha Daily Bee, Omaha, Neb.
Pacific Dairy Review, San Francisco, Cal.
Poultry Life, Portland, Oregon.
Poultry Topics, Lincoln, Neb.
Practical Dairyman, Syracuse, N. Y.
Progressive Farmer and Home Builder, Phoenix, Ariz.
Progressive Farmer and Southern Farm Gazette, Raleigh, N. C.
Pure Products, New York City.
Reliable Poultry Journal, Quincy, Ill.
Republic, St. Louis, Mo.
Rural Home, New York City.
Rural New Yorker, New York City.
South Dakota Farmer, Sioux Falls, S. Dak.
Southwest Trail, Chicago, Ill.
Spokesman Review, Spokane, Wash.
Successful Farming, Des Moines, Iowa.
Successful Poultry Journal, Chicago, Ill.
Svenska Amerikanaren, Chicago, Ill.
Ugebladet, Minneapolis, Minn.
Utah Farmer, Salt Lake City, Utah.
Valley Farmer, San Benito, Texas.
Wallace's Farmer, Des Moines, Iowa.
Waste Trade Journal, New York City.
White Breeders' Companion, Rochester, Ind.
Wisconsin Farmer, Madison, Wis.
FOREIGN PUBLICATIONS

Agricultural Gazette of Canada, Ottawa, Canada.
Agricultural Gazette of New South Wales, Sydney, Australia.
Agricultural Journal of India, Calcutta, India.
Agricultural Journal, Pekin, Republic of China.
Agricultural Journal of the Union of South Africa, Pretoria, South Africa.
Farmers' Advocate, Winnipeg, Canada.
Farm and Ranch Review, Calgary, Canada.
Farmers' Magazine, Toronto, Canada.
Hawaiian Forester and Agriculturist, Honolulu, H. I.
Journal of the Department of Agriculture of South Australia, Adelaide, Australia.
Journal of the Department of Agriculture of Victoria, Melbourne, Australia.
Monthly Bulletin of Economic and Social Intelligence, Rome.
New Zealand Dairyman, Wellington, N. Z.
Philippine Agricultural Review, Manila, P. I.
Revista Industrial Agricola De Tercuman.

AGRONOMY DEPARTMENT

Director James W. Wilson,
South Dakota Agricultural Experiment Station,
Brookings, South Dakota.

My Dear Sir:

I have your request for report of the work of the Agronomy Department for the fiscal year 1913. A report is transmitted herewith.

Within the past year experimental work has been conducted by this Department under both Hatch and Adams Funds.

Projects previously enforced were in the main continued. One new project, namely, Adams' Project No. 3, has been added during the year.
As rapidly as possible the experimental projects of this Department are being made very definite in their application, this with a view to acquiring very specific results along a few lines rather than attempting to solve too many problems at once with a resulting indefiniteness.

During the past year the Agronomy Department has arranged the Hatch and Adams projects by number and title. Thus it will be possible to make future expenditures of Hatch and Adams funds on the basis of the project for which the expenditure is made. The following projects are now in force:

Hatch Project No. 1—A comparison of a system of live stock farming with a system of grain farming, with a special reference to their relative effect upon the permanent fertility of the soil.

Hatch Project No. 2—Breeding corn for chemical composition with a special reference to the comparative total yields of protein and oil per acre as produced by strains of high chemical content and low chemical content respectively.

Hatch Project No. 3—Including several experiments such as testing local varieties and strains and cultural experiments.

Adams Project No. 1—Influence of rotation upon maintenance of soil fertility.

Adams Project No. 2—A study of correlations between certain physical characters of plants and their capacity for yield.

Adams Project No. 3—A project to determine definitely the extent to which water is a limiting factor in the growth of sweet clover (Melilotus alba).

Progress on these projects has been made during the past year as follows:

Hatch Project No. 1—Crop yields have been secured from the plots included in this experiment. These yields have not yet been published in bulletin form. More time is needed to secure yields from the field plots themselves and also to coordinate them with results from greenhouse pot experiments.
Hatch Project No. 2—In part reported upon in Bulletin No. 153, selecting and breeding corn for protein and oil in South Dakota. The summary of this bulletin is as follows:

1. It is apparently not difficult to select strains of corn, which contain comparatively high percentages of protein for feeding, or high percentages of oil.

2. It is even more desirable to know whether high protein strains of corn can yield more pounds of protein per acre than other strains, and similarly whether high oil strains actually yield more oil per acre than other strains.

3. Data indicated that South Dakota farmers and others desiring to produce the highest possible total yields of protein, e.g., for feeding live stock, may do so by selecting high protein ears for planting.

4. A similar statement applies to yield of oil.

5. Yields of bushels of corn per acre are also apparently not reduced by selecting for high-protein, or high oil.

6. It is found that percentage content of oil in ears of corn increases with the degree of maturity of the corn.

Hatch Project No. 3—One of the lines of work accomplished under this project was certain experiments in potato breeding. The Department had previously demonstrated the practicability of using well selected tubers for seed potatoes rather than culls (see Bulletin No. 140.) The experiment reported in Bulletin No. 140 did not give sufficient information to determine the relative amounts of influence exerted by heredity factors and plant food factors inherent in various sizes of potato seed pieces.

An experiment was accordingly arranged by this Department and carried out in detail by Mr. I. S. Oakland, Assistant, especially to secure quantitative information upon the point in question. These quantitative results will be published as early as possible in bulletin form. They indicate that not only the size of seed piece is important as a factor in determining the yield of potatoes, but also the factor of heredity is measurable quantitatively and is of practical importance in the selection of potato seed tubers.

Also under this project results are being published in
South Dakota Bulletin No. 151, "Trials with Sweet Clover as a Field Crop in South Dakota." The summary of this bulletin is as follows:

1. Sweet clover has already been utilized to some extent as a field crop in various states.

2. The total average produce from first and second cuttings of sweet clover at Brookings was 2.91 tons of field cured hay.

3. A first cutting of 1.71 tons of field cured hay and an additional average yield of 8.3 bushels of unhulled seed per acre (second cutting of second year growth) could be reasonably expected at Brookings.

4. At Cottonwood sweet clover made a satisfactory yield of hay per acre, considering adverse seasonal conditions.

5. Trials are in progress at Highmore and Eureka.

The Agronomy Department has published Bulletin No. 146, "Some Varieties and Strains of Wheat and Their Yields in South Dakota." This bulletin furnishes a description of the various wheats of the state. Such a description was necessary before any state-wide work with wheat improvement could be conducted. Results of variety and strain tests are also reported, and the history of certain varieties and strains common in South Dakota, is appended in the latter part of the bulletin. The bulletin is illustrated with eight three-quarter page photographs of leading varieties. These photographs aid in description.

Summary of Bulletin No. 146:

Wheat varieties on trial in South Dakota have ranked in yield as follows:

1. Kubanka and Arnautka Durum.
2. Bearded Fife.
3. Bluestem and Beardless Fife.

Likewise, before definite progress could be made in South Dakota in the improvement of the oats crop by the introduction of new varieties and by breeding and selection, it was necessary to have a clear definition of varieties already commonly grown throughout the state. Therefore, during
the past year, Bulletin No. 149 was prepared and published under the title, "Some Varieties and Strains of Oats and Their Yields in South Dakota." This bulletin is for oats what Bulletin No. 146 is for wheat. It includes a classification of common varieties and the description of these varieties is aided by eleven photographs of panicles and grains. Yields from variety tests are included. Summary:

1. Classification of prominent varieties for South Dakota, according to color, time required for maturity, and shape of panicle.

2. Illustrations of some typical varieties grown in South Dakota.

3. Highest yields of grain at Brookings have been secured from Sixty-day, Swedish Select and North Finnish Black, in order named.

4. At Highmore the most productive varieties tested are Swedish Select or Belyak, Sixty-day or Kherson, Red Algerian and North Finnish.

5. Present data indicate that Sixty-day, an early variety and Swedish Select, a late variety, are most successful for conditions of this test.

6. Short time comparisons of two varieties at Cottonwood and Eureka are not yet sufficient to lead to permanent conclusions.

7. History of certain varieties.

Adams Project No. 1—Influence of rotation upon maintenance of soil fertility. Published results from this project are included in South Dakota Bulletin No. 145. Since the publication of bulletin indicated, chemical analyses for total potassium of soil from plots 140-149 and 150-159 inclusive, have been completed, also analyses for total phosphorus on plots 140-149 inclusive.

These analyses are made with the samples of soil secured from the plots at the beginning of the project. They are the identical samples reported upon in Annual Report of the Director for 1913, page 20.

Adams Project No. 2—The study of correlations between certain physical characters of plants and their capaci-
ty for yield. Under this project the Department has devoted its attention chiefly to a study of correlation between length of head in wheat and the yield of the progeny. A positive correlation has been ascertained between length of spike and yield of progeny, with the use of a particular strain of bluestem wheat. The data arrived at are now in manuscript and will be published as early as practicable.

Correlation studies upon height of ear in corn plants and their corresponding yield are also being conducted.

Adams Project No. 3—A project to determine definitely the extent to which water is a limiting factor in the growth of sweet clover.

Work accomplished on this project up to date, is in preparation. The project has recently been allowed. Specially constructed cylinders have been received and soil has been shipped to Brookings for use in the project.

Respectfully submitted,

(Signed) A. N. HUME,
Agronomist.

CHEMISTRY DEPARTMENT

James W. Wilson,
Director.

Dear Sir:

The work of this Department continues along the same lines of previous years. The Hatch Project has to do with the amelioration of Sugar Beets suitable for this State, while the Adams Project is still investigating the effect on the physical conformation of horses of an extremely wide nutritive ratio in a maintenance ration.

The Hatch Project

The results obtained in this work are very satisfactory. We have not only secured a remarkably high sugar per cent but an extremely large tonnage as well. Of late this work has aroused much attention on the part of Sugar Factory owners and builders. It seems to be the concensus of opin-
ion among these people that if the industry is to survive in this country, it must be aided by just such work as we are doing.

At present the outlook for the industry is not so encouraging. But it is thought best to continue the work on a moderate scale as we are doing. Should we cease, all our highly bred stocks would perish. Even sugar beet seed only holds its vitality for about two years.

We are succeeding unexpectedly well in growing a very potent strain of sugar beet seed. In fact, this is the key note to the large tonnage and high sugar yield obtained.

This work is also commanding the attention of our tariff making commission. The Secretary of Commerce is interested and has requested that information be sent to the Oxnards, which has been done.

It will be necessary for this Station to build a root cellar for the handling of mother beets during the winter season. I would recommend that a cellar 12 feet wide, 30 feet long and 8 feet in the clear should be constructed near the Chemistry building on the Campus, so that it may be handy for the analytical work. The walls and ceiling should be constructed of concrete. I have furnished a root cellar at my own expense for several years past. But I expect to sell the building over the cellar, as I have no further use for the building.

*The Adams Project*

In my last report I called attention to the fact that one of our horses used in the experiments on feeding a ration deficient in protein had succumbed. Evidence is now appearing that the other two horses are beginning to exhibit the same symptoms. It is a long and tedious experiment requiring much patience and no little work.

It begins to seem as if the animals under experiment draw on their own muscles and even on their own bones for protein to keep up the vital processes of life. Of course it is a question of such great importance that it is necessary to reach definite conclusions before giving out facts for publication.
In passing it is well to note that we are doing nothing in these experiments that is not done by farmers with both horses and cattle every winter of their lives. If our results lead where they seem to be going it will throw much light on certain classes of diseases which afflict farm animals.

Very respectfully,

(Signed) JAS. H. SHEPARD,
Chemist.

DAIRY DEPARTMENT

Director J. W. Wilson,
College.

Dear Sir:

As per your request I am pleased to submit the following general report of the experiment work in this department.

During the last year both the Hatch and Adams funds have been used in the Dairy Husbandry Department. Conditions for good efficient work along dairy lines have been better during the past year than during any other previous year the writer has been connected with this Experiment Station. This applies to experiments, to funds, and to help.

The Adams fund project pertaining to the "Effects of Alkali Water on Dairy Cows and Dairy Products," was completed during the last year and Bulletin No. 147 gives complete results. The new project approved by you and the Government officials has recently been started. It pertains to "The Role of Water in a Dairy Cow's Ration."

By reason of the previous project overlapping into this year, and of getting everything pertaining to this previous work summarized and completed, some difficulties have been encountered in making as much progress as we had anticipated on the new project. One experimental period has been concluded, and this department is now in shape to push this investigation the coming year.

This experiment will be somewhat handicapped in the loss of Mr. D. E. Bailey. He leaves this institution to take
work for his Ph. D. degree. Mr. Bailey has been with this department during the last four years as dairy analyst, and his services have been very efficient and commendable. Mr. E. H. Hungerford, now connected with the Kansas Experiment Station, has been recommended to fill this vacancy. He comes to us highly recommended.

Only this one Adams fund project is being investigated in the Dairy Husbandry Department.

With the Hatch fund several experiments are in progress. The experiment pertaining to the different methods of keeping ice on the farm will be completed at the end of this summer, or as soon as the ice now stored is used. A small ice house was built this year with a view of comparing this method of keeping ice and the loss of the ice sustained, to other simple methods of keeping ice on the farm. It is proposed to issue results of these four year trials in bulletin form during the coming year.

The cream ripening and pasteurization experiment is now in progress for the third consecutive year. The obtained data pertains chiefly to the efficiency and cost of the coil cream vat as combined pasteurizer and cream ripener. During the coming year a complete report will be given of at least a portion of this experiment.

A comparative study of the different leading milking machines is now in progress. The Hazlewood, the Sharpless, the Hinman and the Burrill-Lawrence-Kennedy mechanical milkers are now in operation in the dairy barn. The chief objects sought are to obtain first-hand knowledge of the workings of these machines so as to be able to properly inform the many inquirers pertaining to milking machines. The experiments include the close observance of the mechanical workings of these different machines. It includes the study of the bacterial content of the milk drawn by these different machines, and also as to how these different machines affect the cows.

This department is now in shape to concentrate its efforts along this line.

During the past few years the Dairy Husbandry Depart-
ment has been keeping records of all the feed consumed and of all milk and butterfat produced by each of the cows in the dairy herd. Since the barn and the cows have been located on the new dairy farm, records have also been made of the feed produced on the land. All feed produced is weighed and analyzed chemically. Efforts are exerted towards raising the greatest possible amount of nutrients. Sixty acres of ground are used for producing hay and corn for the silos and roots (twenty acres alfalfa, five acres oats, peas and millet, two acres roots, and thirty-three acres corn.) The cows are not pastured; they are fed on silage the whole year.

In this connection four different silos are used; two stave, one concrete and one hollow block. Four pit silos have been built in as many different parts of the state with a view of finding out the practicability of this type of silo. With the cement and the burnt tile block silo put up by the Animal Husbandry Department, first-hand valuable results will be available in the near future for publication. Different kinds of feeds have been put into these silos. Chemical analysis and close observance have been made of these different kinds of silages.

The two first mentioned experiments under the Hatch fund will be concluded this year, while the latter two will be given more emphasis in the future.

With thanks for your co-operation,

Respectfully submitted,

(Signed) C. LARSEN,
Professor of Dairy Husbandry.

HORTICULTURAL DEPARTMENT

James W. Wilson, Director,
South Dakota Experiment Station,
Brookings, S. Dak.

Dear Sir:

I have the honor to make the following report for the Department of Horticulture for the fiscal year ending June 30, 1914. By authority of the State Legislature I was ab-
sent from May 29 to November 8, 1913, to gather alfalfa seed in Siberia. The Semipalatinsk region was chosen because the seed which I gathered in this region in 1908 upon my third trip to Siberia had proven to be the strongest in growth. Part of the 3250 pounds Semipalatinsk alfalfa (Medicago falcata) was distributed last winter and spring. The remainder is ready for next spring's planting. Beside the alfalfa (Medicago falcata), seed of many other plants was gathered, especially 142 pounds Siberian Red Clover, and 36 pounds White Siberian Millet. Some new plants were also obtained.

In conformity with the law passed by the State Legislature the work with the Siberian and Russian alfalfa was continued in the western part of the state. A full report of this work has been made to the Regents of Education. For the purpose of this report the new phases of this subject should be enumerated. 1. Cold and drought-resistant varieties of alfalfa from Russia and Siberia. 2. The effect of spacing and cultivation of alfalfa plants so as to give each plant room for maximum development. 3. The effect of machine transplanting of one year alfalfa plants. The object of this work is to provide forage in the driest seasons on the dry western uplands where no irrigation is possible. To aid in this work a new alfalfa transplanting machine was introduced this spring by the manufacturers, the Madison Plow Company, Madison, Wis., and further improvements are expected.

Progress is also being made in breeding Russian hybrid alfalfas true to color, one with a white flower, and another with a red-purple flower.

*Periclinal Chimeras of the Apple.* The work with apple graft-hybrids has been carried on on a large scale for several years and the first fruits are appearing. However, recent investigations in Germany and France indicate that graft-hybrids are periclinal chimeras. The first fruits of this nature were obtained in the fall of 1912 in the combination of the Hibernal with the Milwaukee apple—the surface characters of the Hibernal with the internal characters of the Milwaukee
My absence in Siberia prevented further study of these trees last year. The work in cross-breeding of the apple makes steady progress, and many seedlings along new lines of pedigree were raised the past season.

The work in breeding plums was continued last spring by the sending out of trees of the following varieties: Tokata, Kahinta, Oziya, Teton, Cikana. Scions of these varieties were sent out in the spring of 1912, but this was the first time that trees were distributed. The pedigrees of these plums are as follows, the female parent being named first: TOKATA—Chinese apricot plum (Prunus Simoni.) DeSoto plum (native.) KAHINTA—Apple plum (Japanese.) Terry (native.) OZIYA—Red June (Japanese.) DeSoto (native.) TETON—Native of Walworth County, South Dakota. CIKANA—Dakota Sand Cherry. Gold plum (Hybrid Japanese.)

In vegetables several new varieties were obtained on my Siberian tour. One variety, a large radish with remarkably mild flavor from northern Turkestan, was introduced last spring as Hansen’s Turkestan Radish.

Several thousand seedling roses were produced by crossing choice cultivated varieties with wild species from South Dakota and Siberia, and the outcome is awaited with interest. Hardy double everblooming roses are much needed in our northwestern horticulture. Only one of the many seedlings so far produced at this Station has been named, the Tetonkaha, first introduced in the spring of 1912.

All of which is respectfully submitted.

(Signed) N. E. HANSEN,
Horticulturist.
REPORT OF THE SECRETARY

James W. Wilson, Director,
State College.

Dear Sir:

I submit herewith, schedules showing receipts and disbursements for the Experiment Station and Sub-Stations for the fiscal year ending June 30th, 1914.

Yours truly,

(Signed) R. A. LARSON,
Secretary.
### EXPERIMENT STATION AND SUB-STATIONS

**Receipts, 1913-1914.**

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<tr>
<th></th>
<th>Home Station</th>
<th>Highmore Sub-Station</th>
<th>Eureka Sub-Station</th>
<th>Cottonwood Sub-Station</th>
<th>Vivian Sub-Station</th>
<th>Misc.</th>
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<td><strong>8,000.00</strong></td>
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* Popular Bulletins.
## Experiment Station and Sub-Stations
### Disbursements, 1913-1914.

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<th>Hatch</th>
<th>Adams</th>
<th>Home Station</th>
<th>Highmore Sub-Station</th>
<th>Eureka Sub-Station</th>
<th>Cottonwood Sub-Station</th>
<th>Vivian Sub-Station</th>
<th>Total</th>
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### Popular Bulletins
- Balance on hand,—Local Fund, Home Station, July 1, 1914: 983.76
- Balance on hand,—Sub-Station Land Fund, July 1, 1914: 2768.89
- Reverted to State Treasurer—Popular Bulletin Fund: 3547.23
- **Grand Total:** $60737.46