Twenty-Eighth Annual Report

OF THE

State Board of Agriculture

AND THE

State Agricultural College

INCLUDING THE

NINETEENTH ANNUAL REPORT

OF THE

AGRICULTURAL EXPERIMENT STATION

FORT COLLINS, COLORADO

1906

DENVER, COLORADO
THE SMITH-BROOKS PRINTING CO., STATE PRINTERS
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MIRIAM A. PALMER, A. M.,
Experiment Station Illustrator.

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R. C. BEAVER,
Vocal Music.

W. E. RUNGE,
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CHAS. GOLDING-DWYER, JR., B. Acct.,
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L. M. MONTGOMERY,
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FRITZ KNORR,
Agronomy.

WM. O'BRIEN,
Farm Superintendent.

L. C. BRAGG,
Curator of the Museum.

ARTHUR D. MILLIGAN,
Stenographer, Agricultural Department.

MARGARET MURRAY,
Stenographer, Director's Office.

KATHERINE MURRAY,
Stenographer, Secretary's Office.

INSTRUCTORS AND ASSISTANTS—Continued.

Page

FLORA THOMAS,
Stenographer, Agricultural Department.

FLORENCE M. ROLLER,
Stenographer, Registrar's Office.

JULIA A. CRARY,
Stenographer, Secretary's Office.

LOVE C. BUTTORFF,
Stenographer, Experiment Station.

EDITH A. BEERS,
Stenographer.

LATHROP M. TAYLOR, B. S.,
Secretary to the President.

SCHOLARSHIPS.

ANNA M. TUTTLE, B. S.,
Domestic Science.

EDNA E. GARBUTT, B. S.,
Literature.

COLLEGE LECTURER.

J. F. TUTTLE, JR.....Denver, Colo.

LETTER OF TRANSMITTAL.

To His Excellency,
THE GOVERNOR:

Sir—Herewith I transmit my annual report as Secretary of the State Board of Agriculture. It is respectfully commended to your attention and to the thoughtful consideration of the General Assembly.

A. M. HAWLEY,
Secretary of the State Board of Agriculture.

The State Agricultural College,
Fort Collins, Colorado, November 30, 1906.

SECRETARY'S REPORT.

REPORT OF THE RECEIPTS AND DISBURSEMENTS OF THE COLLEGE FUNDS FROM DECEMBER 1, 1905, TO NOVEMBER 30, 1906, INCLUSIVE.

RECEIPTS.

Tax Fund.		
Balance, December 1, 1905	$ 3,961.55	
Receipts	69,755.00	
		$ 73,716.55
Land Income Fund.		
Balance, December 1, 1905	$ 1,357.22	
Receipts	18,354.31	
		19,711.53
Annie Jones Library Fund.		
Balance, December 1, 1905		1,175.31
Special Fund.		
Balance, December 1, 1905	$ 1,432.61	
Receipts	12,590.03	
		14,022.64
Appropriation Agricultural Instruction Fund.		
Balance, December 1, 1905		3,986.77
Appropriation Farmers' Institute Fund.		
Balance, December 1, 1905		7,102.66
United States Mechanic Arts (Morrill) Fund.		
Balance, December 1, 1905	$ 8,416.79	
Receipts	25,000.00	
		$33,416.79
		$153,132.25

DISBURSEMENTS.

Agricultural Department—		
Agronomy Division	$ 780.72	
Animal Husbandry Division	5,414.25	
Farm Division	5,842.15	
Farm Mechanics Division	236.58	
General Agricultural Division	4,732.20	
Farmers' Institute Division	5,003.19	
		$22,009.09
Advertising		2,039.28
Bulletins and Reports		1,114.30
Association A. A. C. and Experiment Stations		15.00
Chemical Department		759.75
Commercial Department		16.65

DISBURSEMENTS—Continued.

Constitutional History and Irrigation Law Department	53.85	
Current Expense	804.10	
Civil and Irrigation Engineering Department	2,019.17	
Domestic Science Department	551.06	
Rhetoric and Composition Department	9.15	
Electrical Supplies	162.90	
Freight and Express	1,557.01	
Fuel and Lights	4,785.86	
Firemen and Janitors	3,282.26	
General Repairs	2,043.04	
Girls' Dormitory	785.41	
Horticultural Department	3,465.00	
History and Literature	27.50	
Insurance	993.75	
Library	2,695.19	
Mechanical Department	2,368.39	
Mathematical Department	8.60	
Military Department	74.22	
Music Department	118.84	
Modern Languages Department	13.45	
President's Office	1,442.67	
Physical Training Department	17.30	
Permanent Improvements	14,060.31	
Salary	61,807.02	
Secretary's Office	985.82	
State Board of Agriculture	1,291.40	
Student Labor	3,655.80	
Text-Book Department	3,305.01	
Veterinary Science Department	352.30	
Zoology and Entomology Department	222.66	
Transfers to other funds	3,790.28	
		$142,703.39
Tax fund.		
Overdraft, November 30, 1906	$ 1,994.55	
Land Income Fund.		
Balance, November 30, 1906	$ 358.05	
Special Fund.		
Balance, November 30, 1906	3,210.80	
United States Mechanic Arts (Morrill) Fund.		
Balance, November 30, 1906	8,854.56	
		$10,428.86
		$153,132,25

REPORT OF RECEIPTS AND DISBURSEMENTS OF FUNDS PAID INTO THE SECRETARY'S OFFICE IN CONNECTION WITH SPECIAL FUND.

RECEIPTS.

Domestic Science Department	$ 10.25	
Mechanical Department	36.33	
Chemical Department	57.50	
Freight, etc., Refunded	195.60	
Text-Book Department	2,884.00	
Entrance Fee	380.00	
Library	66.95	
Music Fee	207.75	
Horticultural Department	11.25	
Girls' Dormitory	345.61	
Registration Fee	36.00	
Physics Department	9.85	
Civil and Irrigation Engineering Department	270.00	
Appropriation	3,328.41	
Agricultural Department—		
General Agricultural Division	$ 725.06	
Agronomy Division	28.57	
Animal Husbandry Division	4,805.64	
Farm Division	32.40	
	$5,591.77	
		$13,431.27

DISBURSEMENTS.

Remitted to the State Treasurer for credit of Special Fund as per receipts on file	$13,431.27

REPORT OF THE RECEIPTS AND DISBURSEMENTS OF THE EXPERIMENT STATION FUNDS FROM DECEMBER 1, 1905, TO NOVEMBER 30, 1906, INCLUSIVE.

RECEIPTS

Hatch Fund.		
Balance, December 1, 1905	$ 1,554.40	
Receipts	15,000.00	
		$16,554.40
Adams Fund.		
Receipts		$ 6,750.00
Special Fund.		
Balance, December 1, 1905	$ 686.05	
Receipts	5,756.23	
		$ 6,442.28
Appropriation Animal Industry Fund.		
Balance, December 1, 1905		$ 9,360.76
Appropriation Plant Industry Fund.		
Balance, December 1, 1905		$ 2,058.29
Appropriation Root Crops Fund.		
Balance, December 1, 1905		$ 1,000.00
		$42,165.73

DISBURSEMENTS

Agricultural Section	$ 56.27	
Arkansas Valley Sub-station	54.12	
Animal Investigation Section	2,024.11	
Agronomy Section	2,483.55	
Bulletins and Reports	5,457.19	
Buildings	5,236.68	
Chemical Section	1,345.47	
Director and General	1,716.58	
Entomological Section	1,053.05	
Horticultural Section	1,570.48	
Insurance	33.00	
Library	1,912.63	
Meteorological and Irrigation Section	2,347.39	
Salary	11,136.07	
Veterinary Section	951.83	
Western Slope Fruit Investigation	2,428.11	
Transfer to other funds	1,124.57	
		$40,931.10
Hatch Fund.		
Overdraft, November 30, 1906	$ 286.47	
Adams Fund.		
Balance, November 30, 1906	455.26	
Special Fund.		
Balance, November 30, 1906	1,065.84	
Balance, with Treasurer, November 30, 1906		$ 1,234.63
		$42,165.73

REPORT OF THE RECEIPTS AND DISBURSEMENTS OF FUNDS PAID INTO THE OFFICE OF THE SECRETARY IN CONNECTION WITH THE EXPERIMENT STATION SPECIAL FUND.

RECEIPTS

1905-1906.

Horticultural Section	$ 10.74	
San Luis Valley Sub-station	280.09	
Director and General	599.19	
Arkansas Valley Field Agent	8.00	
Agronomy Section	265.34	
Western Slope Fruit Investigation	1,424.87	
		$ 2,588.23

DISBURSEMENTS

Remitted to Station Treasurer for credit of Special Fund as per receipts on file	$ 2,588.23

SUMMARY

NAMES OF FUNDS	1905			1906
College	Balances	Receipts	Disbursements	Balances
Tax Fund	$ 3,961.55	$ 69,755.00	$ 75,711.10	*$ 1,994.55
Land Income Fund	1,357.22	18,354.31	19,353.48	358.05
Library	1,175.31	.....	1,175.31	.....
Special	1,432.61	12,590.03	10,811.84	3,210.80
Mechanic Arts (Morrill) Fund	8,416.79	25,000.00	24,562.23	8,854.56
Appropriation				
Agricultural Instruction Fund	3,986.77	.....	3,986.77	.....
Farmers' Institute Fund	7,102.66	.....	7,102.66	.....
Animal Industry Fund	9,360.76	.....	9,360.76	.....
Plant Industry Fund	2,058.29	.....	2,058.29	.....
Root Crops Fund	1,000.00	.....	1,000.00	.....
Experiment Station				
Hatch Fund	1,554.40	15,000.00	16,840.87	*286.47
Adams Fund	.....	6,750.00	6,294.74	455.26
Special Fund	686.05	5,756.23	5,376.44	1,065.84
	$42,092.41	$153,205.57	$183,634.49	$13,944.51
				2,281.02
				$11,663.49

*Overdraft.

REPORT OF THE PRESIDENT.

The State Board of Agriculture:

Gentlemen—I submit the following as the Twenty-seventh Annual Report to The State Board of Agriculture. It is accompanied by reports from the heads of the various departments, for which I ask the most careful hearing.

The year has been one of remarkable vigor in the prosecution of the work of the Institution, both in the school and throughout the State. The College and Experiment Station, realizing their obligation to the active farmers of the State, many of whom have recently come to Colorado, have done as much extension work as time and means would permit. Farmers' institutes have been held in many parts of the State. Important bulletins have been printed and widely circulated. Two horticultural experts have been established on the Western Slope in connection with the fruit growers of Mesa county. Much good has issued from this; chiefly, the organization of the fruit growers of the Western Slope, for the protection of their industry and for giving assistance to the College. Many valuable experiments are in action, and orchardists are patiently awaiting final results. I recommend that in the appropriation bill you ask for $20,000 for Horticultural experiment work throughout the State.

The College experts have visited every portion of the State where perplexing difficulties have arisen and have given much valuable aid. The Farmers' Course is in session at the present time with an enrollment of seventy-five. A short course in forestry will be held here February 18th as ordered by this Board. A school in horticulture for the Western Slope will be held in Delta, beginning January 14th and lasting one week, which gives promise of being the most successful effort the College has recently attempted . A remarkably fine exhibit from the College and Experiment Station was made this year at the State fair and several of the smaller fairs. The cost was considerable, but I am sure it was a paying investment. It will be much less expense hereafter.

Correspondence with practical farmers has greatly increased, and much practical work is being carried on, as the accompanying reports will show. I am sure the Board realizes the importance of this extension work. It carries the College directly to the farmers, who need its help. It makes them positive and lasting friends, and makes it far easier to reach the farmers' children and interest them in the work of the College. Like all honorable effort to do one's duty, it brings its own rewards. I think the State wil gladly grant the Institution at least $8,000 a year for the further prosecution of this extension work.

The work of the school has grown more stable and logical. The Board is a unit in its determination to give to the four great departments, i. e., Agriculture, Civil and Mechanical Engineering and Domestic Science, equable support. Upon these four corner stones we are rearing a substantial structure.

A few changes in the teaching force have been made. Those who have recently come to us are strong men and are giving marked satisfaction. Any school might be proud to have its entire faculty composed of such men as Bainer, Coen, Cottrell, Gay and Paull. They have been selected with great care and are more than fulfilling our expectations. I question if a stronger Faculty may be found in any Agricultural College in America than the one this Board has the honor to direct.

As the Board is well aware, the work of this Institution for some years past has been fundamental. We have strengthened the courses of study by striking off the first preparatory year, by adding a year at the top of each course, and by such other changes in the remainder of the curriculum as will best make excellent working experts and good citizens. We have been searching, in fact, for the best possible Agricultural College Curriculum, keeping always in mind the needs of our own State. The Land Grant Colleges have been compelled to slowly find their destiny in the educational world. We think the problem has at last been solved. Their function is three-fold: experimentation, instruction and dissemination. These are met by the Experiment Station, the College, and the institute or extension workers. More and more the members of each of these three groups must work each within his own group. To be sure the ideal condition is that the experimenter shall teach enough and mix enough with the active farmers to keep him fresh and give proper direction to his experiments.

In spite of the lopping-off process, by which four courses have been eliminated from the Institution, we have held our own in enrollment, with a decided gain this present year.

The short course scheme, for which we all have worked so long, has come to stay. Nearly one hundred young men and women are with us at the present time for the three months' work. Some twenty who were here last winter have returned for more advanced work. Others returned last fall for the long courses. These short course students are bright, hard-working and appreciative. I trust their number will increase so rapidly that by another year we may find it advisable to abandon the First Sub-Freshman year of our present system. Then our student body will have a higher age average, come better prepared, having finished the tenth grade elsewhere, and the school will be able to assume more college-like methods. Every alumnus with whom I have talked supports this proposition.

By reason of our constant growth, our fixed charges have become so great that new buildings, or the enlargement of the

present buildings, have been out of the question. Until more room is provided we should not hope for a great increase in enrollment, for it will be impossible to provide comfortable accommodations. With the addition of one hundred short course students now here we are uncomfortably crowded. Many departments are severely handicapped for lack of space. It is clear, therefore, that large appropriations must be asked of the Sixteenth General Assembly if we are to do more than retain our present development. I advise the calling together of those in charge of the departments of Agriculture, Civil Engineering and Domestic Science, at once, for a conference on new buildings. An Agricultural Hall, a Civil Engineering Building and a combined Domestic Science and Girls' Dormitory building must be had within the next two years by some process. It is probable that if two of these could be secured by special appropriations the third may be provided for by private generosity; but procured they must be. The time is favorable, the need is imperative, and the wisdom of the Board must do the rest.

As already stated, further appropriations are needed for extension and experimental work. These requirements will be presented to you in accompanying reports.

I should now like to ask you to consider some important legislation. The State Forestry Association has issued a Memorial to the State in general, and the coming Assembly in particular, in which they ask for the establishment of a Chair of Forestry in this Institution, with sufficient appropriation from the State for its support. This means, if it is to succeed, that the Board must give the measure its heartiest support. We should give the matter a definite expression at this time. No State in the Union is making or will make such demands for instruction in the growth and preservation of forests. Irrigation being the basis of our agriculture, it might almost be said that the mountain forests are the basis of irrigation. If a Chair of Forestry is to receive state or government aid in Colorado, it must be patent to everyone that it should have connection with a State Institution. The State Agricultural College already has much of the equipment needed, a number of the present members of its Faculty have been giving elementary instruction leading to more advanced work. The establishment of such a Chair in this Institution would at once claim the confidence of the entire State.

Professor Gillette has proposed a bill which makes the Entomologist of the College the State Horticultural Inspector, with a company of deputies. The former is to be paid by the State, the latter by the counties wherein the work is done. Owing to the fact that Colorado is fast becoming the first fruit State in America, and that already great injury has been done the industry by reason of ignorance and negligence, such legislation as is here indicated is greatly needed. The leading fruit men of the

State will give it their unqualified support. I recommend that the measure have the full endorsement of this Board.

I desire to know if it be your wisdom that the time is opportune for the introduction of a bill requiring the teaching of elementary agriculture in the rural schools of the State after, say, July 1, 1908. The State Normal School avows itself as willing to co-operate with us both in respect to the bill and in giving at the State Normal a course which shall prepare teachers in this branch by the time the law becomes operative. There are many reasons for enacting such a law. There are a few in opposition; mainly, however, as to the timeliness of such a measure in Colorado.

In all probability a measure will be introduced before the coming Assembly, asking for an appropriation for experimental work in dry farming on the plains. The Department of Agriculture, at Washington, stands ready to grant a sum equal to that which shall be appropriated by the Legislature for dry farming experimentation, provided the work is carried on by this Institution in conjunction with the United States Government. It will be necessary for the Board either to prepare the bill, or look after its interests if the bill is proposed by others.

Some general legislation must be had by which the State revenue shall be increased. This must be done either by amendment to the Constitution, adding one or more mills to the four mills state tax, as at present, or by a legislative enactment to the present revenue law and the present methods of assessment. A conference of all institutions is to be held at an early date to seek relief in this direction. Representation in this conference must be provided for at this meeting of the Board. It is of supreme importance. The State is now possessed of sufficient wealth adequately to care for all of its institutions. The reason for the present lack of funds lies either in the method of assessment or in the fact that the State has not provided itself with a sufficient mill rate.

Another member of the Board will report later relative to a proposed bill concerning the relationship of this Institution to the State Land Board and the college lands now under its control.

This, I believe, covers the legislative question, apart from appropriations. And these can only be determined upon by you after consultation with the Departments of Agriculture, Domestic Science and Civil Engineering.

I wish to recommend that your permission be granted the Committee on Faculty and Courses of Study to prepare for the next annual catalogue a new course of study for women.

I feel that a more general course, in addition to the present Domestic Science Course, will attract many more women students than we seem to be able to reach at the present time. Domestic Science should by all means hold a dominant place in the new course, if one is to be formulated.

I desire also to recommend that so far as possible a special crew be provided for institute work, if sufficient appropriations are made by the coming Legislature, in order that the members of the Faculty may not be overtaxed in time or energy, as at present, often to the injury of their regular class-room work in the College.

I desire also to recommend that at the earliest possible moment buildings and money will permit the course in Veterinary Science be restored. The recent meat inspection bill passed by Congress has greatly increased the demand for competent veterinarians, who shall instruct stockmen in a proper care of animals and in the prevention of diseases.

There are some other minor recommendations which I shall submit later, since they are merely formal and do not require Special Committee action.

Respectfully,

B. O. AYLESWORTH,

President.

Fort Collins, Colorado, November 15, 1906.

REPORT OF THE DEPARTMENT OF AGRICULTURE.

To the Honorable State Board of Agriculture:

Gentlemen—I have the honor to present herewith my third annual report covering the work of the Agricultural Department of the College and Experiment Station during the past year.

Several changes have been made in the staff of this Department during the year. Prof. J. A. McLean, who occupied the Chair of Animal Husbandry, resigned in June to accept a more lucrative position in the Iowa Agricultural College. Prof. H. M. Cottrell, formerly professor of agriculture in Kansas, was secured to fill this position.

Pursuant to instructions received at a former meeting of the Board, a Committee composed of the President of the College and the writer, secured Prof. H. M. Bainer, Professor of Farm Mechanics in the Iowa Agricultural College, to take the Chair recently established in Farm Mechanics in this Institution. Professor Bainer came to us the first of July this year and has already accomplished a great deal in the way of organizing this Department. He has added a vast amount of farm machinery to our already very good collection, and his work with students in operating this machinery and in carrying on some investigations with motive power has been very successful.

The appropriation made by the last Legislature for the carrying on of experimental work in the Divisions of Agronomy and Animal Husbandry has aided us greatly in carrying the research work done in this Department along these lines.

Since the last annual meeting, the new experiment horse barn, with a large number of corrals and paddocks, has been completed and is now occupied by the horses and colts in the co-operative horse breeding experiment.

The steer feeding and the hog feeding experiments proposed in my last annual report have been undertaken and are well under way, giving promise of some results that will be of great value to the live stock interests of this state.

Through the kindness of Mr. F. J. Hagenbarth, ex-President of the National Live Stock Association, we have been provided with a carload of choice lambs for the carrying on of feeding experiments the present winter. The lambs are now on feed at the College barns and an experiment has been outlined in which we will test the comparative value of finely cut or ground alfalfa meal with alfalfa hay as a feed ration for fattening lambs.

The work in hog feeding as outlined is very elaborate, and is, in brief, to make a study of the grains and other feeds that are available for hog feeding purposes in this state in an effort to determine their comparative feeding value for the production of high class meats, more particularly the production of choice bacon. I believe that Colorado possesses greater possibilities along this line than are to be found in any other state in the Union, and I feel that it is the duty of the College and Experiment Station to point the way in this field of endeavor to the farmers and stock men of the State. From information received from one of the large packers in Denver it is apparent that over $4,000,000 worth of hogs and pork products are annually shipped into this state to supply the market here. If, by carrying on some investigations that will give some definite information on this subject, we will be able to direct the farmers and stock men along the channels of pork production it will be the means of greatly increasing this industry, which is now a comparatively neglected one.

A very complete hog feeding yards and stables have been constructed and are now ready for occupancy. These pens and yards have been divided into ten equal parts and will accommodate 100 head of hogs. With these yards the station is fairly well equipped for investigation work on a small scale.

The proposed lines of investigation in hog raising is submitted by Professor Cottrell in his report, a copy of which is herewith presented, which will give a definite idea of the work that we hope to accomplish in the near future if funds can be appropriated for the carrying on of this work.

The horse breeding experiment is going forward in splendid form. We have, as a result of the year's work, fourteen very promising colts from the eighteen mares bred. Recently the Department of Agriculture has increased the stud of breeding mares by two very good individuals from Kentucky. The five yearling colts are doing well and we hope will develop into something that will bring some revenue for the future conducting of this experiment.

LIVE STOCK.

The stock on the farm has increased in numbers and in quality during the past year, with no great expenditure of funds. The inventory shows that we have on the farm at present fourteen head of Shorthorn cattle, valued at $2,105; five head of Hereford cattle, valued at $625; seven head of Holsteins, valued at $875; seven head of Ayrshire cattle, valued at $650; two Red Polled animals, valued at $250; ten Aberdeen Angus cattle, valued at $1,360; one Highland cow, valued at $60; five steers and two spayed heifers, valued at $560. The total value of cattle owned by the College is $6,485.

In sheep we have seven head of Oxfords, valued at $200; nine head of Southdowns, valued at $160; of Rambouillet, four head, valued at $75, and thirteen head of Shropshires, valued at $360, making a total of $795 worth of sheep owned by the College.

In the hog department, we have thirty-three head of Poland Chinas, valued at $592; nine head of Berkshires, valued at $475; nineteen head of Tamworths, valued at $565, and one Yorkshire sow, making the total valuation of our swine amount to $1,709.

In the horse department in the past year we have added two of the finest Percheron mares in America. This purchase has been made possible largely through the liberality of one of the largest importing firms in America. One of these mares produced a very fine colt this summer, and is, I believe, again in foal. We also have added a pair of work horses, giving us a total of twelve head of horses. These horses are valued at $3,515, making the total valuation of live stock owned by the College, at a very conservative estimate, amount to $13,141.

Owing to the increase in number of our live stock made necessary by the horse-breeding experiment and the steer-feeding experiment the additional pasture of 560 acres purchased early in the spring enabled us to have good pasture all summer for our stock and to have them in good condition for the coming winter. With the inevitable increase in breeds that we must maintain to successfully carry out our plans, I would respectfully recommend that an additional tract of land consisting of another 240 acres lying immediately north of the tract purchased from Benny Harris, that is now for sale, should be secured without delay. The 560 acres purchased during the past summer has not an adequate water supply. The half section mentioned as lying north of it contains a large lake which would give an abundant supply of good water for our stock at all times without any added expense. As this land is constantly increasing in value it would seem to be the part of wisdom to secure it without delay. The land purchased in the spring has been fenced on three sides with good woven wire fencing. It still requires some additional fencing to make it safe.

The addition of the Experiment Farm that we have had possession of for the first time this year has made possible a line of work in grain, grass and root investigation under the direct charge of Professor Olin and his assistant, Mr. Knorr, that is bound to be of the greatest value to the agricultural interests of this State. The research work along the lines of increasing the disease resistant powers of plants is in itself promising great returns for the money expended. In addition to the alfalfa work started, a study has been made of the most important varieties of oats, samples of which have been secured from all over the United States and from the countries of the Old World as well. Some of these varieties have proven exceedingly prom-

ising, one of them yielding at the rate of 127 bushels per acre of clean oats. There was also grown in the experimental plots the common varieties of barley and the common varieties of wheat, including those of strong drouth resistant powers which were grown without irrigation. The research work started this year in a study of sugar beets, looking toward the increase of the sugar content and the production of Colorado grown seed is very promising of the results desired.

The work in variety tests on the Experiment farm has been the most expensive ever conducted at the College, the following being the complete record:

Varieties of oats, 28, two increase plots; varieties of wheat, 23, two increase plots; 17 varieties of barley, three of corn, 24 of sugar beets, a like number being for cultural experiments, nine of rutabagas, five of mangels, six of carrots, nine of peas, and some 20 plots of miscellaneous plants.

Already the land available for experiment work is crowded with variety test investigations. We must soon make some arrangements for additional land where the most promising of these varieties can be tested in the field on a larger scale, and when they have proven their superiority over varieties in common use among the farmers, we can produce them in sufficient quantities for distribution throughout the State. I sincerely trust that the option on 80 acres of land lying immediately south of the Experiment Farm, and known as the Mrs. Taylor place, may be secured this winter, that this very important work may be carried on. I would respectfully urge upon the Board the necessity of having the importance of this matter presented to the Legislature at its coming session with a sufficient appropriation for securing this land.

The cooperative work undertaken with various farmers throughout the state has been productive of valuable results. This has been treated of very fully by Professor Olin in his report, which has been submitted to the Director of the Experiment Station. I trust that this line of work may be carried on in the future and extended in its scope, as its results are of great value to the farming interests of our State.

The Farm Mechanics Division of the Agricultural Department presents some of the most important problems for solution, and I would urgently request that this Division be made a section of the Experiment Station at once. A vast amount of research work is already crowding us in this direction. With the great progress that has been made in motor engines and the demands for them at the present in farm operations makes the duty almost imperative. If the farmers of the State of Colorado are to continue to lead along agricultural lines, they must do so through the medium of improved machinery, and it is the duty of the College and Experiment Station to fully investigate the farm machinery offered on our markets, that we may recommend the kind most likely to be of benefit to our farmers.

Another very important phase of the Farm Mechanics work just now pressing in Colorado and one which has attracted a great deal of attention on the part of our business men, is that of road building. This properly belongs to the Farm Mechanics Division of our College, and I hope that it can be made a strong feature of the work offered to students. I do not believe there is anything at the present time that we could do that would tend to popularize our Institution more quickly than such a course in road building as we could put in.

The Farmers' Institute Division of the Agricultural Department of the College has met with a very gratifying success. This work has been fully reported upon by the Superintendent of Institutes, a copy of which is presented herewith.

The College farm proper was never in as good condition as it is at the present time. The fences have been improved and extended and the ditching and drainage contemplated has been partially completed. There is still much to do in the way of leveling various sections of the farm that will render it much more valuable, for it can then be successfully irrigated. If this could be done it would enable us to supply a larger portion of the feed required for the live stock as this Division grows. More fences and corrals will be required the coming year and we will also require more equipment in the way of horses to enable us to properly care for the land that we have and for that which we hope to acquire. I trust that these may be forthcoming when the time arrives.

INSTRUCTION.

It is very gratifying to report that never before in the history of the College has so much interest been shown by the students in the Agricultural Department. We have registered this year in the various classes of the Agricultural Department of the College 110 students, not including those who will attend the two short courses that are now being offered.

Owing to the additions to our teaching force, the work of instruction is now on a broader scope and substantial gains have been made in attendance. Sixty students of the first and second Sub Freshman years who have signified their intention of taking the Agricultural Course have been organized into a special class and are being given some instruction in live stock work. This is supplying in part a long felt demand on the part of these students for some practical work in the lower classes of our College, and I am sure it will be of great influence in encouraging them to continue in their College work.

With our present equipment of buildings, we will be able to work along for a time without additional class rooms by using the offices of the various instructors as class rooms for some of the more advanced students where the classes are small. If the attendance increases very much, as it has every prospect of doing,

there will be a serious demand for increased class room accommodations in the very near future.

A number of our best students desire to continue their work here after graduation, particularly with their study of live stock, and as they can aid us materially in the investigation work we have under way, I trust that you may see fit to provide from time to time a sufficient number of scholarships to enable these young men to carry their work to completion and to enable us to have the benefit of their services.

NEEDS OF THE DEPARTMENT.

As before stated, we should have additional land for the successful carrying out of our College and Experiment Station work. The one-half section of pasture land we should secure will not cost above $12 per acre, or $4,000. The 80 acres adjoining the Experiment Farm will cost $250 per acre, or $20,000 in all. This additional land would give us sufficient area to carry forward our work in both Agronomy and Animal Husbandry Sections for many years to come. Since options have been obtained on this land it would seem almost imperative that a special effort be made to secure it at this time.

We are greatly in need of a suitable building for storing experimental grains. The upper floor of the Farm Mechanics building makes a very satisfactory laboratory for carrying on seed selection work and in storing the smaller samples for seeding the experimental plots which were started this last year, but it will be necessary to take care of the seed resulting from these experiments if any lasting good is to be derived from what we have already done. A suitable building could be erected for about $3,000. This would give us facilities for putting in apparatus to test the milling properties of the various wheats that are being experimented with. The wheat farmers of this state have suffered a great loss through a combination on the part of the millers of the state the past season to keep down the price of durum wheat, claiming that it made inferior flour. It seems very important that milling tests of this and other wheats should be carried on and this could be done in a suitable grain room, reliably and very cheaply on a small scale, as it is now being done in Minnesota, Utah and Washington Experiment Stations. It is desirable to test all wheats grown and developed here for their milling qualities and we should be able to do this in our own laboratory.

Owing to the large amount of machinery that has been secured at no cost to the College other than the payment of freight, it is necessary for us to make some further provision for the housing of this machinery. We have had donated to this Institution $12,500 worth of machinery and if the manufacturers are showing sufficient interest to let us have the use of their machines for demonstrations and tests it is certainly up to us to see that it is

properly taken care of. Such a building as we have had in mind could be constructed for not to exceed $2,500, and this would enable us to remove the machinery now stored in the class room recently built for demonstrating the working of Farm machinery, for the use of students, in the regular as well as the short courses.

In our experimental work with live stock the appropriation received from the last Legislature should be duplicated and an additional amount secured if possible. The stock men of the state are evincing a great deal of interest and are supporting us in every way. I believe the time is opportune to ask for liberal appriations for every division of our work. We have been receiving annually, for the past two years, $5,000 from the special appropriation, and we should have the same amount for the next two years for live stock experiments.

In the Agronomy Department, we have been getting from the State appropriation annually, for the past two years, $2,500, and this should be doubled, that the work may be taken care of as it should be, that we will not be subjected to criticism for neglecting to care for our experiment work through lack of funds. This amount would be sufficient to carry on the work in the improvement of alfalfa and other forage plants, as well as the root crops and the cereals that we have already under way.

In the Farm Mechanics Section, the sum of $1,500 in addition to the amount required for store room will enable us to carry forward this new branch of our work in a very satisfactory manner.

For Farmers' Institutes we have been receiving $4,000 annually for the past two years, and to make the work more effective an additional $1,000 should be asked for, making $5,000 available annually for this work. This will enable us to issue a hand book prepared by our institute lecturers in the form of an annual report to be distributed among the farmers of the State.

There has been an urgent demand from all parts of the State that a Poultry Department be established at this College. This, it seems, is a very important division of College and Experiment Station work and should receive some attention from us, and I believe there is an excellent opportunity to secure, from the Legislature funds to establish such a department. The expense would not be great and the returns from it when once well established should be greater than the expense in maintaining it. I think we could put in a respectable plant and maintain it for the next two years for not to exceed $4,000. This would enable us to erect suitable buildings, to equip the course and to employ a man to take charge of the work, which will be a necessary expense.

The total amount required by the Agricultural Department for the next biennial period, including purchase of land, erection of buildings, purchase of equipment, Farmers' Institute work, and the carrying on of proposed investigations in the Agronomy, Animal Husbandry, Farm Mechanics and Poultry Divisions, is in

round numbers $62,000, of which $24,000 is for the purchase of land, $5,500 for the erection of much needed buildings, $4,000 for Poultry Department, $10,000 for Farmers' Institute work, $10,000 for Animal Husbandry work, including the horse breeding experiment, $6,000 for Agronomy and $3,000 for Farm Mechanics, including road building. Our experience has taught us that we can not depend upon any great amount from the Hatch and Adams funds except in the matter of salaries without encroaching on other lines of investigations equally as important, else this amount asked for might be reduced appreciably in the Agronomy and Animal Husbandry Divisions.

In conclusion, I take this opportunity to express my deep appreciation of the courtesy and kindness of the Board during the past year in granting me a four months' leave of absence in order that I might be enabled to study the practices of the leading stock breeders of Europe. I wish also to express my appreciation of the liberality of the Board in providing ways and means for the carrying on of the most important demands of work in the Agricultural Department.

Respectfully submitted,

W. L. CARLYLE,
Dean of Agriculture.

Fort Collins, Colorado, November 15, 1906.

REPORT OF THE AGRONOMY DIVISION OF THE AGRICULTURAL DEPARTMENT.

Prof. W. L. Carlyle, Dean of Agriculture, Colorado Agricultural College.

Dear Sir—I take pleasure in giving you a detailed report of the work of my Department from December 1, 1905, to December 1, 1906.

1. *Class Work.* This past year I have had classes in Agronomy work, as follows:

Winter term, 1905-6, a class of twenty-five in Farm Mechanics; the work of this class consisted of class lectures once a week and shop work in iron and steel ten hours per week. The State Poultry Association offered prizes for the boys of the Farm Mechanics class who presented the best and most practical Colony Poultry House. Albert Cross, L. C. Aicher and R. C. Littler went to the State Association held in Denver in January with models of poultry houses which they had made in the shop. The boys explained the plan of their houses to the hundreds of visitors who inspected them, and one dealer in fancy poultry has adopted Mr. Littler's design for his colony houses. This work attracted favorable attention, and the State Poultry Association stands ready to assist us in a substantial manner in making this work interesting and of practical value to the boys. Prizes were awarded on the models shown: Littler, first; Aicher, second; Cross, third. I have recommended to Prof. Bainer (who now has this work) that it be broadened and emphasized, and that the Poultry Association be invited to give liberal prizes each year for models of colony houses from original designs; that other prizes for practical models, useful on the farm, be secured from interested individuals or associations. The shop work in iron and steel consisted of fourteen practical exercises in forging. Mr. William Elzinga, Instructor in Moulding, Forging and Foundry Work in the Mechanical Department, was the instructor in the shop work, and while he had very large classes in the Mechanical Course, by some changes he found room and time for the Farm Mechanics shop work and reported a deep interest in this work on the part of the boys. As soon as we can, we should have shop arrangements especially adapted for Farm Mechanics instruction, so we will not need to so seriously inconvenience the work and workers in the regular Mechanical Engineering shop work.

This term I also had the Junior students in the Agricultural Course in Study of Soils three times a week. While there had been no arrangements for definite laboratory periods in the

catalogue for this work, the class found time to take laboratory work. Mr. Knorr directed the laboratory work in Soils. We had practically no apparatus for this work, no place to store said apparatus and no room where this essential work could be done. Our work in this study was greatly strengthened by assignment of a definite amount of laboratory work in Soils in the new year's catalogue, and we have arranged to use the dairy room when dairy classes are not in session. Mr. Knorr will direct the laboratory work in Soils and I will give the class lectures. This term I also had the Senior Agricultural students in Farm Management. This work is becoming an essential feature of the Agronomy work in all colleges where instruction in Agriculture is given. I fully believe that each Senior who comes to this class should have had at least twelve weeks' experience or apprentice work on a western stock ranch and twelve weeks' apprentice on a western farm where general farming is practiced. I would recommend that we make arrangements to give all Agricultural students in the four year course this apprentice work during the Sophomore and Junior summer vacation periods. That we further urge at least one year's field practice work in a responsible position on some suitable ranch or farm, after graduation, under the direction of the professor of that department of Agricultural work in this College where the student desires permanent employment. There are many calls for farm managers which we cannot fill because we have few students who are fitted for the responsibilities which this work entails. Each farm manager of to-day needs thorough instruction in Animal Husbandry, Agronomy and Farm Engineering, with *plenty* of ranch and farm *apprentice* work unless he has been brought up on a farm and is very familiar with all classes of farm operations. Two correspondents are even now urging me to send them each a farm manager for large ranches in the West and Southwest, and I cannot do it, because our work has not been established long enough to give the boys the training this work requires. Let us plan to do some thoroughly practical work along this line of farm management, for there will be pressing calls for workmen along this line of agricultural work and our schools will be valued and rated by the preparedness of our graduates and their practical efficiency.

Spring Term, 1906. The Agricultural Sophomores come to me in the spring term for class instruction and laboratory work in Field Crops. I know of no text book now written which emphasizes the fundamental principles and gives a classification and discussion of crops adapted to our conditions. I am therefore writing the text which shall combine the lectures and an outline of the laboratory work, which I feel will prove interesting and beneficial to our Agricultural students, in a manner which I desire to place in the students' hands. There is a dearth of text books in all our modern agricultural work. Mr. Knorr

was of great assistance to me in the laboratory work during this Spring term. I had special students this term doing research work in Agronomy.

Special Courses. Beginning the first week in December, the first Short Course work in Agriculture for the farmer boys and girls was inaugurated. Fifty students, varying in age from 18 to 35 years, applied for this work. It proved a success from the start. The course, covering three months—December, January and February—was crowded full of instruction in those lines of study and research work which can be carried at once into the practical work of the home and farm life. I had classes in Field Crops and Farm Mechanics. Two Western Slope girls led the class in term standing in Field Crops; one, Miss Emma Larson, gained a grade of 98 and is deserving of special mention. The second term of this Short Course work will be taken up this present month of December, when I will give instruction in Soil Fertility and Farm Management.

Farmers' Ten Day Course. This work was given the third and fourth weeks in January. You will remember that you granted me two days for grain and forage work and one day for Farm Mechanics work. We were able to secure Prof. W. J. Spillman, Agriculturist for the U. S. Department of Agriculture, Prof. C. A. Zavitz of the Ontario Agricultural College, to lecture on Agronomy subjects and Mr. S. M. Woy, General Manager of the International Harvester Company at Denver, to lecture on Farm Mechanics subjects.

One entire day was given to demonstration work by the students in Farm Mechanics work, Long Course. The forenoon session was given to general discussion and demonstration work of models presented of haystackers, racks, feed racks, gates and poultry houses, with miscellaneous exercise work in iron and steel. The afternoon session the students gave a threshing demonstration, all the work from running the engine to sacking the threshed grain being done by the Farm Mechanics students of the school under the direction of Mr. Smith, Assistant to General Manager J. F. Albright, of the J. I. Case Threshing Machine Company, and Mr. Wm. O'Brien, Superintendent of the College farm. A demonstration with gasoline engines, with a lecture on same, was given by Mr. S. M. Woy, of the International Harvester Company, Denver, and this was followed by a manure spreader demonstration in the field. Each spreader was filled with well rotted barn-yard manure, and this load was scattered in a chosen field on the College farm. The following machines were sent to the College and used in this field demonstration work:

1. New American Spreader, from American Harrow Co.
2. Success Spreader, from John Deere Co.
3. 20th Century Spreader, from Parlin & Orendorff Co.
4. Great Western Spreader, from Smith Mfg. Co.
5. International Harvester Co. Spreader.

After this field work with the spreaders, the farmers were invited to a cleared space adjacent to the Farm Mechanics building, where several thousand dollars' worth of modern machinery, which I had prevailed upon various farm implement companies to loan the College, was placed on display. Representatives of the various manufacturing companies were present and explained to interested questioners the use and efficiency of the various machines.

Farm Mechanics Day was so crowded full of helpful instruction and interest, that I trust you can see your way clear to make it a permanent feature of each year's course for the farmers. Here the manufacturers can get the benefit of the farmer's ideas and criticisms, and the farmer gains a better conception and a keener appreciation of the modern machinery the twentieth century is bringing to his aid.

Chair of Farm Mechanics. One year after I had taken up the Agronomy work with you, when I felt sufficient interest and work had been developed to justify it, I recommended that this division of the Agronomy work be made into a new Chair, coordinately with Animal Husbandry and Agronomy. This suggestion was approved by you and, upon your recommendation, the Board authorized the establishment of this chair, and called Prof. H. M. Bainer, of the Iowa State College, to take charge of this new work in Farm Mechanics. His efficiency he has already demonstrated, and the value of this work is now being realized and appreciated by the people of the state.

Colorado Seed Competition Club. Early in the spring, I sent out instructions to members of our seed competition club for seeding and asked that reports be sent in from time to time. These members numbered several hundred, well distributed over the grain growing sections of Colorado. The bad storms of last month delayed threshing operations and not all the members of the club had been able to thresh when this report was written. I hope to be able to get all reports so I can make the prize awards by December 1st. There will be $400.00 in prizes awarded for the 1906 crop, $400.00 for the 1907 crop, $400.00 for the 1908 crop, and $1,300.00 for the term premium awards in 1908. We hope to enlist the support of the rural teachers at the State Teachers' Association in December, and shall strive earnestly to increase the club to 1,000 members next year. I shall send out a New Year's letter urging each present member to bring in one additional member and plan to make the best possible record with our grains for 1907.

Farm Institute Work. It has been my privilege to assist in Farm Institute Work in the following counties: Arapahoe, Bent, Boulder, Delta, Elbert, El Paso, Conejos, Fremont, Gunnison, Kit Carson, La Plata, Logan, Mesa, Montezuma, Montrose, Otero, Prowers, Pueblo, Rio Grande, Routt and Weld.

I find considerable interest is shown in questions of cultural soil treatment to maintain, or regain and retain fertility, seed selection, the thorough tillage treatment and special crop discussions. I have tried to adapt my discussions to the crop and farm environments of the places where the institutes are held. I am certain a considerable influence of permanent value can be exerted by the Farm Institute movement, looking to better systems of crop and live stock farming in our state.

Correspondence. My correspondence is increasing, but I believe it is to be encouraged if we expect to come in touch with farmers in the state. I want every farmer to feel perfectly free to write me on any farm question and to know that his letter will receive careful consideration in a prompt, ready and courteous reply. I have a plan for a crop correspondence system in connection with my Department which, if adopted, will enable us to receive accurate crop statistical data. Some system is now in operation in all the agricultural states and is the source of reliable information as to the number and kind of crops grown, yield and value, market conditions, etc. This plan I will carefully outline and explain to you before January 1st.

Course of Study. The course of study agreed upon for 1906-'07 was printed in the regular course of study. The only changes I would like to see made I enumerate below:

1. Freshman Year—The time for laboratory work in Spring Term Farm Mechanics extended two hours per week and each student in the Agricultural Course taught to run land levels.

2. Senior Agronomy work in the Fall to consist in research work in Tillage and Cultural Methods of Crop Farming. In the Winter Term, lectures in Agricultural Economics; Spring Term work, Senior year, Research work and class lectures in Farm Management.

I would like very much to have the following post graduate work indicated in the new year's catalogue:

I. The Thorough Tillage System of Farming.

II. Grain Judging.

III. Special Studies in Field Crops.

1. Forage Crops for Colorado.
2. Sugar Beets.
3. Wheat.
4. Oats.
5. Barley.
6. Seed Testing and Germination.
7. Plant Breeding as applied to Field Crops.
8. Study of past and present Market Conditions.
9. Rotation of Crops.

IV. Farm Management.

1. Special versus Mixed Farming.
2. Crop Methods for Irrigated Farming.
3. A Method of Farm Accounts.
4. Handling Labor on the Farm.
5. Extensive versus Intensive Farming.

New Assistant Needed. The teaching work is increasing to such an extent that I feel, before another year, I shall need an assistant to take some of the class instruction work in both the Long and Short Courses. I would suggest that we secure one of Dr. Hilgard's students who has made a careful study of soils in both the arid and humid regions, and who will be prepared to also do the chemical work of both the Animal Husbandry and Agronomy sections of the Station when not engaged in class room instruction.

My plan is to organize the Soils into a department as soon as we get an assistant of sufficient ability, force and experience to carry the work.

The study of the soil is the foundation work in all successful crop farming. My work is increasing to such an extent that I feel I must, another year, have an assistant to carry a part of my class work. I would prefer one thoroughly prepared in Soil Study work, so we can make the division of the Agronomy work along this line later on.

Recommendation of Mr. Knorr. Dr. Aylesworth promised to ask the Board at the June meeting, to advance Mr. Knorr's salary from $600 to $800 per year. He told me later that the Board agreed to advance Mr. Knorr's salary to $800 beginning November 1st. Because of the increased amount of class instruction and laboratory work which I am forced to give Mr. Knorr in addition to his field work, I desire arrangements made at the December meeting to advance Mr. Knorr's salary, after graduation, to $1,200, and that he be made Assistant Professor of Agronomy. He is one of the most practical and thoroughly efficient young men in agricultural work, and unless we recognize his ability and plan *now* for his advancement, I fear we shall lose him, later on. He was offered desirable positions this past summer elsewhere, but I told him if he would stay with us we would take care of him and give him merited promotion.

My field work at the College is broadening and I need his help in the College work as well as in the field station work. Kindly present this matter for me at the December meeting, or at such a time as you may think most opportune.

Special Needs. There are some special needs in the way of apparatus and room which I wish to name in a special report later on. There are calls coming in for special farm management work and Mr. Knorr and myself desire to be prepared to give the desired instruction. We seek to make our instruction

in Agronomy as practical and thorough as possible, so students shall feel it helpful in fitting themselves for farm work under western conditions.

I am grateful to you for the many courtesies which you have extended to me during the year just closing.

Respectfully submitted,

W. H. OLIN,
Professor of Agronomy.

Fort Collins, Colorado, November 15, 1906.

REPORT OF THE DIVISION OF ANIMAL HUSBANDRY OF THE AGRICULTURAL DEPARTMENT.

Professor W. L. Carlyle,
Dean of Agriculture,
Colorado Agricultural College.

Dear Sir—I herewith submit a report of my work in Animal Husbandry and a statement of plans and needs for the future:

I began work September 1, 1906, and October 1, 1906, you engaged W. H. Riddell, a graduate of this College, Class of 1906, as my Assistant.

I have taught four classes during the Fall Term of 1906:

Senior Class in Feeds and Feeding.

Junior Class in Feeds and Feeding.

Sophomore Class in Breeds of Live Stock.

Sophomore Class in Judging Live Stock.

During the three months that I have been connected with the College I have made three trips, of a week to ten days each, on Farmers' Institute work. At present, one student, W. H. Riddell, is taking post graduate work under my direction, in feeding.

We have fairly representative pure bred animals of most of the leading breeds of beef and dairy cattle, sheep and hogs. We need for class work in the study of breeds, Galloway and Jersey cattle, and Duroc Jersey hogs.

Our great need for efficient, practical instruction is in feeding animals and in feeding operations. The feeds and climate of Colorado are particularly adapted for the production of meat of the highest quality, and when Colorado stockmen become feeders the State will be noted for its large production of animals fattened on Colorado grown feeds, and the meat from these, on account of its superior flavor, will command a higher price than that from the corn belt.

The College should feed on a commercial scale, to enable our students to obtain a practical knowledge not only of the effect of different feeds, but of how to handle and manage stock on a money making basis. They cannot learn this from feeding small lots. We should feed cattle, hogs and sheep in carload lots, and have a sufficient number of carloads of each class to teach our students to be able to judge and select feeding animals on a carload basis, as a means of making a living that will be worth many times to them the studying and judging of a few choice pure bred animals.

For this purpose I recommend that the College feed each year ten carloads of beef cattle, raise and fatten each year one thousand hogs and feed two thousand sheep. The feeding should be conducted to make money. The work should all be done by students working under the direction of the Professor of Animal Husbandry. With such a system of four years of practical work in feeding, coupled with thorough theoretical work in the class room, our students would graduate ready to profitably operate feeding plants and would become leaders among our stockmen.

Few States have as favorable conditions for profitable poultry production as Colorado, yet the entire yearly poultry products marketed in the State will not supply Denver alone for more than sixty days, and one million and a half dollars' worth of poultry was shipped into Colorado the past year. Colorado should not only produce all poultry and eggs needed in the State, but should and could profitably ship several million dollars' worth each year to other States.

The Colorado Agricultural College should keep one thousand hens and produce on a commercial scale eggs, broilers, roasters, turkeys, ducks and geese. In connection with this work, we should establish a course in poultry raising and furnish an opportunity to every boy and girl in the State to learn how to hatch fowls the natural way and by incubators, and the feeding, breeding, fattening and marketing of poultry.

Respectfully submitted,

H. M. COTTRELL,
Professor of Animal Husbandry.

Fort Collins, Colorado, November 30, 1906.

REPORT OF THE DIVISION OF FARM MECHANICS OF THE AGRICULTURAL DEPARTMENT.

Prof. W. L. Carlyle, Dean of Agriculture, Colorado Agricultural College.

Dear Sir—I hereby submit plans for work which I believe advisable to carry out in the Farm Mechanics Department of the Colorado Agricultural College in the future.

While Farm Mechanics has been taught, to a limited extent, in connection with the Agronomy Department for the past two years, it has been organized as a separate Department since July 1st of this year. I arrived here from the Iowa State College the last of June to begin work organizing this new Department.

Shortly after arriving here, I accompanied a party of Farmers' Institute workers to the Western Slope for the purpose of obtaining information as to various state conditions. Since that time I have made several visits to various parts of the state for the same purpose. The remainder of the summer was spent organizing the work of the Department and securing machinery for instructional and experimental purposes.

For the reason that the Department is just being organized, there was no arrangement made for classes according to the College catalogue, other than the work taken up under the Agronomy Department last year. The work as outlined in the present catalogue for the regular course in Agriculture takes up the following:

Freshmen—Woodwork—Fall Term.

Freshmen—Iron Work—Winter Term.

Freshmen—Farm Machinery—Spring Term.

Farmers' Three Months Short Course:

First Year—Farm Machinery, three weeks—Second Term.

Second Year—Farm Mechanics—First Term.

During the first one-half of the present Fall term a special class has been organized in "Farm Motors," consisting of Seniors and Juniors in the Agricultural Course. The larger part of this class are continuing this work for the remainder of this term.

For next year I recommend that we take up the following class work:

Freshmen—Woodwork—Fall Term.

Freshmen—Iron Work—Winter Term.

Freshmen—Farm Machinery—Spring Term.

Sophomores—Rural Architecture—Winter Term.

Juniors—Farm Motors—Fall Term.

Seniors—Special Farm Mechanics—Spring Term.

Farmers' Three Months' Short Course:

First Year—Farm Mechanics—Second Term.

Second Year—Farm Motors—First Term.

Up to the present time we have been able to secure about $12,500.00 worth of farm machinery for experimental and demonstration purposes. This machinery has cost us nothing more than the freight charges from the nearest general agency of the manufacturer to Fort Collins. We will be able to secure several thousand dollars' worth more of sample implements and machines at no more cost than the above, providing we are furnished with enough funds to cover freight charges. Owing to the fact that implement companies are really asking us for an opportunity to place with us sample goods and that our shed room is very limited, it will be necessary to secure funds for more storage room in the very near future. There is no reason why the student who comes here from the farm, as well as the many interested visitors, should not be able to see well kept sample implements and machinery in this department. For this purpose we need room enough for at least $50,000.00 worth of farm machinery.

On account of not being provided with funds for experimental purposes, it is very difficult to outline work of this kind. We have, however, started some investigation work in the following lines, and expect to carry it out as rapidly as the necessary funds can be secured.

Pumping Plant. The College has agreed to furnish material for causing a well and equipping it to develop additional water supply for the College Farm and for an experimental pumping plant. We expect to dig this well on the College grounds with farm help. We now have a pump and have been able to secure a gasoline engine for power purposes, which can be used in connection with this work. This investigation is for the purpose of ascertaining the cost of lifting the water by gasoline, kerosene or denaturized alcohol; also to determine the amount of water necessary for the growth of certain crops and to gain general information regarding this method of securing water. We believe it also advisable to visit various pumping plants throughout the state for the purpose of securing general information in regard to equipment, arrangement, cost, practicability, etc.

Gasoline Engines. On account of the passage of the bill on denaturized alcohol, we believe it advisable to do experimental work with alcohol, comparing it with gasoline and kerosene. At the present time we are conducting a test comparing kerosene and gasoline for power purposes in the gasoline engine. For this purpose we now have seven gasoline engines.

Steam Plowing. Having secured a 25 H. P. Traction Steam Engine, equipped with eighteen plows, we believe it advisable to make investigation concerning the question of steam plowing, its cost, etc. In connection with this work we are anxious to secure such facts and information as may be obtained from various plowing outfits over the state and to place the data thus obtained so that it will be of value to the general public.

Draft Tests. We find that similar implements of different manufacturers vary greatly in the amount of power necessary to operate them. For the purpose of making comparative draft tests we have secured the use of a German Dynamometer from the U. S. Government.

Special. At the present time we have two manufacturers of grain drills making special drills for use under "Dry Farming" conditions.

Another company manufacturing Grain Graders have made us a special grader for grading beet seed, alfalfa seed and various small grains. We believe that the beet seed grading attachment will be of special value to the Sugar Beet Industry. Uniform sized seeds planted in check with a special planter so the beets can be cultivated both ways will certainly aid in the cost of beet production. By uniform size of seed, two can be dropped in each hill, and in case both seeds grow, one plant can easily be removed. Thus the question of beet thinning will be made less expensive.

We also desire to make special study and investigation of beet cultivators, pullers and toppers.

Still another field open for investigation is the "Use of Cement on the Farm," which we desire to take up.

Respectfully submitted,

H. M. BAINER,
Professor of Farm Mechanics.

Fort Collins, Colorado, November 7, 1906.

REPORT OF THE FARMERS' INSTITUTE DIVISION OF AGRICULTURAL DEPARTMENT.

Professor W. L. Carlyle,
Dean of Agriculture,
Fort Collins, Colorado.

Dear Sir—I have the following report to make as Director of Farmers' Institutes. This report covers the period from August 1st, 1905, to November 1st, 1906, and also covering practically all of the institute work that has been done since my appointment as Director.

The total number of Institutes held were 48; total number of sessions, 152; total attendance, 18,615; number of speakers employed from College Faculty, 16; speakers employed outside of the College, 10. With the exception of a few scattering counties in the Eastern part of the State which are as yet very thinly settled, Institutes have been held in practically all of the Agricultural counties of the State and in some of the counties covering large areas several Institutes have been held.

As regular Farmers' Institute work was new to the majority of our agricultural population, our first year's work has been largely of an introductory nature. This is necessarily more expensive work, as it involves sending out enough speakers to practically occupy all of the time of the Institute.

Commencing this fall we have very materially reduced the number of workers sent to each Institute and are seeking to place the work upon a more practical basis by limiting the number of subjects to be discussed and exhausting those subjects thoroughly. Eleven Institutes are being held during the present month, which will conclude our Institute work for the present year, as the Short Course at the Agricultural College, in December, followed by the holidays, will occupy all the time of the men who might be employed in the Institute work.

The cost of the work up to November 1st has been approximately $5,500.00, leaving a balance of about $2,500.00 to pay the cost of the Institute work this fall and early spring. In estimating the attendance at the Institutes, it has in most instances, been based upon count of the number attending the various sessions. During the past year we have succeeded in developing some local talent that can be used to good advantage in the future for Institute work in the field. We should have an appropriation for the ensuing two years of at least $10,000.00 and in the future the work should be confined to those localities expressing a desire for the Institute work. During the past two years we have, in a measure, forced the Institute work upon the people, as we were

compelled to introduce it. Now that the nature of the work is understood, however, I would recommend that Institutes in the future be given only when the people of any locality express enough interest in the work to request one.

By this method some localities will probably secure more Institutes than others, but this can not be avoided. It has been my policy to encourage the holding of Institutes wherever the people are inclined to show any interest whatever in the work.

In suggesting the increased appropriation for the ensuing two years, I do so under the idea that, in the future, members, of the Agricultural Faculty will be unable to give as much time to this work as they have during the past year, owing to the increased attendance at the Agricultural College. This will make it necessary to engage outside workers as other States do, and will necessitate larger expenditures. As a rule where the Institute has been well atended the effect has been good and there seems to be a general demand that the work be continued during the coming two years, provided funds can be secured from the Legislature. I am assured that we will have the co-operation of the farmers and stockmen generally in the securing of such an appropriation as may be necessary. Our ability to cover the large territory that we have and to hold so many Institutes on the small amount of money appropriated, is due to the liberal assistance provided by the railroads, which have generously provided transportation for our workers on practically all occasions, only one railroad having denied this assistance, and in that case half rate was secured. We have reason to hope that this assistance from the railroads will be continued.

At all of the Institutes we have made it a rule to very thoroughly describe the educational work being done at the Agricultural College and the advantages to be had by young men and women in taking an Agricultural Course at the College. We have also endeavored to interest farmers' wives and daughters in the work, and the attendance at all of the Institutes has been about equally divided between men and women. At many points we have been able to hold special sessions devoted to the women entirely, and as a rule we have found them very effective and popular. I believe that the results obtained from the Institutes already held during the period of this report have unquestionably been of great benefit to Agriculture in the State. The continuation of the work can not fail to bring the same benefits to Agriculture in Colorado that have been secured in other States where Institute work was not only new to the Agriculturists of the State, but also to the men and women from the College and elsewhere, who engaged in the work. I feel that we should be congratulated upon the complete success so far attained.

Very truly yours,

FRED P. JOHNSON,
Director of Institutes.

REPORT OF THE DEPARTMENT OF HORTICULTURE AND BOTANY.

To The State Board of Agriculture.

Gentlemen—I have the honor to present the following report of the Department of Horticulture and Botany for the year 1906.

There have been a number of changes in the personnel of the force of the Department during the past year. Prof. O. B. Whipple was transferred in April to the western part of the State, where he has charge of the Western Slope Fruit Investigations. Mr. E. R. Bennett came to us to take charge of the potato investigations in April, Prof. L. M. Paull was secured to take the place left by Mr. Whipple and assumed his duties at the beginning of the present school year. It will thus be seen that the Department has been materially strengthened and its work broadened.

The work of instruction has gone according to the schedule and the interest has been good. There are some changes in the course of study, however, which we hope to see adopted by the next school year.

FRUIT GROWERS' SHORT COURSE.

Arrangements are progressing satisfactorily for the Fruit Growers' Short Course which is to be held in Delta, beginning January 14th and continuing one week. The citizens of Delta County have taken an active interest in the school and give assurance of a large attendance.

WESTERN SLOPE FRUIT INVESTIGATIONS.

This work, which you authorized at your last December meeting, was duly inaugurated last spring. Mr. E. P. Taylor, a graduate of this College, was appointed Entomologist, and O. B. Whipple, formerly assistant in this department, Horticulturist. Their reports will appear elsewhere, but I may say here that the results have far exceeded our expectations. The calls that came to these men by mail and telephone requesting visits of inspection would have taken all of their time had they been fully met. But a number of experiments were undertaken and results have been attained which should be of much value to the fruit growers.

POTATO INVESTIGATIONS.

The importance of the potato crop in the State seemed to warrant the employment of an expert to devote his entire time to its study. The problems concerned are of such a nature that several years must elapse before much can be accomplished. A good start has been made with the work and a number of leading experiments have been outlined for next season.

EQUIPMENT.

The Department is now very well equipped with apparatus. In former reports I have mentioned our needs in the way of new greenhouses and suitable land for orchard purposes. These needs are still urgent.

The development which the Department has undergone in recent years is certainly gratifying to me and I therefore wish to express my appreciation of the liberality and fairness with which my requests of the Board have always been met.

Respectfully submitted,

W. PADDOCK,

Professor of Horticulture and Botany.

Fort Collins, Colorado, November 15, 1906.

REPORT OF THE DEPARTMENT OF MECHANICAL ENGINEERING.

To The State Board of Agriculture:

Gentlemen—I have the honor to submit herewith the annual report of the Department of Mechanical Engineering.

The students in the first and second Sub-freshman years have received instruction in wood working, being taught the ordinary bench work of the carpenter. This is all the departmental work these students get until they reach the Freshman year.

The Freshman students have received instruction in drafting and bench work in wood and, in connection with their shop work, have had text book work bearing upon the subject.

The Sophomores have received instruction in machine drawing, workshop appliances, machine design and special machines. Their shop work has consisted of training in wood turning and pattern making.

The Juniors have taken up the subjects of machine design, principles of mechanism, steam boilers, steam engines, metallurgy and pumping machinery. Their shop work has been in the foundry.

The Seniors have received instruction in gas and oil engines, steam engine design, transmission of power, thermo-dynamics, compressed air machinery, heating and ventilation, railway mechanical engineering, contracts and specifications.

All the work has been accomplished, and, we believe, with direct benefit to those students who have profited by their opportunities. We have used modern methods in the classrooms, laboratories and shops, and while students have much to learn after leaving college, we are confident they will not have to learn over again what has been taught them. The industrial prosperity and activity of the country calls for large numbers of young men trained along mechanical lines and this demand promises to be long continued. The young men from this Institution are measuring up to the requirements of the times and are to be found in many places of responsibility and trust.

The rapid advance in the improvement of methods and machinery has brought about many changes. High steam pressures are calling for stronger and better boilers, and this in turn calls for better steel. Improved tool steels have called for changes in the design and construction of machines and these new machines are capable of turning out work much more rapidly than ever before. The electric drive has been put to many uses not thought of a few years ago, and has a general tendency to hurry up things.

Great discoveries and the rush of modern methods is calling for more from the young men in the way of knowledge of things and affairs, and this Department has tried to keep up with the world's work in the lines required of us, and if the evidence of those students who have made a success of their work counts, then we have done it.

We believe the work of the Department is in line with that of the best schools of the kind, and that our graduates are able to hold their own.

Respectfully submitted,

J. W. LAWRENCE,
Professor of Mechanical Engineering.

Fort Collins, Colorado, November 15, 1906.

REPORT OF THE DEPARTMENT OF CIVIL AND IRRIGATION ENGINEERING.

To The State Board of Agriculture:

Gentlemen—I have the honor to present the annual report of the Department of Civil and Irrigation Engineering for the past year.

The work of the Department has been hampered by lack of room. The present quarters were outgrown a good many years ago. Though the quarters were a convenience at the time this building, the oldest one on the grounds, was assigned to this Department some twelve years ago, they were even then inadequate, because of lack of laboratory facilities and for instruction in matters relating to irrigation and hydraulics, which requires much more laboratory room. It would have proven entirely inadequate except for the fact that the fields, ditches and reservoirs, streams and mountains of the surrounding country have been used to a great extent as a part of our laboratory equipment. There are more enterprises of this character and more illustrations or irrigation work within a moderate distance of Fort Collins than in any other center. The lack of laboratory room, therefore, forces more attention to outside work, but from the standpoint of teaching, this course has very serious disadvantages. The progress of this State depends so largely upon water that questions of this character are of great importance, but we cannot do what we should, either for our students of for the State without greater facilities of this kind. The requirements of teaching and all programs for recitations do not readily lend themselves to the use of laboratories which may be several miles away. The lack of room has been seriously felt. In the lack of class rooms a make-shift has had to be made to find recitation rooms. Likewise the drafting room has been a make-shift, and moderate sized classes have made it necessary to overflow into adjacent rooms at great inconvenience, as well as under conditions that are not possible for the best work. The fact that we have reached the capacity of the building for instruction has stood in the way of increasing the number of students, although there has been a steady growth.

With the lapse of years there has also been a steady cause of anxiety in the increasing dilapidation of this building. The foundation has settled and the walls have cracked seriously. It is a frequent question as to the safety of the building. Manifestly it cannot be considered as a safe structure for many years longer. If it should be that it is necessary to still occupy this building for some time in the future, I should recommend the construction of an addition or some temporary structure, even a tent, to meet the necessity of additional room. That this building occupies a

central position on the grounds has made us hesitate to recommend temporary additions, unless they could be so built as to be pleasing to the eye. At the same time our necessities are increasing and we must have additional room.

This Department was organized and the course in Irrigation Engineering established in 1890. There had been a Department of Physics and Engineering established in 1887, with Prof. Elwood Mead in charge, and with his resignation in February, 1888, the present head succeeded him. Physics remained attached to the department until 1905.

The Board had recognized from the first the importance which Irrigation and Irrigation Development played in the State and in all the Western States, and that instruction in it was fundamental to the general welfare of the State. It was at their desire and upon their motion, that the original step was taken toward instruction in Irrigation and the establishment of the course in 1890. This was the first course of the kind in this country, and that it has been useful is shown by the record of its students. Since that time many other Institutions have followed this lead and have established courses especially strong in Hydraulics and in Irrigation Engineering, and even eastern schools are giving instruction in this branch. Even from the agricultural standpoint it is recognized that such engineering is the fundamental part of western Agriculture. The eternal problem is to increase the production of our soils, or to render them capable of production. The most necessary element for a plant to obtain is water. In the humid climates of the east this is supplied by the climate, and the problem there becomes largely one of obtaining other elements and the study of chemistry becomes most important. In this region, in the absence of sufficient rainfall, the primary need is for water. The obtaining of water and bringing it to the land is an engineering question, and consequently we find that engineering is of corresponding importance in the west, although not recognized in the east as a part of Agriculture.

The general intent of the Board seems to have been to cover in this course some of the questions relating to Agricultural Engineering, and these have been more or less closely associated. Instruction has been given in Roads, in Farm Irrigation, in Practical Irrigation and Agricultural Hydraulics. The general attempt is to so prepare our students that they shall be qualified to occupy positions of usefulness in the community and in the development of the State.

It is unnecessary to specify the separate studies which are shown in the course of study as given in the catalogue. It may, perhaps, be well to mention that some of these lines of work and study, which have been given in this Department for a number of years and so announced in the catalogue and planned for with the full approval of the Board, are announced by other

Departments of the College, thus making a duplication of work. If it be the intention of the Board that this duplication should exist, it is only proper that it should be clearly understood and expressed.

The work of a College such as this is largely judged in its collegiate work, by the character of the students we turn out and the benefit which they have received, and the training either in discipline or in special work. A number of years is required for a student to show his training and to find his place. Sometimes a good many years are required. It is always a matter of interest to observe the career of students, and so some record has been made from time to time of the work of former students, especially those who have had instruction along the line of irrigation. The following list is therefore only a partial one, showing the work of many of those who have had instruction in Irrigation Engineering. It is a list in which the College may take pride. The first figure being the year of their graduation, the first place being the place they came from. The list is incomplete. Many of those who have taken the course have gone into other occupations, some are dead, and the addresses and history of some have not been well known.

1892. C. W. Beach, Fort Collins. Graduated from the University of Illinois, 1893; special gaging work for the Colorado Experiment Station; mining surveyor, Victor; in charge of the river records and surveys for the Great Plains Storage Co., Lamar, from Twin Lakes to the State line, 1896-1904; Practicing engineer Arkansas Valley, in charge of considerable construction; Deputy State Engineer, 1905.

1892. Frank Beach, Fort Collins. Special student of the University of Nebraska; Supt. New Mexico Sub-Station at Las Vegas; Of the San Luis Valley Sub-Station, Monte Vista; Prof. of Agriculture and Irrigation Engineering, Montana Agricultural College; Farmer and County Surveyor, Las Animas; Farmer, Fort Collins.

1892. L. L. Stimson, Greeley. Special work for the Experiment Station, 1893; Practicing irrigation engineer, Greeley; County Surveyor of Weld County, several terms; City Engineer, Greeley; as such, had charge of the construction of extensive improvements to the city water works during his term; Surveyed and constructed many of the large reservoirs in Northern Colorado, the Jumbo, Empire, etc.

1892. Porter J. Preston, Longmont. In charge of canal rating and river gaging, State Engineer's office, 1893-'96; Engineer, Pawnee Pass Reservoir Co.; In charge of river service in the Arkansas Valley; Construction Engineer, Fort Lyon Canal enlargement; Supt. of the Fort Lyon

Canal (110 miles long), Las Animas, for several years; Deputy State Engineer, 1903-'04; Construction Engineer in charge of canal system and reservoir, Lewiston, Ia.

1893. J. D. Bloomfield, Meeker. Assistant in Irrigation Engineering Experiment Station, Irrigation Engineer, Greeley; Took charge of the Phyllis canal, Nampa, Idaho, organizing and making a financial success of it in 1894-1904; Cashier of the newly organized Citizens' State Bank, Nampa, Idaho.

1893. S. Boothroyd, Arkins. Assistant City Engineer, Fort Collins; Student at Chicago University; Professor at Mt. Morris College, Ill., and at Bellvue College, Nebraska; Assistant Astronomer Lowell Observatory, Flagstaff, Ariz.; Assistant Prof. Engineering, Fort Collins; Assistant Mechanics, Cornell University, Ithaca, N. Y.; Summers in charge of a party on the International boundary survey, between Alaska and Canada.

1893. R. F. Walter, Fort Collins. Irrigation Engineer for a number of years, at Greeley; County Surveyor, of Weld County; City Engineer, of Greeley; Planned and constructed many irrigation ditches and reservoirs, Engineer Reclamation Service 1902, and has been promoted to Division Engineer in charge of South Dakota, and as such is responsible for all surveys and construction of the Belle Fourche Project, S. D.

1895. J. B. Balcomb, Russell, Kan. Practicing mineral surveyor in Colorado, Engineer of various mines and in charge of various hydraulic constructions and mining work in Palo Alto, California.

1895. Henry Calkins, Harris. Assistant Civil Engineer, Molly Gibson Mine; Medical student, Denver; Practicing Physician, Leadville.

1895. E. P. Cooke, Dowagiac, Mich. From responsible position in Iowa, and now connected with the construction and supervision of a large power plant in California and Nevada.

1895. L. B. Curtis, Denver. For several years Assistant Engineer, having charge of the construction work of the Denver Tramway Co.; Engineer on hydraulic projects, including New Century Mining Company, at Gore Canon; Construction Engineer of 115 mile power transmission plant, from California to the Mining Camp of Nevada, making a record in construction.

1895. Geo. W. Nelson, Denver. Has been assistant Superintendent of mines at Grand Forks, B. C.

1896. H. F. Alps, Loveland. Assistant Meteorologist, Experiment Station, Fort Collins; Observer of the U. S. Weather Bureau, Nashville, Tenn.; Lewiston, Idaho, and Reno, Nevada.

1896. R. W. Hawley, Fort Collins. Assistant Supt. Nampa Canal, Idaho; Assistant Engineer of the Western Homestead Co., Albuquerque, N. M.; Assistant Irrigation Engineer for gaging in the Arkansas Valley for the Colorado Experiment Station; Gauger for the State Engineer's office, Denver; On topographical survey in the Reclamation Service, Supt. of the Carson Sink Canal, Carson City, Nevada.

1896. G. S. Norman (Colored), Hamilton, Ohio. Became 2nd Lieut. 8th Inf. in the Cuban war; Instructor in mathematics Bluegrass Normal and Industrial Institute, Keene, Ky.; Instructor in Mathematics and Agriculture, Agricultural and Mechanical College, Normal, Ala.

1896. R. W. Sears, Rye, Colo. Principally associated with stock interests, though also with some irrigation developments.

1897. A. J. Harris, Fort Collins. Entered the regular army as 2nd Lieut. during the Cuban war, Promoted to Captain —— Inf., stationed at the Philippine Islands.

1897. R. S. Gray, Wyoming. In public Service in the P. I., Deputy Division Supt. of Education, Iligan, P. I.

1897. D. J. Richards, Salida. Enlisted during the Spanish war, in public service, since Deputy Post Master, Manila, P. I.

1898. H. O. Brown, Salida. In business with his father and then on the Engineering corps of the D. & R. G. Ry.; Now Engineer, Los Angeles, California.

1898. R. C. Calloway, Livermore. Foreman of the College farm, Fort Collins; Farmer, Bellevue, Washington.

1898. F. S. Hotchkiss, Hotchkiss. Farmer and Irrigation Engineer, Hotchkiss, Colorado.

1898. Amos Jones, Canon City. Assistant Engineer Crystal River Railway; Assistant in Engineering, Agricultural College, Fort Collins; Entered Reclamation Service in charge of topographical surveys in Nevada; Special Deputy from the State Engineer's office in charge of Arkansas River distribution; Civil Engineer, Stockton, California.

1898. C. E. Swan, Delta. Has been connected with the Engineering Department of the U. P. Coal Company, Rock Springs, Wyo., from a short time after graduation. Now

is principal assistant engineer and has charge of the surveys of many mines in Wyoming and Colorado.

1898. M. D. Williams, Victor. Assistant Engineer, West Galla tin Irrigation Co., Montana; On the Short Line Railroad Survey; Pike's Peak Power Co., where he met with a serious accident; Especial work in the Experiment Station at Fort Collins; Engineer of the Kuykendall Co., Saratoga, Wyo.; In stream gaging and survey with the U. S. Reclamation Service, Arizona and Oregon; Practicing Irrigation Engineer, Klamath Falls, Oregon.

1899. Frank Corbin, Fort Collins. Succeeded to his father's interest in business in the firm of Corbin-Black Lumber Co., Fort Collins.

1899. N. M. Fitch, Denver. Has been in the engineering party of the railroads in Texas and Missouri since graduation, and is now resident engineer of the T. & O. Ry., Ada, Indian Territory.

1899. L. C. Hall, Canon City. City Engineer, Canon City, in charge of extensive sewer improvements.

1899. W. R. Headden, Fort Collins. In the Director's office of the Experiment Station; Graduated from Renssalaer Polytechnic Institute, Troy, N. Y., and is now an instructor therein.

1899. J. C. Mulder, Holland. Entered the Civil Service and is now Provincial Supervisor, Province of Bohol Tagbilaran, P. I.

1900. J. A. Stump, Canon City. Instructor in the Engineering Department of this College for several years, then a student of law at Ann Arbor and is now a practicing attorney at Canon City.

1900. T. M. Donelson, ————. Principally in engineering parties on railroad work and now assistant engineer on the Mexican Central Railroad at Aguas Calientes, Mexico.

1900. E. C. McAnally, Fort Collins. Has been county surveyor of Larimer county and City Engineer of Fort Collins for several terms. Constructed the scenic road up the Big Thompson Canon to Estes Park; also had charge of the construction of the Fort Collins water works, which cost over $200,000.

1901. Jas. H. Andrews, Fort Collins. Student at Columbia University, N. Y. In charge of location surveys on the Grand River canal at Lulu Pass; In charge of the trestle and sewer work for the Great Western Sugar Company at Fort Collins in 1905; in charge of extensive railway improve-

ments on the C. & S. between Longmont and Fort Collins; Instructor in Department of Civil Engineering, Fort Collins, and post-graduate student 1906.

1901. A. Jacob, Antonito. Assistant in stream gaging and seepage measurements for the Experiment Station; On the Engineering force of the Great Plains Co., at Lamar; Assistant in the State Engineer's office 1903-4; Practicing Engineering, Denver.

1901. G. B. Stannard, Fort Collins. Assistant Engineer in the coal mine surveys of the Colorado Fuel & Iron Company for a number of years. Now a practicing engineer in Denver.

1902. L. E. Cattell, Ohio. Has been steadily in railroad employment in engineering parties in Ohio since graduation.

1902. Oro McDermith, ————. Fellowship in the Agricultural College, and also served as instructor. Assistant in the U. S. Reclamation Service stream gaging and topographic surveys; now in charge of one heading of the Gunnison Tunnel, Montrose, Colorado.

1902. Oliver Pennock, Bellvue, Colo. Assistant in surveys for Mr. J. C. Ulrich on the Grand Valley Canal at Lulu Pass. Permanent address, Bellvue, Colo.

1902. R. E. Richardson, ————. Assistant in special work of the Experiment Station; Assistant Engineer on the construction of Lake Reservoir for the C. F. & I. Co., at Leadville; Practicing Engineer, Delta; Surveyor and practicing engineer, Longmont.

1902. Harry True, Nepesta. Had a fellowship and acted as instructor in the Agricultural College; Assistant in stream measurement State Engineer's office, Denver; Assistant Engineer Panama Canal, under Civil Service, in 1905-06; On reservoir surveys at Sterling.

1903. C. E. Davis, Canon City. Deputy City Engineer, Canon City.

1903. D. D. Gross, Greeley. Draftsman in the Engineer's office of the Denver Union Water Company, Denver.

1903. R. P. Jackson, Denver. Principal assistant in the State Engineer's office 1903-05; Now in the Engineering force of the American Smelting Co., Salt Lake City.

1903. W. A. Lamb, ————. Assistant in gaging for the Experiment Station; Assistant in stream gaging U. S. Reclamation Service in Northwestern Colorado; Now permanently connected with the U. S. Reclamation Service.

1903. R. C. Murphy, Glenwood Springs. Surveyor at Glen wood Springs.

1903. J. A. Phillips, Fort Collins. In the engineering party on the Grand River Canal; With the Great Western Sugar Company at Fort Collins and Longmont in the development of lime quarries.

1904. H. V. Hubbell, Fort Collins. Assistant to the Consulting Engineer for Colorado in the Kansas-Colorado suit, in charge of stream measurements in Kansas 1903-04; In gaging near Pike's Peak in 1905; Irrigation Engineer, Longmont, and now Engineer on the Western Pacific Ry., in Utah.

1904. Ralph Parshall, Golden. Instructor in the Agricultural College; Charge of survey of a railroad now constructed in the Arkansas Valley; In charge of the students' Field Camp in 1905 and 1906.

1904. Howard Sneddon, Salida. In charge of gaging on the upper Arkansas River for the Consulting Engineer for Colorado in the Kansas-Colorado suit; Now a railroad engineer in New Mexico.

1905. P. J. Mulder, Holland. Engineer for the ——— ——— Company, in charge of construction of a dam near Portland, Oregon.

1906. R. L. Cooper, New Windsor. On surveys for the Great Plains Company at Lamar.

1906. J. C. Counter, Brighton. On surveys of reservoirs near Julesburg, Colorado; Now Engineer for the North Poudre Irrigation Co., Fort Collins.

1906. Geo. M. Neel, Greeley. Assistant Engineer Central Colorado Power Co., Boulder, Colo.

1906. Littell Snively, ————. Engineer for the North Poudre Irrigation Company, Fort Collins and Wellington; Appointed Assistant Engineer U. S. Government, under Civil Service October, 1906, for service in the Philippine Islands.

G. L. Swendsen, a graduate of Harvard College, took special instruction in the summer of 1898. Professor of Engineering in the Utah Agricultural College; in charge of the Utah division of the Reclamation Service, and now Division Engineer, Salt Lake City.

E. P. Sandsten, from Wisconsin, a graduate of the University of Wisconsin, took part in some water and crop development in Minnesota and Wisconsin. Now in the Wisconsin Experiment Station.

Field instruction through the Field Camp still occupies its high place in our estimation as a desirable part of the training, as it has in past years.

For this purpose the students in this course are required to return to us in the fall two weeks earlier than other students, and spend that time in field instruction in the mountains. Under the rearrangement of the course every student will take three such trips. The camp this fall had nearly thirty. The main camp was made on the margin of Estes Park, and the work consisted of surveying a reservoir site with an inlet canal from Fall River. The Sophomores and Juniors composed this party. A portion of the inlet canal was through very precipitous country that could scarcely be traversed, and conditions were good for excellent training.

The Seniors formed a separate camp on the western slope under the instruction of Prof. House. Their camp used Grand Lake as a base of supplies, and their work consisted of running triangulation for a tunnel from Grand River to Estes Park, which would require a tunnel of about eleven miles. A great deal of the work was above timber line and consisted of severe and trying work. In this, as in all instances, the students have shown great zest and willingness to stand privations with alacrity, and ability to do work of a high order.

Each student pays the principal part of his expenses, though the expense has been more than has been thought best to assess. The instruction corresponding in that respect to laboratory work in the various laboratories of the College, which require an outlay for material as well as for the time of the instructors.

Previous classes have made surveys of reservoir sites, also have run lines of levels to the top of Long's Peak, have surveyed reservoir sites both on the Big Thompson and Fall River, which surveys have subsequently been used as the basis of filings by the owners of the land.

We have so far chosen Estes Park as the principal place for our work, because it has the greatest number of conveniences for this purpose. It is far enough from the College for the work to be isolated from such distracting influences, it has regular lines of communication, daily mail and express service, telephone, grocery stores available to supplement our commissary supplies, and from the standpoint of our responsibility an important point is that it has medical service to be called upon in case of necessity. So far in the years which the Field Camp has been continued we have had no accident, and no occasion for medical service, except for minor cases that may arise from camp fare.

Other places have been under consideration from time to time, but so far we have not found it best to make a change. With the growth of the size of the camp party, which has been the case during the past few years and is likely to be in the

coming years, some other arrangements are probably desirable. Thus the extreme limit of our equipment is for about thirty to thirty-five. The indications are that this coming fall we shall need to prepare for forty-five and possibly fifty. This not only requires addition to our equipment, but the proposition becomes an increasingly difficult problem and increasingly expensive. It, therefore, is a question if it were not desirable for us to do as eastern institutions have found it necessary to do—that is, to purchase a small tract of land and there erect a central building which may be used as a mess hall, and leave the tents, stoves and permanent part of the outfit from year to year. The saving in transportation would pay a large part of such expense.

At the beginning of this fall term Prof. G. N. Houston, who had been connected with this department for the past two years, was offered the place of Professor of Engineering in the University of Arizona, and resigned his position here at the beginning of the term, and with the Field Camp just fairly started. The work of the Field Camp was continued very well with Mr. Ralph Parshall, who had been acting as instructor in surveying, and the students received excellent training. The department was assisted during the fall term by James H. Andrews, a graduate of the department in the class of 1901, and who has had responsible work in some of the important irrigation work in this section, also with the Great Western Sugar Company in charge of the work at the Fort Collins factory, also having had charge of the improvements on the C. & S. in northern Colorado. His work has been very acceptable.

The vacancy has been permanently filled by the appointment of Mr. Robert W. Gay, a graduate of the New York University, who has had a variety of field experience, also experience as an instructor in Lehigh University for several years, assistant to Prof. Mansfield Merriman, the head of the department of Engineering in that Institution, and a well known author of many valuable text books. Mr. Gay came to us at the end of the Fall term and took up active work with the beginning of the present term. The work of the Department has begun with the change with a great deal of promise. The students are as numerous as our facilities will permit, are enthusiastic, doing good work and with excellent results, and have also the feeling that there is not only opportunity to benefit themselves, but also to benefit the community.

Respectfully submitted,

L. G. CARPENTER,

Professor of Civil and Irrigation Engineering.

Fort Collins, Colorado, November 15, 1906.

L. G. Carpenter,

Professor Civil and Irrigation Engineering.

Dear Sir—I submit herewith the semi-annual report of the work done as Assistant Professor in the department of Irrigation Engineering. The summer was spent in the Grand Valley upon the investigation of the seepage problem in that valley.

On August 27th the start was made for the field camp at Estes Park, and two weeks were spent with the Senior Civil Engineers of this College. We were camped at timber line on the western slope of "Flat Top" and, although the weather conditions were not favorable, we succeeded in completing the triangulation of a line for a tunnel from Grand Lake in Middle Park to Willow Creek in Estes Park.

During the three months of the Fall Term just closed, the following classes have been taught:

Senior class in Hydraulics.

Junior class in Strength of Materials.

Sophomore class in Photography.

Senior Civil Seminar has also been under my direction.

The afternoon work in the Testing Laboratory was hampered on account of the delay in receiving the parts of the testing machine sent away for repairs; otherwise the work done by all the classes was good and fully up to the standard.

Respectfully submitted,

E. B. HOUSE,

Associate Prof. Irrigation Engineering.

Fort Collins, Colorado, November 15, 1906.

REPORT OF THE DEPARTMENT OF ZOOLOGY AND ENTOMOLOGY.

To The State Board of Agriculture.

Gentlemen—I have the honor to present the following report from the Department of Zoology and Entomology.

The subjects taught in this Department now are Elementary Physiology, Advanced Physiology, Elementary Entomology, Advanced Entomology, Animal Parasites, Histology, Embryology and Evolution of Animals.

The Elementary Physiology is given to all first year preparatory students who do not have passing grades in this subject from accredited high schools.

The Advanced Physiology is taught to the Sophmores of the Agricultural, Horticultural and Domestic Science Courses, and to the Seniors of the Normal Course.

The afternoon laboratory work which used to be given with the Physiology was cut out when the Veterinary Course was introduced. While this is all right for the young men, some arrangement should be made for laboratory work for the women.

Zoology is taught to the students in the Agricultural and Domestic Science Courses. A special effort is made to give the student a good general knowledge of the important types of structure, and the development of the various organs and tissues found in animal bodies, and also to show the relations that exist between these organisms and their environment.

Entomology deals with the insect world and is only required of those students that take the Agricultural or Horticultural Courses. The first term in this subject is practical in its aims, only so much of the structure and general life habits being given as is necessary for an intelligent use of remedies and preventative measures. Two terms of advanced work are also offered to those students who wish to specialize along the lines of either economic or systematic Entomology. So far, the Department has not been able to supply the demands for trained Entomologists and those who have taken our advanced work in Entomology have been quickly picked up to fill positions in various parts of the country. The large systematic collection of insects, and the good scientific library that we now have, are an essential basis for this work.

The lectures to Juniors in the Agricultural and Horticultural Courses upon Animal Parasites, deal with economic species that attack domestic animals either externally or internally, the habits, symptoms and remedies being given in each case.

Histology, which is a study of the tissues of the body, is also taught to the students taking the Agricultural and Horticultural

Courses. So far as possible, the student is taught to prepare the tissues he examines, but the Department has on hand a large variety of tissues in permanent mounts for students' use. The subject is a most interesting as well as a most necessary one for a proper understanding of the organs composing animal bodies.

The lectures in Embryology to Seniors of the Agricultural and Horticultural Courses aim chiefly at laying a foundation for the understanding of the laws of heredity, while they also give a general idea of the first steps in the development of all animals, beginning with the process of maturation and fertilization.

The lectures upon Evolution (or development) of animals are given in the Senior year as a sort of fitting climax to what has gone before in this Department. The theory of Evolution as propounded by Darwin, with the evidence for and against it, and the laws of heredity and variation are discussed, and to make the lectures more easily understood, they are illustrated with numerous lantern slides.

MUSEUM.

The College Museum is now in roomy quarters, but, for lack of funds with which to obtain specimens, it grows very slowly. The recent purchase of over 100 pieces of pottery from the Cliff Dwellings of Montezuma County is by far the finest single acquisition that the museum has had for a long time. The museum collections are unduly crowded now for want of sufficient case room. Mr. L. C. Bragg is in special charge of the museum, and has added many specimens from his own collecting during the year, but I have had to keep him busy in entomological work much of the time.

OUTSIDE WORK.

Much of the time of the head of the Department is required in attending Farmers' Institutes and Horticultural meetings, and in investigating insect depredations in the State. As a result, it has become necessary to throw the teaching of the Department more and more upon the first assistant, Mr. S. A. Johnson.

The work of Miss Palmer as artist in this Department is extremely helpful, especially in my study of injurious insects.

Very respectfully submitted,

C. P. GILLETTE,
Professor of Zoology and Entomology.

Fort Collins, Colorado, November 8, 1906.

REPORT OF THE DEPARTMENT OF CHEMISTRY AND GEOLOGY.

To the State Board of Agriculture.

Gentlemen—I have, in compliance with the requirements of the State Board of Agriculture, the honor to present the following statement of the doings of the Department of Chemistry and Geology since my last report and of its present condition.

The teaching required of the Department has materially increased within the past two years, because it has been necessary to give more time and consideration to the requirements of students taking special courses.

The Department has carried out the work prescribed in the catalogue, adhering faithfully to the courses as laid down. Some changes have been made by other departments in the amount of chemistry required in their special courses, adding somewhat to the work of the Department of Chemistry. The amount of our teaching work has, partly due to this fact, increased till we have at this time ten schedule and twenty laboratory hours weekly, which, in the spring and winter terms, will be further increased by ten schedule hours, making twenty schedule and twenty laboratory hours weekly.

The standard of work in the Department has been maintained as heretofore, but we have not been able to advance it as we would be pleased to do. Changes in the course, extending the required amount of work, have not seemed advisable; in fact, they have not seemed permissible under the obtaining conditions. We have, however, tried to keep fairly well abreast with the advances in this subject by the introduction of new text books whenever it has seemed advisable, and we could do so without inconveniencing others.

While I would be greatly pleased to be able to very materially extend the course, both in the class room and laboratory work, I am still of the opinion which I expressed two years ago, i. e., that under the present conditions it would be of very doubtful advisability.

Our facilities for teaching chemistry are good. If our students had the desire and time to prosecute the study of this branch of science, we are in position to offer them excellent opportunities to prepare themselves for advanced work, particularly in those lines pertaining to Analytical Chemistry.

I have no requests to make in connection with the carrying on of the work of the Department.

The building under my charge is in good condition. The only thing, probably, to which I should call your attention is the condition of walls, which, in the course of the nine years that the building has been occupied, have become very black, due, largely, as I believe, to coal dust. The radiators are not provided with any device to divert the current of heated air from the walls or to catch the dust; consequently, the heated air, with its burden of dust and dirt, sweeps against the walls from the radiator to the ceiling, leaving the dust to mark its path. These walls can not be washed. We have tried this with very bad results. The only thing that can be done with them that will probably give continued satisfaction is to paint them, so that they can be washed and in this way be kept clean hereafter.

Respectfully submitted,

WILLIAM P. HEADDEN,
Professor of Chemistry and Geology.

Fort Collins, Colorado, November 8, 1906.

REPORT OF THE DEPARTMENT OF DOMESTIC SCIENCE.

To The State Board of Agriculture.

Gentlemen—The following is the report of the Department of Domestic Science for the fiscal year just closed. As far as was possible, the work has been prosecuted in accordance with the outline scheduled in the catalogue. An intenser interest has been manifested in the Department as a whole than ever before.

We regret that more young women do not take the regular four years' course; however, the young women who are enrolled in the College in any of its departments take an unusual interest in the work. Excellent work has been done by the young women the past year. The only woman graduating in the regular course, Miss Edna Garbutt, secured a scholarship in the Department of Literature and History.

When this class were Freshmen the standard of the College was raised one year. This necessitated the taking of another Freshman year by the class. Most of the women dropped out, hence the lack of women in the 1906 class. There were three Normal students who finished the two years' course prescribed for them, and they, with all other women graduates of the College who so wished, secured positions. Eight young women of the Second Year Normal Class are candidates for graduation.

Some work in regard to new buildings for this Department has been done. While there is nothing tangible to present in the way of definite sums of money being available, at the same time considerable encouragement has been received.

The Department has long since outgrown its present quarters. But for the courtesies shown by Dr. W. R. Thomas and Professor Paddock's Department, I do not see how our work could have been carried on successfully.

I am sure that your Honorable body realizes the needs of the Department, and we feel sure that, whenever you can, you will aid us in securing more comfortable and commodious quarters.

I would recommend that Miss Anna M. Tuttle be given a scholarship.

In regard to special expenditures, I think the Purchasing Committee will handle that according to the best interests of the College.

Respectfully submitted,

THEODOSIA G. AMMONS,
Professor of Domestic Science.

Fort Collins, Colorado, November 15, 1906.

REPORT OF THE DEPARTMENT OF VETERINARY SCIENCE.

To The State Board of Agriculture.

Gentlemen—This department gives instruction to students in the Agricultural, Domestic Science and Short Courses. The classes are all larger this year, the students are a better average, and the quality of work done, so far, is superior in every respect.

PRESENT QUARTERS INADEQUATE.

We have outgrown our present quarters, and it was found necessary to seek room for the Freshman class in another building. This was unfortunate and was attended with much inconvenience, as the models, charts, skeletons, etc., needed in this class were also necessary in our own rooms for the other classes.

The class in Bacteriological Laboratory is larger this term than usual. Our Laboratory consists of a table along one end of our main class room. This limited space, combined with our meagre equipment, made it necessary to divide the class of fifteen into two divisions, they receiving one-half of the work laid down in the curriculum.

In this Department, as much, or possibly more, than any other, does the practical in education especially appeal. It is of small value to farmer boys to merely discuss the structure of the animal body, the dressing of wounds and animal castration. They must get out and not only see these things, but take a hold and do with their own hands. Our work in Clinic and Dissection, beginning with the winter term, will find us poorly equipped for this practical work. The dissection room has been practically abandoned, on account of being too small and because of the unsavory odors which reach the library above. To use the stock pavilion would be to practically monopolize it for the term. In order to make complete dissections, the cadavers must be kept over for several days, and would be in the way of other classes. The worst feature of it is not the inconvenience, to student and instructor, but rather the fact that we may not be able to maintain the high standards of work hoped for.

DEMANDS FOR A VETERINARY COURSE.

The meat inspection law, recently enacted by the Federal Government, has caused an unprecedented demand for qualified Veterinarians. Such a course established in this school would no doubt be very popular, and would bring to our College a large number of desirable students. If started, however, it should be on a very high plane. The American Veterinary

Medical Association has fixed a high standard for eligible graduation. The days of the "hoss doctor" are few and his destiny is oblivion.

Every College, if it would approach the ideal of the American Association, must see to it that the terms "Gentleman," "Scientist" and "Veterinarian" are synonyms.

An estimation of the probable expense of starting a Veterinary Course has been placed in the hands of President Aylesworth. While my fondest wish is, and my highest ambition all the time has been, to see such a Course established in this Institution, yet I insist that it would be unwise to start it until it can be launched off on such a pretentious scale as would redound to the credit of the College as a whole. The first essential in this respect would be an appropriate building.

I respectfully request that the salary of Dr. Newsom be raised to an amount more nearly commensurate with his ability and services rendered. His work has been very satisfactory.

The Federal Government is bidding for competent Veterinarians at a salary beginning with twelve hundred dollars per annum. We can scarcely hope to keep a desirable man at a less figure.

Respectfully submitted,

GEORGE H. GLOVER,
Professor of Veterinary Science.

Fort Collins, Colorado, November 15, 1906.

REPORT OF THE DEPARTMENT OF PHYSICS.

To the State Board of Agriculture.

Gentlemen—I have the honor to report that thet past year has been a very successful one for this Department. The work of some classes was rendered difficult by the lack of sufficient lecture room and laboratory quarters, but the students have responded cheerfully and heartily with the instructors for thoroughness in theoretical knowledge and in laboratory practice.

The term just closing has been severe in its demands on the teaching force of the Department, caused, in part, by the natural growth manifested in the increased number of courses offered, in part by the very large enrollment. The latter made the formation of three laboratory divisions in the Sub-Freshman work imperative and necessitates the meeting of laboratory classes continuously from half past one to six P. M.

All classes are showing good interest and the general spirit of the students is of the best. They respond readily and cheerfully to all reasonable requests for work and show a pride in their results that is very gratifying.

Better instruction in all classes has been made possible by thoroughly overhauling the demonstration and laboratory equipment. Many pieces of sorely needed apparatus have been constructed and a system of prompt repair of breakage, wherever possible, keeps all apparatus at high efficiency. Our equipment is gradually rounding toward a well balanced arrangement, but it is still deficient in some special lines, notably Mechanics and Light.

The improvements made in the late summer for better ventilation are very good, provision has been made for installing a fan that will furnish a positive quantity of fresh air as soon as power is available for driving the motor. This promises to solve our problems in ventilation.

The teaching force of the department is striving earnestly to be able to meet the increasing demands that must necessarily be put upon it by the rapid growth of the College, and, in hearty co-operation with the other departments, is working for the highest standards of character and scholarship.

Respectfully submitted,

CHAS. A. LORY,
Professor of Physics.

Fort Collins, Colorado, November 15, 1906.

REPORT OF THE DEPARTMENT OF CONSTITUTIONAL HISTORY AND IRRIGATION LAW.

To the State Board of Agriculture.

Gentlemen—The regular work of this Department has proceeded in a most satisfactory manner since the date of my last report. Covering five important lines of study in the Junior and Senior years—Advanced History, the Constitution of the United States, Political Economy, International Law and Irrigation Law—constant study and research are required in order to be able to present to the respective classes the latest and most advanced developments in each one of these topics.

The summer vacation was spent in attending the various Teachers' Normal Institutes held throughout the State, and in presenting to these assemblages of educators the claims of industrial education upon the youth of Colorado. Formal lecturers on historical topics, and informal addresses on industrial, constitutional and other subjects which were being considered by the different Institutes were given. From one to four addresses were made to each of the Institutes. The value of this work, which last summer required 3,700 miles of travel, lies in the fact that it keeps the public school teachers of the State in touch and sympathy with the work of the College.

A few words as to the relation of the general work of the Department to the student body, and of its important bearing on the future of its graduates may not be out of place in this connection. While the special duty of the College is to impart an industrial education, no institution maintained by public funds does its whole duty to its students that fails to give adequate instruction along lines that promote good citizenship and impress the civic responsibilities that will devolve upon them when they arrive at the full stage of manhood and womanhood. More than any other, the industrial classes, for whose special benefit this class of colleges was created, and on whom rests the stability of the republic and the future of free institutions, need a knowledge of the constitution of their country; of the system of government and of laws that have grown up under it; of the relation that the nation has borne and should continue to bear to foreign governments; of the influence that such economic questions as markets, transportation, taxation, public expenditures and tariff regulations have upon their personal prosperity, as well as upon the prosperity of the nation. In no other manner can high ideals of citizenship, and of civic uprightness be impressed upon the youth of the State, and as this duty is well performed, so will this College, and all similar

institutions, become influential factors in promoting the welfare of the Commonwealth, and the future greatness of the Republic.

In the arid region, a knowledge of irrigation institutions, of the laws, customs and usages of the distribution and administration of water, is especially necessary for the Agricultural and Engineering classes. There are errors in the past that remain to be corrected; there are problems rising that must be determined in the future, and as these are adjusted wisely, justly, equitably, so will the Agricultural and Horticultural welfare of Colorado be placed on a more prosperous and substantial basis. Hence the intimate relation of the study of irrigation institutions to the Agricultural and Engineering Departments of the College—wise legislation as to water titles, and an efficient and equitable water administration being absolutely essential to all material growth and prosperity in the arid region.

In conclusion I have to express my knowledgements to the President and to my associates in the Faculty and to the members of the Board for their constant courtesy and assistance.

Very respectfully submitted,

W. R. THOMAS,

Professor of Constitutional History & Irrigation Law.

Fort Collins, Colorado, November 15, 1906.

REPORT OF THE DEPARTMENT OF LITERATURE AND HISTORY.

To The Honorable Board of Agriculture:

Gentlemen—The Department of Literature and History completes another successful year with this report. Attendance upon classes has been large, and the work characterized by increased earnestness on the part of students.

By permission of our College President, and your Honorable Board, I have spent four months of this year in travel in Europe, leaving my classes for the last month of the Spring term in charge of my sister, Mrs. F. G. Willson, of Urbana, Illinois, who completed most satisfactorily the work of the Department for the year. I return to my place this fall with renewed interest, and with the benefit of the inspiration which the student of History and Literature never fails to find in the Old World.

The lecture course for young women supplied for the last three years by this Department is continued, and our thanks are due to the following friends who have given helpful programs since my last report:

Miss Ruth Paxson, Chicago, "In College, What? After College, What?"

Dr. Frank Bayley, Denver, "The Best Gifts."

Miss Olaf Krarer (A native Esquimau), "Life in the Frozen North."

Mrs. Helen L. Grenfell, Denver, "One Part of a Girl's Life."

C. A. C. Girls. A Symposium.

Dr. Louise Hannum, Greeley, "Some Literary Teachers."

Department of Music and Elocution, C. A. C., Recital.

May I call your attention to the fact that the number of women students who select our four years' College course is constantly decreasing. I believe that as soon as funds will permit, this course would be enriched by the addition of more extended work in Modern Languages, and such general science and culture courses as are particularly desired by young women who seek higher education for well developed womanhood. With the additional attraction offered by our courses in Domestic Science, we ought to furnish the most attractive course for women in the State, but while enrollment of women in the four years' courses of other Colleges has increased remarkably during the last few years, we find that in this course our attendance has steadily decreased until this year only four women students, two juniors and two freshmen, are enrolled in our regular four years course.

I wish to express my appreciation of the assistance supplied to my Department this year through the scholarship plan. Miss Garbutt is giving excellent service, both as instructor and office assistant.

May I also express the satisfaction I take in the increased library facilities. Every improvement in the library is an enlargement of every Department of the College.

With hearty appreciation of many courtesies received during the year from our College President and the Board of Agriculture. I am, Very respectfully yours,

VIRGINIA H. CORBETT,
Professor of Literature and History.

Fort Collins, Colorado, November 15, 1906.

REPORT OF THE DEPARTMENT OF MATHEMATICS.

To The State Board of Agriculture:

Gentlemen—The work of this Department for the past year has comprised classes as follows:

(1) Winter Term, 1905-06.

One hundred and ninety-nine students enrolled in Differential Calculus, Descriptive Geometry, Plane and Spherical Trigonometry, Plane Geometry, Elementary Algebra and Arithmetic and reciting in ten divisions.

(2) Spring Term, 1906.

One hundred and sixty-seven students enrolled in Integral Calculus, College Algebra, Solid Geometry, Elementary Algebra, and Arithmetic, and reciting in nine divisions.

(3) Fall Term, 1906.

Two hundred and fifty-one students enrolled in Plane Analytics, Descriptive Geometry, College Algebra, Plane Geometry and Elementary Algebra, and reciting in ten divisions.

The full program of the catalogue has been accomplished with a good standard of scholarship. The general attitude of the students is for hard work, while the number of failures is not above the average.

My summer in the University of Chicago gave me an opportunity to compare our schedule and standard of work with many other schools in the country. As a result of this investigation it is my purpose to make a few changes in our course—changes toward a more concrete application of the advanced problems of mathematics to physical and engineering science.

I have to report the harmonious co-operation of my two assistants, and beg to express my appreciation to the President and Board for their continued courtesies.

Respectfully submitted,

S. L. MACDONALD,
Professor of Mathematics.

Fort Collins, Colorado, November 15, 1906.

REPORT OF THE DEPARTMENT OF RHETORIC AND COMPOSITION.

To The State Board of Agriculture:

Gentlemen—In compliance with your order of November 3, 1906, I hereby submit my report for the year ending November 30, 1906.

GENERAL MENTION.

The work of the Department from November 30, 1905, to September, 1906, I can not report as I did not come to the College until September of this year.

During the first term of the college year 1906-1907, we have been making special effort to get in touch with the work and with the general preparation of the students. We have been somewhat handicapped by large classes. The following schedule gives the number of classes and the number of students in the Department during the present term.

Two (2) Sub-Freshman Classes in Lockwood and Emerson's Elementary Rhetoric. Number of students 82

Two (2) Freshman Classes in Baldwin's College Rhetoric. Number of students 85

One (1) Senior Civil Engineering Class in Creighton's Logic. Number of students 3

In connection with the work of this Department should be mentioned the work in Interpretative Reading, by Miss Baker. The course is for the First Sub-Freshmen only. Half the time given to it is taken from History and half from Rhetoric. For further information concerning this course, see the report by Miss Baker.

FIRST SUB-FRESHMAN CLASS.

The First Sub-Freshman Class is composed of students of very unequal preparation. Some of them have come from good country schools, some have come from poor country schools, while some of them have had a year or more in High School. Consequently the best work can not be done. A considerable part of the time that should be devoted to Rhetoric must be given to Grammar. Either the students should be kept out until they have mastered Grammar, or a course in the study of Grammar should be offered. It is hardly fair to keep the students that are well grounded in Grammar back with those who need another year of work in the subject.

The majority of the class is doing good work. Realizing that the ability to speak clearly and forcibly is almost a necessity, the class has organized a debating society, in which every member will

be on the program once a month. The meetings are held every Friday at 11:15 a. m.

FRESHMAN CLASS.

There are eighty-five students in the class. This number includes the Junior ladies from the Domestic Science Department. The program schedule gave us but one hour for the whole class. The recitation room is too small to accommodate so large a class. About half the number agreed to come to class at 7:30 a. m., so the class was divided. One division recites at seven-thirty and one at eight-fifteen. Although the recitation periods are a little short, fairly good work has been done.

We find that the graduates of good High Schools are better prepared than the students who have come up through the preparatory course here. The students from the High Schools have had much more work in English. The text used in this class is for University rather than College students, and is too difficult. We believe that a simpler text, with more practical work will give better results and increase the efficiency of the Department.

Spelling in all classes is poor. Systematic work needs emphasis. To that end every student is working up a long theme (50 to 125 pages), on a subject of special interest to the student making the investigation. Among the subjects for treatment are the following:

The Development of Irrigation in Colorado.

The Development of Hereford Cattle.

The Summer Tourist.

The Combustion Engine and Commerce.

Reclamation of Worn-out Farms.

Transportation and Commerce.

Four months of systematic work will be put upon these subjects. It is expected that methods of investigation and habits of thought will have been acquired that will be of great value.

It seems that if students work along together in the Freshman Class, whether from the Preparatory Course here, or from good High Schools, there should be more work done in the Sub-Freshman course. The students should have daily work in English during the two Sub-Freshman years.

SENIOR LOGIC.

In Logic we are handicapped by a text meant for the specialist and not for business or professional man, who wants only to reason carefully and well. The class is small but means business. The library facilities for the study of Logic are nil, hence the greater need of a superior text.

RECOMMENDATIONS.

1. We respectfully recommend that provision be made for more English work in the Sub-Freshman classes, because the work given is not adequate.

2. We recommend either that students, who are deficient in Grammar, be not allowed to enter the First Sub-Freshman Class. or that a course in Grammar be offered.

3. Since almost daily written exercises are necessary for the best work in English, and since much better work could be done in this Department, could we offer a course in Grammar, we recommend that an assistant be secured for the Department, the said assistant to take one or more classes and aid in the manuscript work.

These recommendations are urged in the belief that much better work would result, were they granted.

Respectfully submitted,

B. F. COEN,
Professor of English.

Fort Collins, Colorado, November 15, 1906.

REPORT OF THE WORK IN READING.

To The State Board of Agriculture.

Gentlemen—The work in Reading was begun the last of September. It is confined to the Sub-Freshmen who are grouped into two divisions of forty-seven and thirty-seven pupils each. These classes have now diminished to thirty-two and forty-three students.

The aim of the work is to teach students to read aloud intelligently from newspapers and magazines, or understandingly from a text book, if called upon by an instructor in recitation.

In each recitation there is some formal work from a standard text—Interpretative Reading—In addition they are given sight reading from the current press, and practice work in original talks of two minutes each. It takes two recitations to call on each member of a class, and this gives the individual only two or three minutes.

Particular emphasis is placed on the use of the unabridged dictionary. Students are required to use the main body of the work, the various appendices and the supplement. Practice words and phrases are assigned, and the student not only writes out such work in recitation, but must hand in note books at stated intervals. In addition to the dictionary, the use of a few standard reference books, which are to be found in most libraries, is taught.

I think that intelligent reading aloud is rare, and that this accomplishment is useful and practical for the secondary student.

All of which is respectfully submitted,

CHARLOTTE A. BAKER,
Instructor in Reading.

Fort Collins, Colorado, November 15, 1906.

REPORT OF THE DEPARTMENT OF MODERN LANGUAGES.

To the State Board of Agriculture.

Gentlemen—The work in the Modern Languages, including French, German and Spanish, is confined chiefly to the Second Sub-Freshman year, although several students in the higher classes take advantage of the work offered, so that we have, in all, about a hundred in this Department. I am asked, almost every day, why the courses, begun in the Second Sub-Freshman class, are not continued in the college proper. I am certain that we lose students every year, because they cannot get the work in Language which they desire.

I should like to suggest that, in the near future, the scope of this Department be widened and enlarged, that the Language work be carried over into the College course, and that students be given an opportunity to take this work if they so desire. Scientific and Engineering students need this work to enable them to read the technical literature necessary to their advancement and success.

Very respectfully yours,

SARAH I. KETTLE,

Instructor in Modern Languages.

Fort Collins, Colorado, November 12, 1906.

REPORT OF THE WORK IN BOOKKEEPING AND FARM ACCOUNTS.

To The State Board of Agiculture.

Gentlemen—I herewith respectfully submit my report as instructor of Bookkeeping and Farm Accounts.

The class in Bookkeeping is small, owing to the fact that only those students taking a straight course and having the time to devote to this subject are eligible for admission. The present courses of study are so arranged that the student desirous of receiving a knowledge of Accounts finds it, in most cases, impossible to do so. Is not this subject important enough to occupy a place in the curriculum of one or more of our courses? At the present time there are thirteen students in the class, all doing creditable work.

The experience I received with the Short Course students, in Farm Accounts, last year assisted me materially in outlining the work for the class this year. The time being limited for class room work, I was obliged to outline something entirely different to our present system. With "Vye's Farm Accounts" as a text, I have arranged a simple and practical system of accounts, a system adapted for the farmer and stockman and one which requires only the minimum amount of work and at the same time gives the necessary information.

We look for a large attendance at the opening of the Short Course term, December first.

Respectfully submitted,

CHAS. G. DWYRE, JR.,
Instructor in Bookkeeping.

Fort Collins, Colorado, November 13, 1906.

REPORT OF THE LIBRARY DEPARTMENT.

To the State Board of Agriculture.

Gentlemen—The following summary of the annual report concerning the Library is respectfully submitted.

There are a number of items besides the inventory and the statistical matter which would properly come into this report, but the principal part is devoted to an outline of the policy of the library with regard to storage of books and library service.

STORAGE, OR SHELVING AND HOUSING OF BOOKS.

Within five years we have grown in bulk from about 10,000 volumes to about 30,000 volumes, and have moved from the old library rooms into the building lately known as the Commercial Building.

We have added shelving until we have about 4,500 feet, and within five years we shall need more than 7,000 feet. We can add nearly 1,200 feet by building another story to the main stack and 324 feet in the reading room.

Either an addition or box storage will be needed at the end of two years (September, 1908). The expense can be kept below $1,000 for an addition just west of the delivery room and between the two wings.

We have about 6,000 volumes shelved in department libraries in the buildings on the College grounds and that can be increased to 10,000 volumes by building additional shelving, but that does not alter the estimates as given above; that will have to be done in any event, if we continue our present department library policy.

The present library building and present accommodations will shelve about 25,000 volumes only and we have about that number on the shelves.

Documents of the United States government must be shelved or we shall lose our designation. There is an agreement equal to a contract to that effect, and we are observing it to the letter and we could hardly give good service in this library without them.

It is frequently remarked by those who use the library and by our visitors that we need a "new library." We do need a new building, but we need a good book collection first. The *service* which is demanded more and more, year by year, calls for a better collection of literature, maps and reference material than we possess, and this report omits all minor questions in order to give space to the points to be considered in *service*.

SERVICE IN THE LIBRARY OF AN AGRICULTURAL COLLEGE.

An *intensive* collection of books is one which is devoted to a definite field with complete, or nearly complete, material in that field of knowledge. It breeds specialists within the library staff and reinforces all the work of faculty and students, whereas a *general* collection scatters its energy, costs too much money without adequate effect and returns, and duplicates the mediocrity of several neighboring collections.

Nearly all the libraries of Colorado and the West are general collections, and we can easily make this library a *notable* collection by *intensifying*.. It will cost money; as much money as a general collection, but the results are not in the same class. A few libraries in America have caught this idea and are easily leaders for reference work in this classes.

It is cheaper for a scholar to take a journey to the John Crerar library in Chicago for scientific work than to stay at home surrounded by all sorts of general and public libraries; Newberry Library for genealogy; Madison or Topeka for history, etc., etc. (East of Chicago the tale is more complete.)

Our present tendency is toward—

Agriculture.
Engineering (our special field).
Domestic Science.
Public Health.

AGRICULTURE.

The importance of immediate work upon our collection is greater than can be explained without an investigation by an active library committee working through a year with regular meetings. Our collection of documents alone is so weak that we should complete what we can before the material vanishes into the maw of an ever-increasing number of new libraries and libraries who have come to this intensive-collection *policy*.

We have bought about everything in United States Agricultural Department publications for sale in the market, and have some money left which we can not spend by correspondence. Our set is still incomplete and we ought to go out and find where the material is stowed away in duplicate collections, in private collection, and for sale in the market. A personal canvass is all that is left for us, and that must be done before another year if we intend to have a good working set of those very important publications. The same is true of state publications and all other official documents in agriculture.

We have catalogues of about 50,000 printed cards to cover the United States Agricultural Department publications, and it is growing very rapidly.

We can still buy books by correspondence.

ENGINEERING.

Periodicals, transactions of learned and engineering societies, official publications and a mass of monograph literature can be bought by correspondence, but a great deal of that is disappearing and some special effort should be made to assist Professors Lawrence, Carpenter and Bainer in filling lists which their ability would make extremely valuable to this library.

DOMESTIC SCIENCE AND PUBLIC HEALTH.

Official documents, monographs, transactions and occasional publications of great value in scientific and popular research lie all about, and we have a great deal to do before we reach the condition which I have described under the head of Agriculture. We can buy from lists and catalogues for a long time and we can increase our correspondence on all these lines.

GENERAL LITERATURE AND CURRENT INTERESTS.

While we are very well equipped for the work under this head we lack a few books of reference value—dictionaries, concordances, glossaries, lexicons, bibliographies—books which skim the cream and condense information for quick use.

LIBRARY COMMITTEE.

There are two library committees; one of the Board and one of the Faculty, and the relation of these two to the librarian, to library policy, and to each other, has never been clear.

In order to shape a policy for this library there should be a *Library Committee with the Librarian as a member* of that Committee. The Committee should meet several times each year and should become familiar with the whole working of this library. My relations with the Faculty Committee of the Library leads me to think that such a committee would be very helpful. The Faculty are interested in this library and always help whenever there seems to be an occasion, but a committee who would make a business of this library policy for a few years would be of great importance in the future of this library.

To the present incumbent it seems important that the librarian should be a member of the Committee on library.

CATALOGUING.

Our catalogue makes progress more rapidly since we have begun to buy Library of Congress printed cards and, in all, we have about 80,000 cards in catalogue condition, ready for use. 50,000 we received as gift for United States Department of Agriculture publications, and 30,000 are in the new dictionary catalogue. The dictionary catalogue will be increased to about 100,000 as fast as we can arrange them.

This form of service is important, and when combined with the help of intelligent specialists will be worth much more than

the cost. It is now in constant use, although incomplete, and it will soon be the most important help in the library.

A thorough explanation of catalogue service and the preparation of the catalogue is not possible in a report, but a great deal is well understood by every one who has to use a library.

INCREASED USE OF THE LIBRARY.

In spite of the fact that we have large Department Libraries and in the face of our circulation records, which do not appear to change from year to year, we are doing an immense amount of reference work for so small a library in such inadequate floor space and with so few helpers. This little library fairly boils with business during the busy hours of the day, and it is the most gratifying thing to a librarian to see the increase of systematic work and intelligent use of books in the student body. Since the improvements in shelving and lighting in the reading room, there is a growing demand for evening service, and as soon as we can see our way clear to do so, the librarian recommends that the library be open for evening use.

APPRENTICE CLASS IN LIBRARY SCIENCE AND ECONOMY.

We are often asked if we have a training class or a library course, and a brief explanation is given here.

We always have two or three students in library training. We require two years' work and not less than four hours a day. We require in addition to our work a reading knowledge in French, or German, or Spanish. Without this one must take regular College work in one Modern Language. No grade below the College entrance requirements will be considered and higher grades are preferred.

We do not guarantee positions to those who take the work, but we have been fortunate enough to place those who complete the work. We are obliged to limit the number of apprentices and we shall have to omit most of the work in binding until we have more room.

Additional reading, either in College classes or under the librarian is required. Examinations are held as in other work.

HISTORY OF THE LIBRARY.

Information concerning the foundation and history of the library may be found in the annual catalogues of the College. The growth and other statistical matter is given in this and previous annual reports of the librarian.

DONATIONS AND EXCHANGES.

The list of donations is too long for this report, covering several pages.

Our exchanges are extremely valuable and run to a large number of pieces. Our list of addresses for mailing to these exchanges is about 300 in number.

BOOKS IN THE LIBRARY—ANNUAL TABULAR STATEMENT.

Latest accession number		14,300
Missing and withdrawn	1,200	
Experiment station library	1,233	
Blank numbers	777	
		3,200
Number of volumes accessioned in the library		11,100
Number of volumes not accessioned in the library		10,100
Bound volumes in College library		21,200
Pamphlets, duplicates and other unbound matter		18,000
Total of all pieces		39,200

Respectfully submitted,

JOSEPH F. DANIELS,
Librarian.

Fort Collins, Colorado,
November 15, 1906.

REPORT OF THE DEPARTMENT OF PHYSICAL TRAINING.

To the State Board of Agriculture.

Gentlemen—I accepted the position of Physical Director of the Colorado Agricultural College in the latter part of July, 1906. I reported in Fort Collins August 25, 1906, and immediately began active work in the way of becoming acquainted with the general surroundings and planning an outline for my year's work.

I am devoting from seven to eight hours daily to the gymnasium, which is entrusted to my care, and it has been my aim to get the best possible results for the College as well as causing the students to feel satisfied with their work.

During the Fall term I had charge of the football team, and while the work was not entirely satisfactory to me, the season ended without injury to any student thus engaged.

The gymnasium classes, while yet in their inception, show increased improvement in general work. The gymnasium is very well equipped for this class work, and the interest shown by the students pleases me greatly. Owing to this fact it will be a pleasure for me to try to cause each one so interested to be in better physical condition by the end of the year.

The different athletic teams are in my charge and I shall devote such time as is beneficial to the College in general to such sport.

Should any member of the Board or Faculty wish to advise with me in the matter of suggestions for the improvement of this branch of College work, I shall be pleased to have an interview at any time.

Respectfully submitted,

C. J. ROTHGEB,
Physical Director.

Fort Collins, Colorado, November 15, 1906.

REPORT OF THE WORK IN DRAWING.

To the State Board of Agriculture.

Gentlemen—I am outlining the drawing for the first Sub-Freshman class this term. I have endeavored to carry it along the lines which will be most helpful to the students later in their class and laboratory work, where some drawing is required.

I have confined the work entirely to pencil drawing. The classes may take up some water color or other medium in the spring term. The work this term has been outline, and light and shade in plant forms, blocks, outdoor sketching on the campus, and some figure sketching. Special attention has been given to the study of the rules and laws of perspective.

There have been seventy enrolled in the two classes together, and the work on a whole has been very satisfactory, much more so, in fact, than I had anticipated.

Yours respectfully,

NELLIE M. KILLGORE,
Instructor in Drawing.

Fort Collins, Colorado, November 30, 1906.

REPORT OF THE DEPARTMENT OF INSTRUMENTAL MUSIC.

To the State Board of Agriculture.

Gentlemen—I commenced work as Head of the Instrumental and Theoretical Department of Music at the Colorado Agricultural College, September, 1906, under a contract by which there shall be no expense to the College. During the first term, I have enrolled sixteen pupils in all; three in Harmony, two in History of Music, and sixteen in Piano. At present I am giving twenty hour lessons a week.

There has been great interest shown by the students in their work, and a continued increase in numbers, which is most hopeful.

Respectfully,

ANNE PARKER MINER,

Instructor in Instrumental and Theoretical Music.

Fort Collins, Colorado, November 30, 1906.

REPORT OF THE DEPARTMENT OF VOCAL MUSIC.

To The State Board of Agriculture:

Gentlemen—Since last September I have had charge of the Vocal Department of the C. A. C., also Band, Orchestra, and Glee Club.

I have a good sized class of vocal students, and more to come in the first of next term. There are twelve voices in the Glee Club, all interested, and in a short time will be in good shape for concert work. The Band consists of twenty pieces and is doing good work. The Orchestra will begin work soon.

Respectfully submitted,

R. C. BEAVER,
Instructor in Vocal Music.

Fort Collins, Colorado, November 15, 1906.

REPORT OF THE DEPARTMENT OF MILITARY SCIENCE.

To The State Board of Agriculture:

Gentlemen—Pursuant to your communication of the 3d instant, I have the honor to render a report covering the period from my joining this Institution to the present.

The undersigned was placed on College duty by Paragraph 10, Special Order No. 39, War Department, dated Washington, D. C., February 14, 1906; joined and assumed command of the Cadet Battalion, and charge of the Department of Military Science and Tactics, March 7, 1906.

The Battalion at that time consisted of a band of 24 musicians and four companies, averaging thirty-eight to the organization, under the command of Major R. A. Maxfield.

The present Battalion is as follows:

Field staff and band	25
Company "A"	56
Company "B"	54
Company "C"	54
Company "D"	54
Total	243

During my first inspection of the Battalion I noticed that the uniform was the same as that recently discarded by the Regular Army, and entirely unfit, as well as unbecoming, in every respect. Report to this effect was made to the President of the College, who informed me that such change as I deemed fit to make in this line would meet with his hearty approval; so, as a consequence, a neater and more appropriate blouse was adopted, which has already brought about a great change in the Cadets' appearance, as well as a pride in wearing it. Formerly, and with reason, the blouses of the Cadets were always worn unbuttoned while out of ranks and on the streets, which must have given outsiders a bad impression of the discipline of the College, but now, I am happy to state, this has been overcome and brought about by the recent change in the uniform, which is much more attractive than formerly, their pride having been aroused in a most gratifying manner.

A service chevron has been added lately. Those that have spent three full years in this College, or other like Institutions, are permitted to wear them. This, also, I have reason to believe, will show good results. The band will make a good appearance with its new white belts and breast cords of mixed red and white, to be worn during parades and occasions of ceremony.

The discipline of the College, as I made report to the Military Secretary, U. S. Army, Washington, D. C., last September, is very good. This, considering the fact that the Cadets are only under the immediate command of the instructor about four hours a week, and the rest of the time either in class rooms or quartered out in town, there being no dormitories.

The need of a drill hall is very apparent, for during inclement weather but two companies can drill at a time in the present armory, which is very poorly ventilated and unfit to be used, outside of a place to store rifles and equipment.

I can not renew the recommendation of the former commandant to change the present light Cadet Springfield rifle for the Krag Jorginson rifle, which, I am informed by the Chief of Ordnance, U. S. Army, has not been lightened for Cadet organization. A rifle any heavier than the present one could not be well handled by certain of the Cadets not up to the physical standard of the others in the companies.

It is to be regretted that no target range is within easy reach of the College, but since so small an allowance of ammunition is allotted, I do not believe good results could be obtained; it takes weeks of very careful training in pointing, sighting and aiming drill before one is qualified to go to the target range. In the meantime the drilling of the companies and battalion is close and extended order ceases.

Lectures and instruction are to be given the Cadets in the following Military subjects: Field service regulations, Army regulations, Hygiene, First aid to the wounded, Firing regulations, and Guard Duty. This is outside of the weekly three-hour practical instruction.

A system of marking should be adopted by the Faculty whereby the Military Professor can tighten up the strings of discipline where needed; standing in the Military Department should count equally with other departments, and those not qualifying themselves should be expelled from the Institution no matter what their standing be.

The Company drill has greatly improved in the last few months.

The interest taken in the Military Department by the President of the College is most gratifying, and I wish also to record my appreciation of the courtesy and prompt support given me as Commandment.

Respectfully submitted,

THOMAS M. ANDERSON, JR.,
Captain 7th U. S. Infantry,
Professor Military Science and Tactics,
Commanding Battalion.

Fort Collins, Colo., November 15, 1906.

APPENDIX

AUDIT OF

State Agricultural College

FROM

DECEMBER 1, 1892, TO NOVEMBER 30, 1903

By Harry E. Mulnix

FROM

DECEMBER 1, 1903, TO NOVEMBER 30, 1906

By Continental Trust Company,

By E. F. Arthur, Auditor.

To the Honorable State Board of Agriculture.

Gentlemen—I have the honor herewith to hand you my report of the business transactions of the Agricultural College and Experiment Station for the period commencing December 1, 1892, and ending November 30, 1903.

I am pleased to say that I find the accounts as kept by your Secretary, Mr. A. M. Hawley, to be in most excellent shape. I believe, however, that his work, which in my opinion is heavier than it should be, can be lessened, if the funds which can be legally drawn from the State Treasurer in a "lump" sum, and paid out locally, are handled in this manner. At present, with the exception of a very few bills, his office is required to make out both vouchers and bills in duplicate. This system, while it is necessary in the present manner of disbursing the college funds, could be safely changed if the accounts were paid at the College in cash, in which case but one voucher and one bill would be necessary. Then, too, in the matter of salaries and student labor accounts, permit me to offer the suggestion that the Secretary make up a pay roll in books prepared for the purpose, and instead of the person being compelled to receipt two vouchers and two bills he would only be required to sign the book when paid. This, I believe, would be a sufficient record for the Institution and would reduce the work of the Executive Committee, the Secretary, and all others who have to handle the accounts of the Agricultural College.

I might add that the disbursements of the Agricultural College funds require more work in the Auditor of State and the State Treasurer's Offices than do all the other state educational institutions combined.

I have made some suggestions to Secretary Hawley with reference to the accounts which my familiarity with the offices of the Auditor and the Treasurer of State leads me to believe that if followed may be of much benefit.

Respectfully submitted,

H. E. MULNIX,
Examiner.

Fort Collins, Colorado, June 1, 1904.

RECEIPTS AND DISBURSEMENTS.

Experiment Station Fund.

Local Treasurer.

RECEIPTS.

1893—December 1 to June 30	$ 8,713.73	
1893-4	19,675.26	
1894-5	17,287.55	
1895-6	15,000.00	
1896-7	15,065.86	
1897-8	15,000.00	
1898-9	15,000.00	
1899-00	15,000.00	
1900-01	15,000.00	
1901-2	15,000.00	
1902-3	15,000.00	
1903—November 30	7,500.00	
		$173,242.40

DISBURSEMENTS.

Overdraft, November 30, 1892	$ 462.82	
Printing Annual Report	1,046.44	
Salary Account	104,661.27	
Stationery, etc.	497.28	
Printing Bulletins	10,886.08	
Building Account	1,697.25	
Meteorology and Irrigation	5,537.97	
Library	171.08	
Divide Station	1,881.94	
Cheyenne Station	6,582.76	
San Luis Valley Station	3,878.63	
San Luis Valley Station Survey	431.67	
Seepage Survey	856.03	
Contingent Expense	30.00	
Feeding Experiment	3,392.62	
Director's Office	2,239.05	
Chemical Section	3,708.18	
Entomological Section	1,947.52	
Arkansas Valley Station	17,110.80	
Executive Committee	409.85	
Association of Agricultural Colleges	70.00	
Agricultural Section	2,002.43	
Horticultural Section	2,062.21	
Traveling	27.50	
Unexpended balance, November 30, 1903	1,651.02	
		$173,242.40

EXPERIMENT STATION.

Special Fund.

Local Treasurer.

RECEIPTS.

1897 and 1898	$ 1,909.11	
1898 and 1899	2,649.40	
1899 and 1900	1,364.78	
1900 and 1901	1,711.85	
1901 and 1902	2,727.69	
1902 and 1903	623.20	
		$ 10,986.03

DISBURSEMENTS.

Agricultural Section	$ 163.81	
Arkansas Valley Station	2,195.65	
Printing Bulletins	1,240.45	
Chemical Section	447.25	
Entomological Section	278.09	
Feeding Experiment	358.65	
Horticultural Section	410.62	
Meteorology and Irrigation	911.56	
Rainbelt Station	741.75	
Salary Account	2,153.29	
San Luis Valley Station	382.70	
Executive Committee Expense	444.35	
Divide Station	21.80	
Stationery Account	110.50	
Director's Office	1,085.57	
Library Account	39.99	
		$ 10,986.03

EXPERIMENT STATION.

Special Fund.

State Treasurer.

RECEIPTS.

1895.		
July	$ 262.62	
September	201.88	
October	159.48	
November	243.85	
December	10.00	
1896.		
March	187.40	
April	835.25	
May	773.66	
June	278.57	
September	60.41	
November	149.96	
December	47.00	
February	162.13	
March	65.60	
		$ 3,437.81

DISBURSEMENTS.

Executive Committee	$ 454.40	
Traveling Expense	24.15	
Arkansas Valley Station	474.56	
Feeding Experiment	123.00	
Salary Account	1,468.28	
Printing Bulletins	555.27	
Printing Annual Reports	100.00	
San Luis Valley Station	75.00	
Chemical Section	30.60	
Irrigation Section	98.50	
Horticultural Section	5.25	
Rainbelt Station	28.80	
		$ 3,437.81

SUMMARY EXPERIMENT STATION AND EXPERIMENT STATION SPECIAL ACCOUNTS.

November 30, 1892, to November 30, 1903.

RECEIPTS.

Experiment Station (Local Treasurer)	$173,242.40	
Experiment Station (State Treasurer)	3,437.81	
Special Fund (Local Treasurer)	10,986.03	
		$187,666.24

DISBURSEMENTS.

Overdraft, November 30, 1892	$ 482.82	
Printing Annual Report	1,146.44	
Salary Account	108,282.84	
Stationery, etc.	607.78	
Printing Bulletins	12,681.80	
Building Account	1,697.25	
Meteorology and Irrigation	6,449.53	
Library	211.07	
Divide Station	1,932.54	
Cheyenne Station	7,324.51	
San Luis Valley Station	3,953.63	
San Luis Valley Survey	431.67	
Seepage Survey	856.03	
Contingent Expense	30.00	
Feeding Experiment	3,874.27	
Director's Office	3,324.62	
Chemical Section	4,186.03	
Entomological Section	2,225.61	
Arkansas Valley Station	19,781.01	
Executive Committee	1,308.60	
Association of Agricultural Colleges	70.00	
Agricultural Section	2,166.24	
Horticultural Section	2,478.08	
Traveling Expense	51.65	
San Luis Valley Station	382.70	
Irrigation Section	98.50	
Unexpended balance, November 30, 1903	1,651.02	
		$187,666.24

AGRICULTURAL COLLEGE AND MECHANIC ARTS' FUND.

RECEIPTS.

Balance in Treasury November 30, 1892	$ 8,209.44	
1893 and 1894	19,000.00	
1894 and 1895	20,203.00	
1895 and 1896	21,000.00	
1896 and 1897	22,000.00	
1897 and 1898	23,000.00	
1898 and 1899	24,000.00	
1899 and 1900	25,000.00	
1900 and 1901	25,000.00	
1901 and 1902	25,000.00	
1902 and 1903	25,000.00	
1903 and 1904	25,000.00	
		$262,412.44

DISBURSEMENTS.

Salary Account	$244,174.46	
Mechanical Department	2,641.14	
Horticultural Department	657.88	
Chemical Department	4,565.78	
Physics and Engineering	1,800.24	
Mathematical Department	32.60	
Zoology and Entomology	619.98	
Library	22.57	
Farm Department	95.40	
History and Literature	93.50	
Unexpended balance, November 30, 1903	7,708.89	
		$262,412.44

RECEIPTS AND DISBURSEMENTS OF AGRICULTURAL COLLEGE TAX FUND.

RECEIPTS

Balance in Treasury November 30, 1892	$ 11.61	
1893 and 1894	34,830.03	
1894	35,352.24	
1895	33,299.51	
1896	31,711.63	
1897	38,072.61	
1898	38,786.56	
1899	36,616.02	
1900	38,504.97	
1901	41,010.48	
1902	60,795.37	
1903	72,858.92	
Overdraft	900.23	
		$462,750.18

DISBURSEMENTS.

Overdraft, November 30, 1892	$ 4,378.80	
1893	26,687.67	
1894	34,876.59	
1895	38,098.16	
1896	32,600.67	
1897	33,777.25	
1898	40,907.68	
1899	32,201.65	
1900	32,945.99	
1901	51,066.38	
1902	59,592.89	
1903	75,410.21	
Transfers and refunds	206.24	
		$462,750.18

RECEIPTS AND DISBURSEMENTS OF THE LAND INCOME FUND.

RECEIPTS.

Balance in Treasury December 1, 1892	$ 5,282.81	
1893-94	9,561.09	
1895-96	9,313.04	
1897-98	13,890.14	
1899-00	16,624.03	
1901-02	20,256.26	
1903	8,369.57	
		$ 83,296.94

DISBURSEMENTS.

1893	$ 10,305.38	
1894	4,286.63	
1895	3,186.16	
1896	5,416.63	
1897	5,893.98	
1898	8,853,83	
1899	.....	
1900	10,913.09	
1901	10,851.76	
1902	13,124.26	
1903	9,968.12	
Reimbursement	361.56	
Balance, December 1, 1903	135.54	
		$ 83,296.94

RECEIPTS AND DISBURSEMENTS OF SPECIAL FUND.

RECEIPTS.

Balance in Treasury December 1, 1892	$ 269.21	
1893-94	5,910.38	
1895-96	5,389.24	
1897-98	3,782.51	
1899-00	5,322.26	
1901-02	11,672.73	
1903	15,141.86	
		$ 47,488.19

DISBURSEMENTS.

1893	$ 1,377.75	
1894	4,417.44	
1895	3,462.15	
1896	1,957.85	
1897	3,786.18	
1898	146.09	
1899	5,245.21	
1901	5,779.80	
1902	5,941.73	
1903	15,175.82	
Transfers	161.65	
Balance December 1, 1903	36.52	
		$ 47,488.19

RECEIPTS AND DISBURSEMENTS OF THE ANNIE JONES LIBRARY FUND.

RECEIPTS.

1895-96	$ 2,836.05	
1897-98	45.00	
1899-00	158.90	
1901-02	854.07	
1903	204.45	
		$ 4,098.47

DISBURSEMENTS.

1896	$ 2,692.90	
1897	147.35	
1898	31.00	
1899	18.00	
1900	18.00	
1901	40.72	
1902	343.75	
1903	200.95	
Balance	605.80	
		$ 4,098.47

STATEMENT OF DISBURSEMENTS OF SPECIAL APPROPRIATIONS MADE BY THE COLORADO GENERAL ASSEMBLY.

1893	By the Ninth General Assembly	$ 6,500.00	
1895	By the Tenth General Assembly	10,000.00	
1901	By the Thirteenth General Assembly	8,000.00	
			$ 24,500.00

DISBURSEMENTS.

1893.

July	Sewer Account	$ 1,248.27	
Aug.	Sewer Account	1,416.60	
Sept.	Sewer Account	2,900.53	
Oct.	Sewer Account	934.60	
			$ 6,500.00

1896.

Dec.	General Improvement Account	$ 100.00	
Jan.	General Improvement Account	4.40	
Feb.	General Improvement Account	461.72	
Mar.	General Improvement Account	581.80	
Apr.	General Improvement Account	458.98	
May	General Improvement Account	1,203.20	
June	General Improvement Account	642.70	
July	General Improvement Account	1,327.75	
Aug.	General Improvement Account	872.48	
Sept.	General Improvement Account	2,377.73	
Oct.	General Improvement Account	1,249.25	
Nov.	General Improvement Account	718.99	

1897.

Sept.	General Improvement Account	1.00	
			$ 10,000.00

1902.

Apr.	Student Labor Account (special)	$ 2,000.00	
Aug.	Improvement Account (special)	2,387.32	
Sept.	Improvement Account (special)	1,740.40	
Oct.	Improvement Account (special)	529.87	
Nov.	Improvement Account (special)	1,342.41	
			$ 8,000.00
			$ 24,500.00

STATEMENT SHOWING THE RECEIPTS AND FOR WHAT DEPARTMENTS AND ACCOUNTS THE REVENUES OF THE TAX, INCOME, SPECIAL, ANNIE JONES LIBRARY AND SPECIAL APPROPRIATION FUNDS WERE DISBURSED, AND THE AMOUNT CHARGED TO EACH.

RECEIPTS

Tax Fund	$461,849.95	
Special Appropriation	24,500.00	
Special Fund	47,488.19	
Land Income Fund	83,296.94	
Annie Jones Library	4,098.47	
Overdraft	122.37	
		$621,355.92

DISBURSEMENTS

Overdraft, November 30, 1892	$ 4,378.80
Electrical Engineering	447.64
Constitution and History	15.69
Seed Distribution	45.70
Zoology and Entomology	3,963.89
Domestic Economy	3,224.76
Commercial Department	4,053.72
Library Account	7,802.70
Horticultural Department	21,851.21
Farm Department	50,539.81
History and Literature	286.37
President's Office	3,646.14
Student Labor Account	22,796.66
Building Account	225.00
Fair Exhibit	251.19
Insurance	9,517.94
State Board of Agriculture	26,754.23
Dairy Account	882.41
Chemical Department	6,112.70
English and Stenography	461.34
Mechanical Department	21,740.29
Mathematical Department	591.82
Furniture Account	4,835.43

DISBURSEMENTS—Continued

Physics and Engineering	7,925.88
Remodeling Dormitory	2,075.51
Current Expense	39,898.34
Light and Fuel	18,629.18
Veterinary Science	1,358.11
Text-Book Account	25,261.66
General Repairs	14,313.21
Salaries	132,546.56
Secretary's Office	2,280.45
Military Department	1,040.19
Improvement on Grounds	378.27
Permanent Improvements	74,984.31
Advertising	8,670.98
Hose House	3.84
Agricultural Hall	945.00
Farm House	670.35
Mechanic Shop	182.75
Farmers' Institutes	1,668.12
Annie Jones Library Special	533.95
Freight and Express	8,607.16
Annual Catalogue	4,377.85
Membership A. A. A. C.	70.00
Farm Siphon	5.00
World's Fair Exhibit	857.11
Water Supply	322.25
Sewers	7,118.88
Mechanical Building Heating	1,211.84
Drainage Account	233.40
College Stand Pipes	304.71
Engineering Building	42.00
Mechanical Building Closets	418.91
Irrigation Pipe Line	2,896.22
Extension Water Mains	759.43
Secretary's Report	43.75
Horticultural Building	14,715.41
Compiling Laws	132.00
Reimbursing United States	200.00
Farm Root Cellar	148.00
Flag and Staff	25.00
Course in Agriculture	187.80
Feeding	621.29

DISBURSEMENTS—Continued

Domestic Economy Building Repairs	359.01	
Horticultural Building Furniture	499.75	
Greenhouse	3,106.38	
Flagging	240.92	
Chemical Building	29,250.62	
Plumbing	225.26	
Annie Jones Library	3,492.67	
Advertising Pamphlet	223.45	
Mechanical Engineering Building	4,727.80	
Repairs on Barn	4.50	
Student Labor Special	2,000.00	
Improvement Special	6,000.00	
Refunds and Transfers	729.45	
		$621,355.92

AUDIT STATE AGRICULTURAL COLLEGE.

December 1, 1903, to November 30, 1906.

Hon. P. F. Sharpe, President State Board of Agriculture, Fort Collins, Colorado.

Dear Sir—Pursuant to the instructions of your executive committee, we have made an audit of the books and accounts of the State Agricultural College from December 1, 1903, to November 30, 1906, and herewith submit our findings.

SECRETARY'S CASH.

All collections have been properly accounted for and paid over to the State and local treasurers.

DISBURSEMENTS.

All disbursements are evidenced by duly authenticated bills, and all vouchers are properly approved by the finance committee.

LOCAL TREASURER.

We verified the balances shown as in hands of local treasurer, and find them to be correct.

STATEMENTS.

The following statements exhibit the transactions of the past three years:

SECRETARY'S CASH ACCOUNT.

RECEIPTS.

Balance Library Fund, December 1, 1903	$ 1,056.81	
Agricultural Department, sales	8.723.40	
Agricultural Station, sales	201.60	
Agronomy Department, sales	28.57	
Agronomy Section, sales	338.94	
Animal Husbandry Department, sales	4,805.64	
Appropriation Fund transfers	3,328.41	
Arkansas Valley Sub-station sales	723.13	
Animal Investigation	142.00	
Commercial Department, sales	30.00	
Chemical Department, sales	107.50	
Chemical Section, sales	271.75	
Civil and Irrigation Engineering Department, sales	270.00	
Domestic Science Department, sales	19.25	
Directors' Office, sales	893.02	
Entomological Department, sales	10.00	
Engineering Department, sales	350.00	
Entrance Fees	1,502.00	
Freight Refunded	445.44	
Farm Division sales	32.50	
Gymnasium Fund	253.00	
Girls' Dormitory	345.61	
Horticultural Department, sales	163.50	
Horticultural Section, sales	25.74	
History and Literature Department, sales	12.60	
Insurance Refunded	10.00	
Irrigation and Engineering Section, sales	5.00	
Library Department, sales	74.95	
Library Fund Collections (Annie Jones)	407.80	
Mechanical Department, sales	43.83	
Miscellaneous, sales	150.95	
Music Fees	295.50	
Physics Department, sales	9.85	
Registration Fees	36.00	
San Luis Valley Sub-station, sales	1,672.14	
Text Book Department, sales	8,222.17	
Western Slope Fruit Investigation	1,125.00	
Western Slope Fruit Investigation, Transfer	1,303.11	
		$ 37,436.71

DISBURSEMENTS.

Paid State Treasurer, Special Fund, 1904	$ 8,250.03	
Paid State Treasurer, Special Fund, 1905	7,589.37	
Paid State Treasurer, Special Fund, 1906	12,590.03	
Paid State Treasurer, Library Fund	1,464.61	
Paid Local Treasurer, Special Fund, 1904	1,555.34	
Paid Local Treasurer, Special Fund, 1905	231.10	
Paid Local Treasurer, Special Fund, 1906	5,756.23	
		$ 37,436.71

RECEIPTS AND DISBURSEMENTS.

	Balance Dec. 1,	RECEIPTS.			DISBURSEMENTS.			Balance Nov. 30,
	1903.	1904.	1905.	1906.	1904.	1905.	1906.	1906.
Agricultural College, Tax Fund	$ 900.23*	$ 64,036.53	$ 69,067.32	$ 69,755.00	$ 61,429.70	$ 66,812.37	$ 75,711.10	$ 1,994.55*
Agricultural College, Land Income Fund	135.54	6,161.61	31,107.00	18,354.31	8,958.66	27,088.27	19,353.48	358.05
Agricultural College, Library	605.80	1,464.61	.....	.....	895.10	.....	1,175.31	.....
Agricultural College, Special	36.52	8,257.53	7,589.37	12,590.03	8,294.05	6,156.76	10,811.84	3,210.80
Agricultural College, Mechanical Arts (U. S.)	7,708.89	25,000.00	25,000.00	25,000.00	26,016.42	23,275.68	24,562.23	8,854.56
Appropriation, Agricultural Instruction	.....	.....	8,000.00	.....	.....	4,013.23	3,986.77	.....
Appropriation, Farmers' Institutes	.....	.....	8,000.00	.....	.....	897.34	7,102.66	.....
Appropriation, Animal Industry	.....	.....	10,000.00	.....	.....	639.24	9,360.76	.....
Appropriation, Plant Industry	.....	.....	3,000.00	.....	.....	941.71	2,058.29	.....
Appropriation, Root Crops	.....	.....	1,000.00	.....	.....	.....	1,000.00	.....
Experiment Station (Hatch) Fund	1,651.02	15,000.00	15,000.00	15,000.00	14,854.46	15,242.16	16,840.87	286.47*
Experiment Station (Adams) Fund	.....	.....	.....	6,750.00	.....	.....	6,294.74	455.26
Experiment Station, Special Fund	15.50	1,555.34	231.10	5,756.23	834.19	281.70	5,376.44	1,065.84
Totals	$ 9,253.04	$121,475.62	$177,994.79	$153,205.57	$121,282.58	$145,348.46	$183,634.49	$ 11,663.49

*Overdraft.

DISBURSEMENTS, COLLEGE FUNDS.

	1904	1905	1906
Agricultural Department	$ 10,789.00	$ 14,459.10	.....
Agronomy Division	.....	10.80	$ 780.72
Animal Husbandry Division	.....	.....	5,414.25
Farm Division	.....	.....	5,842.15
Farm Mechanics Division	.....	.....	236.58
General Agriculture Division	.....	.....	4,732.20
Advertising	1,490.49	2,149.17	2,039.28
Bulletins, Catalogues and Reports	417.68	881.40	1,114.30
Association American Agricultural Colleges and Experiment Stations	15.00	15.00	15.00
Chemical Department	1,724.16	1,184.94	759.75
Commercial Department	384.85	95.82	16.65
Constitutional History and Irrigation Law Department	20.50	10.45	53.85
Current Expense	2,464.86	2,112.22	804.10
Civil and Irrigation Engineering Department	752.50	1,143.81	2,019.17
Domestic Science Department	430.25	603.37	551.06
English and Sociology Department	16.70	43.87	9.15
Electrical Engineering Department	595.99	1,282.63	.....
Electrical Supplies	.....	407.98	162.90
Furniture	1,513.10	1,734.50	.....
Freight and Express	1,343.96	2,436.29	1,557.01
Fuel and Lights	3,990.44	3,756.04	4,785.86
Farmers' Institute Division	563.55	1,485.94	5,003.19
Firemen and Janitors	.....	.....	3,282.26
General Repairs	2,202.77	3,684.72	2,043.04
Girls' Dormitory	.....	1,272.45	785.41
Horticultural Department	2,872.43	3,780.99	3,465.00
History and Literature Department	47.25	58.47	27.50
Insurance	311.05	1,160.10	993.75
Library	1,856.56	1,761.15	2,695.19
Mechanical Department	2,700.23	4,440.34	2,368.39
Mathematical Department	16.00	13.70	8.60
Military Department	155.14	229.46	74.22
Music Department	.....	.....	118.84
Modern Languages Department	.....	.....	13.45
President's Office	250.83	562.43	1,442.67
Physical Training Department	.....	.....	17.20
Permanent Improvements	9,967.23	12,496.12	14,060.31
Salary	50,191.96	53,775.27	61,807.92
Secretary's Office	255.44	816.20	985.82

DISBURSEMENTS, COLLEGE FUNDS—Continued.

State Board of Agriculture	1,458.85	1,742.55	1,291.40
Student Labor	3,862.19	3,988.69	3,655.80
Text-Book Department	2,632.09	3,111.50	3,305.01
Veterinary Science Department	106.85	137.07	352.30
Zoology and Entomological Department	194.03	1,399.11	222.66
Transfers to other funds	.....	.....	3,790.28
Totals	$105,593.93	$128,243.65	$142,703.39

DISBURSEMENTS, EXPERIMENT STATION FUNDS.

	1904	1905	1906
Agricultural Section	$1,335.48	$ 869.56	$ 56.27
Association American Agricultural Colleges and Experimental Stations	15.00	.....	.....
Arkansas Valley Sub-station	49.36	45.65	54.12
Animal Investigation Section	.....	144.83	2,024.11
Agronomy Section	.....	310.35	2,483.55
Bulletins and Reports	518.20	2,521.98	5,457.19
Buildings	.....	141.40	5,236.68
Chemical Section	366.51	31.75	1,345.47
Director and General	536.56	530.72	1,716.58
Entomological Section	294.71	327.02	1,053.05
Horticultural Section	284.68	390.48	1,570.48
Insurance	.....	6.00	33.00
Library	.....	59.42	1,912.63
Meteorological and Irrigation Section	893.77	252.26	2,347.39
Plains Sub-station	74.00	.....	.....
Salary	11,292.96	10,681.10	11,136.07
San Luis Valley Sub-station	6.00	.....	.....
Veterinary Section	.....	234.60	951.83
Western Slope Fruit Investigation	.....	.....	2,428.11
Transfers to other funds	.....	557.69	1,121.57
Totals	$15,688.65	$17,104.81	$40,931.10

CERTIFICATE.

We have made an audit of the books of the State Agricultural College from December 1, 1903, to November 30, 1906, inclusive; and in accordance therewith we certify that the foregoing statements correctly represent the transactions for the period named.

THE CONTINENTAL TRUST COMPANY,
E. F. ARTHUR,
Auditor.

(SEAL.)
Dated December 8, 1906.

Note—Mr. Arthur also says, "The system in use for the payment of accounts through the State Treasurer is cumbersome and antiquated. Every invoice is duplicated for attachment to the voucher drawn on the State Auditor. If all funds can be drawn from the State Treasurer in bulk and placed in the hands of the local treasurer, this duplication can be avoided and accounts paid by warrant on the local treasurer, each warrant specifying the fund against which it is drawn."

THE STATE AGRICULTURAL COLLEGE
OF COLORADO

NINETEENTH ANNUAL REPORT

OF

THE AGRICULTURAL EXPERIMENT STATION

FOR

1906

LETTER OF TRANSMITTAL.

To His Excellency,
HENRY A. BUCHTEL,
Governor of Colorado.

In accordance with the requirements of an act of Congress providing for the establishment of agricultural experiment stations, I have the honor to present herewith the report of the Colorado Experiment Station, it being the nineteenth annual report. The report of the activities of the Station is for the whole year, while the fiscal report ends with June 30, in conformity with the fiscal year of the United States.

The report and the accompanying documents give an indication of the activity of the Station. The publication of the experiments is made in separate form, as bulletins, which are widely distributed among the agricultural population of the State.

Respectfully submitted,

L. G. CARPENTER,
Director.

The Agricultural Experiment Station.
State Agricultural College,
Fort Collins, Colorado.
January, 1907.

THE AGRICULTURAL EXPERIMENT STATION,

FORT COLLINS, COLORADO.

THE STATE BOARD OF ARGRICULTURE.

	Term Expires
Hon. P. F. SHARP, *President,* Denver	1907
Hon. HARLAN THOMAS, Denver	1907
Hon. JAMES L. CHATFIELD, Gypsum	1909
Hon. B. U. DYE, Rocky Ford	1909
Hon. B. F. ROCKAFELLOW, Canon City	1911
Hon. EUGENE H. GRUBB, Carbondale	1911
Hon. A. A. EDWARDS, Fort Collins	1913
Hon. R. W. CORWIN, Pueblo	1913
Governor JESSE F. McDONALD, President BARTON O. AYLESWORTH,	*ex-officio.*

EXECUTIVE COMMITTEE IN CHARGE.

P. F. SHARP, Chairman. B. F. ROCKAFELLOW.
A. A. EDWARDS.

STATION STAFF.

L. G. CARPENTER, M. S., *Director*.....Irrigation Engineer
C. P. GILLETTE, M. S.....Entomologist
W. P. HEADDEN, A. M., Ph. D.....Chemist
W. PADDOCK, M. S.....Horticulturist
W. L. CARLYLE, M. S.....Agriculturist
G. H. GLOVER, B. S., D. V. M.....Veterinarian
W. H. OLIN, M. S.....Agronomist
R. E. TRIMBLE, B. S.....Assistant Irrigation Engineer
F. C. ALFORD, M. S.....Assistant Chemist
EARL DOUGLASS, M. S.....Assistant Chemist
A. H. DANIELSON, B. S.*.....Assistant Agriculturist
S. ARTHUR JOHNSON, M. S.....Assistant Entomologist
B. O. LONGYEAR, B. S.....Assistant Horticulturist
J. A. McLEAN, A. B., B. S. A.....Animal Husbandman
E. B. HOUSE, M. S.....Assistant Irrigation Engineer
F. KNORR**.....Assistant Agronomist
P. K. BLINN, B. S. .Field Agent, Arkansas Valley, Rocky Ford
E. R. BENNETT, B. S.....Potato Investigations

WESTERN SLOPE FRUIT INVESTIGATIONS, GRAND JUNCTION.

O. B. WHIPPLE, B. S.....Field Horticulturist
E. P. TAYLOR, B. S.....Field Entomologist

OFFICERS.

L. G. CARPENTER, M. S.....Director
A. M. HAWLEY.....Secretary
MARGARET MURRAY.....Clerk

*Resigned December 1, 1905.
**Appointed December 1, 1905.

REPORT OF THE DIRECTOR.

ORIGIN AND ORGANIZATION OF THE STATION.

The Experiment Station of Colorado was organized in February, 1888, in accordance with the Hatch act of Congress, passed in 1887, and made effective in 1888. The organization is under a Director, with the subdivisions of the Station called sections. The idea in this organization was that the Station as a whole had the rank of a department. The Executive Committee has more direct charge of the Experiment Station. The rules relating to organization were adopted by the Board some years since, adopting the suggestion of the Director of Experiment Stations of the U. S. Department of Agriculture. The Board has also recognized that the Experiment Station is the experimental and investigational side of the College, and has provided by resolution that all experimental work shall be considered as a part of the Experiment Station, and, therefore, under its direction. Under the State law experimental work is contemplated as a duty of the State Board of Agriculture, and it seems proper for some of the funds to be used for such purposes if the Board deems it advisable. In that respect our State law is broader than the laws in most states.

The appropriation from the Hatch fund is $15,000 per annum. This fund is surrounded by certain limitations, but is much broader than the provisions relating to the Adams fund. Some supervision rests in the Secretary of Agriculture.

At one time a large part of this fund was diverted to substations. The United States decided that this was not a proper charge on the Hatch fund, and that such use must be discontinued. The older members of the Board will remember the period of several years' effort to withdraw from the substations, and the local influence, without entanglements and without getting into difficulties.

The Adams bill has been passed through the efforts of the Agricultural Colleges and Experiment Stations the past winter. This fund is much more restricted in its provisions. Five thousand dollars was available the first fiscal year, $7,000 the second, and so on, increasing until it reaches the full amount of $15,000. In the case of this fund it can not be used for many purposes for which the Hatch fund is available. It can not be used for printing, for administration, postage nor many of the other necessary functions of the Station. It is available only for original scientific research and experiment. This fund is also more directly under the control of the Secretary of Agriculture.

During the past year some funds have been available from an appropriation by the State. This appropriation has been for special purposes. Also, some revenue has been received from the Fruit Growers of the Western Slope for investigations, which have been supplemented by the Board.

FUNCTION AND OBJECTS OF THE STATION.

The passage of the Adams bill, and the questions and discussions which have arisen from it, have caused a very general consideration of the scope and function of the Experiment Stations. Serious thought has been given not only here, but in all the other Stations in the Union, and has been the subject of discussion at the meeting of the Experiment Stations, at the Society for the Promotion of Agricultural Science and related organizations. Both the Hatch and Adams acts give a different interpretation.

In the eighteen years since the organization of the Experiment Stations under the Hatch act, the Stations have been reaching a clearer understanding of their functions. They have gained a much larger hold on the public mind, and in this very fact lies also a danger to the most important work of the Experiment Stations. With the development of their work there has been a constant tendency for greater demands to be made upon the Stations, often a proper one, especially when the demand is accompanied by funds from the State appropriation to meet the demand. In such cases, the conditions surrounding the work and the duties of the Station may be whatever the State may deem desirable to assign, so far as the State funds will permit. Therefore the lines of work in such states supported by state appropriations can not be taken as a guide for those lines which depend wholly upon United States funds.

The Hatch fund is available for research and experiments and for verification of experiments, and for printing and distributing results.

The Adams fund can be used only "for paying the necessary expenses of conducting original research and experiments." This limitation in the scope of the act was an intentional one on the part of Mr. Adams, and means much in the interpretation of the act. It had been felt that in many cases the Hatch fund had not been used properly, and that the temptation was to use it for doing work that was popular and not scientific, and that work was often undertaken that should more properly be undertaken by the State.

The act was intended by the author to encourage, if not to force, the various states to supplement the fund by appropriations or other funds. The Adams act makes no provisions for heating, lighting, buildings, janitor service, publications, correspondence, stenographers and many other indirect but necessary expenses. A result of the investigations will be an increase in the number of publications, and probably in the number of copies which need to be printed. The work under the Adams fund was

not intended to include the application, but to be the research which would permit the applications to be made at other expenses. Hence, in order to make use of the funds provided by the Adams act, considerable additional money is needed.

The first effect of the Adams act will not be, therefore, to relieve the financial situation of the Station. But as it makes the obligation correspondingly greater, it will be still more difficult to make ends meet in the future unless there can be other support.

There will undoubtedly be disappointment with the first results of the act, because such researches as are contemplated by the act can not reach conclusions short of several years, and, therefore, for the first few years there may be a feeling that the apparent results are not commensurate with the cost. There is however a growing realization of the fact that the best results come from this thorough work. The Department excludes such tests as variety tests, market tests, and tests that do not tend to answer definitely the question "why," or to determine the reasons.

There are so many lines of usefulness for a scientific staff and so many opportunities, that there has been an increasing call for the Stations to do work of a secondary grade, like testing plants, determining the merits of different varieties, testing seed, testing the merits of the different combinations of food, and in short to do many things which do not require any particular scientific knowledge, but only opportunity, and possibly some funds. Some phases of this work are often of extreme economic importance to a community or to the State. The improvement of wheat, the distribution of an improved variety of wheat, the development of an improved variety of potatoes, may be a matter of very great importance. It is the kind of work which naturally clusters around an Experiment Station, and in the past the various states have done a great deal of this kind of work. Such work has been supported mostly, if not entirely, from other funds, but as that fact is not made clear in the publications of the Stations, it gives a wrong idea of what the Stations could do from government funds. Such work is extremely valuable to supplement the more scientific work of the Stations. It is a work whose financial benefit is more immediately seen. It was, therefore, left without aid by Mr. Adams, with the feeling that its financial importance would command support, and this should be from the states, or from other sources.

For these purposes, and for the general purpose of utilizing the Adams fund to the best advantage, some support is needed from the State, and should increase more as the Adams fund becomes larger.

The Legislature two years ago made an appropriation to the State Board of Agriculture for the Experiment Station, and a continuation is needed for the present biennial period. The amount appropriated in 1905 in S. B. No. 172, approved April 6th,

was $14,000 for the biennial period; $10,000 for the lines of animal industry; $3,000 for the lines of plant industry, and $1,000 for potatoes and other root crops.

This appropriation has proven to be of such value, and has been so useful in many parts of the State, that a continuation and extension of the purposes for which these funds were available is needed.

While there is increased recognition of this application of scientific research, it can not be too frequently impressed that these applications can not be made unless the research has previously been made. These applications must depend upon sound research, and it is this work which is the highest function of the Experiment Station, and is the work which is intended to be fostered by the Adams act. Research in the broader sense attempts to answer the question "why." It requires the highest kind of intelligent effort, and should be classed with the highest kind of creative work. The investigator requires peculiar conditions. He should be separated from disturbing influence and from such routine work as saps his energy and vitality and which could be done by cheaper help.

The value of these conditions as provided by Mr. Adams will be increasingly evident as the years go by.

THE FRUIT INVESTIGATIONS.

The fruit growers of the Western Slope made special request for help in the problems which were troubling them, and offered to raise considerable money if the State Board of Agriculture would supply men to aid them, under the direction of the Experiment Station. The Station could not use its funds. Realizing the value of such work, the State Board of Agriculture made special provision, and with the aid furnished by the fruit growers of Mesa county, they carried on investigations on the Western Slope during the past year. The general investigation included two men, one Field Horticulturist and one Field Entomologist, working under the direction of the Horticulturist and Entomologist of the Experiment Station. The investigation was to include the study of the orchard conditions of Mesa county, especially of the injurious insects, the means of combatting them, and the means of improving conditions. Mr. O. B. Whipple, who was Assistant Horticulturalist, was detailed for the work at Grand Junction, under the direction of Prof. Paddock, and Mr. E. P. Taylor, of Illinois, was engaged as Field Entomologist, under the direction of Prof. Gillette. The work was more especially confined to Mesa county, although it was planned on a broad enough scale to take up other counties if time permitted. It was thought best, however, to confine the work to a relatively limited section until it was found that it could be broadened. As a matter of fact, Mesa county alone took the complete energies of the force, and no systematic work was done outside. Some attention was given to Delta and Montrose counties, and enough

so as to keep in touch with the problems of those regions, with the hope of taking up the work there during another year. In addition to the work of the Field Horticulturist and Entomologist, arrangements were made so that investigation of the seepage question was also taken up, and an investigation carried on for a part of the season in conjunction with the other work of the fruit investigation. This was conducted by Mr. F. L. Payne and Prof. House, and directed to find, first, the source of the seepage, where it had been injurious, and then, based on that, to determine the remedy. Some important lessons have been learned which will be fruitful, and will result in a benefit in this way. The total expense of this investigation was estimated to be $5,000 for the calendar year. That amount has not yet been expended, but apparently will be before the end of the fiscal year. If the expense of the seepage investigation is included, the total expense will be over $6,000. For the coming year, with the extension of such work. this would require nearly $10,000.

CO-OPERATIVE WORK WITH THE DEPARTMENT OF AGRICULTURE.

The work of this kind which has attracted the most attention is the horse breeding work, in connection with the Department of Agriculture. For this purpose, the Department of Agriculture provided a horse with an excellent record, and a number of mares also with excellent records. The Department of Agriculture furnished these at a total cost of about $15,000. There were also some gifts.

The provision in the State appropriation for animal industry was rendered available for the construction of a barn, and the total amount put into this barn for this purpose was slightly above $5,000. The college has also furnished pasture ground some three miles west of the Station, and has found it necessary to buy more during the year. There are now a number of excellent colts. The Department of Agriculture contributes $1,000 for the minor expenses of the Experiment. This is to go into equipment, but as the rules for auditing bills are troublesome for the purchase of such materials, the Department contributes this amount as a part of the salary of the Professor of Agriculture, with the understanding that the College will use the corresponding amount toward the minor expenses of the experiment. The Department of Agriculture also pays the salary of a groom, and also meets a number of minor expenses. The work calls, however, for funds from the College.

Under the agreement with the Department of Agriculture, the colts may be sold, except such as may be selected to continue the work. The proceeds from these colts go into the maintenance of the experiment. It is, therefore, hoped that the revenue derived from this source may materially aid in the cost of the experiment.

LOCO INVESTIGATION.

The loco investigation at Hugo has been in co-operation with the United States Department of Agriculture. It is an

outgrowth of previous work done by us with Mr. Payne, when we reached the conclusion that the loco problem needed to be taken hold of on a much more extensive scale. Co-operative arrangements were made with the Department by which we furnished the animals, the services of the Veterinarian, while the Department kept a man and maintained the work. The cost has been principally for the animals. At the end of last winter there were six horses and six cattle, and these were increased by purchase until there were 25 cattle and 25 horses. Of these a number have died during the season, so that at the time the invoice was made, December 1, there were 21 cattle and 13 horses. These are to be put at pasture, and a few have been brought here for better care and to test various remedies and the effect of good feed. The cost has been borne by the special State appropriation. It has amounted as a whole to $1,152.64. The Department of Agriculture feels that they are enabled now to find the cause.

The Experiment Station, through the appropriation of the Legislature, provided a number of cattle and also horses, which were used as the subjects. Careful studies were made by Dr. Marsh. The first and most important step was to attempt to determine conclusively whether the plant was the cause of the loco disease. While there has been a good deal of assertion, and a great many who are convinced either that the plant is or is not, the connection between the disease and the plant had not been so positively determined that it was safe to assume. The test of Dr. Marsh included not only the full tests on the animals, but also a study of the plant, and an attempt to determine a poison in the plant by physiological tests. Dr. Marsh reports that the results of the loco investigation of the past two seasons has substantiated the following things:

"1. In our laboratory in Washington a poison has been definitely separated from the loco plant, and is now being subjected to more complete pharmacological and chemical investigation.

"2. In the field work we have demonstrated definitely the connection of the loco plant with the loco disease, and we have determined to some extent the relative danger of the different kinds of loco plant.

"3. We have also determined definitely the pathological lesions that accompany loco poisoning, so that we can by post-mortem examination make pretty exact diagnoses of the cases.

"4. Considerable work has been done in the way of experimental dosing, but so far without final results.

"5. Considerable attention has been given, and with some success, in investigation methods of exterminating or reducing the number of loco plants.

"It seems to us that the work of the next season must be confined to more detailed investigation under these last two

heads. This, of course, is the practical end of the loco problem, and the solution of the possibilities of dosing, and the possibilities of the destruction of the loco weed would mean the solution of the whole problem."

Under the State appropriation of 1905 for animal industry, of the total appropriation of $10,000, about $5,000 was expended, as mentioned, for stables for the co-operative work with the government. A portion was used in the loco co-operative work, and Prof. Carlyle chose to use the remainder in the expenses in a test to determine the economic conditions of taking range stock and feeding. He has selected a number of calves. One set is brought to the Station at one year old, and fed; a second set remains on the range for two seasons, and a third set for three seasons. Each set is then to be brought to the Station and fed, and finally, when sold, the comparison in the size and gain is to be made.

THE WORK IN PLANT INVESTIGATION.

A considerable co-operative work was taken up by Prof. Olin, and a good deal of energy given to the dissemination of Durum wheat, with a result of a large increase in the crop grown. The work of a number of years in the development of improved wheat and oats in the San Luis valley resulted in the spreading of improved grains, and promises practical results. Very interesting and valuable tests were made with grains and alfalfa.

The fund appropriated for potato and root crop investigations was too small to be of much value in itself, but when aided from other sources, it was possible to employ a potato specialist, Mr. E. R. Bennett, who gave his whole time to the study of the potato industry and the improvement of potatoes. For a part of the season, his headquarters were at Greeley. This has resulted in Bulletin No. 117.

PUBLICATIONS OF THE YEAR.

During the year the Station has issued bulletins from 107 to 116, inclusive, five press bulletins, Nos. 24 to 28, inclusive, and three reports and special bulletin No. 100. The regular bulletins had a total of 192 pages, press bulletins ran from two to four pages each, making a total of 16 pages, and the reports, a total of 478 pages. The edition of the bulletins ran from 3,000 to 10,000. The reason for the publication of three reports was because two reports had not been published at the time they were made because of the stress of funds when the printing fell upon the Station. The total number of pages obtained by multiplying the number of the edition by the number of pages in the bulletin is nearly 5 million pages; leaving out bulletin 100, the total is about 2 million pages.

In this list is bulletin 100, which has been the subject of a note in the annual reports for several years. It is on the Flora

of Colorado. It is a credit to the Station and to the College. While it is a bulletin that will not be sought by the ordinary user, yet it will reach circles that could not be reached by the ordinary bulletins, and will give credit to the Institution and be of value to the State.

BULLETINS ISSUED DURING YEAR 1906.

No.	Pages.	Edition.	Total No. of Pages.
107	8	9,500	76,000
108	18	9,500	171,000
109	12	8,500	102,000
110	16	10,000	160,000
111	12	9,500	114,000
112	8	8,500	68,000
112	32	9,500	304,000
113	46	10,000	460,000
115	24	9,500	228,000
116	16	3,000	48,000
		87,500	1,731,000

PRESS BULLETINS.

No.	Pages.	Edition.	Total No. of Pages.
24	2	3,000	6,000
25	4	3,000	12,000
26	4	8,500	34,000
27	4	9,000	36,000
28	2	3,000	6,000
		26,500	94,000

REPORTS.

No.	Pages.	Edition.	Total No. of Pages.
14 (1901)	54	750	40,500
16 (1903)	40	750	30,000
18 (1905)	65	1,250	80,000
		2,750	150,500

The list is as follows:

No. 100. Flora of Colorado, by Dr. P. A. Rydberg.

No. 102. Feeding Steers on Sugar Beet Pulp, Alfalfa Hay and Ground Corn, by W. L. Carlyle and C. J. Griffith.

No. 103. The Thorough Tillage System for the Plains of Colorado, by W. H. Olin.

No. 104. A Rust-Resisting Cantaloupe, by Philo K. Blinn.

No. 105. A New Apple Rot, by B. O. Longyear.

No. 106. Pruning Fruit Trees, by Wendell Paddock.

No. 107. Peach Mildew, by O. B. Whipple.

No. 108. Development of the Rocky Ford Cantaloupe Industry, by Philo K. Blinn.

No. 109. Cultural Methods for Sugar Beets, by W. H. Olin.

No. 110. Alfalfa, by W. P. Headden.

No. 111. Alfalfa, by W. P. Headden.

No. 112. A Hopperdozer, by P. K. Blinn.

No. 113. Larkspur and Other Poisonous Plants, by Geo. H. Glover.

No. 114. Insects and Insecticides, by C. P. Gillette.

No. 115. Fertilizer Experiments With Sugar Beets, by A. H. Danielson.

No. 116. The Cottony Maple Scale, by S. A. Johnson.

The bulletins are now ordinarily issued in editions of 9,000. In cases, such as seem to be of more than ordinary interest, 10,000 is printed. Technical bulletins may be printed in an edition of 3,000 or less.

INVESTIGATIONS OF THE YEAR.

In most cases, the investigations carried on during the year have been continuations of work previously in progress, or development that has come as a consequence of previous work. The opportunities in the State are so great that there is a constant tendency to make much more extensive plans than can be carried out. The interference, with other duties of the College, of extension work, also prevents the completion of as much work as contemplated, and the same result is caused by the fact that every investigation broadens and extends as the investigation proceeds.

The essential method has been for the lines of investigation to be made by the heads of the different sections and submitted to the Director for co-ordination or suggestion. It has not been the custom for the Director to materially change the plans except as might be necessary to agree with general lines or to fit in with the work of other sections. The Director has, however, exercised the discretion of preventing duplication of work. Under the Adams act in the future it will undoubtedly be necessary for closer control than has been customary in the past.

Outlines of the work of the past year as approved have been as follows:

OUTLINE OF WORK FOR IRRIGATION ENGINEERING SECTION, 1906.

1. Meteorology as hitherto.

The development of lysimeter records, that is, the flow of water through soils.

3. Evaporation through soils under different conditions.

4. The irrigation survey of Colorado. This to include an examination of the State, taking up one valley at a time; a description and map of the canals and study of the methods of irrigation, of the peculiarities of canals as related to local situation and to crops, suggestions as to improvements, and study of such questions as may be found to be desirable for that locality, as, for example, water supply, drainage, storage, etc. This would require several years, but reports and bulletins would be issued as they proceed.

5. The application of water to crops. This has resulted in the past in the studies of the duty of water. Additional equipment of self-recording instruments makes it possible to take this up on a larger scale, and with the variety which is necessary to secure good results. Former co-operative trials have not been entirely satisfactory, but such trials have been necessary from the lack of instruments which now is partially remedied.

6. In connection with the Western Slope fruit investigation, to take up the question of seeped lands in the vicinity of Fruita and Grand Junction. This will require a number of visits, and quite probably a special man for several months.

L. G. CARPENTER.

OUTLINE FOR ENTOMOLOGICAL SECTION, 1906.

1. Collecting and rearing insects to determine food, habits, life histories and Colorado fauna. (Continued work.)

2. A study of sugar beet insects. (Continued work.)

3. Habits and remedies for potato flea beetles. (Continued work.)

4. A study of the habits and remedies for plant lice, with special reference to the woolly louse of the apple.

5. A study of loco insects.

6. A field experiment on the Western Slope to test remedies for the codling moth.

7. *Apiary.*

(a) A continuation of the study to determine relation of bees to apple and pear blight.

(b) Testing different strains of the honey bee.

C. P. GILLETTE.

OUTLINE FOR CHEMICAL SECTION, 1906.

I. Digestion experiments with sheep. (Continued.) Will be finished about midsummer. This is a continuation of studies already reported in bulletins 39 and 93.

II. Study of alkali as occurring in Colorado. (Continued.) This is a study as related to soils and irrigation questions.

III. Methods of extracting beeswax. This work is nearly done, and will be ready to report some time during the year.

IV. Deterioration of barn yard manures. (Continued.) This investigation is to be carried on for several years.

V. Waters of irrigation. This is a continuation of work hitherto begun, especially in the San Luis valley.

VI. Miscellaneous work.

W. P. HEADDEN.

SECTION OF HORTICULTURE ATION IN ANIMAL
—— 'AR 1906.

OUTLINE OF WORK FOR THE YEAR

Potato. Testing varieties. Breeding. Disc*wintering steers*
Plant diseases in general. uniform steer
A study of horticultural conditions. ing time this
Forestry. pe, a like
from a

FARMERS' FRUIT CO-OPERATIVE ORGANIZATIONS. calves

To take up the study of the various Farmers' Fruit Co-oper the
tive Organizations in the State as instances of organization and
co-operation. To study the causes of organization, the methods, expenses and financial results.

To take up these organizations one at a time and make a study of them, and of the Farmers' Co-operative Organizations, of which the cantaloupe organization will be a particular type.

HORTICULTURAL SECTION.

POTATO INVESTIGATIONS: GREELEY.

The principal line of work will be to discover why potatoes run out, and in order to do this one should be with the crop practically the entire season. Irrigate and cultivate if need be, anything to become thoroughly familiar with the growth of the potato plant. This will necessitate a study of all phases of potato cultivation.

Insects and diseases should be studied at the same time.

Selection of seed potatoes from individual hills to be made in the field in the fall.

Data to be collected during the season for a bulletin on potato industry, to be published next winter.

W. PADDOCK.

WESTERN SLOPE HORTICULTURAL INVESTIGATIONS.

OUTLINE OF WORK FOR THE HORTICULTURIST.

Every orchard in Mesa county must be visited as soon as possible and inspected, particular attention being given to spraying pear blight, crown gall, wolly aphis, and all orchard pests; cultivation, pruning, irrigation, and, in fact, all horticultural operations. An orchard survey will be conducted at the same time.

Thus far Mesa county has been almost free from pear blight, but unless all signs fail it will do great damage there next sea-

son, unless means are taken to prevent. There should be a strong effort made to induce all orchardists to destroy all traces of blight before spring opens.

Special: Experiments to control the new apple and pear rot, *Alternaria*.

W. PADDOCK.

TREE PLANTING EXPERIMENT WITH CATALAPA SPECIOSA AND BLACK LOCUST.

Purposes. To determine the adaptability of these two species, as utility trees, to the different localities in this State, and to obtain data for guidance of tree planters.

To encourage and educate the public in the matter of tree planting for posts, poles and fuel, by means of demonstration plantations.

Trees Selected. The trees selected are the hardy or western catalpa (Catalpa speciosa) and the Black Locust (Robinia pseudacacia). They were chosen because of their general utility qualities, viz.: ease of establishing, hardness, rapid growth, great durability when in contact with the soil and good full value.

Plan of the Experiment. (a) A plantation of 300 trees of each species to be established in each of twenty representative localities in the State.

(b) Each plantation to be put in charge of some responsible person who shall volunteer to furnish the ground, set the trees and irrigate and cultivate them according to instructions.

(c) The Experiment Station to furnish the trees free of expense to the person in charge, to supervise the planting of the trees, and to leave the plantation entirely in the possession of the owner of the ground at the end of ten years.

Details of the Plantation. The trees of both species to be planted in rows six feet apart, with the trees four feet apart in the row, thus covering about one-third of an acre. The rows to extend usually north and south, and the area covered to be not more than twice as long as broad; a wind break to be used where thought necessary.

PROPOSED LINES OF INVESTIGATION IN ANIMAL HUSBANDRY FOR THE YEAR 1906.

1. A comparison of the different systems of *wintering steers in Colorado.* The plan is, in brief, to select sixty uniform steer calves from three different parts of the State at weaning time this fall, fifteen of them from a ranch on the western slope, a like number from a ranch on the plains, and thirty head from a ranch on the eastern slope of the foothills. Five of these calves from the plains, five from the western slope and ten from the ranch in the foothills will be brought to the Experiment Station this fall and put on feed. The remaining ten steers on the plains will be wintered almost entirely on the range; the remaining ten steers on the western slope will be wintered with the ranchman from whom they were purchased, on a combination of range and hay feeding, while the remaining twenty steers of the lot selected on the eastern slope of the foothills will be wintered entirely on native hay.

Next fall, five more of these steers from the western slope, a like number from the plains and ten head from the foothills of the eastern slope will be brought to the College and put on similar feed to that given the first three lots, and the succeeding fall the remaining twenty head of the three lots will be brought here and put on feed until ready for market as three year olds.

The object of this line of work is to compare the different systems of wintering cattle, as it affects the cost of beef production, the quality of the meat, and the development of the animals generally.

2. A comparison of roots, hay and grain with hay and grain alone for wintering steer calves.

3. The value of sugar beets in fattening young pigs. In this experiment we will use twenty-four young shoats. Twelve of these will get a mixture of ground corn, ground barley and wheat shorts. The remaining twelve head of similar breeding and like weight will get just half the amount of this same combination of feeds as the first lot received, with what sliced sugar beets in addition they will eat, the object being to determine the value of sugar beets in fattening pigs in comparison with an all-grain ration.

4. An experiment to determine the cost of wintering brood sows, and the effect upon the offspring of wintering brood sows on sugar beets and alfalfa hay, as compared with a grain ratio and alfalfa hay. We will have ten head of brood sows available for this experiment. Five of these will be fed sugar beets and al-

falfa hay, and the others will have a mixture of grain for a ration, and alfalfa hay.

W. L. CARLYLE,
Agriculturist.

ASSISTANT AGRICULTURIST.

GRAINS AND GRASSES.

PLANS FOR YEAR.

I. Grain Investigation Work.
II. Forage and Grass Investigation Work.
III. Sugar Beet and Other Root Investigation Work.
IV. Seed Competition Work.
V. Publication of Data Obtained.

VETERINARY SECTION.

PLANS FOR YEAR.

(1) To continue the investigation of loco weeds and disease in conjunction with the Department of Agriculture.

(2) To investigate poison weeds other than loco and contagious diseases in general over the State.

(3) Printing of bulletin on Larkspur and Other Poisonous Plants.

ARKANSAS VALLEY FIELD AGENT.

Alfalfa, Beets and Cantaloupes. The specific lines of each as follows:

Alfalfa. 1. Improvement by seed selection, extending the present nursery, with planting of seed selected this year, and other promising strains. This work to be done in co-operation with Prof. Olin.

2. A field study and the investigation of conditions and methods of securing the best yields of alfalfa seed. This work might be planned to complete for an early publication, also with a view of extended investigation, if the results warranted.

3. Continued co-operative work with Prof. C. P. Gillette investigating the insects injuring alfalfa, especially affecting seed production.

Beets. The continuation of the efforts to develop a disease resisting beet. Also a similar outline for investigating beet seed growing as that planned above for alfalfa, though the field for observation might be smaller. The two lines could be worked in conjunction.

Cantaloupes. 1. Continuation of the rust-resisting cantaloupe investigation; this could largely be done in co-operation with growers. Perhaps a small plot on the Station property.

2. Improvement of cantaloupe by cross-breeding small test plot.

The general plan to carry out the above line of work would be field work in the vicinity of Rocky Ford and plat work on the Station property at Rocky Ford. The field work also to include several trips up and down the Arkansas valley to investigate alfalfa seed growing. Possibly a trip as far east as Garden City, Kansas, which is a large alfalfa seed producing section.

The investigation of beet seed growing is one of large interest to the State, and to what extent it should be taken hold of is a question better considered than recommended.

I. THE CANTALOUPE INDUSTRY IN THE ARKANSAS VALLEY.

To take up this, and especially the question of Farmers' Co-operative Organizations; to obtain complete data of the original cause of organization; developments from year to year; methods of organization and changes that have taken place, together with results; to obtain data as complete as possible by correspondence and by records, with the idea of issuing as one of a series of bulletins on the Farmers' Co-operative Organizations.

II. STUDY OF CULTURAL METHODS OF SUGAR BEETS.

To take up the methods of growing beets in the Arkansas valley; to spend a great deal of time in the field visiting the beet fields with the agricultural men of the different factories; to especially study the difference in cultivation and yield, and to trace them back to the cause which may have produced them.

To take up more especially in this connection the Arkansas valley as about as much as can be done in one season, but to make several trips into the beet growing sections and other parts of the State, and to give to this matter the time available from the cantaloupe and alfalfa investigations to be carried on at Rocky Ford.

PHILO K. BLINN.

FINANCIAL REPORT OF THE COLORADO AGRICULTURAL EXPERIMENT STATION FOR THE FISCAL YEAR ENDING JUNE 30, 1906.

RECEIPTS.

Dr.	U. S. Fund	Special Fund	State Fund	Totals
From the Treasurer of the United States as per appropriation for the fiscal year ending June 30, 1906, as per act of Congress approved March 2, 1887	$15,000.00	.....	.....	.....
Balance on hand July 1, 1905	.....	$ 686.05	.....	.....
Miscellaneous	.....	2,588.23	.....	.....
*State appropriations	.....	.....	$14,000.00	.....
Total receipts				$32,274.28

DISBURSEMENTS.

Classification	U. S. Fund	Special Fund	State Fund	Totals
Salaries	$10,234.50	$ 1,168.29	$ 180.00	$11,582.79
Labor	446.70	287.95	963.73	1,698.38
Publications	1,677.52	997.78	503.60	3,178.90
Postage and stationery	379.42	39.79	258.98	678.19
Freight and express	129.41	21.16	247.82	398.39
Heat, light, water and power	4.35	5.70	.....	10.05
Chemical supplies	.....	.....	.....	.....
Seeds, plants and sundry supplies	226.95	22.88	630.07	879.90
Fertilizers	.....	.....	3.10	3.10
Feeding stuffs	.....	.....	541.37	541.37
Library	169.27	26.00	.....	195.27
Tools, implements and machinery	.....	18.65	38.80	57.45
Furniture and fixtures	494.42	134.60	33.80	662.82
Scientific apparatus	236.11	242.79	72.79	551.69
Live stock	110.00	.....	1,679.63	1,789.63
Traveling expenses	807.52	260.61	320.19	1,388.32
Contingent expenses	83.83	35.00	6.00	124.83
Buildings and repairs	.....	13.08	6,155.60	6,168.68
Total expended	$15,000.00	$ 3,274.28	$11,635.48	$29,909.76
Balance			2,364.52	2,364.52
			$14,000.00	$32,274.28

*This is a special appropriation by the State Legislature for two years—from December 1, 1904, to November 30, 1906, inclusive.

INVENTORY, AGRICULTURAL EXPERIMENT STATION, 1906.

DIRECTOR'S OFFICE.

Office fixtures and equipment	$ 1,689.38	
Stationery and supplies	417.85	
Half tones and zinc etchings	455.70	
Library	2,410.00	
		$ 4,972.93

METEOROLOGICAL AND IRRIGATION ENGINEERING SECTION.

Meteorological instruments	$ 701.55	
Office fixtures	254.95	
Stationery, books, maps, etc.	56.65	
Irrigation and hydraulic apparatus	449.86	
Photo supplies and negatives	262.19	
Tools, etc., for soil work	180.85	
Miscellaneous	367.18	
		$ 2,273.17

ENTOMOLOGICAL SECTION.

Laboratory and office supplies	$ 329.53	
Entomological supplies	140.90	
Insecticides and insecticide apparatus	283.10	
Apiary	118.45	
Microscopic apparatus	592.25	
		$ 1,464.23

CHEMICAL SECTION.

Calorimeter	$ 210.00	
Polariscope	180.00	
Pulp machine and juice press	70.00	
Three balances	250.00	
		$ 610.00

HORTICULTURAL SECTION.

Photographic apparatus	$ 64.35	
Instruments	114.00	
Herbarium	1,652.00	
Tools	30.80	
		$ 1,861.15

AGRICULTURAL SECTION.

Implements and tools	$ 485.50	
		$ 685.50

VETERINARY SECTION.

Kodak	$ 18.00	
Stationery	2.00	
Stock at Hugo (loco experiment)	408.00	
		$ 428.00

ROCKY FORD SUB-STATION.

Forty acres of land, with water rights (title conditional)	$ 7,000.00	
Buildings and improvements	1,484.00	
Farm machinery and tools	678.75	
Office furniture and fixtures	30.80	
Camera and photo supplies	30.00	
		$ 9,223.55

CHEYENNE WELLS SUB-STATION.

One hundred and sixty acres of land (title conditional)	$ 800.00	
Fencing	110.00	
Three thousand feet galvanized iron pipe, in ground	30.00	
Dwelling house and barn	750.00	
(U. P. Railway property at station, $18.)		$ 1,690.80

WESTERN SLOPE FRUIT INVESTIGATION.

Horse	$ 110.00	
Implements and tools	136.50	
Office furniture and fixtures	157.35	
Camera and photo supplies	69.40	
Negatives	100.00	
Insecticides	3.25	
		$ 576.50
Total		$23,785.83
Total Adams Fund inventory		4,157.36
Total		$27,943.19

REPORT OF THE HORTICULTURIST AND BOTANIST.

To the Director:

Since my last report the work in this section has been divided into several sub-sections, as follows:

Forestry, in charge of Prof. B. O. Longyear.

Western Slope Fruit Investigations, in charge of Prof. O. B. Whipple.

Potato Investigations, in charge of Mr. E. R. Bennett.

Professor Whipple, formerly assistant in Horticulture, was placed in charge of the work on the Western Slope, leaving here in April. His successor, Professor Paull, did not assume his duties until September, consequently the work here has been considerably hampered.

Mr. Bennett began his work with potatoes in April. It is too soon to expect definite results from this work, however; a number of interesting experiments are well under way.

Perhaps the most important departure which the College and Experiment Station has yet undertaken so far as the Horticultural section is concerned is the inauguration of field work on the Western Slope. Both Mr. Taylor and Mr. Whipple have met with good results with their work, and the constant demands on their time shows that the efforts of the College are appreciated.

More detailed accounts of the work of these various sub-sections will follow.

Our own time has been largely occupied with teaching, executive work, correspondence and occasional visits to the fruit sections of the State. A new plant disease has made its appearance in the form of a bacterial blight of alfalfa. This disease appears to be new to science, and in some restricted localities has resulted in the practical destruction of the crop. We have planned to make a thorough study of the disease and hope to discover some method of combatting it.

Material for two bulletins has been collected, as follows: "Fruit Associations" and "The Red Raspberry Industry." We hope to have these ready for publication before the close of the year.

Forestry. A co-operative experiment in tree planting was begun last spring, which originally included twenty farmers in as many localities. Twelve thousand trees were to be distributed in lots of six hundred each. But the demands for trees were so great that the plans were extended till forty-seven co-operators included and 22,200 trees distributed. Reports from these men show that in the great majority of instances these trees have been well taken care of and a good growth is the result.

Potato Investigations. Mr. Bennett began his work with potatoes in the latter part of April. He has visited all of the potato growing sections of the State, and made a systematic study of the culture of the crop and the general status of the industry. A bulletin on this phase of the work is now in preparation.

Several experiments in seed selection in an effort to produce more uniform and more stable varieties are well under way.

Western Slope Fruit Investigations. This work was inaugurated last spring by the appointment of Mr. O. B. Whipple as Field Horticulturist, and Mr. E. P. Taylor, Field Entomologist. I need only mention here that this work has proven most satisfactory from all standpoints. The demands for advice and assistance in various ways have been greater than could be met, even had no experimental work been attempted. The results of one season's experiments are not usually conclusive, but some of the things which these men have determined even in this short time will be worth many thousands of dollars annually to the fruit growers of Grand valley.

Respectfully submitted,

W. PADDOCK,
Horticulturist and Botanist.

SUB-SECTION OF WESTERN SLOPE FRUIT INVESTIGATIONS.

My work in connection with the Station as Field Horticulturist dates from April 1, 1906, and practically all of this time has been devoted to the study of orchard conditions in Mesa county. During the season I have made two trips to Delta county to investigate the conditions there. I find it nearly, if not quite, impossible, to divide my time to any great extent with outside counties.

In my work I have given especial attention to plant diseases, cultivation, watering, pruning and the collection of data on the fruit industry.

The interest taken in the work by the growers has been very gratifying, and at no time have we experienced any difficulty in securing the co-operation of careful growers in carrying on experiments. The success of our work depends to a large extent upon this friendly co-operation of the fruit growers. Our correspondence with growers has not been all we desired, but will no doubt increase as we become better acquainted and the plan of our work better known. Requests for information have been numerous, but, on account of the limited time spent in the office, some growers have no doubt become discouraged in trying to catch us by telephone. We have tried to spend as many evenings as possible in the office, where we hope the growers will learn to catch us.

The orchard survey work has not progressed as rapidly as we at first hoped it would, on account of the time required for other investigations. This survey work has been carried on in connection with other work as far as possible. This part of the investigations can no doubt be pushed more rapidly during the remainder of the year, and while the summer season is no doubt the ideal time for this work, I think the object of the survey can be accomplished during the winter season.

Observations on plant diseases have been very interesting, and some important conclusions have been reached.

In three orchards where experiments were carried on in spraying for Alternaria very satisfactory results were obtained. Bordeaux as a fungicide was used in connection with arsenate of lead and arsenite of lime, being careful in each case to have some check trees where the effect of these insecticides on the fruit and foliage when used alone might be observed. These experimental blocks contained Kieffer pears and Gano and Ben Davis apples, and were so divided as to show the possibility of controling Alternaria with one winter application, with one winter and one summer and with two summer applications of Bordeaux

mixture. For all summer applications half strength Bordeaux was used, and were with the first and second codling moth sprays. The following conclusions were reached:

That Alternaria is, in most cases, a secondary factor in causing the decay of fruit, and in this locality at least follows spray injury to a large extent, though it may follow bruising or codling moth injury.

That the most satisfactory method of controlling it lies in choosing a reliable arsenical poison.

That the Kieffer pear can not, in this locality, be sprayed with any degree of safety with other than a standard or tried brand of arsenate of lead.

That if Ben Davis and Gano apples are to be sprayed with arsenite of lime, special care should be given to its preparation, and a good clear day selected in which to apply it.

As a secondary observation it is found that Bordeaux mixture prepared by using two pounds copper sulfate, four pounds lime and fifty gallons of water will russet Ben Davis and Gano apples, though not to any serious extent, if used on any other than a clear day, and even then russeting may occur on the shaded portions of large trees.

Though only a trace has been found in this county, peach mildew has attracted more attention than usual in other localities this season. This is probably on account of the unusual amount of rain during the early part of the summer. No experiments have been carried on under my directions, but observations made in orchards sprayed by careful orchard men show that one thorough summer application of dilute Bordeaux, 2-4-50, will clean up a badly infested orchard. The disease is capable of ruining a crop in a short time, and prompt action is an important point in fighting this disease.

Gummosis in peach trees has been called to my attention in several orchards, and where not too far advanced, a vertical slitting of the bark seems to bring relief and leads to the recovery of the tree. The use of a sharp knife in cutting through the bark about the affected trunk or branch seems worthy of further trial.

Two apparently distinct forms of root rot found working upon the apple seem to be important enough to require careful study the coming year. One form which is proving the more destructive of the two works exclusively, I believe, on the apples of the Ben Davis type, while the other shows no preference for varieties nor is its presence in the orchard followed by such rapid spread and destruction.

Some experiments have been undertaken in thinning apples to determine the average amount of fruit trees of various ages will produce and the effect of thinning out the color of the remaining fruit and the crop of the ensuing year.

Problems for the ensuing year I believe are:

Pear blight and its control, giving special attention to the form known as blossom blight.

Peach mildew and the effects of winter spraying with Bordeaux mixture and lime-sulphur washes.

Grape mildew (U. spiralis) and methods of control.

Tests in pruning grapes by various methods in hopes of finding a trellis method of training which will hold the fruit off the ground and still allow of the grapes being taken down and covered in winter.

Observations on the amount of irrigation best adapted to grape growing.

And a careful study of the two forms of root rot mentioned above, to determine the nature of the disease and remedies if possible.

Respectfully submitted,

O. B. WHIPPLE,
Field Horticulturist.

SUB-SECTION OF FORESTRY.

A CO-OPERATIVE EXPERIMENT IN TREE PLANTING.

An extensive experiment in co-operative tree planting has been started during the past season, with two species of utility trees—the Common or Black Locust (Robinia pseudacacia) and the Hardy, or Western Catalpa (Catalpa speciosa).

The primary purpose of the experiment is to enable us to secure data as to the adaptability of these two species of trees in different parts of the State, and furthermore to place object lessons in the formation of artificial timber plantations before the farmers and land owners of Colorado.

To this end notices were sent to the newspapers throughout the State, calling attention to the desirability of planting trees for posts, poles and fuel and calling for volunteers to co-operate with the Station in the experiment. To each volunteer was sent a printed leaflet giving the purposes, conditions, and plan of the experiment together with some suggestions for preparing the land and setting the trees for a timber lot. Each applicant for trees was also asked to give the altitude and a description of the land, the use of which was offered for this purpose.

According to the conditions of the experiment, as originally planned, each co-operator should furnish the land free of charge, plant the trees and care for them according to instructions, and report upon their condition whenever requested. The Experiment Station should furnish the trees free of charge, except transportation charges, and give occasional supervision and advice as to their care. It is intended to carry the experiment over a period of ten years, at the end of which time the Station will relinquish all claims upon the plantation.

At first it was planned to establish one plantation of three hundred trees of each species in each of twenty representative localities of the State. For this purpose six thousand trees of seedling locust and an equal number of two year old catalpas were purchased in 1905, and planted on the Station grounds, where they were allowed to grow one season. So many applications were made for trees, that it was impossible to supply all from this stock. An extra appropriation, however, was secured by which enough additional stock of the locust was purchased to supply 500 trees to such of the other applicants as seemed to be favorably situated for the purposes of the experiment. In all forty-seven lots of trees have been placed in the hands of co-operators representing thirty-five different localities and twenty-four counties.

Before shipping the trees, Press Bulletin No. 25, Instructions for Co-operative Tree Planters, was prepared and sent out.

This contains detailed instructions as to location, and preparation of the soil, spacing, heeling in, trimming, planting, irrigating and cultivating.

The catalpa seedlings, when planted on the Station grounds, were two years old, and about eighteen inches high. They were cut back to about one foot in length, and after being root pruned, were planted with ditching spades in rows two feet apart. The locust seedlings were only about one foot long when received and were cut back and planted in the same manner as the catalpas. The catalpas made a growth of about ten to fifteen inches; the locusts an average of about four feet. During the winter of 1905 and 1906, which was very severe on all young trees, both species were killed back nearly to the ground; the locusts being less injured than the catalpas.

The second lot of locust seedlings, purchased in the spring of 1906, were of vigorous growth and about two and three feet high. They were shipped from the nursery to the Station where they were divided into lots of 500 and baled for shipment to the planters.

Respectfully submitted,

B. O. LONGYEAR,
Assistant Botanist.

SUB-SECTION OF POTATO INVESTIGATIONS.

The investigation of the potato industry in Colorado was begun the latter part of April, 1906. Since then the various potato districts of the State have been visited, and a systematic study has been made of the methods of culture, irrigation, insect pests and diseases of the Greeley district and the other districts as far as time has permitted.

Experiments to determine the effect of changing seed from one location to another have been started. Two sacks of Red Improved Peachblow potatoes were selected from the storage cellar of Mr. Edgerton, of Carbondale. One of these was planted there. The other was sent to Greeley and planted on Mr. E. R. Bliss' place, near Greeley. Two sacks each of Late Ohio, White Pearl and Rural New York No. 2 were selected from bins at Greeley, one of which was planted there, while the others were sent to Carbondale and planted.

The work of improving and fixing the existing varieties by selection has been started in co-operation with potato growers in different places. A quantity of a new variety from Scotland, the Delmany Beauty, which is being grown by Mr. Grubb, at Carbondale, was divided into two types, one a round potato, the other long, and planted separately to observe the effect on the types.

Ten sacks of White Pearl potatoes have been selected from a field on the farm of Mr. Bickling, near Greeley, and stored in his cellar. The potatoes in this field were of a superior type to most fields, owing to the effects of two years' careful selection by the grower. Many hills contained potatoes, all of which were of a desirable type. None but the best tubers from these desirable hills were selected. Because of the tendency of potatoes to "run out" when planted more than two or three years on the irrigated land of Greeley, growers do not keep the same seed more than that time, and by changing, the gain from the two years previous selection is lost. The plan is to have these selected potatoes planted on the unirrigated land of the Arkansas divide, and at the end of one or two seasons, bring them back to the Greeley district. If this should prove to be practical, the type of potatoes can be much improved.

It is thought possible by careful selection to avoid the tendency of potatoes to "run out" on the irrigated lands. With this idea in mind, seven sacks of potatoes were selected from a field of new land on the same farm near Greeley. These were grown from Divide seed, which, like most seed brought from outside the district, is mixed as to variety as well as type.

Of the Improved Peachblow potatoes brought from Carbondale, one sack has been selected for seed for next year and a sack of Carbondale seed will be planted with them so as to observe the effect of the acclimatization on them.

One acre of land on the Foy place, two miles east of Fort Collins, was rented for experimental work with potatoes. The land was planted with small plats of about fifty varieties of seedlings and European varieties, obtained from the Department of Agriculture at Washington. The formalin and corrosive sublimate treatment were both used on plats of Pearls and Rural New York No. 2, and one plot of the land was given an application of copper sulphate at the rate of 35 pounds per acre to ascertain the effect on potato scab or *Rhyzoctonia*.

Measurements have been made as to the amount of water used by irrigation to grow an acre of potatoes. Special attention has been give nto the diseases of potatoes, especially *Rhyzoctonia*, as to its effect on yield and quality of the crop and to the conditions of culture and irrigation that have tended to make the disease less or otherwise. Investigation along the same line is now being carried on in the laboratory.

It is the opinion of the writer that cultural methods have much to do with the control of our soil disease, and consequently the success of the potato crop. It is proposed to carry on quite extensive experiments in co-operation with growers in different parts of the State to determine the effect of deep versus shallow cultivation.

Respectfully submitted,

E. R. BENNETT,
Potato Expert.

REPORT OF THE ENTOMOLOGIST.

Fort Collins, Colo., Nov. 24. 1906.

To the Director:

I have the honor to present herewith my annual report of the Entomological Section for the year just closing.

The year has not been marked by any extraordinary insect outbreak unless it be the rapid increase of the green aphis and the woolly aphis of the apple tree in the orchards of the Western Slope where these insects have become an intolerable burden to the apple growers. If these lice continue their depredations unabated for a few years more in the sections where they have been most abundant the past year, there are many fruit growers who will feel like giving up the fight and taking out their apple trees.

Rather extensive experimental work has been outlined with a view to finding better methods for the control of these pests. The work includes a thorough study of the life histories and natural enemies of these insects as well as the testing of insecticide measures for their destruction.

The melon louse (*Aphis gossypii*) continues to be a serious pest in those sections of the State where water melons and cantaloupes have longest been grown in a commercial way. This insect is also a special subject of study by this section, both for the purpose of determining its food habits, and life history as well as to determine the most practical methods of keeping it in check in the melon fields. Considerable has been accomplished along this line already but our work must continue through another year at least before publishing upon it.

While the three plant lice above mentioned are being given special attention, it is thought best to do as much as possible to determine the species of plant lice that are infesting Colorado plants, both native and cultivated, and to determine, so far as possible, their life histories.

Two papers are about ready at the present time for publication upon the plant lice of the genus Chermes attacking Colorado Conifers.

The common grasshoppers (Locusts) have been usually abundant over the State the past summer and the Western cricket (*Anabrus simplex*) is reported to have done many hundreds of dollars damage to crops in Routt county the past year. The depredations are carried on at so great a distance from the Experiment Station that it makes the work of experimentation against this insect very expensive, and nothing has been done in the study of its habits or to determine the best methods for its destruction by this section except what was published in Bulletin 101. If the depredations of this insect continue, it will doubtless be ad-

visable to arrange to take up some special lines of investigation with a view of finding better remedies than are at present known to lessen its injuries.

The work of collecting the economic insects during the past year has been very largely confined to the plant lice and the insects that are associated with them either as friends or enemies.

The only scale insects of much economic importance in Colorado are the cottony maple scale, attacking chiefly the soft maple, the boxelder, and the black locust, and Howard's scale (*Aspidiotus Howardi*), most abundant upon pear, plum and apple trees. The work of the section upon the former scale was reported by Mr. S. A. Johnson in Bulletin 116 and press bulletin 27, and Mr. E. P. Taylor has been giving special attention to Howard's scale in the orchards of the Western Slope where it has been injuriously abundant in many instances to a small number of trees. Mr. Taylor expects to be able to prepare a bulletin giving full life habits and satisfactory remedies for this insect in the near future. He probably will wish to carry his investigations through another year, however, before making his report upon the work.

The oystershell scale (*Lepidosaphes ulmi*) was first taken in the State by Mr. S. A. Johnson the past year, who found it badly infesting a few lilac bushes in City Park, Denver. Mr. L. C. Bragg has since taken the same scale in several instances upon elm trees in the vicinity of Fort Collins, but in scattered numbers only in each case.

I am glad to be able still to report that the San Jose scale continues to be unknown in the orchards of Colorado.

The peach twig borer (*Anarsia lineatella*) did its usual injuries to peach trees of the Western Slope last spring. Mr. E. P. Taylor seems to have demonstrated that the injuries of this insect can be almost entirely prevented by an early spring application of arsenate of lead.

The Eastern peach borer (*Sanninoidea exitiosa*) has also been found by Mr. Taylor to be a serious pest in a few limited localities on the Western Slope. It has not as yet attracted much attention as an injurious insect in this State, but the fact that it is already injuring a few orchards, makes it important that our fruit growers be very watchful and put forth every effort to keep this serious peach enemy in check.

The observations upon fruit blossoms, and the time of the blooming of our fruit trees, that have been carried on for two or three years past are being made chiefly for the purpose of determining the relation of the varieties of fruit to the time for spraying, and to determine the flower visitants and their possible or exact relation to blight in apple and peach orchards. Considerable additional data have been collected during the past year. All of these records with additional ones, I hope to be able to collate for publication some time in the future.

The co-operative experiment with the Horticultural Section for the special purpose of determining whether or not blight

germs are carried over in honey in the bee hive is also being continued for another year.

The codling moth work that was planned for the Western Slope and which was carried on in a section where this insect had become specially destructive and abundant, were carried through by Mr. Taylor to a satisfactory conclusion, proving beyond reasonable doubt that this insect can be almost wiped out as an orchard pest in the worst infected sections of the State by two or three thorough applications of Arsenate of Lead properly applied. (See the report of Mr. Taylor given below.)

Mr. Taylor has also carried through life history records upon this insect the past season that confirm the writer's former views as to the number of broods of the moth and that will be of much value in determining the best dates for the application of arsenical sprays for the control of this insect in the Grand Valley.

Mr. Johnson's investigations of loco insects have been completed and a short bulletin can be prepared soon.

The work upon potato insects, which is also being carried on by Mr. Johnson, will need to be continued through another season.

The entomological outline from this section for the Western slope fruit investigations for the years 1906-'07 is as follows:

I. NOTES ON APPLE AND PEAR BLOOM—

A. In relation to Codling moth spray.
   (a) Date of blooming of different varieties.
   (b) Date of petals falling from different varieties.
   (c) Date of calyx closing in different varieties.
   (d) Relation of early and late blooming to setting of fruit.
   (e) Position of calyx cups, up, out, down, etc.

B. Relation of bees and other insects to blight.
   (a) Proportion of honey bees to all other insects visiting apple and pear blossoms; also collect and pin examples.
   (b) Note condition of bloom when bees stop work.

II. SPRAY NOTES.

A. Kind of poison.
   (a) Compare arsenate of lead and arsenite of lime.

B. Comparative value of different sprays at different dates.
   (a) Once as blossoms fall.

(b) As blossoms fall and again in 30 days.

(c) As preceding and again in 30 days.

(d) As preceding and again in 30 days.

(e) As preceding and again in 30 days.

(f) As preceding, except that first spray (a) is to be left out.

Also note size of trees; amount of spray used, varieties, pressure, etc.

III. LIFE HISTORY NOTES. (Codling moth.)

A. Band record on at least ten trees. Observations not less than once a week.

(a) Try to determine when first eggs are laid, and when first worms enter apples, what per cent enter bloom on sprayed and unsprayed trees, the date of minimum of worms between broods. When second brood of worms begin to come down, when first brood are all down, etc.

(b) By cutting open unsprayed apples wormy by the second brood, determine what per cent really enter at blossoms.

B. Make notes on the work of others bearing on above points, the time and thoroughness of their spraying, etc.

IV. MISCELLANEOUS NOTES.

A. Woolly Aphis.

(a) Varieties most and least attacked.

(b) Extent of injury (little apples, trees killed, etc.); when first winged lice appeared, effects of the remedies that have been used, etc.

B. Howard Scale (and others).

(a) Kind of scale, variety attacked, nature of the attack, extent of injury, when first noticed, stage of insect. Notes on applications that may have been made.

C. Peach Twig Borer.

(a) Fruit tree attacked, nature and extent of injury. Try to determine broods, collect under bands. Notes on remedies.

D. Western Peach Borer.

(a) Rear all specimens possible to determine life history.

E. Apple Aphis (and others).

(a) Note if lime and sulphur or other sprays before hatching lessen lice.

F. Brown Mites.

(a) Same notes as for preceding.

G. Such other miscellaneous notes as seem to you to be of value.

Special emphasis was put upon the codling moth work during the spring, summer and fall of 1906. A greater portion of that investigation having been satisfactorily completed, and the woolly aphis and green aphis having become the two most serious pests on the Western Slope, the principal work for the coming year will be with these two lice. Such time as is unoccupied with this investigation will be devoted to carrying on other work outlined in the schedule.

I believe we are very fortunate in securing so good a man as Mr. Taylor to carry on the entomological work in the orchards of the Western Slope, and I very much hope his services may be continued another year.

The plant lice investigations of the Western Slope are only a portion of a larger scheme for the study of the habits and life histories of Colorado aphididæ to be carried on from the Central station.

The bulletins published from this section during the year just closing are No. 114, Insects and Insecticides, C. P. Gillette; No. 116, The Cottony Maple Scale, S. A. Johnson, and press bulletin No. 27, The Cottony Maple Scale, S. A. Johnson.

I am also appending a report from Mr. E .P. Taylor, entomologist of West Slope Fruit Investigations, and an index to the entomological writings of the station from its organization to the present time, all of which is

Very respectfully submitted,

C. P. GILLETTE.

REPORT OF FIELD ENTOMOLOGIST.

To the Director:

I herewith report the results of work of the field entomologist of the Western Slope fruit investigations for the year 1906.

The lines of research outlined as a guide by the Entomological Department of the station at the beginning of my duties have been adhered to as closely as possible, with an occasional broadening or deviation of experiments and investigations as the conditions of the situation presented new possibilities.

The principal lines of work for the season have been as follows:

1. Experiments upon practical methods of controlling the principal insect pests of the orchard.
2. The collection and study of other economic insects.
3. Visitation of orchards by request or otherwise.
4. Attendance at fruit growers' meetings, farmer's institutes, county fairs, etc., where questions relating to the work of this office were being considered.

The experiments conducted upon economic insects have been carried on in co-operation with the orchardmen themselves who are suffering losses from these pests. These experiments have been as practical demonstrations in each neighborhood in which they were carried on and have served as object lessons at the same time they were revealing new facts. They have been the objects of the deepest local interest. These co-operative experiments have in general proven most successful and beneficial, as evinced by the hearty support and appreciation shown. The territory covered by the demonstrative experiments has been thus far limited to points lying in the lower Grand valley, principally in the orchard sections surrounding Grand Junction, Palisade and Fruita. Numerous requests for such work have been received from other fruit sections of the Western Slope. These districts wish to have similar investigations planned for them.

The codling moth has received the greatest share of attention. Spraying experiments have been completed in five orchards of the valley, and the results successfully answer the principal questions which were being asked by orchardmen at the beginning of the season. These results, among other things, have demonstrated the fact that this important pest may be controlled by a fewer number of sprays than have ordinarily been given in this locality. The proper time to spray has been determined as well as the proper spray materials and the right way in which to do the spraying. The life history of the codling moth for this section

has been studied and the method of spraying against it planned, with the life history and habits of the moth in view.

Probably no district in the United States is better equipped with modern spraying appliances than the orchard district of Grand valley, but in spite of this fact codling moth ravages have injured the fruit of the one locality to the extent of a great many hundreds of thousands of dollars each year for some years past. This was done in spite of the fact that many orchardists gave eight or ten or even more sprayings per season. It has been determined that these failures have been due to several causes: (1) lack of thoroughness of method; (2) lack of proper spray material, and (3) lack of knowledge of the exact life history of the moth enabling them to apply their sprays at the most effective time. At Fruita experiments were conducted determining the proper time to spray, resulting in practical control of the moth in badly infested orchards with from two to three applications. In the experimental plat of this orchard sprayed three times with Swift's arsenate of lead a count of 3,971 Ben Davis apples, picked from average trees, gave but 1.8 per cent. wormy apples; from 437 Jonathan apples, from trees receiving the same treatment, 2 per cent. were wormy, and 2,683 apples from Winesap trees of the same plat gave only 1.19 per cent. wormy. Out of 4,818 Jonathan apples picked and examined from trees sprayed five times, only 99/100 of one per cent. were wormy, while picked apples from unsprayed Jonathans in the same orchard gave 78.1 per cent. wormy apples, and the majority of the crop had fallen to the ground as wormy wind-falls previous to the count. At Grand Junction the codling moth experiments were conducted upon the proper methods of application of spray; comparative values of arsenate of lead and arsenite of lime as a spray and the comparative merits of different formulæ of these insecticides. These experiments were conducted along practical lines, with economic results in view. Great pains were taken to make the tests upon an extensive practical basis in order that the results would represent the greatest accuracy possible. In obtaining the exact outcome of the work, very large numbers of apples have been given careful hand to hand inspection, as it seemed that only averages from large numbers of apples could accurately represent the true condition. In determining the codling moth percentages, over 100,000 apples were critically examined, representing upwards of 600 boxes chosen as the nearest types of the various plats under comparison. The examination and counting of this number of apples has been in itself no small task, but the results seem to more than justify the time and labor spent.

Experiments conducted at Palisade have demonstrated the great value in the use of arsenate of lead against the peach-twig borer which has caused damage to the peaches of that section.

The life history of the Howard scale of the pear has been partially worked out and the insect successfully and cheaply controlled by dormant sprays of the lime and sulphur wash. The

mite of the pear has likewise been experimented upon and a similar treatment found successful. The peach borer has been found present and experiments for its control are under way. The unusual abundance this season of all forms of aphids has made it necessary to devote some time to their injuries and treatment. A number of insecticides were tested in April against the eggs of the insect then hatching and the lime and sulphur wash found destructive to their eggs. Experiments of insecticide against the woolly aphis so universally destructive are now under way. A new injury to the tender buds of pear and apple by a minute chrysomelid beetle (*Myochrous squamosus* Lec.) was discovered and studied and some measures of control undertaken. The microscopic bee (*Trichogramma pretiosa*) infesting the egg of the codling moth was studied in relation to its benefit in our apple and pear orchards in assisting in the control of this insect. Studies were made also of lace wings and lady beetles, which are so helpful in reducing the number of woolly aphis and other aphids. Injury by ants and prairie dogs to young cantoloupes planted upon virgin land has been observed and assistance given in their control. The injury to fruit from sprays containing an excess of free arsenic has been fully investigated and is now under preparation for fuller report. Other miscellaneous notes have been made upon peach aphis, elm aphis, mosquitoes, green fruit worm, grasshoppers, round head borers, etc., and considerable material collected and preserved. An insectary for the study of life histories of insects has been maintained throughout the season.

Various new insecticides have been tested, some where the fruit growers' association desired information upon such products before making large purchases of them. In all my work an intimate and beneficial relation between the associations of fruit growers has been maintained.

Notes on fruit bloom in relation to sprays have been collected, such as the date of blooming of different varieties, the date of petals falling from different varieties, date of calyx closing, relation of early and late blooming to setting of fruit, and the direction of fruit bloom upon the tree.

An exhibit of the entomological work being done was prepared and shown at the local county fairs, attracting considerable attention.

A considerable number of horticultural meetings have been attended. Short addresses upon subjects relating to the work have been given at seven meetings held throughout the fruit sections of Mesa county by fruit growers' associations or horticultural societies. Aside from these some part in regular farmers' institute work has been taken.

Respectfully submitted,

ESTES P. TAYLOR,

Grand Junction, Nov. 8, 1906.

REPORT OF THE IRRIGATION ENGINEER.

During the year, the work has followed the outline, and it together with the accumulated results of previous years, needs to be worked up to result in a number of bulletins.

The general topic of the irrigation survey of Colorado is one which has been the constant purpose of this section of the Station for a number of years, but the scope has been such that but little can be done from year to year. The special studies which have been made in Evaporation, in Duty of Water and in the Return of Waters, have been only separate steps which when completed will close into a whole.

The valleys of the Platte, the Poudre, the Arkansas and the Rio Grande have been quite thoroughly investigated.

The most time and expense this year has been given to the investigation of the draining of the lands near Grand Junction.

Because of the Western Slope fruit investigation, this investigation seems a timely one. A great many acres of valuable land in that community have become water logged and it has been therefore a matter of great economical importance to determine the remedy. The first and most important step in prescribing has been to be sure of the diagnosis. During the year careful and complete measurements have been made over an area of many square miles including the determination of the surface and ground water in the attempt to get at the source of the water and the reason for its action in separate cases. The study is not complete but leads to some manifest conclusions. One is, that the water is used in excess, and that a united system of drainage becomes necessary.

An interesting study has been made of a water system isolated from all others and where the conditions were especially favorable for a record of the water as applied, of the acreage and the other phases of the water. In most cases, the application of water from one ditch is so complicated from the effect of the water applied from other ditches that the study has to be taken up on too large a scale to be within our means of men and apparatus. This also is being worked up. The records in meteorology have been continued as before, and now with the nearly twenty-five years' record, they have become of much value for a knowledge of the climate. These records involve an enormous amount of time and labor but they are worth the time and cost. An intelligent study of the plant life can not be made without a knowledge of the portions relating to water.

The measurements of water developing in streams has been made for a number of hundred miles. They show the continued increase in the water which returns to the streams. It indicates

that the water thus coming to the Poudre, as a specific instance, has practically doubled in the past fifteen years, and that this increase means an increase of many thousands of acres as possible from the water supply of that stream. Where the other streams of the State are also included, it means the increase of several hundred thousands of acres in the Platte Valley alone.

These measurements with further extensions relating to the mutual relation of water and crops, which is a laboratory study, long wanted to be undertaken, we desire to take up at fuller length during the coming year.

In this work, we have had the efficient help of Professor House, Mr. Trimble, Professor Lorey, and Mr. F. L. Payne, to whom much credit is due.

Respectfully submitted,
L. G. CARPENTER.

December 1, 1906.

L. G. Carpenter, Director,
Colorado Experiment Station.

Dear Sir—The months of June, July and August were spent by the Assistant Irrigation Engineer in the Grand Valley upon the investigation of the seepage problem presented in that Valley.

Headquarters were established at Grand Junction. Holes six inches in diameter and running down to water were dug one-fourth of a mile apart and running on each section line from the ditch to the river. These lines of holes cover nearly the entire valley. A line of levels was run over the holes and accurate data has been collected of the depth of the surface water throughout the entire irrigation season.

Seepage measurements were taken on the Grand Valley Canal, the High Line Canal, the Mesa County Ditch, and the Independent Ditch.

The data has all been taken but it yet remains to tabulate this data, draw the maps, write up the conclusions, and an instructive bulletin ought to be the result.

The data collected seems to point to the fact that the seepage in the valley is due to excessive application of water in irrigating the land and is not due to the seepage from the main ditch. The remedy, of course, will be more economical use of water in irrigation, and the drainage of the worst seeped places.

Respectfully submitted,
E. B. HOUSE.

REPORT OF THE CHEMIST.

To the Director:

I herewith hand you my report of the work of the Chemical Section, covering particularly the period since my last report.

The only bulletin work completed is represented by the manuscript on the extraction and refining of beeswax and some analytical work requisite to the preparation of a small bulletin on the Australian salt bush, Atriplex semibaccata, and Russian thistle hay.

My reasons for the preparation of the latter material are essentially the following: In the eastern portion of this State, where the rainfall is small and stock raising is almost the only dependable industry, it is a question of considerable importance to the people that they should have a forage plant for hay-making which will not only make a good growth with a very small rainfall, but which will also furnish a relatively good fodder. The need of such a forage plant is so badly felt in some sections that the grass, locally known as sand grass, a dry, coarse, harsh grass, Russian thistle, and the native salt bush, Atriplex Argentea, have been used for this purpose.

In Bulletin 93 I recorded some experiments with hay made from the native salt bush, Atriplex Argentea, which while it is richer in the proteids than either corn fodder, timothy hay or native hay, and would, from the standpoint of Analytical Chemistry, be considered a fairly good fodder, and this judgment would not be gainsaid by a consideration of the coefficients of digestion unless those for the crude fibre and ash, the former being very low and the latter very high, should give rise to a question in regard to its value. The results of feeding for the short period of twelve days, however, showed that it is a very poor fodder—one whose use under any circumstances would probably be attended with more evil than good.

Concerning the Russian thistle hay, I have no data except such as I have gathered from individuals who have used it, which is, as a rule, of little value. There is, however, a substantial agreement that the thistle hay is of some value, though the claim made by some that it is very good is not to be accepted, as established.

There have been times in the eastern part of the State when any fodder at all for a few days would have saved the lives of many head of stock and it is to meet the exigencies of these short periods that energetic and provident persons have resorted to the expediency of using the fodders named. It is my belief that the Australian salt bush named is worthy of consideration in this connection and will probably furnish a source of fairly good fod-

der. This seems to me to justify the publication of a short bulletin on this subject.

The work in connection with my digestion experiments, is nearly completed and would have been wholly so before this had we not had our attention diverted to other work which would not so well admit of postponement.

The study of the deterioration of farm-yard manure, under our conditions is progressing as rapidly as the subject will permit. The practical importance of this work has become very much less than it was when we began it. The practice of our ranchmen up to a few years ago was irrational and wasteful in the extreme. This work was undertaken primarily to obtain data on this subject, which are at present wholly wanting, but it was hoped that its practical bearing upon our farm practice would be to correct this wastefulness and contribute to more rational treatment of our soils. The practical results hoped for have already been largely anticipated, due to a number of reasons but probably, most largely to the monetary returns obtained by fertilizing the land to be planted to sugar beets.

We have not been able to approach the new work which we planned for the very simple reason that we have been busy all the time, having more work than our present force can get done.

In regard to the study of the changes in the water used in irrigating the meadows of our mountain districts, the composition and digestibility of the forage grown under these conditions, I have nothing other to say than I have already put in writing. The subject is not wholly peculiar to Colorado, and has been studied, but not recently, so far as I know, and not under such favorable conditions as obtain here.

The subject presents, as it appears to me, some very interesting questions pertaining both to the water and the vegetation. But aside from these chemical questions, the marked economic results obtained in feeding, in the high parks of the State, for instance in North Park, invite inquiry into their causes, for these results are wholly, or in the main, obtained by the use of the native, mountain meadow hays, without the addition of grain.

The completion of the study of the waters, surface and underground, of the San Luis Valley is also awaiting us. The work which we did on these waters some years ago ought to be repeated and extended. The study promises some very interesting results pertaining to the changes which these waters undergo, both on the surface and within the strata composing the formation of the valley.

I have done very little, practically nothing, on the subject of alkali within the past year. Considerable material has been accumulated but the importance of the subject since our people have begun to drain their lands is less than formerly; another reason why I have not prosecuted further work on the subject is that I have found the character of our alkalies to be so nearly uniform that further addition to the already considerable number of

analyses seems to be useless. This subject of late years has become of some importance in the San Luis Valley and an extension of this study in connection with that of the waters of this valley might be worth the doing, otherwise I do not see any good reason for not considering the work completed.

We have done some miscellaneous work during the year covering quite a range of subjects. Such work takes a relatively large amount of time, often wholly disproportionate to its importance.

The requests for work of this character are quite numerous and though both the President of the College and yourself answer a number of these, we have received requests for one hundred and nine analyses in the past eight months, not counting requests from other sections of the Station. These requests are mostly for analyses of soils and waters, frequently specifying that a complete, thorough, correct or reliable qualitative and quantitative analysis is desired. It is simply impossible to consider these.

If we count a complete analyses, such as is frequently specified, of a soil or water, as requiring 60 hours work and we agreed to do one-half of the work requested within the last eight months, not counting the requests from other sections of the Station, we would have 3,000 hours' work or one man's time for 377 days of eight hours each—about 15 months' continuous work, counting 26 work days to the month. The department would either have to have two assistants for this class of work should we do all that is presented, or give up our station work proper.

The same considerations apply to a certain extent to work from other departments. It is a very easy matter to make work enough to keep twice my present force busy the whole year through. The chemical section is, as I understand it, supposed to be as independent as the other departments and as much independent work is expected of it as of any of the others. At the present time, I have but one station assistant on whose time I can depend for station work. I present these facts to make it clear that the chemical department can not accept much work of a miscellaneous character and carry on systematic work of its own.

In regard to the salary of Mr. Douglass, I recommend that he receive from January 1st, 1907, a salary of $1200.00 per year. I make this recommendation because Mr. Douglass is a willing and efficient assistant and deserves this recognition of his services, which have extended over seven years.

Respectfully submitted,

WM. P. HEADDEN.

Fort Collins, Colo., Nov. 14, 1906.

REPORT OF THE AGRICULTURIST.

To the Director:

I have the honor to submit the following brief report covering the work of investigation in the Agricultural Section of the Experiment Station.

Investigations in Agronomy.—The work in this division has been reported on very fully in the supplemental reports submitted herewith, prepared by Professor Olin and Mr. Knorr. The agronomy work is sub-divided into plant breeding, or field nursery work; co-operative experiments with selected farmers in various parts of the State, and cultural, seed selection and variety tests on the station farm. The plant breeding, or nursery work, has been directly in charge of Mr. Knorr, and the results obtained have been very encouraging for the first year. In this sub-division definite results can not be expected for a number of years.

In the co-operative work with the farmers the object has been to determine to what extent the results obtained by the farmers in all parts of the State would compare with those secured by the workers on the station farm, and also to introduce new varieties into the various sections, giving the farmers of that section an opportunity to study the characteristics and utility of the various grains, grasses and roots. This work has been carried on in forty-eight of the counties in the State and embraces all the varying conditions. We are very anxious to continue and to extend this work in the future and also to co-operate with the United States Department of Agriculture in the conduct of a dry land farm at Eads, on the Missouri Pacific railroad, in the eastern port of this State.

The station work proper, as reported by Professor Olin, has been greatly enlarged and developed on the new experiment farm. This work sub-divides into investigations in the various cultural methods for the growing of roots, grains and grasses; also the amount of water required by the various crops. In variety tests a vast amount of valuable work has been undertaken. Twenty-eight of the most promising varieties of oats were grown during the past season. One of these in particular yielded at the rate of 127 bushels per acre; twenty-three varieties of wheat, seventeen varieties of barley, nine varieties of peas, three varieties of corn, twenty-four varieties of sugar beets, nine varieties of rutabagas, four varieties of mangels, six of carrots and twenty-seven varieties of alfalfa were grown. A special effort is being made to secure varieties of grain with stiff straw and rust resistant characteristics for irrigated regions. Also drouth resistant varieties for dry farming conditions, and especially hardy varieties for higher altitudes. Already the new experiment farm is taxed to

its utmost in the conduct of this work. There is special need at this time for additional land where the most promising of these varieties of grains may be grown under field conditions where sufficient quantities may be grown for general distribution and for further testing under field conditions. To this end I would respectfully urge that the eighty acres of land lying immediately to the south of the Experiment farm, belonging to Mrs. Taylor, and upon which the College now has an option, be secured without delay for this purpose. The investigations now under way in alfalfa and sugar beets are especially valuable for the conditions prevailing in this State.

Investigations in Animal Husbandry.—The investigation started last year in the wintering of range steers on various rations is still being continued and its scope enlarged. In lamb feeding by the aid of College funds and through the liberality of one of our friends we are investigating the comparative feeding value of finely cut vs. whole alfalfa hay for sheep feeding purposes.

The supplemental report of Professor Cottrell outlines some very extensive plans for investigations in pig feeding, the importance of which I am sure will appeal to your judgment, and I trust will have your earnest consideration and support.

The National Horse Breeding Experiments.—This division of our work is directly in charge of the head of the Agricultural Department, under the United States Department of Agriculture, and I have to report very encouraging progress. Last year five foals were secured from five of the mares that were in foal when purchased. These have developed into strong, thrifty colts, of a size and quality for their age that augurs well for the future success of the experiment. Of the nineteen mares in the stud bred last year, seventeen proved to be in foal, two aborted and one colt died at birth. We now have fourteen fine thrifty colts, all showing marked uniformity of characteristics and all approximately the type desired. The stables and corrals, the building of which was made possible by the special appropriation by our State Legislature two years ago, have been completed at an approximate cost of $6,000, about $4,800 of which came from the special appropriation and the remainder from College funds. As this experiment progresses and the stock multiplies, there will be urgent demands for additional sheds and paddocks. At the present time there is great need for shelter for the brood mares.

Respectfully submitted,

W. L. CARLYLE,
Agriculturist.

REPORT OF AGRONOMIST.

I take pleasure in reporting to you the work of the Agronomy Section of the Experiment Station since December 1, 1905.

Since that time our experimental grounds have been enlarged by the station gaining possession of the land purchased two years ago for experimental purposes. I have never seen better grounds for demonstration experiments than the new Experiment Farm presents. The soil, however, is not in good mechanical condition, and we shall plan our crop work to bring it into better tilth. The work of this section is divided as follows:

1. Co-operative work over the State with good representative farmers. We are testing several crops in this way to determine their adaptability to that particular region.

a. Hardy types of winter wheat in southwest Colorado.

b. Desirable native and cultivated grasses for improving native meadows in various parts of the State.

c. The best milling type of durum wheat in 39 of the 59 counties of the State on non-irrigated lands, to determine areas adapted and to what extent it is drought resistant.

d. High altitude grains with the view of pushing the grain belt 1,000 feet nearer snow line.

e. Vetches for forage in the higher altitudes where other cultivated forage has not been successfully grown.

f. Varieties of corn to determine best type for the few regions which are successfully growing corn.

g. Testing crops best adapted for North Park—a continuation of last year's work. This should be carried on for at least another season.

2. Experiments with Mr. Blinn, station agent at Rocky Ford. The work with Mr. Blinn is the development of desirable seed producing hardy, disease resistant types of alfalfa for the Arkansas Valley region. The work is so interesting and shows such a satisfactory beginning that I wish Mr. Blinn to report specifically upon the progress of this work. I sent seed from various sources and he has done exceptionally well with it.

3. Eperiments at the home station. The following outline gives a summary of our field experiments now under way:

a. Development of a Colorado type of durum wheat, of known milling value, adapted for certain non-irrigated lands.

b. Development of the earliest maturing types of wheat, barley and oats, of reasonably good yielding power and of good quality for the higher altitudes.

c. Development of a barley of high feeding value adapted for the irrigated lands and another type having drought resistant power adapted to certain non-irrigated lands, the object being to substitute barley for corn in finishing certain classes of live stock for market.

d. Development of distinct types of alfalfa well adapted to Western conditions which show disease resistant power, hardiness and carry a high percentage of leaf to stem, increasing forage value. This is so important a work that the alfalfa expert of the Nation—Mr. J. M. Westgate—has joined with me in this work. We have our alfalfa nursery south of Agricultural hall and expect to make this breeding of alfalfa one of the most important divisions of the agronomy work.

e. Development of a malting type of barley adapted to the irrigated lands of the foot hills and mountain mesa regions of Colorado.

f. Development of beardless types of drouth resistant spring and winter wheats of superior milling quality.

g. Experiments to improve cultural methods in beet culture, reduce cost of growing the crop and increase yield and quality of beets.

h. Development of good yielding stock roots well adapted to our climatic conditions. We should grow more roots for our live stock.

4. Correspondence Work. The correspondence work in agronomy has nearly doubled during the year, and I find it takes a considerable portion of my time. I believe this is an important part of the station work that should be carefully and thoroughly done.

5. Publications. During the year our section has issued two station bulletins and two press bulletins.

At the beginning of the year, Mr. A. H. Danielson, the assistant agronomist, left the station work to engage in farming operations for himself, and Mr. Knorr was called to the work. Mr. Knorr had completed his agricultural work under the direct supervision of Prof. W. M. Hays, now Assistant Secretary of Agriculture at Washington. Mr. Knorr was in the junior year of university work in Minnesota and on coming here took up our junior work and completes our regular agricultural course this school year. He is efficient, industrious and careful in his work and is proving a most competent helper in station work. Respectfully submitted,

W. H. OLIN,
Agronomist.

November 15, 1906.

REPORT OF CROP NURSERY WORK.

The breeding of our field crops to secure increased yields, and plants or grains that are higher in food value than those we now have is one of the many problems that must be worked out by the Experiment Station; the start made at this Station bids fair to success along this line of work; it will be seen, however, that this work is hampered to an extent through the lack of apparatus and funds.

The growth of the nursery and the results obtained this year are as satisfactory as could be expected under the conditions under which we worked. The land on which the nursery was located was in sugar beets the previous year; when the beets were removed the ground was wet; this packed the soil and left it in a poor physical condition; later on the pasturing of the tops by cattle again packed the soil; the scattering of manure by these cattle made the field on the whole very uneven, and in a very poor condition for experimental purposes as in some instances the results are hardly comparable.

In the spring of 1906, 155 nursery stocks of wheat, oats and barley were selected from the more than 500 stocks that were grown in 1905; the selections were based upon yield, and quality of the grain. Of the 155 stocks grown, 104 were wheat; these were again divided into 39 varieties of straight selections, and 65 hybrids. At harvest time 46 of the wheat stocks were discarded; 6 stocks were selected for increase in 1907, among which 4 of them are crosses of common and durum wheat, hence a beardless durum type; from the remaining 52 stocks individual selections were made to be used as mother plants in 1907.

Of the barleys twenty-three selections were made in the spring of 1906; of these fifteen stocks were discarded; some of those that were retained promise to be varieties of exceptional merit.

The oats did remarkably well; of the twenty-eight stocks planted only eleven were discarded; the basis of selection for this grain is yield, quality, ability to stand, and rust resistance.

The work with alfalfa is perhaps as promising as that with the grains; the alfalfa nursery contains twenty-six stocks, most of which are from as many different parts of the globe; the first object is to find which of these are best adapted to Colorado conditions; in the spring of 1907, after ascertaining which of these varieties can best stand the winter, individual plant selections will be made. The breeding work with alfalfa is a fairly new proposition; the problems presented along this line are numerous, but the first of these that require our attention are: increased yield; disease resistance; increased leafiness—most of our pres-

ent varieties of alfalfa yield a higher per cent. of stem than leaf, hence a loss in feeding value.

It is hoped that in the coming year we may be able to extend our breeding work to some of the native grasses and other forage plants. All of this work is very slow and painstaking, but if nothing intervenes we may be able to show some results of plant breeding work in less than two years hence.

Respectfully submitted,

F. KNORR,
Assistant Agronomist.

Fort Collins, Colo., Nov. 13, 1906.

REPORT OF THE ANIMAL HUSBANDMAN.

I herewith submit a report of my work in Animal Husbandry and a statement of plans and needs for the future:

I began September 1st, 1906, and by mutual agreement the Animal Husbandry work was divided—you retaining all work with horses and pure bred stock and assigning to me charge of all lines of feeding. October 1st, you engaged W. H. Riddell, a graduate of this College, Class of 1906, as my Assistant.

I found an experiment under way with steers to test the difference between keeping beef cattle on the range from birth until marketed at three years of age and of feeding them through the winters and running them on the range during the summers. There are good yards and sheds for handling the cattle in this test. With this exception I found no stock nor equipment available for feeding work.

A plan for feeding experiments with hogs was submitted to the Director of the Experiment Station and he stated that all funds under his control were needed for experiments under way and that no money could be spared then for feeding tests. The matter was submitted to the Executive Committee of the Board, and they made an allowance from College funds sufficient to provide for yards for feeding 250 lambs and for sheds, yards and hogs for a feeding test with 100 hogs.

At this date we are feeding 250 lambs to ascertain if it will be profitable to cut alfalfa hay when it is fed to fattening lambs. The lambs were furnished by the Wood Live Stock Co., Spencer, Idaho, who pays us for the gains we put on. The yards and sheds are ready for feeding 100 hogs, the experiments are planned and feeding will be started as soon as the hogs can be purchased at a reasonable price.

The lamb feeders have demonstrated the advantages of this State for producing a high quality of mutton profitably and Colorado feeds and conditions are as well adapted for feeding all other classes of farm animals as for sheep. The Animal Husbandry Department of the Agricultural College should demonstrate this on a commercial scale and when we do so, the work will not only enable stockmen now in the State to increase their profits but it will induce stockmen with capital to come in large numbers to this State to secure the special advantages which Colorado conditions furnish.

I urge that at the earliest possible date equipment for this work be provided as follows:

Sheep. Ten feeding yards with feed boxes and water supply, each yard for 100 head, scales for weighing sheep and feed and storage for grain. This equipment will cost about $900.00 and it

is probable that we can arrange to fatten the sheep and lambs needed for experiments, getting paid by the pound for the gains we put on and not be obliged to have the funds with which to buy the animals.

Our first work in feeding lambs and sheep should be to find methods that will secure greater gains for feed consumed and profitable ways of using a greater proportion of Colorado grown feeds. This should be followed by tests to determine the lines of breeding that will produce the most profitable feeder having a carcass with the greatest proportion of high priced cuts.

Hogs. Eighty-five per cent. of the hogs slaughtered in Colorado are shipped in from Kansas and Nebraska, yet Colorado feeds are particularly adapted for producing pork of the best quality and at less cost than pork is generally produced in the corn belt.

Denmark spent large sums in finding what feed would produce bacon having the choicest flavor and found it to be barley; England pays $18,000,000 a year for barley-fed bacon from Denmark and pays a much higher price per pound for it than for the best grade of American corn-fed bacon. Barley is the surest grain crop grown in Colorado, yielding well under both dry land farming and irrigation, and Colorado feeders have alfalfa and peas to feed with it, both of which produce choice flavor in pork at low cost.

We should demonstrate on a large scale just what these and other Colorado hog feeds will do and induce Colorado stockmen to produce all the pork needed in the State and that demanded both by the high price trade in eastern United States and in Europe.

I recommend the securing of 100 sows and 8 boars, 100 farrowing sheds for individual sows, yards for 100 sows and their pigs, fattening sheds for 500 pigs and the division of 50 acres of land west of the farm machinery sheds into ten five-acre lots for hogs. This plan will cost about $6,500 and by raising two litters a year we can feed and market 1,000 hogs annually.

We should find the best methods and feeds for producing pork cheaply, then in co-operation with the packers determine ways of feeding and curing to produce the choicest flavored products; when we have secured both these, we should send our College fed pork to Europe and find what modifications in feeding and curing will be desirable to fill the requirements of the highest priced trade there.

Poultry. One million and a half dollars worth of poultry were shipped into Colorado the past year and the entire yearly poultry products marketed in the State will not supply Denver alone for more than sixty days.

Few states have as favorable conditions as Colorado for profitable poultry production and the State should not only produce all the poultry and eggs it needs but should ship to other states several million dollars worth annually.

The Agricultural College should take hold of this industry and push it. We should keep 1,000 hens and I recommend 20 colony houses, each for 40 hens, 20 colony houses each for 10 hens, an incubator house for 20 100-egg incubators, brooding facilities for 5,000 chicks and a fattening house.

The building equipment needed to start this work will cost about $2,500 and I believe the poultrymen will aid us with donations of a sufficient number of fowls. With such an equipment we could determine the best methods of breeding, rearing and handling poultry in Colorado and could establish a practical poultry school. This work will interest and benefit financially more people than any other line we can take up.

Beef Cattle. Colorado feeds are particularly adapted for the production of beef on growing animals. We need ten feeding yards with sheds, racks, feed boxes and water supply each for twenty head and I believe the work we should first undertake should be the testing of Colorado feeds in the production of baby beef, taking calves off the range at weaning time and fattening them ready for market when twelve to eighteen months of age.

Dairy Cattle. The best work that we could do at present with dairy cattle would be to take 20 ordinary cows off the range and develop them as quickly as possible a dairy herd of twenty cows that will produce per cow per year 8,000 pounds of milk and 400 pounds of butter.

Respectfully submitted,

H. M. COTTRELL,
Animal Husbandman.

November 7, 1906.

REPORT OF THE VETERINARIAN.

To the Director:

The claim is made, and I believe fully substantiated, that tuberculosis and asthma in the human family are greatly benefited by the climatic conditions found in Colorado. It is also true that not one of the great animal scourges has ever seriously threatened our State, and our live stock is to-day as healthy as can be found anywhere.

These facts are no doubt responsible for the sweeping claim often made and entirely unwarranted that tuberculosis, hog cholera, and other contagious diseases do not find a natural habitat under the climatic conditions found in the arid West. The danger is that we become overzealous in our claims in this respect and relax our vigilance in necessary quarantine and sanitary measures.

As college veterinarian, I am frequently called to various parts of the State to investigate outbreaks of supposedly contagious diseases among all kinds of domesticated animals. This field work is not always directly connected with my duties as veterinarian to the Experiment Station. It serves, however, to keep me in touch with the existing live stock conditions throughout the State, and which is indispensible to my work in every way.

The most important diseases named casually in the order of their economic significance are as follows: Tuberculosis, mostly in cattle and swine; poisonous plants, largely on the open range; mange in cattle in western half of State; strangles in young horses all over the State; scabus in sheep; black leg and anthrax; contagious abortion in cattle; parasite diseases; calf scours; horse typhoid; calf diphtheria; hog cholera and glanders.

Poisonous plants, horse typhoid, and tuberculosis have been the subjects of special investigation since my last report.

LOCO WEED INVESTIGATION.

The investigation of loco weeds has progressed satisfactorily. We were fortunate in securing the same pastures and buildings at Hugo that served us so well last year. In addition to the station at Hugo, the Department of Agriculture saw fit to start another station without our co-operation at Woodland Park, on the Divide.

By mutual agreement it was decided to withhold report on this work until the investigation is completed, or at least far enough advanced to warrant positive assertions. Although a

number of the experiment animals (horses and cattle) at Hugo are badly locoed, there will probably be at least twenty live over until spring.

The work thus far has brought to light some of the hidden mysteries surrounding this perplexing problem, and it is hoped that it will result in something that will be of real economic value to the live stock industry, as well as a valuable contribution to science.

The last part of the work, yet to be done, is of vastly more importance. It is not sufficient to simply know the specific cause of the locoed conditions. The question always to the front is, What are we going to do about it? Unless we are able to suggest effective prophylactic and remedial measures, it will have very little if any economic value.

Bulletin No. 113 on "Larkspur and Other Poisonous Plants" was published early in the summer. This was an illustrated bulletin, gotten out especially for the farmers and stockmen, and containing a summary of what is known about Western poison weeds, with a patent suggestion as to the best means of contending with them.

HORSE TYPHOID.

This disease, it seems, has existed in the State for several years. In the last two years it has greatly increased, and in the vicinity of Colorado Springs and on the Western Slope has caused the death of a large number of horses. It is so entirely unlike any disease known to horsemen and so little understood by veterinarians that the appellation "No named disease" seems quite appropriate. The symptoms are much like typhoid fever in the human. In many respects it is like malarial fever, swamp fever, or the oriental disease, surra. The victims practically all die in from three weeks to as many months.

In Wyoming, where the disease has assumed more serious proportions, investigation revealed the presence of large numbers of parasites (Strongulus armatus) in the large intestines. This led to the assumption that they were in all probability the direct cause of the malady. Our work with the disease thus far has not tended to substantiate this claim. In most cases it is found in horses that graze on bottom lands. In exceptional cases, however, the disease has developed in horses stabled and furnished with apparently pure water. The symptoms all point to the presence of a blood parasite, but so far we have not been able to find it. The etiological factor in this case, as in many others, can only be worked out in the laboratory. Our laboratory equipment is so meager as to make even a satisfactory blood count impossible.

A summary of our work with tuberculosis in the college herd, for the past six years, is as follows:

PER CENT. NATIVE TO COLORADO.

Year	Tested	Responded	Reacted	Per Cent.	Kept Over
1900	9	5	55.5	60	2
1901	27	7	25.8	00	5
1902	36	12	33 1-3	33 1-3	8
1903	50	7	14	14.3	0
1906	29	5	10.4	25	2

Sixty-three and six-tenths per cent of cattle tested were natives of Colorado; 25 per cent of all cattle responding were native Colorado cattle.

Test in 1902 included six animals that reacted in 1901.

Test in 1903 included eight animals that reacted in 1902.

Test in 1906 included no animals that reacted in 1903.

One animal responding still remains on the farm.

Leaving out the animals each year that had previously responded to test, the following results were obtained:

Year	Tested	Reacted	Per Cent. Reacted
1900	9	5	55.5
1901	27	7	25.8
1902	29	5	10.3
1903	42	0	00
1906	29	5	17.3

This table is especially interesting and instructive as showing that while more than one-half of the cattle tested for tuberculosis were natives to Colorado, yet three-fourths of the animals diseased were imported.

While 11.8 per cent of all native cattle tested on the college farm in the last six years have been proven tuberculous, nearly one-half of all cattle brought from outside the State on to the college farm have responded to the test and were disposed of accordingly.

Respectfully submitted,

GEO. H. GLOVER.

November 13, 1906.

REPORT OF THE ARKANSAS VALLEY FIELD AGENT.

To the Director:

As outlined, the work in the Arkansas valley has been pursued under three general subjects, alfalfa, beets and cantaloupes.

Under the subject of alfalfa, there has been two objects in view: First, the improvement of alfalfa by a systematic seed selection from a nursery of individual plants, and second, the investigation of the methods employed by the most successful alfalfa seed producers to develop the essential conditions that are necessary to a good yield of alfalfa seed under the conditions of irrigation in Colorado.

During the past season our alfalfa seed nursery was enlarged by the addition of twelve rows, sown with seed selected the previous season. A careful observation of the individual plants in the nursery was made and this study revealed the fact that there was a wide variation in individuals which had grown under the same conditions, and that this variation in many instances was in the line of marked improvement. for example, the general yield of seed in the nursery was poor, yet a few individual plants "set" remarkably heavy yields of seed, while many adjacent plants, apparently as vigorous, were almost barren of seed production.

As marked lines of variation were also noted in the matter of desirable hay producing qualities, disease resistance, and possibly the character of the bloom for honey yield. From these desirable variations the seed of sixteen individual plants was saved separately to continue the work in seed selection.

The second topic, the investigation of alfalfa seed production has occupied but little time as yet, but it is the plan during the next two months, while the alfalfa seed threshing is in progress, to visit the most successful seed growers and ascertain their theories and methods relative to alfalfa seed production, and collect as much data as possible for further study, and solve this important question.

Beets.—Under this topic we have continued the efforts to develop a disease-resisting beet. We have now about fifty pounds of seed, the second generation of seed produced since the selection of beets from "curly top"-affected fields in 1903. Since that year the trouble has not appeared in Colorado, and in order to test the merits of our selection at this time, we have sent to Dr. C. O. Townsend, of the Department of Agriculture, about twenty-five pounds of this seed, he agreeing to send it out to portions of California and Utah, where the trouble occurs to some extent

each year, and will report to us if the seed possesses any inherent resistant qualities.

In this connection we have gained considerable knowledge and information relative to the problem of beet seed growing, the methods and conditions required for securing a yield of beet seed; this data might be of value if commercial beet seed growing should be undertaken in the State.

The study of cultural methods for sugar beets, that was outlined, has not been taken up to much extent as yet. It is planned, however, to begin the work during the winter by making a digest, if possible, from the field books of the several beet sugar factory companies.

We have received some encouragement from some of the officials for such a plan of study.

Cantaloupes.—This subject has required rather close attention through the summer. The work of developing a rust resisting cantaloupe was continued on a half-acre plat, which for four seasons had produced cantaloupes badly affected with rust, the idea being to develop the quality in as adverse conditions as possible, consequently irrigation was applied in excess to favor the development of the fungus. The plat planted with the seed of nine individual melons planted in rows each one separate, these melons were from the most resistant plants found in 1905.

One row was planted as a check row, with seed from a very perfect melon, but from a field that had not been selected for rust resistance. The plat developed nicely without rust until about August 15; the season was characterized by cool nights and frequent rains and heavy dews, and in July the rust spots appeared on all the early melons, and when the first picking began, about August 10, the fields were getting brown with rust, as was also the check row in the rust resistant plat, while the other rows were comparatively free from rust, some of the rows revealed more rust resistance than others. The seed from the most resistant plants in 1905 were producing this year, also, the most resistant plants.

When the rust had developed to some extent on the plat which was at least ten days later than any field otherwise under equal conditions, the plat was carefully studied, and over one hundred resistant plants were staked with a number, and each day as the ripe melons were gathered they were marked with the number of the hill and the seed saved separately and a description made of the qualities of each melon.

The last of September the numbered hills were gone over and notes taken of their rusted condition, and this revealed that a few of the whole number of resistant plants had remained resistant later than others, and now it is possible to select by the number from several hundred melons, saved separately, the best melons from these most resistant hills, to further develop this valuable trait.

Careful consideration and a great deal of time was devoted to selecting melons with a view to improve their keeping qualities, as well as flavor and all the qualities desirable in a perfect cantaloupe.

The question of the fertilization of the flower and the crossing of varieties was carefully studied.

A comparative test of a list of foreign varieties received from Mr. A. J. Peters, of the Department of Agriculture, was made. Many of this list failed to germinate, but of those that did nothing desirable for home or market use developed.

Some investigational work in regard to the life history of the melon louse and means of combatting the louse were taken up in co-operation and under the direction of Prof. C. P. Gillette.

This constitutes a general review of the work of the season.

The investigation of the development of the cantaloupe industry as outlined has been submitted and published as Bulletin 108.

Yours truly,

PHILO K. BLINN.

November 1, 1906.

REPORT OF THE PLAINS FARM.

To the Director:

I desire to submit the following report for the year 1906, of work done at the Experimental Sub-Station of the Plains.

On September 22, 1905, there was 10½ acres of Turkey red wheat sown on land that was all plowed in the month of May and packed with a sub-surface packer. Eight acres of this land was planted to corn on May 15, the other 2½ acres rested until the wheat was sown, but was worked after each rain, as near the same as the corn as possible, storing the moisture of 1905. On the last day of August the eight acres of corn was cut, yielding 24 bushels to the acre, this land was then disked and harrowed, receiving this much more work than the land that rested. The wheat was sown crosswise of the two pieces, one bushel to the acre, and harrowed three times during the months of April and May; the 2½ acres was cut July 5. While that on the corn ground was not cut until July 10, the piece where the moisture was stored yielded a little over 44 bushels to the acre, while the other piece made 25 bushels to the acre.

There was sown on April 6 five acres of macaroni wheat, which yielded 17 bushels to the acre.

On April 7 there was sown five acres of side oats, sown 34½ pounds to the acre, and cut July 27, yielding 29 bushels to the acre.

There was six acres of corn planted on May 14, which yielded 25 bushels to the acre.

There was some slender wheat grass sown, which gives very fair promise, and a variety of other grasses, of which the Bromis Inermis seems to give the best results.

There was a garden of general character and everything was raised in abundance. The potato crop was unusually good. The trees have done quite well in growth. The cherry crop was good, and plum crop fair. The apple crop was light, the trees were not sprayed, as we had had no occasion to do so heretofore, but this year we were bothered with the worms. The apples blew off very badly and were quite small in size. The peaches have done well, and we had some very fine peaches. The apricot trees were loaded almost to breaking down with fruit, the quality being excellent.

J. B. ROBERTSON,
In Charge.

Cheyenne Wells, Colorado, December 10, 1906.