

THIRTY-SECOND ANNUAL REPORT

OF

The State Board of Agriculture

OF COLORADO

---

INCLUDING THE TWENTY-THIRD ANNUAL REPORT

OF THE

Colorado Agricultural Experiment Station



THE STATE AGRICULTURAL COLLEGE

Fort Collins, Colorado

1910

# THE STATE BOARD OF AGRICULTURE

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## LETTER OF TRANSMITTAL.

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Fort Collins, Colo., Nov. 15, 1910.

Sir—I have the honor to submit to you the annual report of The State Board of Agriculture, for the year 1910, containing an inventory of the property under the direction of the Board, with the exception of the land grant made to the State by the United States as an endowment for the Agricultural College when the Morrill Act was accepted by the Legislature and the Agricultural College established; the financial report of the Secretary, showing the receipts and disbursements for the fiscal year ending November 30, 1910; the report of the President of the College, covering the work of instruction, experimentation and research, and extension carried on under the direction of the Board during the year.

Respectfully submitted,

A. A. EDWARDS,

President, The State Board of Agriculture of Colorado.

To His Excellency

John F. Shafroth,

Governor of Colorado:

THE STATE AGRICULTURAL COLLEGE.

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Fort Collins, Colorado, November 30, 1910

*Sir:*

I submit herewith my report for the year 1910, accompanied by the reports of the Director of the Agricultural Experiment Station, the Superintendent of Extension, the Principal of the School of Agriculture, and the Farm Manager, all of which are submitted as a part of my report of the year's work of the State Agricultural College.

Respectfully submitted,

CHAS. A. LORY,

President, State Agricultural College.

*To the President,*

*State Board of Agriculture:*

**THE STATE BOARD OF AGRICULTURE.**

HON. B. F. ROCKAFELLOW.....	Canon City, 1911
HON. EUGENE H. GRUBB.....	Carbondale, 1911.
HON. A. A. EDWARDS.....	Fort Collins, 1913.
DR. R. W. CORWIN.....	Pueblo, 1913.
HON. FRANKLIN E. BROOKS.....	Colorado Springs, 1915.
HON. JARED L. BRUSH.....	Greeley, 1915.
HON. E. M. AMMONS.....	Littleton, 1917.
HON. JOHN C. BELL.....	Montrose, 1917.
GOVERNOR JOHN F. SHAFROTH, } PRESIDENT CHAS. A. LORY, }	Ex-officio.

**OFFICERS.**

HON. A. A. EDWARDS.....	President
HON. JARED L. BRUSH.....	Vice-President
L. M. TAYLOR.....	Secretary
GEO. A. WEBB.....	Treasurer

**STANDING COMMITTEES.**

<b>Executive</b>		
A. A. EDWARDS	J. L. BRUSH	E. M. AMMONS
<b>Finance</b>		
F. E. BROOKS	R. W. CORWIN	J. L. BRUSH
<b>Farm, Stock and Veterinary Science</b>		
E. H. GRUBB	J. L. BRUSH	JOHN C. BELL
<b>Faculty and Courses of Study</b>		
E. M. AMMONS	F. E. BROOKS	JOHN C. BELL
<b>Botany, Horticulture and Entomology</b>		
R. W. CORWIN	E. M. AMMONS	E. H. GRUBB
<b>Mathematics, Engineering and Military Science</b>		
B. F. ROCKAFELLOW	E. H. GRUBB	E. M. AMMONS
<b>Mechanics, Chemistry and Electrical Engineering</b>		
F. E. BROOKS	JOHN C. BELL	R. W. CORWIN
<b>College Lands and Leases</b>		
JOHN C. BELL	J. L. BRUSH	B. F. ROCKAFELLOW
<b>College Buildings and Permanent Improvements</b>		
J. L. BRUSH	E. M. AMMONS	R. W. CORWIN
<b>Home Economics, Library and Music</b>		
R. W. CORWIN	E. H. GRUBB	B. F. ROCKAFELLOW
<b>History, Literature, English and Rhetoric</b>		
C. A. LORY	B. F. ROCKAFELLOW	J. L. BRUSH
<b>Farmers' Institutes</b>		
E. M. AMMONS	JOHN C. BELL	F. E. BROOKS
<b>Salaries</b>		
E. M. AMMONS	F. E. BROOKS	B. F. ROCKAFELLOW

## INVENTORY OF LANDS.

College Farm, 320 Acres .....	\$128,000
East Farm, 152 Acres .....	76,000
Pasture, 1,350 Acres .....	21,000
Cheyenne Wells, 160 Acres .....	4,000
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Total .....	\$229,000

## INVENTORY OF BUILDINGS.

Conservatory of Music .....	\$ 4,650.00
Electrical Building .....	9,000.00
Main Building .....	58,000.00
Chemical Laboratory .....	30,000.00
Hose House .....	75.00
Depot .....	200.00
Lavatory .....	3,500.00
Horticultural Building .....	15,000.00
Greenhouses .....	4,200.00
Potting House .....	300.00
Library .....	5,000.00
Zoology .....	8,000.00
Mechanical Engineering .....	30,000.00
Mechanical Engineering Laboratory .....	2,000.00
Simon Guggenheim Hall .....	53,000.00
Pathology Laboratory .....	2,300.00
Veterinary Hospital .....	1,200.00
Anatomy Laboratory .....	100.00
Anatomy Building .....	700.00
Bunk House .....	150.00
Coal House .....	15.00
Small Animal Ward .....	100.00
Box Stalls .....	150.00
Civil and Irrigation Engineering .....	75,000.00
Poultry Plant Residence .....	1,000.00
Workshop .....	85.00
Main Chicken House .....	450.00
Ten Colony Coops .....	500.00
Agricultural Hall .....	10,500.00
Andrews Group:	
“Andrews” House .....	10,000.00
Chicken House .....	25.00
Bunk House .....	100.00
Ice House .....	100.00
Experiment Station Horse Paddock Shed .....	100.00
Experiment Station Horse Paddock Shed (2) .....	200.00
Experiment Station Horse Barn .....	5,000.00
Experiment Station Horse Barn, Stone .....	1,000.00

Agronomy Seed House .....	3,200.00
Miller Group:	
Dwelling (East) .....	1,200.00
Ice House .....	200.00
Chicken House .....	25.00
Brick Hay Storage Building .....	600.00
Cellar .....	250.00
Wood Shed .....	20.00
Dwelling (West) .....	500.00
Cellar .....	75.00
Wagon Shed .....	25.00
Barn .....	250.00
Hill Pasture Shed .....	300.00
Hill Pasture Bunk House .....	25.00
Farm Division:	
Farm Superintendent's Residence .....	3,500.00
Farm Superintendent's Barn .....	200.00
Chicken House .....	125.00
Implement Shed and Granary .....	6,150.00
Work Shop .....	600.00
Bunk House .....	200.00
Barn (Horse) .....	5,000.00
Barn (Dairy) .....	4,000.00
Experiment Hog Feeding Shed .....	500.00
Piggery .....	1,000.00
Bull Shed .....	200.00
Stallion Shed .....	200.00
Steer Barn .....	1,500.00
Colt Shed .....	100.00
Dairy Shed .....	500.00
Experiment Grain Shed (Steers) .....	100.00
Experiment Steer Shed .....	400.00
Sheep Barn .....	500.00
Experiment Grain Shed (Sheep) .....	20.00
Buck Shed .....	20.00
Lambing Shed .....	15.00
Concrete Potato Cellar .....	1,200.00
Stock Judging Pavilion .....	4,500.00
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Total .....	\$368,900

#### INVENTORY OF EQUIPMENT BY DEPARTMENTS

Agronomy .....	\$ 146.75
Animal Husbandry .....	12,785.45
Botany and Forestry .....	1,463.64
Chemistry .....	5,000.00
Civil and Irrigation Engineering .....	11,506.00
Farm .....	11,703.00

Farm Mechanics .....	9,457.25
Farmers' Institutes .....	573.35
Home Economics .....	2,204.78
Horticulture .....	2,269.50
Library .....	49,804.09
Mathematics .....	522.00
Mechanical Engineering .....	21,192.15
Military Science .....	131.40
Modern Language .....	400.00
Physics and Electrical Engineering .....	9,504.86
President's Office .....	539.00
Registrar's Office .....	555.43
Rhetoric and Composition .....	780.50
School of Agriculture .....	186.00
Secretary's Office .....	1,035.00
Veterinary Science .....	5,289.72
Zoology and Entomology .....	11,843.85
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Total .....	\$159,793.72

#### AGRICULTURAL EXPERIMENT STATION, INVENTORY OF EQUIPMENT.

Animal Investigation .....	\$ 2,354.00
Arkansas Valley Field Station .....	4,528.75
Bacteriological Investigation .....	2,045.59
Botanical Section .....	1,715.00
Chemical Section .....	2,469.07
Cheyenne County Experiment .....	3,885.20
Director's Office .....	6,346.72
Entomological Section .....	1,564.12
Fruit Investigation .....	260.75
Horse Investigation .....	11,691.15
Horticultural Section .....	494.15
Irrigation Engineering Section .....	7,028.64
Plant Industry .....	2,946.15
Potato Investigation .....	1,831.43
Veterinary Section .....	688.75
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Total .....	\$49,849.47

#### SUMMARY.

Value of Lands, Not Including Congressional Grant .....	\$ 229,000
Value of Buildings .....	368,900
Equipment .....	209,643
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Total .....	807,543

## SECRETARY'S CASH ACCOUNT.

December 1, 1908 to and Including November 30th, 1909

## Receipts.

Animal Husbandry .....	\$ 3,344.54
Farm Department .....	1,721.73
Farmers' Institutes .....	3,151.55
General Agriculture .....	107.75
Farm Mechanics .....	103.08
Botany and Horticulture .....	166.00
Chemical Department .....	155.33
Civil and Irrigation Engineering .....	312.40
Library .....	12.52
Library Fee .....	375.00
Mechanical Engineering .....	46.95
Music Department .....	40.00
Physics and Electrical Engineering .....	42.70
Veterinary Science .....	331.68
Girl's Dormitory .....	100.00
Permanent Improvements .....	1,200.72
Current Expense .....	91.80
General Repairs .....	1.39
Entrance Fees .....	189.00
Lights .....	4 00
Miscellaneous Sales .....	144.25
Transfers—College Funds .....	2,313.91
Transfers—Experiment Station Funds .....	4,049.59
Agronomy Division .....	152.89
Animal Investigation .....	2,678.23
Arkansas Valley Field Agent .....	874.50
Director and General .....	.75
Horticultural Section .....	203.09
Veterinary Section .....	330.07
Fruit Investigation .....	40.00
Plant Industry .....	9.01
Horse Investigation .....	4,221.25

## Disbursements

College Special Fund—Paid College Treasurer .....	13,956.30
Experiment Station Special Fund—Paid Ex. Sta. Treas. ....	12,559.38

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\$ 26,515.68 \$26,515.68



## DISBURSEMENTS—COLLEGE FUNDS

For the Year 1908-1909

Agronomy .....	883.67
Animal Husbandry .....	5,997.32
Farm Mechanics .....	574.23
Farm Department .....	6,790.21
Farmers' Institutes .....	7,825.63
General Agriculture .....	2,405.91
Bookkeeping .....	13.47
Botany and Horticulture .....	1,791.31
Chemical .....	648.67
Civil and Irrigation Engineering .....	240.88
Constitutional History and Irrigation Law .....	18.25
Domestic Science .....	561.47
History and Literature .....	104.72
Library .....	1,736.39
Mathematics .....	15.67
Mechanical Engineering .....	1,859.91
Military .....	201.05
Modern Languages .....	13.12
Music Department .....	430.42
Physical Training .....	148.16
Physics and Electrical Engineering .....	789.25
Salary .....	\$ 75,733.34
President's Office .....	845.26
Secretary's Office .....	921.01
Rhetoric and Composition .....	130.49
Veterinary Science .....	3,653.58
Zoology and Entomology .....	88.63
State Board of Agriculture .....	1,464.66
Quarterly Bulletins and Reports .....	937.22
College Campus .....	1,414.17
Insurance .....	522.00
Student Labor .....	2,348.26
Firemen and Janitors .....	4,724.28
Fuel .....	3,171.11
Advertising .....	1,178.39
Permanent Improvements .....	3,819.74
Current Expense .....	2,031.47
General Repairs .....	1,365.35
Furniture and Fixtures .....	79.55
Irrigation Building .....	35,425.20
Lights .....	835.48
Water Assessments .....	1,183.48
Library Fee .....	449.80
Power .....	27.30

State Entomologist .....	144.95
Electrical Supplies .....	251.91
Registrar's Office .....	90.77
School of Agriculture .....	533.75
Land and Water .....	12,563.96
<b>Total</b>	<b>\$188,984.82</b>

### DISBURSEMENTS—EXPERIMENT STATION

For the Year 1908-1909

Salaries .....	\$ 16,941.67
Agronomy Section .....	170.98
Animal Investigation .....	4,330.54
Arkansas Valley Field Agent .....	59.32
Bulletins and Reports .....	3,087.83
Chemical Section .....	958.40
Director and General .....	1,680.19
Entomological Section .....	825.87
Horticultural Section .....	1,042.99
Irrigation Section .....	1,753.75
Library .....	65.90
Veterinary .....	623.01
Fruit Investigation .....	5,287.25
Plant Industry .....	2,070.11
Horse Investigation .....	6,063.42
Farm Mechanics .....	547.80
Poultry Experiments .....	1,523.17
Potato Investigation .....	2,326.16
Secretary's Office .....	100.60
Bacteriological Section .....	188.00
Farm Machinery and Roads .....	283.99
<b>Total</b>	<b>\$ 49,930.95</b>

**RECEIPTS AND DISBURSEMENTS:**

	Balance Dec. 1, 1908.	Receipts	Transfers to	Transfers from	Disbursements.	Balance Nov. 30, 1909.
	State Treasurer	College Treasurer	College Treasurer	State Treasurer	College Treasurer	State Treasurer
<b>Agricultural College</b>						
Tax Fund .....	\$ 1,299.41	\$25,554.66*	\$73,324.73		\$82,442.18	\$ 5,996.84*
Land Income Fund.....	461.36	43.21	7,966.87		7,858.26	584.95
Special Fund .....		101.32	11,642.39	2,313.91	10,732.15	3,325.47
†Secretary's Revolving Fund		1,500.00				1,500.00
Mechanic Arts Fund.....		20,404.49	40,000.00		38,343.08	22,061.41
Appropriation—Irrig. Bldg.			40,000.00		35,435.20	15,425.20*
Appropriation—Firm's Ins.			10,000.00	2,313.91	1,619.99	1,066.10
Appropriation—Land-Wat'r			16,372.38		12,563.96	4,377.77*
<b>Experiment Station</b>						
Hatch Fund .....		1,975.54	15,000.00		13,416.37	3,559.17
Adams Fund .....		1,399.84	12,000.00		10,906.00	2,493.84
Special Fund .....		10,895.02	8,509.79	4,049.59	13,077.94	10,376.46
Appropriation—Ani. Inv...			10,000.00	355.59	2,808.04	5,000.00
Appropriation—Plant Ind..			8,000.00		1,410.39	1,836.37
Appropriation—F M & Rds.			5,000.00		283.99	2,589.61
Appropriation—Fruit Inv. .			10,000.00		2,025.14	2,216.01
Appropriation—Potato Inv.			10,000.00	1,962.22	5,000.00	1,012.64
Appropriation—Polty. Exp.			5,000.00	488.98	1,837.18	2,673.84
Appropriation—Horse Inv..			5,000.00		1,523.17	976.83
Appropriation—Chey. C. Ex.			2,000.00	1,242.80	2,642.73	1,385.53*
<b>Total</b>	\$1,760.77	\$10,764.76	\$289,816.16	\$6,363.50	\$238,915.77	\$33,338.56
†In Secretary's Hands.						\$30,087.36
*Overdraft.						

**FINANCIAL STATEMENT.**  
**THE STATE AGRICULTURAL COLLEGE,**  
**Fort Collins, Colo.**

**SECRETARY'S CASH RECEIPTS.**

Dec. 1, 1909, to and Including Nov. 30, 1910.

**COLLEGE.**

Animal Husbandry Department .....	\$ 3,889.79
Building Superintendent .....	10.00
Chemical Department .....	141.66
Civil and Irrigation Engineering .....	126.71
Entrance Fees .....	2,540.00
Farm Mechanics .....	34.20
Farm Department .....	7,640.61
Horticultural Department .....	272.06
Library .....	3.47
Mechanical Engineering .....	20.05
Miscellaneous Collections .....	798.20
Physics and Electrical Engineering .....	26.05
Rents .....	397.00
State Entomologist .....	180.15
Veterinary Department .....	816.06
Total	\$16,896.01

**EXPERIMENT STATION.**

Animal Investigation .....	\$ 8,415.29
Farm Machinery and Roads .....	290.65
Horse Investigation .....	2,229.36
Horticultural Section .....	182.73
Irrigation Section .....	34.10
Plant Industry .....	137.65
Potato Investigation .....	365.09
Poultry Experiments .....	55.30
Total	\$11,710.17

**DISBURSEMENTS.**

College Special Fund—Paid College Treasurer .....	\$16,896.01
Exp. Station Special Fund—Station Treasurer .....	11,710.17
<b>\$28,606.18</b>	<b>\$28,606.18</b>

## DISBURSEMENTS ON EXPERIMENT STATION FUNDS

For the Year 1909-1910

Department or Section	Hatch	Adams	Special	Appropriation	Total
Salary .....	7,755.94	9,577.72	1,873.51	.....	19,207.17
Ark. Val. Field Agent ..	265.27	.....	.....	.....	265.27
Building .....	750.00	500.00	.....	.....	1,250.00
Bulletins and Reports ..	2,184.49	.....	1,440.53	.....	3,625.02
Chemical .....	152.45	2,048.25	.45	.....	2,201.15
Director and General....	1,604.22	2.36	60.75	.....	1,667.33
Entomological .....	490.10	420.46	.....	.....	910.56
Horticultural .....	280.25	33.15	35.00	.....	348.40
Irrigation .....	1,846.61	742.67	.97	.....	2,590.25
Library .....	91.31	65.59	.....	.....	156.90
Veterinary Science .....	206.51	.....	496.23	.....	702.74
Fruit .....	.....	.....	46.10	6,012.64	6,058.74
Plant Industry.....	104.00	.....	155.97	6,589.61	6,849.58
Horse Investigation ..	.....	.....	2,318.55	1,114.47	3,433.02
Secretary's Office .....	244.21	26.47	30.15	.....	300.83
Bacteriological Inv't'g'n .....	.....	1,050.81	.....	.....	1,050.81
Botany .....	.....	5.80	16.45	.....	22.25
Animal Investigation ..	.....	.....	8,462.66	6,836.37	15,299.03
Plains Investigation .....	.....	.....	52.97	.....	52.97
Potato Investigation.....	.....	.....	86.86	7,673.84	7,760.70
Poultry Investigation....	.....	.....	65.71	3,476.83	3,542.54
Farm Machinery & Road .....	.....	.....	554.03	4,716.01	5,270.04
Cheyenne County .....	.....	.....	.....	2,000.00	2,000.00
Totals .....	\$15,975.36	\$14,473.28	\$15,696.89	\$38,419.77	\$84,565.30

## DISBURSEMENTS ON COLLEGE FUNDS

For the Year 1909-1910

Department	Tax	Special	Land Income	Appropriation	U. S.	Total
Advertising .....	\$ 1,405.74	34.70	.....	.....	.....	\$ 1,440.44
Agronomy .....	316.80	75.80	.....	.....	.....	392.60
Animal Husbandry .....	6,865.81	3,427.07	171.66	.....	.....	10,464.54
Botany and Forestry .....	70.98	.....	.....	.....	.....	70.98
Campus .....	721.95	662.04	50.00	.....	.....	1,433.99
Chemistry .....	421.82	.....	.....	.....	.....	421.82
Civil and Irr. Engineering ..	1,816.34	18.51	.....	.....	.....	1,834.85
Current Expense .....	1,677.90	115.62	.....	.....	.....	1,793.52
Electrical Supply .....	647.91	102.42	20.00	.....	.....	770.33
Farm .....	3,266.73	5,975.50	713.50	.....	.....	9,955.73
Farm Mechanics .....	327.05	25.51	.....	.....	.....	352.56
Farmers' Institutes .....	12.75	.....	.....	6,066.10	.....	6,078.85
Firemen and Janitors .....	548.00	4,574.60	365.00	.....	.....	5,487.60
Fuel .....	3,133.51	199.18	.....	.....	.....	3,332.69
General Repairs .....	1,045.45	10.00	.....	.....	.....	1,055.45
History and Literature .....	55.20	.....	.....	.....	.....	55.20
Home Economics .....	1,037.57	101.69	.....	.....	.....	1,139.26
Horticultural .....	333.21	1,049.26	.....	.....	.....	1,382.47
Insurance .....	1852.98	.....	.....	.....	.....	1,852.98
Irrigation Building .....	7,872.70	.....	.....	4,574.80	.....	12,447.50
Land and Water .....	111.30	.....	.....	3,808.42	.....	3,919.72
Library .....	1,624.54	6.59	.....	.....	.....	1,631.53
Library Fee .....	857.09	.....	.....	.....	.....	857.09
Lights .....	1,046.50	.....	.....	.....	.....	1,046.50

## DISBURSEMENTS OF COLLEGE FUNDS—Continued.

Department	Tax	Special	Land Income	Appropriation	U. S.	Total
Mathematics .....	.85	1.50	.....	.....	.....	2.35
Mechanical Engineering ..	4,886.62	18.70	.....	.....	.....	4,905.32
Military .....	163.55	15.00	.....	.....	.....	178.55
Music .....	507.59	2.25	.....	.....	.....	509.84
Permanent Improvements ..	2,547.16	320.00	.....	.....	.....	2,867.16
Physical Training .....	107.14	16.04	.....	.....	.....	123.18
Physics & Elec. Engineering	2,575.88	11.63	.....	.....	.....	2,587.51
Power .....	286.30	.....	.....	.....	.....	286.30
President's Office .....	1,017.99	1.20	.....	.....	.....	1,019.19
Quarterly Bulletin & Report.	941.09	.....	.....	.....	.....	941.09
Registrar's Office .....	191.97	.....	.....	.....	.....	191.97
Rhetoric and Composition ..	77.94	.....	.....	.....	.....	77.94
Salaries .....	17,367.59	1,872.19	8,288.06	.....	40,896.85	68,424.69
School of Agriculture .....	434.53	3.24	.....	.....	.....	437.77
Secretary's Office .....	570.57	.....	.....	.....	.....	570.57
State Board of Agriculture..	819.65	.....	.....	.....	.....	819.65
State Entomologist .....	35.20	.....	.....	.....	.....	35.20
Veterinary Science .....	2,587.87	946.08	.....	.....	.....	3,533.95
Water Assessments .....	1,197.97	.....	.....	.....	.....	1,197.97
Zoology and Entomology...	173.36	8.78	.....	.....	.....	182.14
Bacteriological .....	183.54	.....	.....	.....	.....	183.54
Rural Education .....	85.53	.....	.....	.....	.....	85.53
Farmers' Congress .....	33.05	.....	.....	.....	.....	33.05
Guggenheim Building .....	319.20	94.98	.....	.....	.....	414.18
	\$74,182.37	\$19,690.08	\$9,608.22	\$14,449.32	\$40,896.85	\$158,826.84

**SUMMARY.**  
**RECEIPTS AND DISBURSEMENTS FOR THE YEAR**  
**1909-1910**

<b>COLLEGE FUNDS:</b>	Balance Dec. 1, 1909	Receipts	Disburse- ments	Balance Nov. 30, 1910
Tax .....	\$33,496.84*	\$75,000.00	\$74,182.37	\$32,679.21*
Land Income .....	584.95	9,350.00	9,608.22	326.73
Special .....	3,325.47	16,896.01	19,690.08	531.40
Secretary's Revolving Fund	1,500.00	.....	.....	1,500.00
Mechanic Arts .....	22,061.41	45,000.00	40,896.85	26,164.56
Appropriation—				
Irrigation Building..	15,425.20*	20,000.00	4,574.80	.....
Farmers' Institutes..	1,066.10	5,000.00	6,066.10	.....
Land and Water....	4,377.77*	8,186.19	3,808.42	.....
<b>STATION FUNDS:</b>				
Hatch .....	3,559.17	15,000.00	15,975.36	2,583.81
Adams .....	2,493.84	14,000.00	14,473.28	2,020.56
Special .....	10,376.46	11,710.17	15,696.89	6,389.74
<b>APPROPRIATION:</b>				
Animal Investigation .....	1,836.37	5,000.00	6,836.37	.....
Plant Industry .....	2,589.61	4,000.00	6,589.61	.....
Farm Machinery and Roads	2,216.01	2,500.00	4,716.01	.....
Fruit Investigation .....	1,012.64	5,000.00	6,012.64	.....
*Potato Investigation .....	2,673.84	5,000.00	7,673.84	.....
Poultry Investigation .....	976.83	2,500.00	3,476.83	.....
Horse Investigation .....	1,385.53	2,500.00	1,114.47	.....
Cheyenne County .....	1,000.00	1,000.00	2,000.00	.....
<b>Total .....</b>	<b>\$2,587.36</b>	<b>\$247,642.37</b>	<b>\$243,392.14</b>	<b>\$6,837.59</b>

\* Overdraft



## THE STATE AGRICULTURAL COLLEGE PAY ROLL.

### Instructors and Assistants

Annual Salary	Name, Position and Department	Col-lege	Sta-tion
\$4,500	Chas. A. Lory, President .....	\$4,500	...
2,500	Jas. W. Lawrence, Prof. of M. E. and Dean of Faculty	2,500	
3,000	C. P. Gillette, Director and Prof. of Ento. and Zoology	100	\$2,900
2,750	Wm. P. Headden, Professor of Chemistry and Geology	200	2,550
1,800	E. B. House, Prof. of Civil and Irrigation Engineering	1,800	
1,600	Virginia H. Corbett, Associate Prof. of English and Lit.	1,600	
2,000	Geo. H. Glover, Professor of Veterinary Science .....	2,000	
1,600	W. R. Thomas, Associate Prof. Const. Hist. & Ir. Law	1,600	
1,700	B. F. Coen, Professor of English and History .....	1,700	
1,700	S. L. Macdonald, Professor of Mathematics.....	1,700	
	H. D. Humphrey, Prof. Military Science and Tactics ( Paid by U. S.)		
1,700	G. E. Morton, Professor of Animal Husbandry .....	1,700	
*1,500	F. C. Alford, Associate Professor of Chemistry .....	1,500	
1,700	B. O. Longyear, Professor of Botany and Forestry ....	1,700	
1,700	S. Arthur Johnson, Associate Prof. of Ento. & Zoology	1,600	100
†1,600	Mary F. Rausch, Professor of Home Economics.....	1,600	
1,600	I. E. Newsom, Associate Professor of Veterinary Sc.	1,600	
1,800	C. L. Barnes, Associate Professor of Veterinary Science	1,800	
2,000	B. F. Kaupp, Associate Professor of Veterinary Science	2,000	
1,200	Sarah I. Kettle, Professor of Modern Languages .....	1,200	
2,250	Alvin Keyser, Professor of Agronomy—Farm Manager	850	1,400
800	H. E. Kingman, Associate Professor of Vet. Sc. (1/2)	800	
2,000	L. M. Taylor, Secretary .....	1,500	500
1,900	E. R. Bennett, Professor of Horticulture .....	700	1,200
1,800	T. M. Netherton, Prin. of the School of Agriculture..	1,800	
1,800	F. A. DeLay, Prof. of Physics and Electrical Eng....	1,800	
§1,500	Inga M. K. Allison, Acting Prof. of Home Economics	1,500	
1,100	Charlotte A. Baker, Librarian .....	1,100	
500	D. C. Bascom, Assistant. Student Life .....	500	
1,000	B. G. D. Bishopp, Assistant. Animal Husbandry....	1,000	
1,200	Philo K. Blinn, Field Agent, Ark. Valley.....		1,200
800	L. C. Bragg, Assistant. Ento. and Zoology.....	600	200
1,000	Zula Brockett, Assistant. English and History.....	1,000	

\* Resigned Dec. 12, 1910.

† On leave of Absence.

§ Acting Head of Department.

1,200	A. Cammack, Assistant, Mechanical Engineering....	1,200
1,000	G. M. Cassiday, Director, Physical Training.....	1,000
600	Phebe S. Copps, Assistant, Home Economics.....	600
900	J. B. Crabbe, Instructor, School of Agriculture.....	900
480	Arlene Dilts, Assistant, Library .....	480
1,500	Earl Douglass, Assistant, Chemistry .....	1,500
900	Margaret Durward, Instructor, Mathematics .....	900
1,000	H. E. Dvorachek, Assistant, Animal Husbandry ....	1,000
1,400	C. G. Dwyre, Jr., Accountant .....	1,400
400	Anna E. Elwell, Assistant, Physics .....	400
900	Alexander Emslie, Director, Conservatory .....	900
1,200	Julius Erdman, Florist, Horticulture.....	1,200
50	Frances Farrar, Assistant, Physical Training .....	50
1,500	C. L. Fitch, Specialist, Potato Appropriation .....	1,500
1,100	D. W. Frear, Instructor, Agronomy .....	1,100
1,200	R. S. Herrick, Field Agent, Fruit Investigation ....	1,200
2,000	C. H. Hinman, Superintendent, Farmers' Institutes	2,000
200	Alfred Johnson, Electrician, Electrical Department...	200
1,200	F. N. Langridge, Instructor, Mechanical Engineering	1,200
1,000	J. D. Marshall, Instructor, Agronomy .....	1,000
900	D. H. Mathias, Aid, Irrigation.....	900
850	Miriam A. Palmer, Delineator, Station .....	850
1,300	R. L. Parshall, Instructor, Civil Engineering.....	1,300
360	D. C. Patterson, Assistant, Veterinary Hospital....	360
1,500	J. E. Payne, Field Agent, Plains .....	1,500
1,300	F. G. Person, Assistant, Physics and Electrical Eng.	1,300
600	M. Pesman, Assistant, Botany and Forestry.....	600
1,080	W. A. Peek, Assistant, Farm Mechanics.....	1,080
1,200	H. Pierce, Instructor, Mechanical Engineering....	1,200
1,000	Maud A. Propst, Instructor, Home Economics.....	1,000
1,000	F. J. Rankin, Instructor, Mechanical Engineering....	1,000
1,000	Annie Robinson, Instructor, Home Economics.....	1,000
1,900	Walter G. Sackett, Bacteriologist .....	1,900
1,000	S. Van Smith, Instructor, Horticulture .....	1,000
1,000	J. S. Staudt, Instructor, Electrical Engineering....	1,000
1,100	J. C. Summers, Station, Chemistry .....	1,100
1,200	R. E. Trimble, Meteorologist .....	1,200
500	C. Agnes Upson, Assistant, Physical Training.....	500
1,100	C. E. Vail, Instructor, Chemistry .....	1,100
1,200	W. E. Vaplon, Poultryman .....	1,200
540	Ida Walker, Assistant, Library .....	540
1,600	G. P. Weldon, Field Agent, Horticulture .....	1,600
600	Susie Albee, Stenographer, Station .....	600
720	Daisy Bohnenkemper, Stenographer, Station A. Husb.	360
600	Mazie Danford, Stenographer, President.....	600
900	Margaret Murray, Stenographer, Director .....	900
900	Julia Reed, Stenographer, President .....	900
600	Jennie Short, Stenographer, Registrar .....	600

720	Ida Smith, Stenographer, Farmers' Institutes.....	720	
600	Edith Weldon, Stenographer, Agronomy .....	600	
600	Nora Zenor, Stenographer, Assignable .....	600	
600	Colin, Allan, Fireman-Janitor .....	600	
110	O. Hurich, Student-Janitor .....	110	
110	A. A. Catlin, Student-Janitor .....	110	
110	A. J. Calloway, Student-Janitor .....	110	
110	Lloyd Coon, Student-Janitor .....	110	
110	R. F. Herdman, Student-Janitor .....	110	
110	A. Hibner, Student-Janitor .....	110	
110	O. Hurich, Student-Janitor .....	110	
900	Wm. Kelly, Head Janitor .....	900	
110	E. O. Marks, Student Janitor .....	110	
110	G. S. Ralston, Student-Janitor .....	110	
600	W. H. Sullivan, Fireman-Janitor .....	600	
110	J. D. Paxton, Student Janitor .....	110	
720	J. L. Veasey, Fireman-Janitor .....	720	
600	J. E. Walker, Fireman-Janitor .....	600	
720	I. N. Chatfield, Fireman-Janitor.....	400	320
600	W. H. Marshall, Nightwatchman .....	600	
600	J. W. Bales, Teamster, Farm department .....	600	
540	H. J. Brown, Laborer, " " .....	540	
600	E. C. Coulson, Laborer, " " .....	600	
540	Fred Coutts, Laborer, " " .....	540	
540	Thomas Coutts, Laborer, " " .....	540	
540	J. W. Dallas, Laborer, " " .....	540	
720	J. Dalrymple, Laborer, " " .....	720	
600	James Fraser, Laborer, " " .....	600	
600	Alvin Fry, Irrigator, " " .....	600	
540	C. S. Grundy, Laborer " " .....	540	
540	E. L. Grundy, Laborer " " .....	540	
600	S. J. Lawson, Laborer, " " .....	600	
600	Wm. Munn, Laborer, Horticulture .....	600	
720	Alex. Nicholson, Herdsman, Animal Husbandry .....	720	
1,200	Wm. O'Brien, Superintendent Farm, Farm Department	1,200	
540	J. M. Portner, Laborer, Farm Department .....	540	
600	S. S. Portner, Laborer, Farm Department .....	600	
600	Wm. Thompson, Herdman, Animal Husbandry.....	...	600
240	Adam C. Auld, Assistant Groom, Horse Invest.....	...	240
600	A. T. Barnhart, Laborer, Agronomy .....	600	

Total

120,760

\$95,800 \$26960

## THE STATE BOARD OF AGRICULTURE:

*Gentlemen.*—In presenting to you this, my annual report, I must of necessity cover many of the subjects presented to you in the semi-annual report last June. The work of instruction on the campus falls naturally in the year beginning June 1st and ending May 31st, and the June meeting is the best time for receiving reports of progress, of needs, and of achievements in the educational work done on the campus. It is also the natural time for allowing the budget of expense for the following school year and for making the necessary plans for whatever repairs and new work that is to be done on the campus during the summer months. For this reason much of the material that was presented to you in the semi-annual report last June you find embodied also in this report.

*A Year of Organization.*—The past year has required many changes in our general organization, made necessary by the growing importance of extension work, by the many demands upon the Experiment Station, and by the desire on the part of your Executive Committee, the Faculty and myself for greater efficiency in the educational work at the College. The first result of these changes in organization is the increase in the work of your Executive Committee. For years the Committee has confined its work to making a monthly audit of the expenditures, while the many matters relating to the administration, such as finance, faculty and courses of study, college lands and leases, college buildings and permanent improvements, farmers' institutes, the work and the needs of the several departments, were the subjects of recommendation from special committees of the Board. We have found it almost impossible to secure meetings of these special committees during the half-year interval between the semi-annual and annual meetings of the Board of Agriculture, and the practice, by special committees, of asking the Executive Committee, which meets monthly in a one or two days' session, as the volume of business requires, to take care of their special work, has increased until now practically all work of the Board between regular meetings is done by the Executive Committee. In order to keep all members of the Board advised on the work of the Institution an abstract of the minutes of each meeting of the Executive Committee is made out by Secretary Taylor and mailed to each of you, with a letter of general information, by myself. Nothing has done so much to facilitate work and make possible effective administration as this desire of the special committees to refer their work to the Executive Committee, and the willing-

ness of the latter to give much time each month to the many problems incident to our various lines of work.

Gradually, then, we have come to look more and more to the Executive Committee as the representative of the Board in all matters of administration, and we have built up our organization on the plan of referring to its monthly meetings questions of administration and of general policy. In building up our organization we have many problems confronting us. To the three main lines of work of the land grant colleges; first, the training of specialists and of practical workers, in Agriculture, Mechanic Arts, and Household Arts; second, research and investigation in agriculture, and, third, extension work by means of correspondence, lecture courses, institute trains and demonstration experiments in all parts of the State, we have added the problem of administration of a large farm under intensive cultivation, and through recommendations to the State Land Board of the grant of 90,000 acres of land, given the State as an endowment for the College when the provisions of the Morrill Act were accepted by our Legislature.

The training of specialists and of practical workers in Agriculture, Mechanic Arts, and Household Arts in strictly educational. High efficiency in this line of work requires that the teacher be well trained; that he have ability in giving instruction; that he make teaching his main work, that he be interested in his classes; that he have time to look after the lagging students and time to keep in touch with the advancement in his specialty. This will not allow much time for investigation or for extension work during the school year. Research and investigation work in the Experiment Station require a man well versed in his specialty, a man able to think independently and to interpret laboratory data. His success largely depends upon his freedom from interruption, upon the possibility of giving his undivided attention and time to his investigations, and upon reasonably good working facilities and considerable freedom for personal initiative in the planning of his project and the publication of his results. If he is to give time to teaching, it should all be confined to one semester, when his service can be best spared by the Station, and if he is to do extension work, this should largely be along the line of his research at the time. Work in college and station extension calls for special training and for qualities on the part of the worker different from either those of the teacher or of the investigator. He must have the gift of teaching, but must be able to accommodate his mode of presentation to a constantly changing class; he must be able to take the lectures of the specialist at the College and the data of the investigator in the Experiment Station, and, modify both, present them in such a way that they can

be understood by his audience and incorporated into their daily practice. He must be able to carry on demonstration work and teach by actual example the value of new methods. His work naturally is in the field, among the men engaged in agriculture, and in the industries. To withdraw him for long periods, either for teaching or for research work on the campus, cuts down his efficiency.

When the attempt is made to carry on these three lines of work, which differ so fundamentally from one another, with the same corps of men, difficulties multiply at once. The needs of his classes prevent the teacher from doing much station or extension work during the school year, and the efficiency of the station worker is cut down if he must spend too much time in the field or in the class room. The extension work suffers at once if the worker is withdrawn for any considerable period from the field and put to work in class rooms or investigations and good team work and helpfull co-operation among the workers in the three lines require that each be well informed of the work of the other two. Moreover, a certain amount of extension work should be done by both teacher and investigator; it places them in touch with actual conditions in the field, with the problems of the producer, and makes them familiar with the producer's point of view. A certain amount of teaching and investigation should be done by the extension worker, because it puts him in touch with the work of instruction and investigation.

Proper organization, then, should provide for a certain exchange between the work of the teacher, the man engaged in research, and the extension worker. It should provide for good team work and for the opportunity to plan work for several months in advance, and it should make possible high efficiency in all three lines of activity. Proper organization must also provide for meeting the demand of more extension work, which the needs of our State make imperative, and provide for the increased demands upon the Experiment Station and upon the educational work at the College which will naturally follow the increased activity in extension work.

In working out our plan of organization we made an extensive study of the systems used by the colleges and universities of the middle West, and were fortunate enough to hear the discussion of college organization, with relation to extension work, at the Graduate School, at Ames, Iowa, this summer. Bringing the information gleaned from the experience of others to bear on our own problem, it was not thought desirable to establish a separate corps for extension work, even should we have the funds to do so.

The plan of making the Experiment Station worker entirely independent of the College department has never seemed advisable and as research work increased, certain departments were organized for instruction and for investigation, men being assigned to one or the other line of work as its needs made necessary. The work was planned so as to free the teacher for the time being, as far as possible, from station work and vice versa. A scheme of organization, based upon this plan and modified so as to include extension work, was finally adopted by the Executive Committee. This scheme provides that all departments in the College shall be organized for instruction, for research and for extension work. Full work in these three lines will require that a department have a number of workers for teaching, a number of workers for research and a number of workers for extension. It is not expected that a department like Mathematics, English and History, Modern Languages, etc., shall do station work, but answering the call for help from the public schools, there is no reason why these departments cannot do valuable extension work in their respective lines.

The department is made the unit of organization. The worker in teaching reports through the head of the department to the Dean of the Faculty. Those engaged in investigation report through the head of the department to the Director of the Experiment Station, and the extension workers report through the head of the department to the Superintendent of Extension Work. The Dean of the Faculty, the Director of the Experiment Station, and the Superintendent of Extension Work report to the President, who reports directly to the Executive Committee of the Board, which Committee in turn reports to the full Board at the annual and semi-annual meetings. Monthly reports and estimates of expenditures for the coming month are made to the President by the three executive officers, the President in turn submitting his report and a general estimate of expenses to the Executive Committee at its monthly meeting. The Dean, the Director, and the Superintendent meet at the call of the President for consultation on questions of general policy and with the President and Executive Committee, for conference at the monthly meeting. Projects for research work must be submitted to the Director for his approval before any investigation is started, and plans for extension work must be approved by the Superintendent and the work done in the field under his direction. The plan of organization is shown in the following outline:

*The Executive Committee of the Faculty.*—The general routine work of the Faculty is done by the Executive Committee of the Faculty, made up of the Dean of the Faculty, the chairmen of the divisions of Agri-

culture, Mechanic Arts, General Science and Home Economics, and Veterinary Science, the Principal of the School of Agriculture, the Chairman of the Committee on Rural and Industrial Education, the Chairman of the Committee on Courses of Study and Catalogues, and the chairman of the Athletic council. The division of Agriculture comprises the departments of Agronomy, Animal Husbandry, Chemistry, Entomology, Farm Mechanics, Botany and Forestry, and Horticulture. The division of Mechanic Arts is made up of the departments of Civil and Irrigation Engineering, Electrical Engineering and Physics, Mechanical Engineering, and Mathematics. The division of General Science and Home Economics is made up of the departments of English and History, Modern Languages, and Home Economics, and the division of Veterinary Science of the various parts of the department of Veterinary Science.

The chairman of each division is responsible for the students of the division and for general division interests. General division and weekly departmental meetings are helpful in securing good team work.

*The Experiment Station Council.*—In order to secure effective co-operation and good team work among the workers in experiment station lines, the Station Council, made up of all men who are carrying on projects under the Adams and the Hatch funds or special appropriations made by the State Legislature for experimental purposes, has been organized and meets at the call of the Director for the consideration of general Experiment Station matters and policy.

*Council of Extension Workers.*—Our extension work has not yet developed sufficiently to warrant the organization of a special council for the extension workers. Should more appropriation be provided by the Legislature for this line of work, so that a greater force can be employed in the several departments for the extension work, such an organization will be necessary.

*Changes in the College Courses.*—At present many of the classrooms must be used both by the college and the School of Agriculture classes at different times in the day. When the college year was divided into three terms, of twelve weeks each, the School of Agriculture, opening in October and closing in April, overlapped both the fall and the spring terms, making it very hard to adjust classes at the close of the fall and winter terms and at the close of the first term of the School of Agriculture. To avoid this the college year was divided into two semesters, so that the first semester in the college work and the first term in the School of Agriculture work end practically at the same time, and the courses in the college arranged accordingly. A further change in the course



of study made the first two years for all courses in the division of Agriculture alike, the first two years for all engineering courses in the division of Mechanic Arts alike, and the first two years in the courses in General Science and Home Economics alike. Ten hours of electives are allowed in all four-year courses in the Junior, and twenty hours in the Senior year, and the requirements for graduation were made the same in all four-year courses. One hundred and sixty semester credits, six of which must be in military drill, for men, and in gymnasium work for women. Women are allowed to present five credits in Music; 145 semester credits are required for graduation in Veterinary Science, four of which must be in military drill.

*Farriery and Two-Year Course in Mechanic Arts Discontinued.*—Neither the course in Farriery nor the two-year course in Mechanic Arts was well patronized, the former having no students enrolled last year. By action of the Executive Committee both were discontinued, the Farriery course in January and the Mechanic Arts course in June.

*Salary Schedule.*—At the semi-annual meeting, 1909, you appointed a committee to work out a salary schedule, especially for the workers engaged in teaching, and requested this committee to report at the annual meeting. At the annual meeting the committee reported progress and asked for more time. At the semi-annual meeting, in June, 1910, Chairman Ammons reported that it had been very difficult for him to get his committee together and that he was not yet ready to report. The question of salaries, therefore, was referred again to the Salary Committee, with instructions to report to the Executive Committee and at a special meeting in June, the report of the Salary Committee was adopted, and the schedule of salaries proposed accepted and ordered put into effect beginning with September 1st, of the past year.

*Changes in the Faculty.*—Librarian Joseph F. Daniels, presented his resignation at your last annual meeting and left his work here December 31, 1909, Miss Charlotte Baker was appointed Acting Librarian until June, and Librarian at the June meeting. Miss Daisy Frink, assistant in the Department of Mathematics, resigned in December. Mr. James Pennycook, Assistant in Farriery, severed his connection with the Institution in January. Instructor E. J. Iddings, of the Department of Animal Husbandry, resigned in May to accept a position with the University of Idaho. H. M. Cottrell, Director of Farmers' Institutes and Extension Work, presented his resignation to the Executive Committee at its May meeting in order to accept a position with the Rock Island Railway Co., as Agricultural Commissioner. Director Cottrell had been with us four years and did great service for the State. Though we rejoice in his good for-

tune, all of us keenly regret the loss of his valuable services to the Institution and to the State at large. Director L. G. Carpenter presented his resignation as Director of the Experiment Station at your semi-annual meeting last June. In order to meet Director Carpenter's request to be relieved of the duties of his office as soon as possible, the Executive Committee appointed me Acting Director until the new Director could be appointed and take over the duties of the office. Prof. C. P. Gillette of the Department of Entomology and Zoology, was appointed Director of the Experiment Station, at a special meeting of the Executive Committee, June 14th, but did not take over the work of the office until the beginning of the new fiscal year, July 1st. Prof. Carpenter told the Committee that it would not be possible for him to give all his time to the work of the Institution. The Committee therefore relieved him of all instructional work in the Department of Civil and Irrigation Engineering, so that he could give his time entirely to Station work. H. M. Bainer, Professor of Farm Mechanics and Dairying, and Farm Manager, resigned in June to accept a position as Agricultural Commissioner with the Santa Fe Railway Company. It was found impossible to find a man to take Professor Bainer's work, so the dairy work of his department was transferred to the Animal Husbandry Department. Professor Keyser was appointed Farm Manager and Mr. H. B. Bonebright placed in charge of the work in Farm Mechanics. The position of Mr. D. E. Mackey, instructor in Forge in the Department of Mechanical Engineering, was declared vacant by the Executive Committee at its special meeting June 14th. Mr. Claude Rothgeb, Director of Physical Training, resigned in June to accept a position with Colorado College, Colorado Springs. Leslie F. Paull, Associate Professor of Horticulture, severed his connection with the Institution, in August. Professor Mary F. Rausch, of the Department of Home Economics, who has not been well for some time past, was forced to give up her work entirely in October for an extended rest. She will spend several months in Europe and is not counting on taking up her work again before next year. She was granted a leave of absence for a year, if necessary, by the Executive Committee, with the understanding that when she returned to the College most of her time should be given to extension work. Edward A. Bessey, instructor in the Department of Physics and Electrical Engineering, died suddenly June 12th. His death was wholly unexpected and came as a great shock to the Faculty and the students alike. Mr. Bessey had been with us only a year, but in this time he had securely won the respect of his associates and the confidence and friendship of all of his students.

*Promotions.*—E. B. House, associate professor in Civil and Ir-

rigation Engineering, was promoted to Professor of Civil and Irrigation Engineering. Ralph Parshall, instructor in the Department of Civil and Irrigation Engineering, and Fred G. Person, instructor in the Department of Physics and Electrical Engineering, were promoted to assistant professors. H. B. Bonebright, assistant in the department of Farm Mechanics, was promoted to instructor.

*New Appointments.*—Claude H. Hinman, B. S., University of Nebraska, and a member of the Extension Division in the Kansas Agricultural College, was appointed Superintendent of Extension Work, in June, to succeed Director H. M. Cottrell. Superintendent Hinman took up his duties with us August 1st. Inga M. K. Allison, head instructor in the Department of Home Economics last year, and granted leave of absence for a year, by the Executive Committee, in June, was appointed acting head of the Department of Home Economics when Miss Rausch had to give up her work in October. H. E. Dvorachek, B. S., University of Minnesota, was appointed instructor in Animal Husbandry, April 29th, to take the place made vacant by the resignation of Mr. Iddings. Mr. Dvorachek entered on his duties here July 1st. Margaret Durward, Ph. B., Chicago University, was appointed assistant in the Department of Mathematics, June 28th. Mr. S. V. Smith, B. S., Kansas Agricultural College, was appointed instructor in the Department of Horticulture at the same meeting. B. G. D. Bishop, B. S., C. A. C., was appointed instructor in Dairying in the Department of Animal Husbandry, J. F. Staudt, B. S., A. M., Franklin and Marshall College, was appointed instructor in the Department of Physics and Electrical Engineering. F. J. Rankin, B. M. E., University of Kentucky, was appointed instructor in Forging in the Department of Mechanical Engineering. Michiel Pesman, B. S., C. A. C., was appointed assistant in the department of Botany and Forestry. Anna Robinson, B. S., Teachers' College, Columbia University, and Maud Probst, B. S., Rockford College, Rockford, Ill., were appointed instructors in the Department of Home Economics. Pheobe Copps, B. S., Armour Institute, was appointed instructor in Home Economics for work in the School of Agriculture. J. B. Crabbe, B. S., Ohio Wesleyan University, was appointed instructor in the Department of English and History for work in the School of Agriculture. James D. Marshall, B. S., University of Wisconsin, was appointed instructor in the Department of Agronomy. George D. Cassidy, B. A., University of Vermont, was appointed Director of Physical Training, and D. C. Bascom, B. S., Kansas Agricultural College, Secretary of the College Y. M. C. A., was engaged to give half his time to the student life work of the Institution

*Enrollment.*—A study of our enrollment this school year, fur-

nishes much food for thought. When we were planning our campaign for new students last spring we set our mark at three hundred for the College and four hundred students for the School of Agriculture. While it was not possible for us to conduct nearly so vigorous a campaign as we wished on account of lack of funds, yet we tried to speak before high schools in the State at least once and some more than once. However, the results show that our work was not effective enough and that we did not put ourselves and our work before the high school students sufficiently to turn them to us in as large numbers as we are entitled to or have reason to expect. The work done by Miss Rausch and by Professor House before the high schools bore excellent fruit. No one who has not had actual experience in this field knows how strong the competition for students is in this State. In Agriculture we have no competition, but the high school boys do not as yet understand the great opportunities that are offered in this field of endeavor, so that very few are looking toward some branch of agriculture for a vocation. Neither do the young women of the State realize the great demand that is bound to come for teachers in agriculture and domestic science, so that the young women of the high schools who are looking toward a teaching career naturally think of the Normal School, first, or, if they expect to teach in a high school, many of them look to the University. When it comes to Engineering, quite a number of high school graduates go out of the State. Those that remain here have the choice of three institutions; the University, Colorado College, and our own Institution, if they desire to take either Mechanical, Electrical, or Civil Engineering. The strongest work in Irrigation Engineering must naturally be with us, and I think we should look with considerable disfavor upon the efforts of any other state institution toward the establishment of such a course.

The very fact that we are a technical school; that our graduates do not enter the teaching profession, but go into the industries where they are not in touch with great numbers of young people, especially high school students, while the other institutions that have engineering schools, also have a Liberal Arts course where quite a number of teachers are prepared annually, these teachers going into the high schools of the State and naturally working, perhaps unconsciously, to turn the minds of the graduates to their own Alma mater, gives these institutions an advantage in the solicitation of students, for it can hardly be expected that one of our teachers visiting a high school, speaking perhaps for half an hour or forty minutes once a year, can have as much influence in directing the students here as can the teacher who is with the class constantly and by her very efficiency and popularity makes a strong impression for the institution that

trained her. We must have students here if this Institution is to give the service the State has a right to expect. A splendid plant has been established here; a splendid Faculty has been gotten together. We have the facilities for taking care of more students than we have now, especially since we have gotten the two new buildings that have come to us this past year. It is just as easy to teach a class of twenty or thirty as it is a class of three, and every young man that we can graduate and send back to the industrial work of the State carries the work of the College to his community far more effectively than we can do through our extension work. The following table will show our enrollment to date, also what percentage of students of last year's classes returned to the College this fall.

	Men.	Women.	Total.
College Students -----	179	62	241
School of Agriculture Students -----	188	85	273
Conservatory of Music -----	20	57	78
Returned to College this fall:			
Unclassified Students -----			30%
Freshmen -----			68%
Sophomores -----			83.6%
Juniors -----			86%
Returned to School of Agriculture -----			56%
College Graduates Last Year -----			42
Non Resident College Students -----			27
Non Resident School of Agriculture Students -----			19
Number of Accredited High Schools Not Represented -----			23
Number of Counties not Represented -----			27
Number of Counties Not Represented in School of Agriculture --			16

*Conference of Presidents of the Four Institutions of Higher Learning.*—Early in the year Governor Shafroth issued a call to the Presidents of the four institutions of higher learning for a conference to be held in his office, on the 19th of February, to consider the question of cutting down expenses of the several institutions, and particularly to consider the question of duplication of courses. Senator Ammons was requested to meet with the presidents and to take part in the discussion. The whole question of cutting down expenses at the several institutions was gone over and the question of duplication of work taken up. It was shown by President Victor C. Alderson that the School of Mines is confining itself entirely to the teaching of courses in Mining Engineering and Metallurgy and that no other courses in Engineering are attempted or contemplated, and in its main courses the School of Mines is duplicating none of the work of the other institutions. A certain amount of duplication

was found between the State Normal School and the State University, in the department of Education, and between the University and the Agricultural College, in the courses in Engineering. No satisfactory method to avoid duplication could be worked out; in fact the conference could not agree that this was altogether desirable. A committee was appointed, with Senator Ammons Chairman, and the Presidents of the Institutions of Higher Learning to look into the matter and report to the Governor later. At a meeting of this committee later the School of Mines, the Normal School, the Agricultural College could agree upon a line of work, but the University Regents, through President Baker, declined to consider this plan. Since then no meeting has been held and no report was ever made to the Governor. This conference has a great opportunity, and if it should be possible for it to outline the function of each institution so that the four can work together as an efficient, well organized educational machine, each taking part of a certain share of the work, it will be the greatest achievement possible for education in Colorado and will furnish the possibility for each and every one, no matter what institution he attends, to be a loyal supporter, not only of his own, but of all the State institutions. As soon as the true function of each school is thoroughly understood by the public it will be easy to secure adequate appropriations, and each school can adapt itself to carry on its particular work in the most economical and efficient manner possible. It is unfortunate that this has not been done before, but we are in the same position as practically every other state in the Union where the Agricultural College is separate from the State University, with possibly two exceptions. The separate Universities are following, as closely as they can, the Universities of the states where the Agricultural College is a part of the State University. They feel that the range of subjects that they are allowed to teach should not be limited; that, being a University, they can branch out and cover the entire field of human thought. In this they are encroaching more and more upon the work of the Agricultural College as outlined in the original Morrill Act and as specified by the Commissioner of Education. This has led to increasing duplication of work and bitter rivalry between the institutions.

As a Board we have been criticised for duplicating the engineering courses of the State University, when as a matter of fact, engineering courses there were established after our own. Not only that, we at this Institution must live up to the contract between the Legislature and the Federal Government, entered into when the Agricultural College was started. Under this contract Military Science, Agriculture and Mechanic Arts must be taught. The fault of duplication rests with the Legislature when funds were appropriated for es-

tablishing the School of Applied Science, later developed into the College of Engineering at the University, after the Government had provided funds for maintaining this work at this Institution. If the people of the State, through the Legislature, wish to maintain an engineering school at the University, we can find no fault, but in maintaining engineering work here we are only living up to the contract entered into by the Legislature whose terms we as a Board are responsible for carrying out.

*Conservatory of Music.*—On account of lack of room it was found necessary to rent four extra rooms down town last year for the use of the Conservatory of Music. The plan was not at all satisfactory because it took the Conservatory students away from the campus. At the opening of school this fall the Conservatory of Music took up its quarters again on the campus and is permanently housed in the old Domestic Science Building.

*Student Life Work.*—During the year considerable attention has been given to the student activities outside the class room. Miss Corbett, as Adviser of Women, and as Chairman of the Social Committee, has helped the young women in finding satisfactory homes, has kept in close touch with them through weekly conferences and through visits at their homes. By the establishment of a social calendar where the dates of social meetings are posted after a conference with the Chairman of the Social committee, the plan of confining all social meetings to the week end has been helped and a better regulation of the social life of the Institution made possible. By agreement between the College and the Young Men's Christian Association a part of the Secretary's salary is paid by the College, so he takes charge of the work of helping men find rooms and board, of directing the student labor bureau, and of helping the men generally in the problems of the daily College life. He also takes charge of some teaching in the School of Agriculture during the second term. The Physical Director is giving a great deal of time to the men outside of athletic activities, and by his influence is stimulating their ideals of courage, right conduct, good scholarship and fair play. Professor Macdonald, as Faculty Treasurer of the Athletic Association, has been able to do much good by wise counsel and helpful suggestion in athletics and other lines of student activity. In fact the entire Faculty has taken a keen interest in the work of the student outside the class room, and we have good co-operation between Faculty and students that works strongly for increase in the efficiency of instruction.

Some progress has been made in student self-government, in both the College and School of Agriculture, and the manner in which the students are working out their problems is gratifying and encouraging.

The Young Men's Christain Association is strong and vigorous and exerts a powerful influence for right living. No less in scope and effectiveness of service is the Young Women's Christain Association.

Our technical and literary societies receive good support and afford excellent training in problems of administration, in the preparation of technical and literary papers, in parliamentary practice and in public speaking.

*The Budget.*—Last year we started the budget system for all departments of the College. This year the plan was extended to cover the work of the Experiment Station. The extension work has its funds practically set by appropriation from the legislature, although both the strictly educational funds and the special appropriations for experimental work made by the legislature, contributed for extension work. The railroads of the State, also, through their generosity in transportation for men and materials, and in their granting of institute trains, have given nearly as much as the amount appropriated by the legislature for farmers' institute work. Were it not for this help from the railroads and the help from the other funds, the five thousand dollars per annum annual appropriation made by the last legislature would be wholly inadequate to meet the needs of extension work.

The State fiscal year closes November 30th, the government fiscal year June 30th, for the educational work on the campus it is far more convenient to make the estimates for the school year closing almost forced to follow the reciation or catechetical method of teaching June first than for the year ending November 30th. This introduces some difficulties in bookkeeping and unless the rate of expenditure is specified, the tendency on the part of heads of departments to spend their allowance as rapidly as possible will cause an overdraft on the funds by the end of the fiscal year. No matter how carefully an estimate may be prepared, there are so many uncertainties in the matter of enrollment, repairs, fuel needs, calls for special work, etc., that a large contingent fund is a necessity. The most difficult problem of all in making out the budget for instruction, experiment station and for extension work is met in the special appropriation for farmers' institutes, for special demonstration or experimental work. The funds must be used by the end of the fiscal year, but many lines of work can not be discontinued November 30th and held in abeyance till the new appropriation is available. Well trained men for both extension and research work are not only scarce, but are in strong demand. It is hard to hold good men against the higher salaries paid by older and richer institutions. It is simply out of the question to expect men to wait from the end of the fiscal year till the new appropriation is available without salary. Moreover, the nature of



the work is such that such a wait would often mean the loss of an entire year. This unfortunate condition makes it necessary for the Board of Agriculture either to discontinue these lines of special inquiry at the end of the fiscal year, and then start in again with such men as may be secured when funds are again available, or to continue until the Legislature shall again provide funds for the work. This, however, puts an undue burden on the educational funds and makes them assume the loss should the Legislature not consider it advisable to continue a certain line of work. The special fund of the Experiment Station, which consists of money derived from the sale of products grown and animals fed for demonstration or experimental purposes, is used for this purpose, also, but is usually not sufficient. In making out the budget, allowance is made for the purchase of material and labor by one department from another and from the farm; in other words for the full cost of the department in every case. The departments are credited with the funds thus received, but are not allowed to disburse them. This plan is used because we have as yet insufficient data to make a good estimate of this departmental income.

*Improvements.*—At the June meeting of the Executive Committee, Prof. J. W. Lawrence was appointed Superintendent of Buildings. He began at once a vigorous campaign of general repairs and improvements. The janitor force was organized and used in making repairs, in oiling floors, painting and varnishing. Prof. E. B. House, and Assistant Professor Ralph Parshall, spent the entire summer in fitting up the laboratories of the new Civil and Irrigation Building. The splendid facilities we now have for laboratory work in irrigation engineering are largely due to their efforts. The old Civil Building was remodeled for the Department of Physics and Electrical Engineering. Cement floors in the basement, the papering, painting of wood work, oiling floors, and repairing of walls and painting outside wood work and roof have transformed this into one of the neatest buildings on the campus. The forge room at the Mechanical Building was enlarged to accommodate forty forges, and the necessary increase in anvils and forges ordered. Delay in securing the last prevented the completion of work of installation before the opening of the School of Agriculture. Enough new benches and tool sets were purchased to bring the total capacity of the wood working room up to forty students, and the Electrical Engineering laboratory was moved from the Mechanical Building to the basement of the Electrical Building. More coal and general storage capacity was provided for the Mechanical Building by building a 20-foot addition to the old storage shed west of the foundry.

Provision had to be made to connect the heating system of Simon

Guggenheim Hall of Household Arts to the boiler in the Mechanical laboratory. This is a vacuum system, while a low pressure steam system has been in use in the Mechanical Building and Library. It was thought best to change this to the vacuum system, the saving in fuel warranting the extra outlay of a thousand dollars. Provision had to be made also for a hot water heater and tank for the Household Arts Building, and cooking tables for the foods laboratory in this building. The drugroom was enlarged at the hospital and a ward built for small animals.

The experimental driveway built under the direction of Mr. J. H. Dodge, of the Good Road Division, United States Department of Agriculture, furnishes a good example of what can be done in road building, with native material, and is a splendid addition to the campus. The grading around the Household Arts and the new Civil and Irrigation Engineering buildings has been completed and the ground gotten ready for seeding to lawns in the spring.

*New Buildings.*—The new Civil and Irrigation Building was ready for use last February. Furniture and equipment have been provided for class rooms and laboratories. The building proves to be especially well designed for its purpose.

Simon Guggenheim Hall of Household Arts is a splendid monument to the generosity of Senator Guggenheim. The building was ready for use by the middle of November. It proves to be well adapted for the work and has relieved congestion that was almost unbearable. Equipment sufficient to meet classes has been installed, but much more is necessary.

*Insurance.*—An effort has been made to reduce the fire risk on the campus, to increase the efficiency of our protective apparatus, and to develop a fire fighting organization among our employes. We have made progress and have gotten some reduction in insurance rates.

*Administration of the Farm.*—Beginning March 1, 1910, the plans worked out by Prof. H. M. Bainer, as Farm Manager, for the administration of the Farm were put into effect. Under this plan each workmen fills out a time sheet on which he tells what he is doing and where, for each hour of the day. A map was prepared of the Farm and each field numbered. Each field is charged with labor, seed and fertilizer. A schedule of prices was arranged for man labor and horse labor, and whatever is done for other departments in the way of labor or for improvements about the campus is charged to the department or to the campus and the farm given credit. Any feed, grain or other products grown on the farm and gotten by other departments, is charged at current market prices, and the farm pays for what it receives in the way of services, such as veterinary

service, surveying, or other work furnished by the other departments. Keeping these farm accounts has added a very heavy burden to the clerk of the Department of Agronomy and to the Secretary's office, and yet we believe it is worth while, because after a time it will be possible to take these accounts and to show exactly how much it costs the farm to produce a ton of hay or a bushel of grain. It gives us at all times a definite idea of how much the farm is costing us—how much it is earning for the institution. Plans are now under way for working out a definite rotation for the farm, and to extend the system of charging to include water as well as labor, seed and fertilizer for each field in determining the cost of production; we will also determine the duty of water and be able to include the value of it in the cost of production for each field.

*Visits to Other Institutions.*—During the last year we have gradually developed the policy of sending some of our men to study the methods of other Institutions. This was inaugurated by Senator Ammons, who, at heavy expense to himself, took a trip to Washington last winter and on his way back visited a number of the institutions in the middle West. His knowledge gained at first hand, of the methods and plans of these were so helpful in his work on the Executive Committee here that it was decided to have our men follow his example whenever possible.

I spent three week last summer as the guest of the Agricultural Commissioner of the Rock Island Railroad, visiting the Agricultural Colleges and Universities in the middle West. This fall Dean J. W. Lawrence spent a month studying the heating plants, shops, equipment, methods of administration and general student life of some of the middle West and eastern colleges, and last month Director C. P. Gillette, Superintendent C. H. Hinman, and myself, attended the meeting of the American Association of Agricultural Colleges and Experiment Stations, at Washington, where we had the privilege of meeting workers in our respective lines from all over the country and listening to discussions of vital problems in general college, experiment station and extension work, administration methods, and policy. These visits give a broader view, they give a first-hand knowledge of what other institutions are doing, they give the opportunity of direct comparison between ourselves and others, the study of methods better than our own, and make possible the adaptation of these to our own conditions. I hope this policy can be continued, I know of nothing that will do more for the general work of the Institution than to have its men make occasional trips to the leading institutions of our country.

*Experiment Station.*—The work of the Experiment Station has responded in a most gratifying manner under the stimulus of increased appropriation. With all our increased activity, however, the

demands upon the Station are far beyond its ability to supply. The accompanying report of Director Gillette shows how much has been accomplished this year.

*College Extension.*—The great amount of extension work that we have been able to do is the best evidence of effective organization on the campus and of the strong co-operation between the College and all the organizations and workers who are interested in the agricultural and industrial development of Colorado. The report of Superintendent C. H. Hinman shows you how much has been accomplished and how varied and extensive the extension activities of the college have become.

*Needs.*—The needs for the next biennium have been thoroughly gone over, conferences have been held between the various parts of the College and the needs of the work on the campus, of the Experiment Station and of the Extension thoroughly considered. Conferences have also been had with various organizations and the needs of various industries and sections taken into account with the result, a bill to be submitted to the next Legislature has been drawn up and is submitted for your consideration. The amount asked for has been made as conservative as possible. We do not believe in the plan of asking for double as much as we expect to get. We want to go before the Legislature with a straight, open, business-like statement, showing just what has been accomplished the past two years, what the needs of the various industries are and what we hope to accomplish with the amount asked for the next two years and we hope the Legislature will treat us in the same way and if possible pass the bill without cutting down a single section.

*Appreciation.*—This report would not be complete without expressing my appreciation to the entire Board for the help you have given me during the past year. To the members of the Executive Committee, for their efforts in behalf of the Institution; to Dean J. W. Lawrence, Director Gillette, and Superintendent Hinman, for their untiring efforts in behalf of their special lines of work and for the splendid spirit of mutual help and co-operation they have shown; to Secretary Taylor and Accountant Dwyre, whose initiative, ability and willingness to take on new work have made it possible for us to tell now at the end of each business day how every fund and budget account stands, to the Executive Committee of the Faculty and other workers as a whole. We have all worked hard, we have pulled together, we have enjoyed the day's work, and have striven to make it result in higher efficiency and in making our Institution of greater service to the State.

Respectfully submitted,  
CHAS. A. LORY, President,  
State Agricultural College.

## REPORT OF THE DEPARTMENT OF AGRONOMY.

To the President:

Prior to the beginning of the school year, 1910-1911, the Agronomy courses were thoroughly revised. The object of the revision was twofold. First, the school year was changed from a three term to a semester basis, which change made necessary several readjustments in the courses. Second, changes in state conditions and personnel made it advisable to adjust to the new problems to be met. As revised, courses are offered in Crop Production, Soils, Crops Laboratory, Soils Laboratory, Advanced Farm Crops, Farm Management, Plant Breeding, Agronomy Seminar, or Special Problems in Agronomy. Soil Fertility Laboratory.

The change from a three term to a semester basis permits much better arrangement of time. The student is kept in contact with the subject for a longer period. The arrangement also gives both student and teacher more time for preparation. Thus we are able to require, of the student, more preparation outside the class room.

The Department is teaching Crops, Crop Production, Soils, Soils Laboratory and Farm Management in the School of Agriculture.

To more effectively teach these subjects in the College and in the School of Agriculture, the teaching force has been increased by employing Mr. J. D. Marshall, a graduate of the University of Wisconsin. Thus the teaching staff now consists of Alvin Keyser, Professor; Mr. D. W. Frear, Instructor, and Mr. J. D. Marshall, Instructor.

Mr. Frear is at present teaching the class in Farm Management in the School of Agriculture. The rest of his time is entirely given to college classes. Mr. Marshall is devoting practically his whole time to classes in the School of Agriculture. It is thought that this specialization of the instructor's time, i. e., having the instructor devote nearly his entire time to either the School or College will give higher teaching efficiency, and the results so far bear out this opinion.

Since the last report the room above the chapel has been assigned to this Department for the School of Agriculture classes. This change has enabled the Department to provide materials and equipment especially adapted for the two different classes of students, School and College.

This room permits larger classes. Thus, although the registration and number of classes is larger this year than last, we can handle the larger number with less friction than last year.

New equipment, which will increase the efficiency of the work, will be installed during the year in both the crops and soils laboratories.

The total number of students taking work in the Department, at present, in the School and College, is 153.

Aside from the regular teaching work on the campus, the Department has done considerable extension work. The extension work has consisted of articles written for "News Notes," farmers' institute work, lectures to teachers' institutes, preparation of courses of study and outlines for agricultural instruction in rural schools, and help furnished in judging, lecturing, etc., for boys' and girls' clubs.

Mr. Frear has supplied six articles for "News Notes." He lectured four weeks before teachers' institutes. He spent between two and three weeks in preparing "Outlines and Exercises for Elementary Agriculture for Rural Schools." It is expected that this material will be used by the State Superintendent of Public Instruction in the rural schools of the State, and he judged the exhibits of two special and one general boys' and girls' club exhibit.

I furnished eleven articles for "News Notes," one of which was published as a thirty-two page special edition of "News Notes." In addition I attended nine farmers' institutes, two farmers' picnics, two fairs, and gave ten special short course lectures.

About two thousand letters, furnishing information of a general and technical nature, have been sent out to farmers of the State.

Mr. Payne, of the experimental staff of the Department, has delivered about fifteen farmers' institute lectures. He has also addressed a number of special farmers' meetings and given addresses at fairs. He has also done almost all the department judging and lecturing for the boys' and girls' meetings on the Plains.

It has been necessary in choosing assistants to go to other institutions for such help. I believe this policy to be one which will materially strengthen the Department, as it brings new ideas and new blood into the work. The experience gained in other schools cannot be used directly, because outside conditions differ from ours. But with the acquisition of an acquaintance with our conditions, the outside experience aids in placing or weighing local values. We advance in teaching efficiency and power by acquiring new and more advanced ideas rather than in a rehash of old ones.

The varied experience and information obtained through the work of the Department in the Experiment Station is thus put at the service of the teaching force. By this means much that is new and

interesting concerning the Agronomy of this very varied State is brought to the class room. Such practice increases interest and, it is hoped, better equips the student for meeting the agronomic problems of the State when he comes in contact with them later in his post-school experiences.

Respectfully submitted,

ALVIN KEYSER,  
Professor of Agronomy.

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## REPORT OF THE DEPARTMENT OF ANIMAL HUSBANDRY.

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To the President:

Instructional work in the Department of Animal Husbandry has been greatly modified during the past year. Standardization of the first two years of the agricultural course, with specialization, in Animal Husbandry during the Junior and Senior years, gave opportunity for the introduction of advanced work in livestock subjects. Specialized courses in animal nutrition, meat work, sheep farming, beef production, swine growing and horse rearing have been added, bringing the work up to the highest plane of collegiate education in animal husbandry.

Livestock, dairy, and poultry work have been consolidated in this department since the last annual report. The teaching work was carried during the school year 1909-1910 by two men. Another man was added this year. The addition of the dairy work, and increased attendance in the school of agriculture, necessitating the sectioning of classes, has made the first semester's work equal to that of last year; while the second semester's work will average six hours a week heavier for each man.

The department is this year holding weekly meetings in which the instructional work and other departmental work is discussed. While this is a new departure, the tendency of the meetings is towards a greater solidarity of the department and a strengthening of weak points in the instructional and departmental work.

The correspondence of the department has aggregated approximately 1,200 letters during the past year. The bulk of this correspondence has been in the nature of answers to inquiries concerning the handling of livestock and the sale of animals. With the addition of the dairy and poultry correspondence, the number of letters is greatly increasing.

Extension work has been done as follows:

Ten articles have been furnished for "News Notes."

Six institutes and one farmers' short course have been attended.

Judging has been done at four fairs, and superintendent's work done by two men at one fair.

Senior students have been furnished for judging at two fairs.

Station work, which is a very important part of departmental work, is detailed fully in the report to the Director. Two bulletins have been published during the year, and material for two others is on hand.

Respectfully submitted,

G. E. MORTON,

Professor of Animal Husbandry.

## REPORT OF DEPARTMENT OF BOTANY AND FORESTRY.

To the President:

In both lines of work the schedule has been followed as outlined in the courses of study. In Botany each subject offered has been taught, while in Forestry only the work scheduled for the Junior year has been given. This is due in the latter case to the fact that this course is but two years old and that the technical subjects in Forestry begin with the Junior year.

The increased work of instruction, entailed by the teaching of Forestry, made it necessary for the Botanist to have help. Mr. M. Pesman, one of our graduates, was engaged for the ensuing year to assist in teaching. As this is only a temporary arrangement and as there will be additional teaching to do next year in Forestry it will be necessary to secure an assistant with more extended experience and training along the lines of work taught.

In all eleven classes have been instructed during the year, with a total enrollment of 92 four-year students.

*Extension Work.*—The correspondence during the year has been nearly double that of any preceding year, and consisted mainly of inquiries concerning weed eradication, tree planting, nature study and the naming of plants.

Three weeks were spent during the summer in teaching elementary agriculture and nature study at district institutes for teachers. In addition to this an outline for nature study in the rural schools has been prepared for publication by the State Department of Public Instruction.



In thus promoting the introduction and encouragement of agricultural instruction in our rural schools I believe we are doing a much needed work.

Farmers' institutes were attended at Fountain and Elbert during the summer.

An article for "News Notes" has been furnished monthly.

The equipment for the work in Botany and Forestry is fairly good, and while improvement in some lines is desired, everything asked for in this connection has been supplied as needed.

One thing which the Botanist greatly desires to be able to undertake in the future is the planning and establishing of a botanic garden on the college grounds. This could be made a most attractive feature of the campus, as well as a source of supply for materials in laboratory teaching, which must now be sought for at a distance often at the expenditure of considerable time and labor.

Respectfully submitted,  
B. O. LONGYEAR,  
Professor of Botany and Forestry.

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## REPORT OF THE DEPARTMENT OF CHEMISTRY.

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To the President:

The work in the Department of Chemistry has been in strict conformance with the prescribed work as given in the college catalogue.

The number of students enrolled so far in text-book work is 109, in laboratory work, 43. The latter number will be greatly increased during the second semester. The veterinary students are using one text-book and the regular classes another. This difference is made because we believe it to be to the advantage of the students in the respective courses. The classes this year are so large that it has been necessary to divide them into sections, which, of course, increases the teaching hours. This is better however, for the students than to have them in larger classes, especially as we find ourselves almost forced to follow the recitation or catechetical method of teaching in which a class of 25 is almost too large. I will state that we have in years past tried the demonstrative, or lecture system, but it proved very unsatisfactory with students accustomed only to the method of recitations. I am fully convinced that our present method is the one best adapted to our conditions.

We have been compelled within the last few years to change the character of the work in the laboratory and to begin with elemen-

tary work in qualitative analysis instead of quantitative experimentation, in general chemistry, which course we followed for a number of years with very good results. I mention this because the adoption of quantitative instead of qualitative work for the purpose of instruction in general chemistry is now receiving attention from teachers and the writers of text-books. I adopted this method in our laboratory sixteen or seventeen years ago and followed it for eleven or twelve years, but the changes in the curricula of the various courses demanded by different departments has necessitated us to adopt the most feasible course under the circumstances.

The Chemical Department has no special course of its own. I do not believe that conditions justify us in attempting to establish one. The work of the department is consequently wholly general and supplemental to the courses established in other departments. These statements apply to instructional work and do not at all relate to research work pertaining to our Station duties which are not referred to in this report.

The force of the department has worked harmoniously and been a unit in trying to maintain a healthy spirit and a fair standard of work.

The influence of the work of the chemical section of the Experiment Station upon the work of the Chemical Department of the College has, in my opinion, been very beneficial. The relations of the two are not intimate, but it is well, perhaps, better that they are not. The station work is close enough to the college work to make it, the college work, real and serves as a constant incentive to raise the latter.

I regret to say that within the past few days, even since this report should have been in your hands, Prof. F. C. Alford, who has been with us for the past thirteen years, informs me that it is his desire to accept another position and wishes to be relieved from his present duties not later than the 10th of December. Professor Alford has been efficient and faithful in the discharge of his duties, he took one year's leave of absence to study in an eastern institution better to fit himself for his work. With this exception he has not been absent on account of sickness, or from other causes, for more than a very few days, less than one month, in all this time. His record in the class room and in the laboratory as an instructor and an analyst has been excellent. It is with great regret that I find it my duty to communicate this information to you. Through Professor Alford's resolution to enter upon another position the department and the Institution loses a faithful and efficient man who

always desired to advance the interests of the College and was in sympathy with the best interests of the students.

Respectfully submitted,

WM. P. HEADDEN,

Professor of Chemistry.

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## REPORT OF THE DEPARTMENT OF CIVIL AND IRRIGATION ENGINEERING.

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To the President:

June 15th I was placed in charge of this department as Professor of Civil and Irrigation Engineering. I was notified that my new position would include the instructional part of the work, and that for the present the experimental side would be separate and under the supervision of Director Gillette.

Mr. Ralph Parshall was appointed Assistant Professor of Civil and Irrigation Engineering, and together we have pushed the work during the summer and fall. The problem which confronted us was a big one. True, we had a splendid new building, but there was nothing in it. After figuring the cost of the equipment necessary to give instruction in irrigation work and comparing this with the amount allowed in our budget, we found that in order to make any showing at all we must spend our money for material only. We got together, took off our coats, and went to work. The Janitor for this building was formerly a carpenter. Mr. Parshall and myself are what might be called "handy men," and together we fitted up the Cement Testing Laboratory, the Irrigation Laboratory, the Dark Rooms and the Class rooms. The Cement Laboratory contains an immersion tank, moist closet, bins for cement and aggregates, an instrument case, mixing tables and wall bench together with the necessary plumbing. As soon as our cement testing machine can be ordered we will have, together with the apparatus already on hand, an up-to-date laboratory for practical as well as instrumental work in this branch.

In the Irrigation Laboratory we have so altered the large hydraulic tank that it is now suitable for pipe work, pump work and power work under all heads up to 400 feet. The long tank in the floor was lined up and water proofed by plastering out on the sides; angle irons were set so as to allow it to be divided by steel bulk heads and thus give an "elastic" tank as it were. A rating car has

been designed and constructed and is now ready for use and we have now the only perfect rating station in the West. We have installed a 15 H. P. motor which is connected with a long line shaft driving the pumps when installed. We have installed also an air compressor of about 80 cubic feet capacity for the purpose of producing the necessary pressure when working under high heads. This equipment puts us in a position where we can make practical pump tests, and as pumping for irrigation is bound to grow in importance, there will be demand for work along this line. The long floor tank gives us really an indoor irrigation ditch with known dimensions and under absolute control where the water may be allowed to run or be held stationary in a tank for measurement purposes. It gives us an opportunity to do all kinds of weir work and meter work which plays so important a part in the measurement of water. We have also resurrected and repaired a large set of scales and tanks for the more accurate measurement of smaller quantities of water.

You will notice that all this apparatus is of sufficient size for practical work, and not designed for theoretical experiments only, and it is our intention to throw the laboratory open for extension work so that people over the State may come here and find facilities for doing experimental work with irrigation apparatus, or send the apparatus here and have us do the work for them. Already we have had two calls, one from the Metal Flume & Culvert Company, of La Junta, and another from the McGinnis Metal Flume Company. In each case we have determined the co-efficient of roughness for their conduits, which was not before known for this particular kind of structure.

We have a donation of two pumps; one a rotary pump which won first prize at the Irrigation Congress Exhibit at Pueblo, the other a Blazer Patent Spiral Pump from the Humphrey's Manufacturing Company of Mansfield, Ohio. These were both secured in lieu of the tests to be made and a statement of the results to be sent to the manufacturer.

On the upper floors furniture has been placed in the library and seats in the class rooms so that we can now take care of the students in the department.

The above work has kept us busy during the summer and the Saturdays and odd hours during the fall.

During the summer Mr. Parshall and myself each spent two weeks on farmers' institute work, speaking in fourteen places on subjects related to irrigation.

At the opening of the school year we spent two weeks in the

mountains on the annual "Field Camp." This was a most successful camp, and the work done by the students the best and most accurate ever done by a "Field Camp" crowd from C. A. C.

All the work scheduled for students in this department is now taught.

Five articles for the "News Notes" have been contributed from this department.

I wish to thank the members of the Board and especially the members of the Executive Committee and yourself for the interest taken in our work and the help given us.

Respectfully submitted,

E. B. HOUSE,

Professor of Civil and Irrigation Engineering.

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## REPORT OF DEPARTMENT OF ENGLISH AND HISTORY.

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To the President:

By Board action, June, 1910, the Department of History and Literature, Constitutional History and Irrigation Law, and English and Philosophy, were consolidated into the Department of English and History. In accordance with that change you will note that the work of the Winter and Spring terms of 1909-1910 shows only classes in the Department of English and Philosophy, while the work for the First Semester of 1910-1911 is the report for the new Department of English and History.

In the department there are at present the following teachers:  
Dr. W. R. Thomas, Associate Professor of History and Law.  
Virginia H. Corbett, Associate Professor of History and Literature.

J. B. Crabbe, Instructor in English (C. S. A.)

Zula M. Brockett, Instructor in English and Literature.

B. F. Coen, Professor of English.

The teaching force is the same under the new organization as it was under the old, and the different members of the new department are teaching about the same line of work as they were before. Owing to increased enrollment in the College and in the School of Agriculture, it was found necessary to secure an additional instructor in English.

It should be remembered that Miss Corbett, on account of her work as Adviser of Women, gives only half her time to the department.

*Extension and Committee Work.*—During the year Doctor Thomas has been a member of the Catalogue Committee. As such member, he wrote the article on "The Mission of the Agricultural College." He delivered the high school commencement addresses of Hotchkiss and Idaho Springs.

Mr. Crabbe has had charge of the athletics in the School of Agriculture, and he has helped Coach Cassiday with the College football team. He has also helped in the School of Agriculture literary society.

Miss Brockett's work has been wholly class instruction.

I have been a member, during the year, of the following committees:

- Social Committee (Chairman.)
- Executive Committee (Proctor for Freshman Class.)
- Registration Committee. ..
- Rural Education Committee.
- Co-ordination Committee (Chairman.)
- Catalogue Committee (Chairman.)
- Student Correspondence Committee. ..

About one-third of my time has been taken up with these committees.

During the summer I went on an institute trip in the Arkansas Valley. I talked on "The College and The School of Agriculture." At the close of the institute trip, I visited the towns of Holly, Lamar and Las Animas on a campaign for students. Later, I visited Loveland, Berthoud, Longmont, Greeley, Fort Morgan, and Sterling for the same purpose. I wish to state that everywhere I went people were interested in the College. I could not wish for more courteous treatment than I received on these trips.

During the summer I also sent out letters and postals to this year's graduates of the Colorado high schools. For about two weeks I looked after the correspondence this line of work brought forth.

This fall, with the assistance of my senior class in Practical English, I got out a Campus Guide and Directory of the Instructional Force of the College.

In the main, the work done in the department has been satisfactory. Every effort has been put forth to increase efficiency. Departmental meetings have been held every two weeks or oftener. The co-operation of the other departments of the College has been sought in an endeavor to make students more capable in their use of English.

There are three things that I had hoped to do this year that time has not permitted. I wished as Proctor of the Freshmen class,

to confer monthly with every member of the class. I wished to have every bit of written work that came in, read and graded. I hoped that time might be found to go over this written work with the students, individually. The work will be more efficient when these things can be done.

Respectfully submitted,

B. F. COEN,

Professor of English and History.

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## REPORT OF DEPARTMENT OF MODERN LANGUAGES.

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To the President:

In the Department of Modern Languages, a one-year course in German is offered. This work requires, as a prerequisite, two years of German grammar. The work done here consists of prose composition, conversation, with the daily reading of some standard German prose. The course is an alternative required in general science and domestic science and in electrical engineering.

Two years of French are given. The first year is necessarily devoted to grammar, reading and the memorizing of words and phrases. The second year's work is a continuation of that of the first, an important addition being the reading of technical and scientific articles from current French magazines and periodicals. The aim is to make the course as technical and practical as possible. The civil, mechanical and electrical engineering students, and the students in the general domestic science courses, are required to take either this work, or the course in German or that in Spanish.

A one-year course is offered in Spanish. The demand for a second year's work in the language is growing annually. For students planning work in the Southwest, or in our dependencies, Spanish is a practical necessity, and it might be well in the near future to make further provision for such students. Twenty-seven of the sixty-seven language students are taking Spanish.

The department has been strengthened this year by the introduction of a course in word analysis. This course was put in at the request of the Veterinary Department, and its aim is to co-operate with this department in that part of the veterinary work which has to do with the use and meaning of scientific words and phrases.

Respectfully submitted,

SARAH I. KETTLE,

Professor of Modern Languages.

REPORT OF THE DEPARTMENT OF FARM MECHANICS.

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To the President:

During the months of May and June nearly all my time was taken up by the investigation of farm machinery conditions throughout the State. The results of this investigation formed the basis for the bulletin "The Life and Care of Farm Machinery."

I was granted a leave of absence by the College during the months of July and August. These two months were devoted to assisting Prof. H. M. Bainer in the writing of the bulletin "The Life and Care of Farm Machinery." Some time was also given to assisting in the construction of an experimental road upon the college grounds.

The work for the bulletin on "The Life and Care of Farm Machinery," and a small pamphlet telling of the success of the paraffine-lined cider cistern, which was built and tested by this department, is all the experimental work that has been done during the past year.

The cider cistern was built by the department and tested for one year. It proved to be so satisfactory that it was deemed advisable to publish the results in pamphlet form.

Many "News Note" articles have been furnished by the department during the past year.

Scarcely any extension work in the field has been done, except while I was out on investigational work for the bulletin on "The Life and Care of Farm Machinery."

The department is the recipient of a great many inquiries on all lines of farm machinery and farm motors. The answers to these inquiries, together with what correspondence is required to keep up our stock of loaned machinery, requires on an average about two hours a day the year round.

The department has secured some new machinery during the past year. Among the new machines loaned the department are three new model six-foot binders, a new Spalding tilling machine, new hay loader, an up-to-date side delivery hay rake, two new beet cultivators and a new style concrete mixer. The department has the written promise of a new style J. I. Case 15 H. P., traction engine and a Hart-Parr gasoline traction engine. This brings the farm machine equipment up to date.



A class room exhibition case has been purchased. It is now fitted up with model boilers, steam guages, injectors, etc., for farm motor work and with farm machine models and samples too numerous to mention. These models are all used for class room work. They are valuable in that they do away with the necessity of taking the classes from Agricultural hall to the farm machinery building for class room demonstrations. This means a great saving of time in class room work.

Respectfully submitted,  
H. B. BONEBRIGHT,  
Instructor in Charge.

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## REPORT OF THE DEPARTMENT OF HOME ECONOMICS.

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To the President:

I submit herewith the annual report of the Department of Home Economics:

Since the retirement of Miss Mary F. Rausch, October 22d, on a leave of absence, the writer has served as Acting Head of the Department.

As a matter of interest a statement of comparative enrollment is given:

	Fall 1909.	Fall 1910.
Freshman -----	7	25
Sophomore -----	9	8
Junior -----	5	12
Senior -----	3	6
Special -----	18	11
	<hr/>	<hr/>
	42	62
School of Agriculture:	Fall 1909.	Fall 1910.
First Year -----	54	61
Second Year -----	10	24
	<hr/>	<hr/>
	64	85

The student body, in so far, at least, as it is represented in the Home Economics Department, shows unusual maturity. Ten students

among those newly registered have presented credits for advanced standing from normal schools and colleges.

Beyond the statement that during the last school year all courses scheduled in the catalogue were taught, there is little to add advantageously. The readjustment of college courses on the semester basis has been accompanied by some rearrangement of the departmental instruction. This has made possible a more logical presentation of work. Again we can now require of specials, as well as of students regularly registered by classes, the basic work in science. This appreciably strengthens class work.

A plan which the departmental faculty hopes to carry into effect for the next school year is that of compiling laboratory manuals for the courses of that character, these to be furnished to the students at cost price. At present a manual issued by the University of Chicago, is used with a considerable degree of satisfaction and success. The needs of the average student in this college, are, however, quite distinct from those of the average student of the University of Chicago. Such laboratory guides as we have in mind shall take into consideration this difference. If this plan is carried out, I believe it will be of very special benefit; first, in that we shall not put into mimeographed or printed form laboratory directions not most carefully planned; again in that it shall give to the student at once the face value of well developed laboratory plans.

For the School of Agriculture classes the above plan cannot be so effectively used. The essential difference between the College and School of Agriculture courses is that in the latter the work contains less work of experimental nature, is in larger part the doing, according to direction, without being so able to go into the "why." In the School of Agriculture classes we cannot assume basic preparation in the sciences.

Owing to the overflow condition of the department during the early fall of this year, the cooking classes of the School of Agriculture have been given but half of the time scheduled. Six of the courses offered have been taught in class rooms in other buildings. After the Thanksgiving recess when we shall be housed in the new Hall of Household Arts, all work will be fully cared for.

*Assistants.*—Three Senior college students are each giving six hours a week as teaching assistants in First Year School of Agriculture classes, under the direction of an instructor. This teaching will continue through the winter. Miss Edna Neff, formerly in charge of the Domestic Science work at the State Home for Dependent Children, Denver, has been engaged to give temporary assistance, for two months, beginning October 7th.

*Extension Work.*—Aside from the work of giving instruction in the class room a considerable amount of time has been given to extension work.

During the seven weeks beginning January 17, 1910, Miss Rausch visited thirty-one high schools throughout the State. This visitation we believe to be largely responsible for the increased attendance of young women. A housekeepers' conference extending throughout the week January 3-8, was conducted at the College. The enrollment for the week was two hundred and seven.

During the past summer Miss Rausch taught thirty-five sessions in Norman Institutes, having a total enrollment of 804, and I taught in twenty-five sessions having a total enrollment of 355.

It remains to express appreciation of the interest and courtesies extended by members and officers of the State Board of Agriculture, and by members of the Faculty.

Respectfully submitted,

INGA M. K. ALLISON.

Acting Professor of Home Economics.

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## REPORT OF THE DEPARTMENT OF HORTICULTURE.

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To the President:

The change in the course of study of last year has lightened the teaching work of this department quite materially owing to the fact that the plant physiology and plant breeding which were previously taught in this department are now studies common to the agricultural group and are taught by Professor Longyear, of the Department of Botany and Forestry, and Professor Keyser, of the Department of Agronomy, respectively. Last year four students graduated from the horticultural course. At present we have four Seniors and five Juniors taking horticulture. No horticulture is taught until the second semester of the Sophomore year which is common to all the agricultural group. The School of Agriculture has materially added to the teaching work of the department, as the number, one hundred and five students, requires this work to be divided into four sections.

The work in this department is divided between the teaching work of the department, office or executive work, extension work, including institutes and correspondence, and the station work. The station work occupies the larger part of my time. It is difficult to estimate the exact amount of time devoted to these different branches

of the work as they overlap in such a way that few days are devoted exclusively to any one kind of work. During the year practically 1,000 letters have been written in answer to correspondence concerning horticultural problems in this State. More than two months have been devoted to institute work in various parts of the State. Several trips have also been made in the State in the interests of the experiment station. Occasional articles have been written for "News Notes."

We believe that the course of study as adopted last spring is one that will make the student proficient in the particular lines that they take up. The only criticism or suggestion from the horticultural standpoint is that our students need more laboratory and practical work in horticulture to enable them to fill the many important positions that are constantly opening up in this line. We recommend that students spend their summer vacation in practical work. This is particularly desirable for the last two years of the course.

Respectfully submitted,

E. R. BENNETT,

Professor of Horticulture.

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#### REPORT OF THE LIBRARIAN.

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To the President:

Several changes have been made in the library during the summer which have added both to the appearance and to the comfort of the building.

A stack has been placed in the south basement, and this has made it possible to remove all books from the floor and to place them on shelves. In the old reading room a skylight has been built into the roof. This saves light bills, and, what is far more important, eyesight. Now that this room is cheerful the students are using it more. It is furnished with small tables. The students do better work in small groups, and the question of discipline is practically eliminated. The room back of the reference room has had its stack removed to the basement. It has been papered and painted. We are now using it for a periodical reading room, and for student exchanges. The delivery room has had two book cases placed elsewhere, and is lighter and airier.

*Documents.*—Thirty-six hours have been given to the documents in the basement since September first. Checking the departmental libraries has lessened the time that ordinarily would be given to this work. As the regular library work must always be done, and as the

student public must be waited on, the document work will suffer until we have a special document clerk.

*Decoration.*—We have had a poster sale this fall, and from the proceeds have bought a picture for the periodical room. Mr. Pierce of the Mechanical Department is having one of the students make us a frame as a class exercise.

*Statistics.*—1,171 books have been added to the library by accession from Nov. 1st, 1909 to Nov. 1st, 1910. This does not necessarily include cataloguing. New record work moves slowly, partly on account of back work, partly because the demands of the counter are increasing, and largely because we are a small library with a limited force.

We have been open 179 nights, or five nights a week during the college year, and have had an attendance of 2,084 people, or 11.6 persons each night. We have been open 219 days when students were here, and have lent 2,962 books. As a matter of fact, the library is open every day excepting Sundays and legal holidays whether the students are here or not.

Our statistics mean very little. As one person, only, is on duty at night, it is possible for students to come and go without being counted. The library is used more or less by the people of the town, and especially by club women. This work is all reference, as is the bulk of the college reading. Of this it is impossible to keep a record.

Five articles have been written for "News Notes" this year.

*Future Work.*—During the coming year we hope to add materially to the agricultural publications of the various state boards of agriculture. Miss Dilts has already made a good beginning here. We wish to do more with the public documents of Colorado. There are many gaps in the long sets both in the general and departmental libraries. The Government has offered to give us some help in this matter after January 1st. The library also intends to buy for these gaps, rather than new books the remainder of the year.

Eventually we ought to work up little loan libraries for the farmer, and charge a small fee. This can be done from our agricultural duplicates. Our binder now is working on a cheap pamphlet binding.

Respectfully submitted,  
CHARLOTTE A. BAKER,

Librarian.

## REPORT OF THE DEPARTMENT OF MATHEMATICS.

To the President:

Last winter term I taught four classes daily, comprising fifty-one students, twenty hours a week.

Miss Frink and Miss Cash each withdrew January 1, 1910. The former taught four classes daily through December 1909, comprising 120 students; the latter, four classes daily, comprising 63 students.

Last spring term I taught five classes daily, comprising 41 students, twenty-five hours a week.

For the present semester I have four classes; one comprising 18 in Calculus, and three in Trigonometry and College Algebra, comprising 31, 28 and 7 respectively, in all twenty hours a week.

Miss Durward has five classes daily in the School of Agriculture, comprising 16 in Algebra and 37, 27 and 17 respectively in Arithmetic. She also has one class three times a week in the College, in Solid Geometry, a class of three. Miss Durward is doing twenty-eight hours of teaching a week.

Miss Miriam Miller and Miss Nida Deal each have a class in Algebra in the School of Agriculture. These classes meet five times a week and comprise 18 and 28 students respectively.

With my present schedule I find it almost impossible to assist in College Extension or other lines of work. During last summer I went with Dr. Glover on an institute trip, explaining the work of the College by public addresses and personal work in nine different localities.

The Department of Athletics continues to demand much of my time. The condition this year is much improved over last, both as to finances and general interest. In my judgment the scheme for season tickets is responsible for the better condition.

I have been working with the leaders of the student body in an effort to organize an association among the upper classmen which shall tone up our so-called student life and act as a check in many ways upon the differences growing out of our complex system. We have had two meetings to this end and another meeting appointed at which a committee on organization is to report. I can only say that the present is assuring of good fruits.

In conjunction with Miss Durward, I am interested in the project of a practical course in Arithmetic for the first year of the Colorado

School of Agriculture. Besides getting a part of the work typewritten we have been able to do but little, due to the pressure of the schedule.

Respectfully submitted,

S. L. MACDONALD,

Professor of Mathematics.

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## REPORT OF THE DEPARTMENT OF MECHANICAL ENGINEERING.

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To the President:

The results attained in the Department of Mechanical Engineering throughout the year have, in the main, been gratifying. The change from the term to the semester plan has caused some slight confusion, but not nearly so much as was anticipated. Some changes in the way of improvement have been made in the course of study, but the underlying principles of the course cannot be departed from to any great extent, except as we may, from time to time, modernize methods of teaching in the class room and laboratories and adopt improved text-books and apparatus.

During the past year, we have taught in the different classes, shops and laboratories a total of 592 students, counting each student once in each class he attended. This apparently large number counts also the students of the School of Agriculture, who receive instruction in the shops.

The increase in the number of students taking shop work has necessitated the addition of new equipment, and nine woodworking benches, each with a complete set of carpenter's tools, have been put in use in the wood room.

In the forge room sixteen forges have been added. These are of the very latest design, and they are completely fitted out with tongs, hammers and other necessary tools.

A number of class room models have been added to our equipment during the year. Some have been made in the shops, and some have been presented to us by generous and interested manufacturers. These models are of great value in showing the application of the principles taught in the class room.

The principal directions along which growth is desirable are in the machine room and the mechanical engineering laboratory. In the machine room work can be done which can be carried to a certain

point where it has to stop for want of the necessary tools and machinery.

The great advance of the department must now lie along the lines of the mechanical engineering laboratory work, and if the department is to live up to its name it must receive consideration for its engineering laboratory.

Respectfully submitted,

J. W. LAWRENCE,  
Professor of Mechanical Engineering.

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## REPORT OF THE DEPARTMENT OF MILITARY SCIENCE AND TACTICS.

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To the President:

I have the honor to report an increased attendance in the Military Department for the year 1910-1911, especially in the School of Agriculture. The discipline has also improved and the work has shown a creditable gain over last year in both branches. The band is making splendid progress and should receive all possible encouragement. The Department is hampered by lack of armory facilities and some provision must be made for indoor drill and gallery practice; three hundred cadets cannot be given proper instruction during inclement weather in the quarters allotted. The entire basement of the new part of the main building would only give the cadets the same floor space allotted to one company (fifty men) of the National Guard. I earnestly recommend that all of said basement be assigned to the Cadet Battalion for armory and drill hall.

I believe that the better discipline, morale, college spirit and efficiency in my department is due to the small allowances granted to Cadet Assistants by the Board and to the cordial support given me by yourself and Faculty.

Respectfully submitted,

H. D. HUMPHREY,  
Captain, U. S. Army, Commandant.



REPORT OF DEPARTMENT OF PHYSICS AND ELECTRICAL  
ENGINEERING.

To the President:

All the work in college Physics for the year ending June last, was carried by Mr. Person, and the School of Agriculture work by Mr. Bonebright, Mr. Person's work was unusually heavy. The teaching of electrical engineering was done by Mr. Bessey and myself. All the work of the department has been of high grade and we have endeavored to improve wherever possible.

Considerable apparatus was added to the equipment for the electrical engineering laboratory, so that we are much better prepared to teach the subjects than at the beginning of the year.

In the sad death of Mr. Bessey we have lost a very valuable assistant and the College an earnest, capable, and loyal teacher.

Early in the spring the department moved into the building formerly occupied by the Civil and Irrigation Department. This gave us much needed room for office, class rooms and laboratories. Funds were provided for repairing the building and I spent all the summer vacation looking after this work and the moving of the dynamo laboratory from the mechanical building to the basement of the electrical engineering building. We are now well settled in the new building and while there are many needs, still, we are comfortable.

Last June we graduated the first class, a class of six from the Electrical Engineering Department.

The showing made by the return of students this fall was especially good. We have a Senior class of eleven, a Junior class of nine, all members of both classes returning; a Sophomore class of four, this being twice the number in the Freshman class the year before; and a Freshman class of four. This gives us an enrollment of twenty-eight in electrical engineering work.

The work is progressing nicely. Mr. Person has as before all the College Physics. Miss Elwell has been added to the department to take the School of Agriculture Physics. The work in Electrical Engineering is handled by myself and Mr. Staudt.

The electrical supply and repair work has been going along as usual. Since last December we have put in underground power, light, and telephone cables to the Civil and Irrigation Building and to Guggenheim Hall; installed transformers for the Civil and Irrigation Engineering and the Mechanical Engineering Departments; we have done all the electrical repair work and much new work about

the campus. Student labor has been used entirely for this work. Such work is of great benefit to the electrical engineering students, both financially and as a source of education and experience.

Respectfully submitted,

F. A. DE LAY,

Professor of Physics and Electrical Engineering.

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## REPORT OF THE DEPARTMENT OF PHYSICAL TRAINING

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To the President:

My work began September 1st. It has been of a supervisory order, two departments (a) that of the boys, (b) that of young women.

The boys' department has been under my immediate supervision. There have been two branches of athletics participated in thus far, viz., football and track. Taking these up in order: Football, because it is the leading college sport, is given more attention than the latter. There have been on the average fifty men in uniform each night since College opened. A high degree of interest has been manifested by the boys. While the season has not been a success from some stand-points, from others it has been entirely satisfactory. The spirit has been good and the boys have worked faithfully, thus arguing well for the future of athletics along this line. In track there have been on the average, ten men out each night preparing for the first annual cross country run, which is being planned for the early part of December, thus making a combined number of from sixty to seventy men out for athletics each night.

We hope to hold an indoor and one outdoor inter-class track meet during the year. We are also planning for basketball, both for the young men and young women during the winter months. Plans are also being made for baseball in the spring. It is the aim of the Physical Director to get out as many men for the various classes of athletics as is possible, thus to meet the cry that college athletics is specified for the few rather than the whole student body. Therefore, it will be the aim of the department to have every man in College out for some branch of athletics during the year.

Respectfully submitted,

GEO. M. CASSIDY,

Director of Physical Training.

To the President:

Progress is manifest throughout the classes in the Department of Physical Education for Women. There are one hundred and twenty-nine pupils taking regular gymnasium work, which is the largest number of students taking physical training at any one time during the period which I have had the supervision of this Department. There is one division of College students and three of the School of Agriculture. Each division has regular class work twice a week, and there are teams of Volley Ball and Basketball which meet for regular practice at stated times during the week, outside of the regular class periods.

From the standpoint of discipline, the work has been easier this year than at any time during the two previous years. The attendance in each class, so far, has been perfect, and a spirit of co-operation and a growing interest is noticeable throughout. Many of the students who have been under my direction during the entire period of my work in this Department have come to me voluntarily and spoken of the benefit and also of the pleasure they have received in the Gymnasium. Some have been benefited from the standpoint of health—others have learned how to accomplish ordinary duties with a minimum expenditure of energy, and have come to see the real value and expediency of systematic and regular physical exercise. Such sentiment among the old students has undoubtedly been advantageous to the new students, and the seeds they have sown this year have, as it were, fallen "into good ground," with the gratifying result that harmony and a spirit for work is manifest from every quarter. It has taken, seemingly, a long time to gain this desired result.

One new feature has been added to the Department this year, that of requiring each student to take a physical examination. This brings the Directress in personal contact with each girl who is required to take Gymnasium early in the year, and acquaints her with the deficiencies of those composing her classes so that she is better able to direct the exercises that they may always be a benefit. There have been fewer certificates of excuse brought to me this year as one of the immediate results of this new feature of my work. Also, with this personal contact with the members of my classes, I have found not a few who need corrective Gymnastics, and these receive private instruction each week. The necessary equipment for the taking of these physical examinations was borrowed from the Y. M. C. A., and I would recommend that equipment for this part of the work be added to the Department for next year.

I would suggest that, if possible, provision be made so that next year the College classes be arranged in Freshman, Sophomore and

Junior divisions, in order to make the work more progressive and therefore more interesting to each class. Also that this same provision be made for the first and second year students in the School of Agriculture.

Since work in the Department of Physical Education is required of each student attending College, I would recommend that Physical Training be given a place in the class schedule for next year, equally with any other required work of the College.

Respectfully submitted

C. AGNES UPSON,

Directress of Physical Education for Women.

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### REPORT OF THE REGISTRAR.

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To the President:

The card system of registration and recording is being developed and improved, and the transcribing of the former record books to cards is progressing as rapidly as possible, this work being done as opportunity presents itself in connection with the other work of the office.

The record of daily attendance is kept in this office by means of a card system, a student's full record of absences being listed on one single card, thus enabling us to ascertain at a glance whether there is a lack of application or not.

A most thorough examination of the systems used in many of the largest and best institutions has been made during the year, and much valuable assistance has been received, and we shall be enabled to improve our own methods very materially.

I find in all institutions a striving for improvement in methods of registration and recording. Most methods seem to be too slow and cumbersome, and constant effort is being made to simplify.

Respectfully submitted,

J. W. LAWRENCE,

Registrar.

## REPORT OF DEPARTMENT OF VETERINARY SCIENCE.

To the President:

*Experiment Station.*—A separate report has been made to the Director of the Experiment Station, of work done by the two Veterinarians on the Station staff.

*Extension Work.*—A large correspondence with farmers, stockmen, veterinary associations, etc. This work is attended to largely by the head of the department and D. B. F. Kaupp.

We also have the honor of being collaborators on the "American Veterinary Review," and regular contributions for the "American Journal of Veterinary Medicine." The head of this division is editor of the Veterinary Department of the "Ranch and Range," and, contributor to farm and livestock papers and in this work is ably assisted by the four veterinarians on the staff.

Dr. B. F. Kaupp took an active part in the deliberations of the Missouri Valley Veterinary Medical Association last February, in Omaha, and was honored by being elected President of the Association. Dr. Kaupp and the head of this division were privileged to attend the annual meeting of the American Veterinary Medical Association which convened in San Francisco last September, and the latter was honored by being elected its President.

We have furnished twenty-five articles for "News Notes," as follows: Dr. H. E. Kingman, 4; Dr. I. E. Newsom, 4; Dr. C. L. Barnes, 5; Dr. B. F. Kaupp, 6; and Dr. G. H. Glover, 6.

We have attended eighteen Farmers' Institutes, as follows: Dr. H. E. Kingman, 1; Dr. I. E. Newsom, 2; Dr. C. L. Barnes, 5; Dr. B. F. Kaupp, 4; and Dr. G. H. Glover, 11.

*College Work.*—The object of the Veterinary College is well defined by the legislature of the State of New York, "To conduct investigations as to the nature, prevention and cure of all diseases of animals, including such as are communicable to man and such as cause epizootics among livestock; to investigate the economical questions which will contribute to the more profitable breeding, rearing and utilization of animals; to produce reliable standard preparations of toxins, antitoxins, and other products to be used in the diagnosis, prevention and cure of diseases and in the conducting of sanitary work by approved modern methods; and to give instruction in the normal structure and function of the animal body, in the pathology, prevention and treatment of animal diseases, and in all matters pertaining to sanitary science as applied to livestock and correlatively

to the human family." The motto of the Veterinary Department of the Colorado Agricultural College is "quality and not quantity," and the object is to give a thorough scientific training to a few men each year, to go out from this institution as guardians of the animal wealth and the public health.

*Faculty.*—Eighteen members of the Faculty teach in the Veterinary Department, of whom five are veterinarians. One veterinarian teaches in the School of Agriculture, and another in the College of Agriculture, Seniors and Juniors of the agricultural course. Still another teaches bacteriology to students of the Domestic Science and Agricultural courses. The head of this department is City Food Inspector of Fort Collins, but receives nothing for these services. The entire amount paid by the city for this work goes to Dr. H. E. Kingman, who does most of the work and from this source receives more than half of his salary. The U. S. Department of Agriculture requires that every class "A" Veterinary College employ five veterinarians on the teaching staff, and it is fortunate that we are thus able to perfect an arrangement with the city of Fort Collins whereby the College is saved half the salary of one man and the city is enabled to secure the services of two men at approximately half the salary of one.

*Clinic.*—When the Veterinary Department first assumed the proportions of a Veterinary College, it was argued by those who spoke inadvisedly, that the location of such a school in a small city was a mistake because a sufficient amount of clinical material could not be provided. All the Veterinarians on the staff have made a special effort in this direction, reaching out as far as one hundred miles for clinical material. We have worked day and night to bring in cases for the benefit of students and to give cases in the hospital the best possible care. I am pleased to report that we now have a clinic, in number and variety of cases equal to any veterinary college in the land. We have treated over a thousand cases a year. It is our wish now to systematize the teaching of practical medicine and surgery by dividing it into the distinct lines of consulting, medical, surgical, small animal and ambulatory clinics, with a member of the staff in charge of each line of the work.

*Pathological Museum.*—We appreciate the new offices given us in the Civil and Irrigation Engineering Building and for the large commodious room so well adapted for our pathological museum. We have in this museum over 500 specimens representing as many different diseases and parasites of our domestic animals. These specimens are of inestimable value for class room and laboratory instruction.

*Pathological Laboratory.*—The Pathological laboratory under the direction of Dr. B. F. Kaupp, is gaining an enviable reputation in

laboratory diagnosis. Five hundred and sixty-four cases have come to this laboratory for diagnosis in the last year. Of these 66 were for rabies, 89 for bloodcount, 24 urine analysis, 116 for cutaneous and subcutaneous inoculations, 24 for cancer, 14 swamp fever and 24 of these specimens were of human origin. There have been prepared 40,000 doses of black leg vaccine, 11,480 doses of antisympthymatous vaccine and 2,000 doses of strangles vaccine.

We have reached a high degree of efficiency with a meagre expenditure of funds, and we are satisfied with the recognition given us in this State and throughout the land.

We can be of far more service to the State if more provision is made whereby we can go and help the farmer and stockman when he is losing a large number of animals from contagious diseases.

Respectfully submitted,

GEO. H. GLOVER.

Professor of Veterinary Science.

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## REPORT OF THE DEPARTMENT OF ZOOLOGY AND ENTOMOLOGY.

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To the President:

*Work of Instruction.*—Most of the teaching, both in class room and laboratory, has been carried on during the past year by my associate, Prof. S. Arthur Johnson. During the last school year he conducted classes in Physiology, Zoology, and first-year Entomology. And delivered lectures to the Juniors and Seniors on Embryology and Evolution.

Miss Miriam A. Palmer taught a class in drawing from nature during a portion of the year.

Mr. L. C. Bragg has devoted much of his time to experiment station work, but has done a small amount of laboratory instruction for the classes in Zoology, Entomology and Embryology, and has had the care of the museum.

*Extension Work.*—Both Professor Johnson and the writer have given considerable time during the year to extension work in one form or another. Professor Johnson has been chairman of the Committee on Rural Education, which has required considerable of his time during the school year. He has also attended a number of farmers' institutes and teachers' institutes during the summer vacation. The writer delivered forty-eight addresses to popular and tech-

nical audiences, aside from the regular college work of instruction, during the year. Most of these were to the farmers and fruit growers of the State. Professor Johnson and the writer have contributed a number of articles for College "News Notes" during the year.

*Museum.*—No new material has been purchased for the museum during the year, but there have been a few contributions worthy of mention. Mr. Dana Q. McComb has placed in the museum a loan collection of interesting articles from the Philippine Islands, where Mr. McComb has been stationed several years in educational work.

The heirs of the late L. E. Burnett, who a few years ago acted as taxidermist for our museum, have placed in the College museum three cases containing 114 birds mounted by Mr. Burnett as a monument to his memory, with the understanding that the College will properly care for this collection and keep it as a unit.

During the year we have mounted and placed in the collection one elk calf donated by Mr. A. W. Scott of Fort Collins.

Dr. H. J. Livingston has presented to the department a collection of 100 histological mounts, nearly all of human tissues, which will be of much service in the laboratory work both in Zoology and human Physiology; and there have been several smaller contributions.

*State Entomologist.*—The Entomologist of the Agricultural College is designated by statute as State Entomologist, and upon him are imposed the duties which are incident to this office. So, during the past year, I have had charge of the horticultural inspection work in the counties of the State that have appointed inspectors. The number of these counties is twelve and the duties of this office have necessarily consumed much of my time. The First Annual Report of the State Entomologist, and Circular 1, giving information concerning the inspection, have been published during the year.

*Our Graduates.*—It is gratifying to be able to state, in closing, that all the graduates who have specialized in Entomology here are holding good positions, the call for prepared men for expert work in this line has been larger than we have been able to supply, and it has been greater during the past year than ever before.

Respectfully submitted,

C. P. GILLETTE.

Professor of Entomology and Zoology.



## REPORT OF THE SCHOOL OF AGRICULTURE.

To the President:

After carefully considering the needs of the State and what the State Agricultural College might do for the boys and girls of the State, who have finished the eight grade work, but do not have access to high schools, or who, for any reason, do not care to enter the high school, the State Board of Agriculture decided to establish in connection with the Agricultural College, the Colorado School of Agriculture.

During the latter part of the summer of 1909, a vigorous campaign of advertising, through letters, circulars, and personal visits, was conducted and the school was formally opened with the present Principal in charge, Tuesday, October 5, 1909. The Board had said that it would be satisfied if there should be an enrollment the first year of from fifty to seventy-five, but to the delight of the Board and Faculty the enrollment far exceeded all expectations. In this connection it may be of interest to give a comparative statement of the registration for the year 1909 and up to November 15th of the present year.

Those entering at opening of College in		
	1909	1910
September -----	7	10
Those registering in School of Agriculture one day in advance of regular opening -----	111	108
Registration at close of first week -----	158	227
Total Registration.		
1st Year Boys -----		131
1st Year Girls -----		54
2d Year Boys -----		18
2d Year Girls -----		10
Total		213
Enrollment to date this year:		
1st Year Boys -----		123
1st Year Girls -----		63
2d and 3d Year Boys -----		53
2d and 3d Year Girls -----		24
Total		273

Your Principal considers this a remarkable record, since it took Nebraska School of Agriculture eleven years to secure 235, and the School of Agriculture of the University of Minnesota twenty-two years to secure 700. Our enrollment is not so high this year, however, as we had hoped on account of poor crops in the State.

*Purpose of The School.*—In the State of Colorado there are more than fifteen hundred districts in which there are no high schools. In these districts are found many people who are anxious for more training for their children than that afforded by the eighth grade. To these people there were, before the establishment of the School of Agriculture, practically no opportunities for further training than those offered by the high schools, and with the high school, as it now exists, they are not fully satisfied, because it does not give the kind of training they wish for their children. The high school has a tendency to educate away from rather than back to the farm. That the School of Agriculture satisfies a long felt want is shown by the enrollment for the first year. Forty-five of the sixty counties are represented this year.

*Curriculum.*—The curriculum has been arranged especially to train boys and girls for life in the open country. Thus far the work, as outlined; has seemed to cover the needs fairly well. If your Principal were to consider making any special changes in the curriculum as it now stands, they would be to give more time than three hours a week to Horticulture, as this field of work in the State of Colorado is a large one. The time now given to this subject does not seem to be commensurate with the needs of the field. The time is sufficient for text-book work but is not sufficient for the proper amount of laboratory work. Then, too, the time allotted for Dairying seems too short. As it now stands, one-half term of ten hours a week is given to Dairying. This field of work in the State of Colorado is a very promising one, and should be cultivated. The difficulty, however, in strengthening these two subjects in particular is the fact that the course is now as heavy as can be carried by the average student. Last year forge work and bench work were given ten hours a week each for one-half term. We found this to be too short, and this year each is given ten hours a week for one term, just doubling the work offered last year. To the bench work this year, in addition to the regular exercises offered, four things have been added, viz., rafter cutting, sill construction, the making of a miniature door frame and window frame, casing each complete inside and out. The time given to other subjects last year was found to be fairly satisfactory but none too long. It would be a pleasure to give a little more time to all subjects offered, but it is not possible to do so.

As the work now stands, a student may be admitted into the College by taking, in addition to the three years' work of the School of Agriculture, an additional or intermediate year of nine months. The work of the additional year has not yet been organized, not simply because we have not had a sufficient demand for it, but because we wish our experience to help us to decide what it ought to be. At present there is a growing feeling in the mind of your Principal that the additional year should be six months instead of nine, and the subjects therein should be largely elective. Those of the School of Agriculture who are looking forward to entering College have their minds pretty well made up already the courses in college they will wish to pursue. Your Principal believes that there should be a sufficient latitude in the matter of electives to enable the student to make his work during the fourth year an immediate preparation for the course he wishes to pursue in college. If the additional year should be made nine months instead of six months, he still feels that the fourth year should be made up largely of electives. The University of Nebraska has recently added a fourth year of six months to its School of Agriculture.

*Method of Instruction.*—The method of instruction followed has, as much as possible, been the text-book and laboratory method, rather than the lecture system. In some subjects it has been necessary, because of inadequate and unsatisfactory texts, to follow the lecture system more or less, but this has been made the exception rather than the rule, and if it were possible would be eliminated entirely. The lecture method is for advanced students, but not for students of secondary grade. Frequent quizzes or tests are given in all classes.

*Discipline and General Supervision.*—During the first part of last year the teachers sent in weekly reports of absences. These were soon found to be too far apart to bring the best results. Daily reports were then asked for and were checked up at first by the Registrar's office, but on account of other work of the office they were not always checked up promptly. This year the reports are sent daily to the Principal and are checked up by him in person. He is now enabled to know at once about the absences and to see after them promptly. Last year when they became too numerous the student was asked to come before the Executive Committee of the Faculty. This year each unexcused absence carries with it three demerits and zero, for a grade, and the number has been materially reduced. Last year what is known as the student self-governing plan was inaugurated. The students of the second year class were asked to elect six members from their body, the students of the first year class the same number from their body. The entire student body then elected a presiding officer from the second year class, thus giving a majority

to the maturer students. This body of its own accord took up and tried a number of offenders and recommended to the Principal what punishment they thought should be administered. A number of offences were dealt with that could not have been easily reached by the Principal. It should be understood that the control of the School is not in the hands of this governing board, but they simply help the Principal in dealing with anything that casts discredit on the School. The plan had its advantages and disadvantages. This year we are trying to overcome some of the disadvantages of the plan. On the whole it was a very satisfactory beginning. If, at any time, an offense should be too serious to be handled by this governing board and the Principal, it will be presented before the Executive Committee of the Faculty.

Respectfully submitted,

T. M. NETHERTON,

Principal.

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## REPORT OF THE DIRECTOR OF THE EXPERIMENT STATION.

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To the President:

I have the honor to present the report of the Agricultural Experiment Station for the year just closing.

The financial statement and inventory of the Station will be found embodied in the financial report of the Secretary of the State Board of Agriculture.

This report has to do with three administrations. Prof. L. G. Carpenter was Director until June 1; you were Acting Director during the month of June, and the writer entered upon the duties of the office July 1st.

*Organization.*—The Station is organized for work under sectional heads as follows:

Chemistry -----	William P. Headden.
Irrigation Engineering -----	E. B. House, Acting.
Bacteriology -----	W. G. Sackett.
Horse Breeding ..-----	J. O. Williams.
Entomology -----	C. P. Gillette.
Horticulture -----	E. R. Bennett.
Agronomy -----	Alvin Keyser.
Animal Husbandry -----	G. E. Morton.
Veterinary Science -----	Geo. H. Glover.
Botany -----	B. O. Longyear.

Associated with the Agronomist is Mr. P. K. Blinn, as Alfalfa Specialist; associated with the Horticulturist is Mr. C. L. Fitch, Potato Specialist; and associated with the Animal Husbandman is Mr. W. E. Vaplon, Poultry Specialist. Then, upon the Western Slope we have two field men in horticulture, Mr. George P. Weldon, devoting his entire time to the study of insect problems, and Mr. R. S. Herrick, giving his time to the study of plant diseases and orchard management. On the plains, in the dry farming section, we have Mr. J. E. Payne, as a field man, studying dry farming methods, and Mr. J. W. Adams, in charge of the dry farming station at Cheyenne Wells.

Mention should also be made of labors performed by men detailed from the U. S. Department of Agriculture, at Washington. Early in July co-operative work in dairying was taken up with the Bureau of Animal Industry. Since that time Mr. R. R. Welch, Special field agent of the Bureau, has had his office with the Experiment Station and has been spending his time almost entirely in the field doing what he could to instruct the farmers in better methods of feeding and caring for their stock and handling their dairy products, and the best methods to pursue in building up better and more profitable dairy herds. Mr. Welch's only expense to the Station has been for office and office supplies.

The Office of Public Roads, of the Department of Agriculture, also co-operated very generously with the Experiment Station the past summer by sending one of its good roads experts, Mr. J. H. Dodge, with an engineer, Mr. W. R. Creelius, to direct the construction of a piece of experimental road with money made available for that purpose by one of the State appropriations passed by the Sixteenth General Assembly.

The object in putting in this piece of road, which lies partly upon the College grounds and partly upon Laurel Street, adjacent to the College campus, was to demonstrate what could be done in the making of a first-class road with surfacing materials that are close at hand. A bulletin is in preparation giving full information as to manner of construction, cost, and material used in the building of this road. I believe the State Board of Agriculture should express to the Bureau of Animal Industry, and to the Office of Public Roads, their appreciation of the important services they have rendered the Experiment Station through their co-operation in our work.

Of the above Station workers, most of the heads of sections devote some time in instructional work in the Agricultural College, and a few have so much teaching there is very little time left for their experiment station projects. The specialists and field men devote their entire time to experiment station and extension work. The fact is that

a large part of the work of the field that has gone under the name of experiment station work is really extension or demonstration work and probably will be so classified in the future and placed in charge of the Superintendent of extension work.

*Our Funds and How They May Be Spent.*—The Experiment Station funds are from two sources, the general Government and the State, but they really are in three classes.

*The Adams Fund.*—Which gave us \$13,000 the past year, but which has now reached the annual allowance of \$15,000 a year, is very much restricted in its application and can only be used for scientific investigations of a rather high order. The ordinary "experiments," so-called, of the field, the orchard, or the feed yard, cannot be carried on under this fund, nor can any office expenses or expenses of publishing the results of experiments be charged to it. This fund calls for high priced men of ability in technical lines of work, and quick results can seldom be expected.

The Hatch Fund is a little more elastic and may be used for definite and well planned investigations which have for their object the discovery of new facts, or the testing of old laws under new or untried conditions and it can also be used for office expenses and the publication of bulletins that are the result of experiments under either the Adams or Hatch Funds, or any other fund the work under which is of Adams or Hatch grade. This fund also contributes \$15,000 a year for our work.

*State Special Appropriations.*—The appropriations made by the Sixteenth General Assembly for the support of experiment station work during the biennial period just closing, were as follows:

Horticultural Investigations -----	\$ 10,000
Potato Investigation ----	10,000
Animal Industry -----	10,000
Co-operative Horse Experiment -----	5,000
Poultry Investigations -----	5,000
Grains and Grasses -----	5,000
Farm Machinery and Roads -----	5,000
Cheyenne Wells Station -----	2,000

These funds have been expended in the lines of work for which they were appropriated and the results of the work have been, or are about to be sent out to the farmers in the form of bulletins and circulars or in the College "News Notes." Summaries of the different lines of investigation will be found in the reports here presented by the men who carried on the work.

The different lines of experimental work that have been carried on during the past year on all funds will be found in the reports of the different sections that follow.

*Future Needs.*—Colorado is young as an agricultural State. Her agricultural lands in the main are very fertile but the conditions of soil, climate and moisture are hardly the same for any two counties in the State. We are growing crops in all altitudes between 3,400 feet in the valleys of the Arkansas and the Platte, and 7,000 to 9,000 feet in the mountainous districts. The annual precipitation in the different agricultural sections ranges between about 7 inches and 18 inches. In the eastern portion where the precipitation is greatest, it is possible, under the most thorough farming methods, to grow certain crops with a degree of success, while other crops which grow luxuriantly in irrigated sections cannot be grown there at all. In the same county may be found, in some sections, flourishing peach orchards and the eternal snows upon the mountain peaks. And then we have an area nearly equal to all the New England states with New York thrown in. When we add to all this the specialized condition of our agriculture, one locality noted for its alfalfa and sheep, another for its sugar beets, another for potatoes, another for grain, and another for its peaches and its apples and still another for its pasture and meadow lands and its fine live stock, it can readily be seen that the agricultural problems to be solved for the benefit of the farming classes are many and important and extremely varied. There is also a class of problems associated with the application of water to land for the purpose of growing crops that the eastern farmer knows nothing about. If there is any state where liberal appropriations are needed for experimental work for the benefit of the farmer, I am sure Colorado should be placed in that class.

*Publications.*—The bulletins and circulars published by the Experiment Station during the past year are as follows:

*Regular Bulletins.*

No.	Title	Edition.	Pages.
153	Agricultural Products Shipped into Colorado in 1909 -----	20,000	24
154	Alfalfa Studies—Third Progress Report ---	18,000	12
155	The Fixation of Nitrogen in Some Colorado Soils -----	5,000	48
156	Butter Making—Clean Milk and Commercial Starters -----	20,000	16
157	Arsenical Poisoning of Fruit Trees -----	5,000	56
158	A Bacterial Disease of Alfalfa -----	5,000	32
159	A New Alfalfa Disease—Stem Blight -----	20,000	16

160	Nitrates in the Soil -----	20,000	8
161	Cement and Concrete Fence Posts -----	20,000	20
162	Rabies -----	20,000	8
163	Farm Butter Making -----	20,000	16
164	Poultry Raising -----	20,000	16
165	Ration Experiments with Swine -----	20,000	24
166	Information Concerning the Colorado Carriage Horse Breeding Station -----	5,000	12
167	Life and Care of Farm Machinery in Colorado -----	20,000	20
168	Deterioration of Farmyard Manures -----	20,000	24
169	Some Insects Attacking the Peach -----	15,000	20
170	Thinning Winesap Apples—Winter and Frost Injury to Fruit Trees -----	15,000	20
171	Raspberry Growing -----	10,000	20
172	Garden Vegetables -----	20,000	20
173	Plains Orchard -----	10,000	8
174	Adobe Farm Buildings -----	10,000	8
175	Colorado Potatoes -----	20,000	80
176	Production and Degeneration of Potatoes --	10,000	16

These 24 regular bulletins would make a volume of 540 pages and the total pages published is 7,786,000.

*Press Bulletins.*

No.	Title	Edition.	Pages.
50	Hints to Plains Settlers—The Home Garden	5,000	2
51	Hints to Plains Settlers—Sod Crops -----	5,000	2
52	Hints to Plains Settlers—The Cow as an Assistant -----	5,000	2
53	Hints to Plains Settlers—Windmill Irrigation.	5,000	2
54	Parafine-lined Vinegar Cistern -----	10,000	1

A total of 60,000 pages.

*Correspondence Circulars.*

No.	Title	Edition.	Pages.
7	Milo -----	5,000	16
8	Growing Potatoes in Colorado -----	5,000	24
9	Growing Broom Corn in Colorado -----	5,000	16

A total of 280,000 pages.

A grand total of 8,126,000 pages of printed matter published by the station during the fiscal year just closing.

Following are the reports from the various sections of the Experiment Station in which you will find brief summaries of the work that has been in progress during the year.



A careful reading of these reports will show that the Station force has been working upon problems of great importance to the various agricultural interests of the State. There are many others of as great importance that we should like to take up but are prevented from doing so from lack of funds to support the work.

Respectfully submitted,

C. P. GILLETTE,

Director.

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## REPORT OF AGRONOMY SECTION.

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To the Director:

I transmit herewith my report of the Agronomy Section of the Experiment Station.

The following projects have been carried on under the Hatch fund:

Correlation of different Plant Characters with Intrinsic Values or Qualities.

*Alfalfa Investigation.*—The Correlation project was maintained by funds from the State Agronomy Appropriation. Hatch funds were used only to assist in paying a portion of the salary of the head of the Section.

This project is one which should run for a considerable period in order to eliminate, so far as possible, season differences. The work of the year, while largely preliminary, indicates possible lines of development. There is, for example, a seeming relation between certain habits of leaf growth in oats and barley and the adaptability of these crops to high altitudes.

The alfalfa investigation has, so far, been entirely supported by Hatch funds. Up to the present this project has been entirely the work of Mr. Blinn and has been carried on at Rocky Ford. Alfalfa is the foundation crop in Colorado agriculture and deserves even more attention than it has received in the past. We need to know more definitely how seed may be produced successfully and profitably; just what strains are adapted for different regions; what cultural methods give the greatest success; its effect on the soil when on the land for short and long periods; how the yield may be increased by usable means; and many other things concerning the exact place of the crop in the different sections of the State.

The following projects are being carried on under State funds (The Agronomy Appropriation):

- Project 1. Name, Wheat Improvement.
- Project 2. Name, Feed Crop Improvement.
- Project 3. Name, Rotation in Colorado.
- Project 4. Name, Methods of Selection Breeding.
- Project 5. Name, Farm Management.
- Project 6. Name, Field Pea.
- Project 7. Name, High Altitude Crops.
- Project 8. Name, Preparation of New Land.
- Project 9. Name, Correlation of Characters in Grain. (Partly supported by Hatch Fund.)
- Project 10. Name, Plains Crops and Management.

*Progress of Projects.*—Project 1, Wheat Improvement—In this work three lines are being followed; 1st, prospective new strains are being introduced and thoroughly tried out; 2d, selection breeding is being carried on in the effort to improve the best adapted existing sorts; 3d, crosses are being made in the effort to combine desirable qualities of different strains. Special effort is being put forth to produce a high yielding wheat of good quality which will mature very much earlier than any of our present sorts. Progress has been made toward this end. There are now in our Wheat Breeding Nursery sorts which will ripen very much quicker than Turkey Red, our earliest winter wheat.

*Project 2, Feed Crop Improvement.*—Progress.

*Project 3, Rotation in Colorado.*—An investigation concerning the rotations best adapted for the various sections of the State, the effect of such rotations upon the soils and production. Rotations are carried on on farms. In addition information is gathered on the working of operative rotations. It would be possible to put out information at the present time.

*Project 4, Methods in Selection Breeding.*—Methods of Handling the selections in the various crops and regions of the State. Progress.

*Project 5, Farm Management.*—An investigation into the present systems of farm management in the State, and into methods of improvement.

*Project 6, Field Pea.*—Progress.

*Project 7, High Altitude Crops.*—Experiments and tests in the endeavor to find or produce profitable crops for our high altitudes, and to determine what crops are best adapted to the various regions, also what constitutes adaptability. Progress, and a Progress Bulletin now ready.

*Project 8, Preparation of New Land.*—Experiments, tests and information in methods of preparing and handling the different types of new lands in the different regions of the State. Considerable information is now on hand.

*Project 9, Correlation of Characters in Grain.*—Progress. Will require several years' data.

All projects are new.

During the past year the following publications were issued by the Department:

Press Bulletin 49, "Treatment of Seed Grain to Prevent Smut."

News Notes No. 135, "Growing Sugar Beets."

Correspondence Circular No. 7, "Milo."

Correspondence Circular No. 9, "Growing Broom Corn in Colorado."

Ready for publication:

High Altitude Crops—Progress Report.

Alfalfa in Colorado—Progress Bulletin.

Two classes of work are being carried by the Section. The first class aims to gather information, by experiment and otherwise, concerning the best crops and methods of handling the same, and put this information in the hands of the people as soon as possible, in order that it may be of immediate use and help in the farming operations of the State. Such work is of necessity, largely general and informational. But it is of large immediate value, and assists in raising the general level of our agriculture.

The second class of work which we are doing attempts the more exact and protracted investigation and study necessary for the solution of specific agronomic problems. This often means the continuation of a piece of work through a period of several years in order to eliminate unknown or uncontrollable factors. Except for the factor of time, these two classes of work are not necessarily antagonistic. Many of the specific projects, if successful, will point the way to a better agriculture. If negative results are obtained they will be equally valuable in showing what not to do.

The Plains projects were merged during the summer into one general project. This work has been quite productive. Mr. J. E. Payne, the Plains Field man, has prepared six reports, results of specific work done, which will be offered for publication.

Respectfully submitted,

ALVIN KEYSER,

Agronomist.

## REPORT OF ALFALFA SPECIALIST.

To Alvin Keyser, Agronomist:

I herewith submit my annual report on the alfalfa breeding project in progress under my control. So far, this work has been supported by Hatch funds. There have been no new projects during the past year, and as my last annual report was published as a Progress Bulletin, that has covered the material really available for publication at the present time.

The past year's efforts have been directed along two lines of the alfalfa seed problem; First, observation, records and selections of seed from the alfalfa nursery have been made for the purpose of combining and improving the desirable traits that have been revealed. Second, observations and investigations have been carried on to find the factors that influence the setting of alfalfa seed, to determine the best methods for producing commercial quantities of seed.

Under the first line there are two important observations that have been made; first, that there seems to be a direct relation between the stooling habits of an alfalfa plant and its tendency to winter kill. The type of plant with the deep crowning habit that sends out root stalks beneath the surface of the soil, with the bud areas protected with earth, characterizes the non-winter killing strains, while the plant that has a small stool that throws out its shoots almost upright at, or very near the surface, has its bud areas exposed and is therefore easily winter killed.

These two types of plants are found to some extent in nearly all the common alfalfa, while the Arabian and non-hardy strains are of the latter described type. It does not follow that endurance to low winter temperatures is entirely due to the stooling habits, for there are other factors that may enter. But for Colorado conditions it seems very evident from the tests we have made that freedom from winter killing can be secured by selecting the proper stooling type of plants.

The second observation referred to was the marked disease resistant or frost resistant tendency of the Baltic alfalfa which was revealed by its freedom from the bacterial disease that seriously injured all the other varieties that were growing under the same conditions in every particular. Professor Sackett, who has been investigating this disease, reports that it seems to be associated with frost injuries, and he also reports the Baltic variety as showing the resistant trait in a test that he has made at Gypsum, Colorado. The contrast in the test made at Rocky Ford this spring was very marked. It oc-

curred under field conditions in a five acre field sown in rows to test cultural methods for seed production. The field was seeded in 1909 to ten varieties, the seed being selected from the most promising plants in the 1907 nursery of sixty-four strains. The whole field was irrigated in the fall, and the space between the rows thoroughly cultivated in the spring, each variety receiving the same treatment in every respect. The field seemed to be very uniform until after a few sharp frosts, the latter part of April, when the field began turning a light yellowish green, except a strip of fourteen rows through the center of the field, that was distinctly marked by dark green, normal colored foliage. On investigation it was found to be the rows that were sown to Baltic. The plants in these rows were nearly free from the bacterial disease, and the contrast became more marked each day as these rows continued to grow, while the balance of the field stopped growth for nearly ten days.

One half of each variety was cut for a hay test, about June 1st. The remainder of the field was allowed to go to seed. The advantage of the resistant trait of the Baltic variety is shown by the yield of hay per acre from the ten varieties computed on the yield of dry hay from an equal area cut from each variety, as follows:

Plat 1	Variety Developed from one plant found on Railroad Right-of-way. Yield per acre -----	4,126 pounds
Plat 2	Turkeystan, Yield Per Acre -----	3,930 pounds
Plat 3	Utah Alfalfa, Yield Per Acre -----	3,920 pounds
Plat 4	Dry Land Nebraska, Yield Per Acre -----	4,126 pounds
Plat 5	Argentine Alfalfa, Yield Per Acre -----	3,920 pounds
Plat 6	Baltic Alfalfa, Yield Per Acre -----	<b>5,702</b> pounds
Plat 7	Sand Lucern, Wash., Yield Per Acre -----	4,126 pounds
Plat 8	Peru Alfalfa, Yield Per Acre -----	3,603 pounds
Plat 9	Arizona Alfalfa, Yield Per Acre -----	3,870 pounds
Plat 10	Ecuador Alfalfa, Yield Per Acre -----	3,732 pounds

The contrast in growth of the second crop was not so pronounced. It was not cut for hay but left to go to seed. The Baltic was one of the best in point of leafy character and fine stems. The Baltic variety blooms almost a week earlier than most of the plats, and it also gives evidence of superior seed yielding traits, the results of which cannot be given at this time.

A new alfalfa breeding nursery comprising nearly eight miles of nursery row thinned to single plants, has been established the past season. The nursery is largely composed of individual plant selections from the Baltic and other very promising strains and varieties. Careful observations and records have been kept on any contrasts that have appeared, for future breeding investigations. One interest-

ing point was shown in the selections from the Baltic strain, of a decidedly less injury from the mildew that affected the leaves of nearly all the plats.

The Baltic alfalfa originated as a strain in South Dakota. A field over ten years old was discovered by Professor W. A. Wheeler near a little place called Baltic. The strain seemed to possess many desirable traits. This strain has gone out from the South Dakota Experiment Station as Number 167. The seed we have had come through the Department of Agriculture, and originally came from the Highmore Sub-Station, South Dakota.

There is hardly a doubt but that the Baltic strain originated from seed of the Grimm alfalfa, as the two strains are so near alike in many ways, but there is no direct way to trace its identity.

The cultural methods for seed production have not yielded the results hoped for on account of various adverse influences, namely, the test was made on new seeding. It was evident the field was over watered in the fall. While it had no other irrigation the field grew too rank a growth of hay for satisfactory yields of seed, as can be seen from the heavy yields of hay already reported. The bacterial disease and grasshoppers also modified results. The seed from the first crop on one-half of the field, and the second growth on the other half, is in the stack. An estimate is hardly worth while to report, but a bushel to a bushel and a half might be a close guess for the average.

The investigation has emphasized several points of great value.

1. That the cultivation of alfalfa in rows can conserve the moisture of one irrigation of the fall before to produce two heavy crops of hay, on soil of the character upon which the test was made.

2. That alfalfa in rows with irrigation furrows smoothed out can be irrigated with a minimum amount of water that is impossible where the alfalfa is sown broadcast and the field is flooded.

3. That the moisture control is one of the principal points in successful alfalfa seed production.

4. That alfalfa in rows will not lodge so bad as broadcast stands.

5. That weeds and grasshoppers can better be controlled by cultivation where the alfalfa is in rows, allowing intertillage.

6. That different varieties of alfalfa have different seed yielding traits.

There are many questions in relation to alfalfa seed setting that need solution, that will require more time and equipment to determine.

Respectfully submitted,

P. K. BLINN,

Alfalfa Specialist.

## REPORT OF THE PLAINS SUB-STATION.

To Alvin Keyser, Agronomist:

The following is a report of the work at this station, for the season of 1910. The work has been carried on with a view to demonstrating general farming, combined with dairying and poultry raising. In connection with this there has been experimental work.

Because the land had not been properly treated during the previous season, it was impossible to follow strictly dry-farming methods for the present season's crop. This applies especially to the spring grain.

*Orchard and Other Trees.*—The orchard and shade trees have been pruned, thinned and cultivated so as to improve the health and general appearance very materially. On account of the freezes and hail the fruit crop practically failed. We had a few cherries (1½ gal.), a few gooseberries, and about a bushel of apples (Winesap, Missouri Pippin and Geniton varieties. There are some indications of blight in the orchard, but I think the difficulty lies mainly in a lack of moisture because the trees are too close together, and on account of insufficient pruning and cultivation in the past. The station should be provided with apparatus for spraying as the leaf rollers and kindred insects damaged the trees last spring. I have not seen any evidence of the codling moth in the apples produced.

*Garden.*—One acre of choice land was set aside for a family garden. In this we planted the following vegetables; potatoes, peas, beets, carrots, beans, onions (sets), radishes, turnips, lettuce, peanuts, tomatoes, cabbage, cantaloupes, water melons, cucumbers and preserve melons. From this garden we have raised all the vegetables used during the summer by the family and the hired help. In addition to this we sold from it \$16.12 worth of vegetables.

Practically everything planted in the garden was a success except the water melons; they were destroyed by hail on the 15th of August. There were 1,500 melons on ¼ acre at that time and they would have ripened in a short time.

*Experimental Plots, Stock Beets.*—One acre was planted to stock beets. They came up nicely but were destroyed by hail on May 15th just as they were coming out of the ground. They were replanted twice, but failed to get a start owing to drouth. On July 7th I planted all but ¼ acre to Kafir using furrow opener attachment to corn planter. In spite of the long drouth this came up and made a good crop, clearly showing the value of the furrow-opener in dry seasons. The remain-

ing  $\frac{1}{4}$  acre of beets made 400 pounds (estimated) of beets, or 1,600 pounds per acre.

*Potatoes.*—Besides the potatoes planted in the garden and used during the summer, we planted one acre for the station, with the following results:

Ohios, per acre, 1,304 lbs., Peach Blows, per acre, 1,460 lbs., Pearls, per acre, 1,716 lbs., Rose Seedling, per acre, 1,760 lbs., Irish Cobblers, per acre, 1,440.

The potatoes were of very good quality. Considering the very dry season and the fact that the ground had no previous preparation (last season) I think that the results are encouraging. In addition to the above, I raised at the station 2 acres of potatoes for Professor Fitch. He will make the report on those.

*Small Grain.*—Seven acres were devoted to variety tests of spring grain. Four varieties of spring wheat planted as follows;  $\frac{1}{2}$  acre of Durum wheat,  $\frac{1}{2}$  acre of Bluestem;  $\frac{1}{2}$  acre Velvet chaff;  $\frac{1}{2}$  acre Fife. 1-10 acre of each of these was harvested with a cradle and an attempt made to thrash by hand to determine the yield. But it was found that mice had destroyed so much of some plats that a comparative yield could not be made in this way. It was thought we could get at a fair estimate only by observation. The values as estimated were from 4 to 7 bushels, in the following order: Durum, Velvet Chaff, Blue Stem, Fife.

*Oats.*—Three varieties of oats were sown, as follows: Kherson, Swedish Select, and Sixty Day oats. The same method of determining the yield was followed as in the case of wheat, and some difficulties were encountered. The Kherson and Sixty Day oats seemed to be identical. The Swedish Select came later and showed a better yield this season.

Estimated yield Kherson and Sixty Day oats, 10 bushels per acre. Swedish Select, 15 bushels per acre.

*Barley.*—Plats of common barley and Bald barley were sown. The common barley made good considering the season. The other variety was a failure. Our experience this year has shown that it is not practical to sow grains on plats without a small thrashing machine to thrash them with when they have been cut.

*Stock Melons.*—One acre was planted to stock melons. From this were gathered nine loads. They were fed to milk cows. Although the cows seemed to relish them very much we are unable to detect any increase in the flow of milk due to their use.

*Corn.*—Twelve acres were planted to eight varieties of corn. The drouth in the early part of the season was almost too much for it.



but the late rains brought it back so that we had an estimated yield of 6 to 12 bushels. Most of this was cut with a corn harvester and will be fed to the cows without husking.

*Non-Saccharine Sorghums.*—For variety test we planted 1-3 acres each of the following:

VARIETY	Fodder Yield Per Acre	Grain Yield Per Acre
Texas Seeded Ribbon Cane -----	2,000 Qual. good	000
Brown Knowliang -----	1,800 Qual. poor	585
White Durra -----	1,200 Qual. poor	339
Dwarf Milo -----	1,800 Qual. fairly good	745
Sudan Durra -----	900 Qual. poor	481
Black-hulled White Kafir -----	2,400 Qual. good	000
Dwarf Milo Kafir -----	2,400 Qual. good	670
Standard Milo -----	1,500 Qual. poor	627

The figures for fodder are in pounds (estimated.) These plats were thrashed by hand and the grain weighed.

*Broom Corn.*—Four varieties were planted in 1-3 acre plats. Owing to the drouth it was cut for feed, making about 3,000 pounds per acre fairly good fodder. This would have produced some good brush but it was believed to be more valuable as feed.

*Beans.*—Besides the beans planted in the garden, we planted  $\frac{1}{2}$  acre of cow-peas and Mexican beans in the field. The cow-peas made 5 bushels per acre. The Mexican beans were damaged by the hail and drouth more than the cow-peas, but made 3 bushels per acre.

*Millet.*—Four acres were sown to hog millet. It did not come up good; it made about  $\frac{1}{4}$  ton per acre.

*Summer Fallow.*—About 4 acres were summer-fallowed and two acres of this were sown to Kharkof winter wheat. The wheat is looking fine now. About 4 acres were sown on ground that raised crop this season. Its appearance is not nearly so promising.

*Sod Crops.*—During the spring and summer thirty-two acres of new land were broken out and about twenty acres of this were planted in Kafir and Milo. Two plantings were made. The earlier produced a good crop of fodder and a fair yield of grain; it has not been thrashed. I estimate that it will yield 2,000 pounds of fodder and 500 pounds of grain per acre. The late planting did not produce grain but made about 1,200 pounds per acre of first-class fodder.

*The Dairy.*—On March 1st we had 18 head of cattle, as follows:

15 head of cows and heifers.

- 2 calves.  
1 grade Red Polled bull.

The cows were selected from a rough herd. We began keeping a record of feed and cash receipts. Four of these cows were giving milk of March 1st. Eight more were fresh during the summer. On June 1st I began keeping individual records by use of scales and Babcock test. In October I sold five of the less promising ones. It is my plan to purchase as soon as possible at least one good Holstein cow and a Holstein bull. In this way we hope to breed up a dairy herd from native cows, and at the same time demonstrate the value of the dairy bred cow as compared to the common cow.

A brief statement of the results of my records follows: (An itemized statement and individual records of cows will be furnished if desired.)

Cost of feed for entire herd for 8 mo. beginning Mar. 1-----	\$137.00	
Cash received for butter fat -----	283.56	
Cash received for 10 head calves -----	90.00	
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Total	\$373.56	
Balance		\$236.56

Estimated receipts based upon records of scale and Babcock tests for 5 mo. from June 1st -----	\$183.87
Actual cash receipts for butter fat for the same period -----	181.54

Discrepancy between actual receipts and theoretical amount	\$2.33
We brought to the station 60 hens and 4 roosters valued at-----	\$ 30.00

#### *Poultry.*

Cost of feed and new stock for the 8 months -----	57.60
Cash receipts for eggs and chicks -----	\$ 97.91
Poultry on hand—80 hens and 4 roosters valued ---	40.00
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Total	\$137.91
Balance Credit	
	<hr/>
	\$80.31

*Repairs and Improvements.*—Besides repairing and painting the barn and dwelling house and repairing and rebuilding fences, we have built as follows:

- 1 dairy barn 26x60 inside measure—walls of adobe, roof of corrugated iron.
- 1 poultry house 13x20 inside measure—walls of adobe and roof of boards (with tar paper and adobe.)

1 smoke house and store room, 14x14 inside measure. Walls and roof same as poultry house.

Details of these buildings will be given in bulletin on adobe building.

Items of expense not otherwise accounted for:

Pasture -----	\$30.00
Water Privilege -----	30.00
Horse Feed -----	189.47
Labor -----	316.37
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Total	\$565.84

The settlers of this section of the State are vitally interested in the following lines of work; farm dairying; poultry raising; wheat farming; potato raising; family gardening and the growing of fruit and shade trees. Therefore the station should give all the aid possible particularly along these lines.

Respectfully submitted,

J. W. ADAMS,

Superintendent Cheyenne Wells Sub-Station.

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## REPORT OF ANIMAL HUSBANDRY SECTION.

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To the Director:

The following projects were carried on during the past year under State Funds:

1. Ration Experiment with Swine. A continuation of our investigations concerning the value of tankage in swine rations, involving a test of fertilizer tankage for feeding purposes. This year's work ends for the present our work with tankage.

2. Ration Experiment with Lambs. A continuation of our work comparing the feeding of alfalfa hay in self-feeders, with feeding upon the ground; comparing cut or chopped hay with whole hay; and comparing California Feed barley with corn. This ends our tests of the self-feeder for hay. The work with cut hay will be continued during the coming year, and will be enlarged to include a test of granulated hay. California Feed barley will be tested again, and compared with a two-rowed brewing barley.

3. Ration experiments with Steers. A test of California Feed barley in comparison with corn, and in comparison with a mixed

ration. Part of this work will be duplicated the coming year, and a test of granulated alfalfa made.

4. Beef Production in Colorado. A new project begun during the past year, aiming to arrive at the cost of producing an 1,100 pound steer fit for market as a long yearling. Cows were bought in the spring and calved on enclosed range. The calves are now being winter fed. This must be continued another year in order to complete it, possibly two years.

Two bulletins have been issued during the year, numbers 151 and 165 upon "Ration Experiments with Lambs" and "Ration Experiments with Swine."

Inquiries are constantly coming to the office concerning the best rations to use for the various classes of livestock. The work we have done gives us considerable definite information upon various rations, and the work should be continued along these lines.

The poultry work has been conducted independently during the year, and the report of the poultryman follows.

Respectfully submitted,  
G. E. MORTON,  
Animal Husbandman.

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#### REPORT OF POULTRY SPECIALIST.

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To G. E. Morton, Animal Husbandman:

We believed at the beginning of the past year that we might be able to carry out certain projects, such as determining cost of egg and flesh production, etc., but on account of absence from home much of the time, these projects were discontinued.

As it seems more necessary to carry on extension and other outside work than to undertake such projects as mentioned, we are planning an egg-laying contest which should bring a model poultry plant or school into a number of localities in Colorado and show the farmers and poultrymen in these communities the advisability of keeping pure-bred poultry in order to secure the best results and best market prices.

One hundred visitors a month are coming to the Poultry Department, a large percentage of whom are seeking information of some character. Some borrow models of our poultry houses in order to build like them; many have sick fowls; some are in doubt as to which breed of fowls to handle; and we are getting an average of fifty let-

ters a month from all parts of Colorado and other sections of our country asking for information.

We have recently completed a building 96 feet long: part of it 16x18 feet and two stories, to be used as a feed house and office room, the rest of the building, 80x12, consists of ten pens for ten different varieties of poultry for the benefit of our students and visitors who wish to become familiar with the most popular varieties of fowls. In addition we have a work shop and ten colony houses of five different types. Most of these are 8x14 feet in size and are of such patterns as to meet the different needs and demands of different conditions and surroundings. This enables prospective builders to get specifications, cost of material, advantages and disadvantages of different types, etc.

We believe the farmer who is raising some poultry should double his output rather than that others should jump into the business without proper preparation, and to keep this policy in operation we are endeavoring to show him the necessity of keeping the kind of stock the market wants, and the necessity of housing and caring for such stock in a manner to produce satisfactory results.

With our present equipment of buildings, incubators and stock, if we are to continue extension work as in the past, we feel the need of help to carry on the work in our absence. We find it necessary to neglect much office work, which, should be carefully looked after, because of outside work, and are unable to carry on experimental work which our poultrymen are asking for and which would benefit the industry if followed up.

Respectfully submitted,

W. E. VAPLON,

Poultryman.

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## REPORT OF THE FIELD HORTICULTURIST.

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To E. R. Bennett, Horticulturist:

The following is the annual report covering the work in State Fruit Investigations from November, 1909, to November, 1910.

The following approved projects have been worked upon:

1. Shade Crops for Old Apple Orchards.
2. The Season of Bloom of Fruit Trees.
3. The Control of the Brown or Pustular Spot of the Peach.
4. The Thinning of Jonathan and Winesap Apples.

5. The Cold Storage of Jonathan Apples.
6. The Growing of Raspberries in Colorado.

*Shade Crops for Old Apple Orchards.*—For this purpose a nine-acre orchard near Delta, owned by Mr. Wm. Duling, was secured and eight different legumes sowed, leaving one acre for a check which was clean cultivated. The following legumes were used: field peas, cow peas, crimson clover, winter vetch, red clover, alfalfa, mammoth red clover, and sweet clover. These were all sowed near the tenth of April, 1910.

The conclusions for the season's work, so far as tests of varieties are concerned, in brief, are: 1st—Field peas make a very good growth, if sowed very early, and thus can be reseeded in July by disking in, but for an old bearing orchard, especially where the middles are pretty well shaded, this second crop does not always grow well; 2d—Cow peas were planted twice, the second seeding being done in the latter part of July. Neither planting did well as the seed failed to germinate, due very likely to the cold ground caused by the shade of the trees; 3d—The clovers, winter vetch and alfalfa are at this time the most promising for shading the ground and making a good mat to be turned under later on for green manuring. Of these the winter vetch has the greatest mat and would be the best for a green manure, if plowed under at the present time.

In connection with the foregoing project a cover crop experiment was started in the Excelsior peach orchard at Paonia. Mr. Frank Van Deren, Manager. In this orchard, on July 23d, was sown the following: red clover, crimson clover, fall rye and field peas. Of these the fall rye at the present time appears to be the best for a winter cover crop. The clovers made very little growth and the field peas were but from four to seven inches high and were badly mildewed. It would seem from this that with but one irrigation after the seed was planted that July 23d was too late for the sowing of field peas in a bearing peach orchard.

*The Season of Bloom of Fruit Trees.*—At first the object of this project was to determine what varieties of apples bloomed near enough together to insure cross pollination. When it was found that the season of bloom for the summer and winter varieties, respectively, bloomed so near together, it was thought best to see what varieties of the important winter ones were self-fertile and also those which were self-sterile. For this purpose about 900 bags were placed on unopened bloom clusters. The freeze on the night of May 16th put an end to this part of the experiment. A record of the number of days that the calyx remained opened was kept for each variety. The minimum

number of days, which was about seven, gives plenty of time for the first codling moth spraying.

*The Control of the Brown or Pustular Spot of the Peach.*—This trouble was first noticed at Eckert, during the summer of 1908, and during the season of 1909 did a great deal of damage in that locality. A block of peach trees in Mr. A. L. Reynolds' orchard, at Eckert, was secured for spraying to find out what kind of spray to use and when best to apply for the control of the trouble. Two applications of Rex lime-sulfur, Bordeaux and home-made lime-sulfur were made, but the May freeze killed every peach in the orchard, so that no conclusions could be made except the effect of the one summer spray (May 25th) on the leaves, which was as follows: With one-half strength Bordeaux (2-5-50) there were some shot holing, perhaps more than from the use of Rex, but not enough to do any particular damage. The Rex lime-sulfur, 1 to 50 with 6 pounds of lime added, did some leaf burning but the injury was not severe. The self-boiled lime-sulfur (10-8-50) did no injury to the leaves whatsoever, and if it proves to have the same fungicidal value as Bordeaux, will no doubt be used in its place.

On August 19th six trees were sprayed in the Henry Teachout peach orchard at Eckert. In this orchard there was a fair crop and not many diseased peaches. The same fungicides were used as in the Reynolds' orchard. The following conclusions were noted. 1st—August 10th this year was the earliest date that peach spot was noticed at Eckert. 2d—That August 19th is too late to spray for its control. 3d—The summer being very dry the trouble did not gain much headway. 4th—That excessive moisture caused either from over irrigation or rains tends to favor the trouble and especially is this true when the trees are close together, thus affording plenty of shade. 5th—The softer the peach the more liable it is to attack.

*The Thinning of Jonathan and Winesap Apples.*—The object of this project was to determine whether, from a money standpoint, thinning of heavily loaded fruit trees will pay, and if a systematic thinning each year will have something to do to prevent the "off year," especially of the Jonathan. The result of this work has been published in bulletin 170.

*The Cold Storage of Jonathan Apples.*—As a rule the Jonathan apple does not keep in cold storage so well as it is thought it might, and for this reason an experiment is now being carried on in the Colorado Ice and Cold Storage plant in Denver. The object of the work was to determine if the delayed picking and packing or the delayed storage had anything to do with their keeping qualities.

*The Growing of Raspberries in Colorado.*—The information secured on this project is being published as bulletin 171.

*Incidental Observations Other Than Experimental Projects.*—Some time was spent in observations along the line of Arsenical Poisoning of Fruit Trees and injuries done by nitrates in the soil. These are being worked on by Dr. Headden and Professor Sackett.

*Winter Injury.*—Notes on this work have just been published in bulletin 170.

*Orchard Heating.*—With good systematic work orchard heaters can be used to good advantage. This was demonstrated on the night of April 15<sup>th</sup>, when with oil and coal heaters the temperature was raised 6 to 8 degrees, and this was with an outside temperature of about 21 degrees. On this date apple fruit buds were out of danger with a temperature of 29 degrees.

*Demonstration Work in Orchard Management.*—Demonstrations in pruning, grafting, etc., were given whenever the occasion called for it. About twelve days, not including the time it took for travel, were spent at Palisade helping Mr. G. P. Weldon with his codling moth and other insect spraying experiments.

About a month was spent at the college last winter doing teaching work for Professor Bennett while he was away on institute work.

During the year the following articles have been written for College "News Notes;" The Time for Pruning Peach Trees When Injured by Winter Freezing; Treatment for Winter Injury of Young Apple Trees; Low Headed Trees in the Orchard.

The following projects will be worked upon during the coming year, viz: 1, Shade Crops for Old Apple Orchards; 2, The Season of Bloom of Fruit Trees; 3, The Control of the Brown or Pustular Spot of the Peach; 4, The Thinning of the Jonathan Apple; 5, Cherries in Colorado.

Respectfully submitted,

R. S. HERRICK,  
Field Horticulturist.



## HORSE BREEDING INVESTIGATION.

To the Director:

I beg to submit the following brief report of the carriage horse breeding experiment as conducted by the Experiment Station in co-operation with the U. S. Department of Agriculture:

*Stud Record Summary.*—There are in the stud at the present time seventy-five animals, consisting of the following:

- 1 aged stallion.
- 1 four-year-old stallion.
- 1 three-year-old stallion.
- 3 two-year-old stallions.
- 20 aged mares in service.
- 6 four-year-old mares in service.
- 5 three-year-old mares in service.
- 1 four-year-old gelding.
- 6 two-year-old fillies.
- 7 yearling colts.
- 7 yearling colts.
- 6 yearling fillies.
- 12 male foals.
- 6 female foals.

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75 Total number in stud.

There have been no additions made to the brood mare ranks during the present season except those developed at the station. One two-year-old stallion, Red Cedar, was purchased during the season for use in mating with the Carmon fillies. The retention of this stallion in the stud depends upon his development as an individual, and his ability to nick well with the Carmon blood.

One valuable mare, Wyoming, died on September 10, 1910, the immediate cause of death being pulmonary gangrene. This mare was a very valuable brood mare and her loss is regretted.

*Sale of Surplus Animals.*—The Board of Survey, in its annual report dated August 19, 1910, recommends that the following animals be disposed of at public auction as their retention for breeding purposes is undesirable.

- 1 four-year-old bay Gelding, Alva.
- 1 two-year-old black mare, Carnation.
- 1 two-year-old bay mare, Cora.

- 1 two-year-old bay mare, Columbia.
- 1 yearling bay colt, Dandy Jim.
- 1 yearling bay colt, Denver.
- 1 yearling bay filly, Dolly Wilkes.
- 1 yearling bay filly, Dorothy.

All the above-named animals are the property of the station, with the exception of the two-year-old mare, Carnation, which is the property of the Department of Agriculture. I recommend that these animals be sold at the earliest convenient date.

The progress made during the past season is very satisfactory. Out of eighteen foals being raised, twelve are male foals and six are fillies. The type is uniform with very few possible exceptions. Especially good results have been attained on the first cross of Carmon on the "King," "Red Cloud" and "Chester Dare" blood—these mares being of American Saddle breeding. The result of this mating has increased the size ordinarily found in the Kentucky saddle horse, yet retaining the quality for which the breed is renowned. The development of these foals will be watched with great interest.

The difficult problem facing the experiment at the present time is obtaining a satisfactory stallion to follow Carmon at the head of the stud. Carmon will be retained, but it is very important to secure a stallion of the proper type and breeding to follow on Carmon's progeny. The Expert-in-Charge has spent considerable time during the past two months endeavoring to locate such a stallion, also some satisfactory standard-bred mares for use in the stud. Some mares have been located and it is quite likely some additions to the stud will be made in the near future. It is very important that no additions be made unless the animals purchased are superior individuals of pure breeding along known lines. In an important experiment of this kind it is better to have a few specimens of known value rather than an unlimited number of indiscriminately bred animals.

The result of the mating of Carmon mares to the Government Morgan stallion, General Gates, at Middlebury, Vermont, has resulted in the production of very superior foals. This blood should be of extreme value in the development of the ultimate type of carriage horse.

*Summary.*—The Board of Survey in its annual report to the Secretary of Agriculture reported that "the stud was found in excellent condition, and that the standard, judged by the improvement in the young stock and the appearance of the foals this year, is steadily being raised."

The standard of excellence at the Horse Breeding Station is being maintained by a strict process of selection. The station is carefully

inspected each year and inferior animals are eliminated. This results in raising the standard of the animals at the station. The various producing families are carefully observed, and those mares which consistently produce inferior progeny are discarded along with their progeny. This process of strict selection will ultimately result in the retention only of those families which consistently produce individuals of uniformly superior merit, adhering to a definite type.

Respectfully submitted,

J. O. WILLIAMS,

Expert-in-Charge.

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## REPORT OF BACTERIOLOGIST.

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To the Director :

I have the honor to submit herewith the annual report of the Bacteriological Section of the Experiment Station for the year 1910.

Under the provisions of the Adams Fund, four lines of investigation have been pursued during the year which is about to close. Two of these were carried over from last year, one of which has been completed, and two new studies have been begun.

*Project 1, Bacterial Disease of Alfalfa*.—The results of this investigation have shown the stem blight of alfalfa to be due to a germ, to which the writer has given the name, *Pseudomonas medicaginis*, n. sp. The causal organism, presumably, lives in the soil, and enters the plants with soil, through stems which are cracked and split by late spring freezing. The disease is so serious in some localities as to cause the loss of 85 per cent of the first cutting. It was especially serious in the vicinity of Rocky Ford last spring, and was also reported as occurring in Eagle, Garfield, Mesa, Delta, Denver, Morgan and Larimer Counties. As a means of control, we have recommended that the diseased alfalfa be clipped as soon as the danger from late spring frosts is past, thereby ridding the plants of the blighted portions, and affording an opportunity for the early growth of a new cutting. Where this has been practiced, the results have been entirely satisfactory, and the tonnage has been considerably greater than that from areas which were not clipped. Our variety test work which we have been carrying on at Gypsum, for the purpose of obtaining disease resistant varieties, has been transferred to Rocky Ford. This has seemed desirable because of the difficulty we have experienced in getting the services of a

competent person to look after the field plats. Professor Blinn has very kindly consented to include this work with similar studies which he is carrying on. Through the courtesy of Mr. J. M. Westgate, of the United States Department of Agriculture, we have secured fourteen new strains of hardy alfalfa, which have been planted at Rocky Ford. No entirely disease resistant varieties have been obtained up to the present time.

With the exception of the field work mentioned above, this project has been completed, and the results of the whole investigation have been published in bulletin 158, "A Bacterial Disease of Alfalfa," April, 1910. A popular edition of Bulletin 158 has been issued as Bulletin 159, "Stem Blight, A New Disease of Alfalfa."

*Project 2, Bacteriological Studies of Alkali Soils.*—This line of investigation, as originally outlined, was intended to include the different functional activities of soil bacteria as related to agricultural practices, and as possibly modified and influenced by our peculiar climatic and alkaline soil conditions. Thus far, our work has been confined to a study of the nitrogen fixing flora of certain soils which Dr. Headden has shown to contain excessive nitrates, it being our purpose to establish, if possible, some definite relation between the high nitrates and the nitrogen fixing bacteria, whereby we should be able to explain the presence of the nitrates. During the past year we have examined forty samples of soil of widely separated sections of the State, where the nitrates have been so abundant as to cause serious loss to the agricultural interests. Thirty-nine of these samples have possessed very marked nitrogen fixing properties, and pure cultures of *Azotobacter*, the nitrogen fixing micro-organism, have been isolated readily.

We have established with a reasonable degree of certainty the relation between the characteristic brown color of the soil which frequently accompanies the nitre trouble, described by Dr. Headden as "brown spots," or "black alkali," and the presence of *Azotobacter*. We have produced the color experimentally on sand where it seems to be due to the brown pigment incident to the growth of certain nitrogen fixing species which are very abundant in some of the soils in question.

Technical studies have been carried on along the following lines: the germicidal action of metallic copper as a possible remedy for the trouble; the influence of different combinations of carbon as found in manite, filter paper, cotton, etc., upon nitrogen fixation by pure cultures; the relation of aeration, chemical reaction, quantity of carbohydrate, substratum, etc., to the amount of nitrogen fixed.

Experiments are now in progress to determine the relation of the different soil constituents, peculiar to our soils, to nitrogen fixation.

We hope by this means to throw some light upon the apparently extreme and unprecedented activity of the Azotobacter, whereby we shall be able to explain more satisfactorily the high nitrates. We are also endeavoring to produce these high nitrates *in situ* in sterilized soil, which has been inoculated with infected soil; if by simulating field conditions thus, we are able to demonstrate the accumulation of large quantities of nitrogen, there should be no longer any question as to the part which Azotobacter plays in the high nitrogen content of certain Colorado soils.

*Project 3, Holdover Blight in the Pear, Apple, etc.*—A new line of investigation has been called for in regard to what is known as "holdover" blight in the pear, apple, quince and apricot. This has come about through a difference of opinion among fruit growers, as to whether the germs of blight can live through the winter in the diseased limbs and twigs and be active in the spring to renew the blight. Our studies for the past spring showed 41 per cent. of the diseased twigs to contain living germs on March 1, 1910. Observations should be made for at least two more seasons to confirm these findings.

*Project 4, Raspberry Yellows.*—For several years past the raspberry growers in the vicinity of Loveland, Colorado, have complained that the canes were small, brittle, discolored, and that the young shoots in the spring showed a tendency to turn yellow and shrivel.

A number of factors seem to be responsible for this condition of the raspberries, among which may be mentioned winter injury, spring freezing, methods of covering, and the presence of the fungus, *Sphaerella rubina*. The fungus attack has been prevented entirely the past season by the use of Bordeaux mixture and several different methods of protecting the canes during the coming winter have been carried out on the experimental berries at Loveland. The question is such a complicated one that it will probably require at least two seasons more before we shall be in a position to suggest remedial measures.

A popular bulletin along lines of Dairy Bacteriology has been prepared and published as No. 156, entitled "Butter Making, Clean Milk and Commercial Starters."

Respectfully submitted,  
WALTER G. SACKETT,

Bacteriologist.

## REPORT OF BOTANIST.

To the Director :

During the year just ending the following projects have been under investigation :

*Adams Fund.*—Black Root of Strawberry.—This rather indefinite trouble is characterized by the blackening and ultimate decay of the roots of plants during the second season after setting a plantation. It usually starts at the season when new growth is beginning in spring and affected plants may put forth leaves and blossoms only to wilt and die later on. The trouble appears to be closely associated with winter injury and unfavorable soil conditions. Attempts have been made during the past growing season to determine the possible presence of parasitic fungi as one of the causes of this trouble. Plants have been grown in sterilized soil and in soil from fields where the trouble existed but thus far no positive results pointing to any parasitic organism as the cause have been secured. The arrival of some special glassware for growing the plants under sterile conditions will enable me to further investigate this phase of the subject. No publications on this subject have been issued.

*Special Fund.*—Five years ago last spring forty-eight lots of Black Locust and Hardy Catalpa trees were sent out for co-operative planting in different parts of the state. During the past season two weeks were spent in trips of inspection of these plantations. Upon receipt of further data from some of these parties it is my intention to submit a report covering this experiment. This is expected to be done by the expiration of the present year. On the whole this kind of co-operative experimenting has proven unsatisfactory, due largely to frequent changes in ownership of the land planted to these trees and the failure of those in charge to follow the instructions of this department. A few plantations, however, offer much encouragement in the way in which they have been handled and in the growth the trees have made.

This experiment was originally planned to extend over a period of ten years.

Some further experiments in the control of the dandelion pest in lawns were carried on during the past season. This work was not taken up under the head of a project. It was learned that a solution of commercial iron sulphate of 15 per cent. strength is as effective as a 20 per cent. solution. One and a quarter pounds of iron sulphate dissolved in each gallon of water gives approximately such a solution.

In the past season spraying was begun in April. The results were not so successful as those of last season when the first application was made in late summer. The varied results secured during the past season indicate that the conditions for success are not at all uniform and that careful study and experimenting is necessary to reveal the most favorable time and conditions for this work.

Respectfully submitted,

B. O. LONGYEAR,

Botanist.

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## REPORT OF THE CHEMICAL SECTION.

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To the Director:

The Chemical Section has no project on either the Hatch or State funds at the present time. On the Adams fund we have the following projects:

First—The relation of the waters of the San Luis Valley, especially those of the Rio Grande, to the alkali question.

Second—The relation, if any, of the alkali in our soils to the arsenical poisoning of fruit trees.

Third—The occurrence and formation of nitrates in our alkaline soils. This subject includes the effects of nitrates on fruit and incidentally other trees, also its effect on general crops—the sugar beet in particular.

Fourth—A study of Colorado fodders.

The status of the work on these projects is as follows: The first project is well advanced, much field work has been done and all of the analytical work consequent thereto has been completed. So far as I can now see there is a small amount of field work which can advantageously be done before this project may be considered as completed.

The second project is practically completed and already reported on in Bulletins 131 and 157. There are some experiments which were started during the progress of the work the results of which could not be made available at the time that Bulletin 157 was written. The work on this project is already completed, with the exception of a few delayed results and observations, as I have indicated. I do not wish to report this project wholly completed, as constant observation in the orchards and unfinished experiments may open up new questions in

this connection. The expense of keeping this project as an open one is nominal.

The third project, the nitre problem, is at the present time receiving our undivided attention. All of our energies are concentrated upon the study of the occurrence of these salts, their formation and their effect upon sugar beets. Their effects upon fruit and shade trees are so evident that the question is practically closed by the death of the trees which ensues within a few weeks, or at longest within a few months after the concentration of the nitrates becomes sufficient to produce visible effects. The progress of this difficulty during the past season in some portions of the State has been very marked, and I may say disastrous. The study of this subject has already resulted in the publication of Bulletins 155 and 160—the former in February and the latter in May of this year.

The fourth project, the study of Colorado fodders, is at present held in abeyance because the nitre problem seems to be not only a very interesting scientific problem, but of the very greatest, if not vital importance to several sections of the State. Cattle will continue to feed and fatten on our fodders grown under the system of irrigation practiced in our mountain parks just as they have done in the past whether the cause for the excellent results be discovered or not. It will not matter very much from a practical standpoint whether our criteria for judging the value of fodders be greatly improved or not, but not so with the nitre question. If I am correct in my views that this is one of the principal causes for the anomalous agricultural results already observed by very many of our people, it is of vital importance to the State, as well as of the highest interest, that this problem should be solved quickly. The questions pertaining to our fodders are exceedingly interesting, but they involve no element of danger as yet discovered.

These statements are made to indicate clearly that I have not postponed the study of the fodders because I have come to believe such study to be of too little scientific or practical value to justify its prosecution, but simply that I have discontinued it because the nitre problem is, perhaps, of even greater scientific, and is certainly of very much greater immediate and practical importance.

Nothing has been published on the subject of Colorado fodders during the year just ending, but several bulletins, viz., 39, 93, 124, 125 and 135 have appeared during former years. Most of this work was done before the Adams fund was created. This project is, however, a continuation of the project extended to our fodders grown under the system of mountain irrigation, a study of which, as a condition of prime importance, is necessarily involved.



The first three projects enumerated have been the outgrowth of a more general study begun almost immediately upon my assuming the duties of Chemist in charge of this Section of the Experiment Station. At that time this question was considered of great importance, and I gathered many samples of alkali in various parts of the State and studied some of our alkali soils both in the laboratory and in the field, growing four successive crops on a soil very high in alkali and without drainage.

The conclusion of that study was summed up in the sentence "That the alkali question in Colorado is one of drainage." I still think that this is wholly true of all the features of the problem as they then presented themselves and of the same features at the present time. I have not at any time presented a discussion of the general question of alkalis in Colorado, because I believe that the question is understood by the public at large, and yet there are a few phases of it which might justify a little further study and a presentation of the facts gathered.

Bulletins published by this Section during the year are, No. 155, "The Fixation of Nitrogen in Some Colorado Soils;" No. 157, "Arsenical Poisoning of Fruit Trees;" No. 160, "Nitrates in the Soil, An Explanation of So-Called Black Alkali or Brown Spots;" and a manuscript presented by Mr. Douglass on the Deterioration of Farmyard Manures under Colorado Conditions.

The following persons have been engaged in Adams work as assistants during the whole or a part of the year; Prof. F. C. Alford; Mr. Earl Douglass throughout the year; Mr. C. E. Vail and Mr. J. C. Summers a part of the year. Professor Alford was engaged on Adams work for a short time during the summer vacation. Mr. Vail has duties in connection with the College during a portion of the school year, depending upon the schedule, approximately for one-half of the year. Mr. Summers entered upon his duties about June 15, 1910, and is engaged exclusively on station work. Mr. Douglass has been with us for the past ten years.

My college duties are almost wholly confined to the executive affairs of the Chemical Department and I do but very little teaching.

Before closing this report I wish to gratefully mention the interest shown in my work by the Holly and American Beet Sugar Companies operating in the Arkansas Valley, and their willingness to help me both in the field and laboratory. My acknowledgements are especially due to the officers of the American Beet Sugar Company from whom I have received, both in the agricultural and operating departments, many courtesies and material aid.

Respectfully submitted,

WM. P. HEADDEN, Chemist.

## REPORT OF ENTOMOLOGICAL SECTION.

To the Director :

I am presenting herewith my annual report of the Entomological Section of the Experiment Station for the year 1910.

The projects carried on in this section during the past year have been upon the Adams and the Hatch funds chiefly as given below.

## ADAMS FUND PROJECT.

*Plant Louse Investigations.*—Is the only project I have had, the expenses of which have been paid from the Adams fund. In our studies of these lice we have gathered a large number of records as to food-plants, dates of spring and fall migrations, dates of the hatching of the eggs in the spring, dates of the appearance of the sexual forms, and the like. We have also worked out the alternate hosts or food-habits of some species not before recorded. Mr. L. C. Bragg has proven beyond a doubt that the fall migrants of *Pemphigus betae* go to cottonwood trees where the sexual forms are deposited upon the bark of the trunks

Both Mr. Bragg and the writer have made numerous observations upon the migratory habits of *Aphis cornifoliae* Fitch, which leaves the dogwood, *Svida* (*Cornus*) *stolenifera riparia*, in the spring and takes up its abode chiefly upon the sunflower (*Helianthus*) leaves, and then sends return migrants from the sunflowers to dogwood again in the fall. It also seems most certain that *A. helianthi* Monell, and *A. gillettei* Cowen are both synonymous with *cornifoliae* Fitch.

Many descriptions of new species have been made in manuscript, as well as numerous descriptions of sexual and other forms of described species, and nearly all that have been described have been carefully drawn in color from living specimens for future reference by Miss M. A. Palmer.

Several technical papers giving the results of this work have been published in the "Journal of Economic Entomology."

I believe the work should be actively continued for another year at least, looking to the publication of a comparatively complete list of Colorado Aphididae with their food plants and migratory habits so far as we have been able to determine them.

## HATCH PROJECTS.

*Codling Moth Experiments.*—To determine more certainly the number of broods of this insect in the principal fruit sections of the

State records have been collected through the season in Mesa County by Mr. George P. Weldon.

Experimental spraying has been carried on to get additional data upon the comparative importance of the different periods of spraying throughout the season, and upon the comparative values of the different strengths of spray materials, and also to determine the value of sulfide of arsenic in comparison with lead arsenate for the control of the codling moth. Some of this work was supported from the State fund for Horticultural Investigations.

*Miscellaneous Insect Pests.*—The work on this project has been mainly directed to the determination of early spring remedies for orchard plant lice, the working out of the habits of a new corn root-worm, *Diabrotica virgifera* Lec., and var. *filicornis* Horn, which have done serious injury in limited localities in Colorado for the past two summers, at least, and a study of our grasshopper problems. Under this head Professor Johnson also has carried on some further observations and experiments upon life habits and control of potato insects, especially the flea-beetle, *Epitrix cucumeris*, and the potato beetle, *Lepitotarsa decemlineata*.

*Insect Collection.*—The work of collecting insects for the purpose of getting together the insect fauna of the State and having it systematically arranged for reference has been continued, but only in a small way.

*The Experimental Orchard.*—Has served for some of our experiments with insecticides and for the destruction of plant lice.

The projects under the Hatch fund that I am not planning to continue another year are Potato Insects, Insect Collection and Experimental Orchard.

#### STATE APPROPRIATION.

*Fruit Investigations.*—Under the State Appropriation for Horticultural Investigations I have had general oversight and planning of the field work in Entomology that has been carried on by Mr. Geo. P. Weldon on the Western Slope. Mr. Weldon's report is appended hereto.

Respectfully submitted,

C. P. GILLETTE,

Entomologist.

## REPORT OF FIELD ENTOMOLOGIST.

To C. P. Gillette, Entomologist:

Projects for the year consisted in codling moth, plant louse, peach twig-borer, San Jose scale and mite work. None of these projects was entirely completed and it would seem desirable to continue the work along the same lines; in some cases for a number of years.

The codling moth work required much attention throughout the season. Probably never before were demands upon the time of the field men by the orchardists so great. While the fruit crop as a whole was a wormy one, there are a number of orchardists in the Valley, who are willing to testify that their eagerness to listen to the advice of those who are spending their entire time toward devising means of control of these, as well as other pests, and to follow out instructions as to the proper time to spray and the best methods to pursue, resulted in their being able to keep the fruit comparatively clean, even though the season was an unfavorable one.

While we regret the fact that this year's crop of apples was wormy we feel that many valuable points in regard to the control of this insect were gained. From the standpoint of the orchardists the season brought some fruitful results. The idea that codling moth control is only a matter of spraying most any time and in an indifferent way, should no longer have a place in the mind of any intelligent orchardist. It was only by very careful spraying at the right time, that the great majority of orchardists who were successful in this work, met with success this year. Until the codling moth is much scarcer in Western Slope orchards, we will urge the use of other means of control besides spraying, such as the scraping off of all loose bark from the trees in the fall or early spring, and the destruction of hibernating larvae found beneath; the destruction of larvae hibernating in packing houses; banding of the trees and collection of larvae, as well as any other means which may be employed in decreasing the present abundance of worms.

There is need for very careful life history work on the codling moth, as well as extensive experiments with arsenate of lead and other insecticides. Tests show that arsenate of lead acts so slowly that apples are always badly specked when numerous worms have been trying to enter the sides, also it is not adhesive enough for some varieties of apples—for example, Ben Davis—this variety has an oily skin and no matter how thorough the spraying may be done the liquid applied tends to collect in large drops instead of forming an even coat-

ing of smaller ones over the entire surface of the fruit. Such varieties as the Winesap are much more easily coated simply because the skin is not so oily and the tendency for the water to run off is therefore not so great.

Plant louse investigations are carried on as the abundance of any certain species during the season requires. The past season was noted by the very severe attack of green peach aphid and some helpful points in regard to the control of this pest were gained through experimental work.

The peach twig-borer work of the season consisted almost entirely of a test with different insecticides used in the spring, and some beneficial results were obtained from this experiment. A bulletin on peach insects soon to be issued will treat fully of these two pests.

Mite work this season brought out the very important fact that a dormant spray of lime and sulfur applied in the spring, will control brown mite very effectively, but is of no value in the control of the red spider.

The San Jose scale has not been found hard to control wherever it has occurred, and orchardists will probably experience less trouble in controlling this pest by means of a spray, than codling moth, peach aphid, or some other pests which we have had with us for a number of years.

The work of this office is steadily on the increase; the problems to be solved are many and of great importance; the efficiency can be greatly impaired by the lack of funds to carry on important projects.

Respectfully submitted.

GEORGE P. WELDON,  
Field Entomologist.

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## REPORT OF HORTICULTURAL SECTION.

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To the Director :

I have the honor to make the following brief statement of the work of the Horticultural Section for the past year.

The work has been divided between three men, Mr. C. L. Fitch, the Potato Specialist, has had charge of the potato investigations under the special state funds which were given us for that purpose. Mr. R. S. Herrick has had charge of the fruit investigation and has been located most of the year at Delta, Colorado. The investigations at Fort Collins and the management of the office have been in my

charge since August 1, 1909. The reports of Mr. Herrick and Mr. Fitch are submitted separately.

The plans at Fort Collins are as follows:

*Asparagus Investigation.*—Although there is not enough asparagus grown in Colorado to supply the local demand we believe that this should be one of our important truck crops, both for local supply and for canning purposes. With the idea in mind of investigating this industry and overcoming some of the difficulties that present themselves in its culture, we have started a small plot of asparagus. During April a plot of about a quarter of an acre was sown with three of the standard varieties of asparagus. This asparagus nursery has done particularly well so far. Next spring the permanent plot can be made. This investigation will require a little work each year for several years, and we believe that it is well worth carrying forward.

The asparagus investigation is being carried on by funds from the State Fruit Appropriation. The expense so far has been very light and will be pretty nearly self-supporting after the plots are established.

*Cover Crops for Orchards.*—One of the most serious problems confronting the orchardists of Colorado is that of maintaining the physical condition of the soils in the orchards. Clean cultivation has been the rule and we believe this has been carried on to the detriment of the orchards. Experiments along lines to determine the best crop to grow between the trees for the benefit of the soil, have been started both here and at Fort Collins, by myself, and at Delta, by Mr. Herrick. Plots in the old orchard on the west college farm and in the young orchard in the same place were planted to red clover, crimson clover, field peas, cow peas, alsike and winter vetch. Two plantings were made, one in May, the other in July. Owing to the invasion of grasshoppers from outside fields and inability to secure water for these orchards both plantings were practically failures. It is thought advisable to carry on this investigation another year, both here and on the west slope.

The Cover Crop project was carried on by State Fruit Appropriation funds.

*Cabbage Investigation.*—This project was started with a hope of working out both a scientific principle and eliminating a difficulty that has been experienced with cabbage growers at Greeley. The Cross cabbage, which is almost universally used in that district, is a hybrid between a pointed early cabbage, the Winningstadt, and a flat later cabbage, the Flat Dutch. Since the introduction of this variety some ten or twelve years ago the seed has been grown at Greeley and while the cabbage is a valuable one, there has always been a tendency for

a certain per cent. of the crop to revert back to either one or the other parents. It is thought that this tendency might be eliminated by saving seed separately from many different plants. Seeds were saved during the season of 1909 and were planted in the college gardens in separate plots this season. The work so far has been very satisfactory. Four out of about fifty plots gave heads, all of which were true to type. These have been saved from which to get seed to carry the experiment further.

This project was carried on by Hatch funds.

*The Vegetable Garden.*—The vegetable gardening industry of the State is one of the important agricultural industries of Colorado. A great deal of the correspondence in the line of information is in regard to various crops for the vegetable garden. In order to have material for experimenting and demonstrating work it was thought advisable to establish and maintain vegetable gardens. In carrying out this project about three acres of ground west of the Veterinary Buildings, on Laurel Street, were planted to the various garden vegetables that are grown in this climate. It was aimed to have in this garden some of the standard varieties of all of the vegetables that could be profitably grown here, partly as a demonstration and partly for the purpose of experimenting with various problems that came up. Several of the other projects as the asparagus, cauliflower, cabbage, etc., were carried on in connection with this work. The results have been gratifying and it is hoped to continue the work in the future.

This project was carried on under the Fruit Appropriation, but can be made practically self-supporting after the garden is well established.

*Cauliflower Investigation in High Altitudes.*—Cauliflower is one of the crops that seems to be particularly adapted to the high altitude agricultural districts of Colorado. As a matter of demonstration and experiment, cauliflower plants were grown at the college greenhouses, for use in this experiment. About 1,000 were sent to Grand County and about the same to Del Norte. The remainder, something over 1,000 plants, were planted in the college gardens at Fort Collins. Those sent to Grand County came to an untimely end as a result of ground squirrel depredations. The season in San Luis Valley was not favorable, yet the plants sent there made a very good showing, though not so good as crops grown there in former years. Those planted in the college gardens were entirely successful and are being sold and used for experimental purposes at the present time.

This project was carried on under the special Fruit Appropriation.

*Orchard Investigation.*—The only orchards connected with the Experiment Station at Fort Collins are some old trees on the west farm and a few old trees near the house occupied by Prof. Keyser. Both of these old orchards are practically useless, owing to having been planted too close together, and the fact that the varieties are undesirable. In order to determine the best method of handling an orchard in this district and to work on the many orchard problems that are continually coming up, such as cover crops, pruning, spraying, grafting, and a method of establishing the best kind of a tree, it was thought desirable to plant a small orchard on the college grounds. Accordingly an orchard was set consisting of 90 cherry trees, including the standard varieties of sour cherries, and 90 plum trees and the same number of apple. Weather conditions have been decidedly unfavorable for this work the past season, yet the trees have made very satisfactory growth where uninjured by grasshoppers. Along with this work a nursery has been started and about 200 apple root grafts have been grown. It is hoped to carry this work further another year and make it include some of the nursery and young tree problems that are troubling the growers of Colorado.

This project was carried on under the Hatch fund.

*Raspberry Investigation.*—It was thought desirable to investigate and write up a short description of the raspberry industry in Colorado. With this in mind some investigation has been made along this line and a bulletin is about to be published.

This work was carried on under the State Appropriation.

*Cherry Investigation.*—It was thought advisable to take up the investigation of the cherry industry of the State for the purpose of writing a short bulletin particularly for the benefit of new comers the same as with the raspberry industry. Owing to lack of time this investigation has received comparatively little attention up to the present. It is hoped to carry this investigation on the coming year and possibly issue a bulletin during the coming winter or spring.

This project is to be carried on under the Fruit Appropriation of the State.

By the aid of the Potato Appropriation, a model potato storage cellar has been made on the college farm. This cellar is one of the buildings needed on all of the potato ranches of Colorado, and is a valuable building for any farm place. In building this it was aimed to establish a model that might be used by the growers of the State.

The time of the writer during the past year has been divided up between the work of these various projects, the executive work of the department, correspondence, teaching and extension work. It is difficult to say just how much time has been devoted to each of these



branches of the work. About 1,000 letters have been written during the past year. Practically two months' time has been devoted to institute work in the State. The demands of the college and executive work of the department have taken up a larger share of the time than is desirable, but this cannot well be avoided. On the whole the work of the past year has been fairly satisfactory from our standpoint. The amount of work done has been limited by the amount of time that could be devoted to the various projects. Both Mr. Fitch and Mr. Herrick have carried their work along in a very efficient manner.

I strongly recommend that Mr. Julius Erdman, our greenhouse manager, and Mr. S. V. Smith, the assistant in horticulture, both be placed on the Station Staff.

We believe the projects outlined that have not been completed are well worth continuing in the future. This section has in process of writing, bulletins on the "Colorado Potato," by Fitch and Bennett; "The Irish Potato—A Study of Productiveness and Degeneracy in the Pearl Variety," by Mr. Fitch; "Fruit Notes," by Mr. Herrick; "The Raspberry Industry," by Herrick and Bennett, and "Garden Notes of 1910," by Bennett.

Respectfully submitted,

E. R. BENNETT,

Horticulturist.

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## REPORT OF THE VETERINARY SECTION.

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To the Director:

According to statistics found in the Year Book of the Department of Agriculture for 1910, there is in the State of Colorado, a total valuation of \$73,362,000.00 in horses, mules, cattle, sheep and swine. This does not include poultry and other animals, nor the revenue from our domesticated animals.

It has been estimated in some of the states that there is a loss on the average of about two and one-half per cent from preventable diseases. On account of the heavy loss in Colorado from poisonous plants this estimate would doubtless be too low.

*Necrotic Stomatitis.*—Under this project we did field and laboratory work during the lamb feeding season last winter. We are under obligation to Senator W. A. Drake for assistance given us in furnishing animals for experiment, for information as to the handling of diseased bands of sheep, and location of the same. Under this project we have studied both "lip" and "leg diseases" of sheep

and "sore mouth disease" of hogs, they being caused by the same specific micro-organism. This disease of sheep, because of the seemingly necessary quarantine regulations imposed, has been a serious handicap to the lamb feeding industry of the State. The contention of the lamb feeders has been that most of the sore lips of lambs in this State is not the real necrotic condition, and that while it has been known here for many years, it has never caused any loss, and further that the quarantine of such animals is unjust and unnecessary. In eleven out of fourteen bands of sheep affected the specific organism has been isolated, in the others only varieties of pus organism were found. It is our wish that we be given funds with which to continue this investigation, as it means much to the lamb feeding industry of the State. We have not progressed far enough in the work to warrant the giving out of information in the form of a bulletin.

*Diseases of Poultry.*—We have been working on diseases of poultry, and have discovered that very little is known about the diseases common to poultry in this State. It has also been determined that there are in this State several of the most deadly diseases of poultry, among them black head disease of turkeys, cholera of chickens, and several parasitic diseases. These diseases can in most instances be prevented, and several practical bulletins would be of much value. A bulletin on Poultry Diseases is now in preparation.

*Rabies.*—The eastern portion of the State, north of Pueblo, is generally infected with rabies. Dr. B. F. Kaupp has examined the brains of 66 rabid animals in the pathological laboratory in the last year. Many animals have died from being bitten by rabid dogs, coyotes and wolves. Quite a number of people have been bitten, and obliged to go away and take the Pasteur treatment. A bulletin on Rabies was issued in August last.

We are ready and willing to do more work for the State in the identification and control of animal diseases, and we trust that we may be provided with funds which will make this possible.

Respectfully submitted,

GEO. H. GLOVER,

Veterinarian.

## ANNUAL REPORT OF SUPERINTENDENT OF EXTENSION.

To the President:

The report of such of the activities of this branch of the College work for the year ending Nov. 1, 1910 as can be tabulated is as follows:

Farmers' Institute Meeting (1 to 6 sessions -----	89	Total attendance	22,566
Train Institutes (29 stops) -----	29	Total attendance	4,850
Organizing Boys' and Girls' Agricultural Clubs -----	96	Total attendance	3,740
Farmers' Short Courses, 1 week -----			
Housekeepers' Short Courses, 1 week -		Total attendance	215
Colorado Farmers' Congress -----		Delegates	140
*Normal Institute (1 to 2 weeks each)	13	Total attendance	1,213
Total Attendance			32,839

*Farmers' Institutes*.—The total number of Farmers' Institutes held has been 89, with a total of 170 sessions, and an aggregate attendance of all sessions of 22,566. Thirty-one speakers from the College and 4 outside speakers have assisted in this work. All railroads, except the Burlington and the Missouri Pacific, have given free transportation to attend Farmers' Institutes to some of our speakers, and most of them have furnished transportation to all of them.

The demand for Farmers' Institute work is greater than can be met with the available funds, and the work has been handicapped because of the inability of the Superintendent to command the time of the members of the faculty and Experiment Station staff as fully as he could wish. The increased demands made by the College and Experiment Station have rendered it impossible for faculty members to spend much time in extension work off the campus. It is hoped that the new plan of organization of the College work, which is now being put into operation will enable the Superintendent of Agricultural Extension to plan his work with more certainty than heretofore.

It is believed that local organizations to carry on the Farmers' Institute work should be formed as rapidly and as extensively as possible, so as to place the responsibilities for the success of these Institutes in the community for which the institute is held, rather than in

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\*This work was conducted on College funds under the faculty committee of Rural Education, of which Professor S. A. Johnson is Chairman. The work was carried on by Professors Johnson, Longyear, Rausch, Allison and Mr. Frear. Credit for this work does not appear in the tabulation of Extension Work by individuals, which is attached to this report.

this Department. It is hoped by this means to work up a much better local support for the institutes and to develop local men by giving them a place on each program. It is believed that if this work is carried on actively for the next two years the State will be in a position to reasonably ask adequate county support for the Farmers' Institute movement, and thereby remove a considerable burden from the College and place it where it logically belongs.

It will be necessary as soon as possible to increase the staff and give the Superintendent of Agricultural Extension a small force, possibly not more than two at present, on whom he can count for assistance the greater part of their time. Under our form of organization these will be connected with some department, but will give practically all their time to extension work. One of these should be in the department of Household Economics.

An effort should be made to reach all portions of the State with Farmers' Institute work and to assure local organization to take charge of this work under the direction of the Superintendent of Agricultural Extension.

Women's institutes and institutes for boys and girls should be added.

*Train Institutes.*—A "Potato Special" train institute was conducted by the Agricultural College in connection with the Denver and Rio Grande Railroad from April 11 to 20, 1910, making 29 stops, the meetings being attended by 2,770 adults and 2,080 children, a total attendance of 4,850. These "Agricultural Specials" have come to be a permanent part of the extension work of the College and result in great good to the district through which they pass. It is the cheapest means of extension afforded the College.

In a recent conversation with your Superintendent of Agricultural Extension, Mr. F. A. Wadleigh of the Denver and Rio Grande Railroad, expressed himself as being greatly gratified with the results of the three potato specials operated on their lines, making the statement that in two years the tonnage of potatoes shipped from their lines in Colorado, was very much more than doubled, and expressing his opinion that by far the greater share of this increase should be attributed directly to the work of these potato specials. A certain amount of the interest aroused by these trains has been due to their novelty. Insofar as this is true this interest cannot be expected to be permanently maintained, but disregarding this feature it remains true that the "Agricultural Special" train affords the College an inexpensive means of reaching a large number of people in a very short time, and for this reason these trains should be undertaken as often as practicable, and as the co-operation of the railroads of the State can be secured.

*Boys' and Girls' Agricultural Clubs.*—During the spring of 1910

Professor Cottrell, Principal Netherton and Mr. Vaplon of the College visited 96 schools, talking to 3,740 boys and girls with reference to the organization of Boys' and Girls' Agricultural Clubs, in accordance with plans contained in Farmers' Institute Circular No. 1 of April 1910, which circular accompanies this report and is made a part of it. Fifty-two of these clubs were formed, many of these being formed in the "plains or dry farming" districts of the State. Because of the change in the Superintendent of Agricultural Extension in this Institution and because of an unusually severe season a considerable number of these clubs did not succeed in growing enough products to exhibit. Sixteen clubs are now active and have made exhibits and it is believed that these clubs have resulted in the greatest value to their communities.

The State Exhibit of products of these clubs will be held in Fort Collins during the week of January 9 to 14, 1911, instead of Denver according to the original plan as published in the above mentioned circular. The reason for making this change will be found in the report of your Superintendent for the work of the month of October, 1910.

This work should be carried on and extended to cover practically the whole State, but it will be necessary to place it in charge of some one whose sole business shall be to have an intimate acquaintance with the rural schools of the State, and to work up the Boys' and Girls' Clubs. The proper conduct of these clubs involves too much detail to make them practicable to handle solely from this office so long as it is necessary for the superintendent to be away from the office the greater part of his time. It is believed that this will be a proper part of the activities of the rural school visitors whom it is hoped the College will be able to employ during the next biennium.

*Short Courses.*—In the opinion of your Superintendent the work of the College should be extended by means of special short courses, or movable schools as rapidly as possible and it is hoped that a considerable number of these may be undertaken during the next two years. The plan adopted should be that of confining these schools to a single subject or a small group of closely related subjects, to furnish specialists in these subjects and study them carefully for one week with a class limited in number, so as to allow good work to be done. Such classes may be made self-sustaining by a reasonable registration fee, except as to salaries and railroad expenses. It is hoped that in Home Economics, especially, a large number of these schools may be held. During the past year there has been held at the Agricultural College, the Annual Farmers' Short Course, continuing one week, with the registration of 115, and the annual Housekeepers' Short Course of five days, with a total registration of 215.

*Colorado Farmers' Congress.*—In connection with the above meetings was held the first meeting of the Colorado Farmers' Congress, to which there were 140 delegates representing sixteen organizations at this meeting. It is hoped that the next meeting of this Congress may show a large increase in the number of organizations represented by delegates, that this State organization may develop into the most important agricultural organization in the State, and that the week of its meeting at Fort Collins may become the most important event agriculturally in the State in the minds of all people interested in agriculture.

*Miscellaneous.*—The activities of the College in Agricultural Extension for the past year have included the furnishing of speakers to special meetings such as those of granges, picnics, etc., the furnishing of judges for various fairs, carnivals and similar occasions, as well as the carrying on of a very considerable correspondence. It is recommended that the several departments of the College be requested at an early date to begin the preparation of suitable material for exhibit at the various fairs of the State next fall. It is believed that if suitable material be prepared so that transportation may not be too difficult nor expensive that the various fair associations will be glad to assist, that they will in fact bear the expense of these exhibits to their various fairs. The plan which your Superintendent would suggest is a modification of the plan used by the Ohio State College which is made the subject of a bulletin now in your possession.

.. Respectfully submitted.

C. H. HINMAN,

Superintendent of Extension.

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## REPORT OF THE FARM MANAGER.

To the President:

I submit herewith my report as Farm Manager for the current year up to and including September 30th. I am aware that this report should contain all data up to December 1st. Our data up to September 30th is now on the Secretary's books, but owing to the lack of sufficient clerical help, it has not been possible to get the books in shape beyond this date.

There has been considerable complaint in the past among our own people, and from others, that the college farm was a constant bill of expense. As no account had been kept of receipts and expenditures, the Board decided to appoint a Farm Manager. Accordingly in March, 1910, Professor Bainer was appointed Farm Manager and instructed to keep an accurate account of all labor and materials fur-

nished to other departments, as well as all labor and materials furnished outside the Institution. Professor Bainer immediately organized a system of daily accounting so that all work done or materials furnished were reported daily to his office. A summary was then made of these daily reports which was sent to the Secretary's office, and there entered upon a set of books kept in that office. In the system devised an account was kept not only with the various departments, but also, an accurate account of the various operations entering into the cost of producing crops on the fields. The effects of the system of daily reports were at once apparent. The men began to feel that the office knew what they were doing from day to day, and as a consequence they succeeded in accomplishing about one-third more than they had formerly been doing. If nothing else had been accomplished other than increased efficiency of the labor, the system would have justified itself.

The total received from all departments for man and horse labor and materials furnished is \$13,141.52.

It will be noticed from these figures that the farm is doing a great deal of work and furnishing a large amount of material to other departments on the campus. This work must be done either by our own college force or by labor employed from the outside. As at present conducted, the farm stands ready to furnish this necessary labor and material. For doing all these things, however, a slightly larger force is required than would be necessary to simply conduct the ordinary farm operations, and, as a consequence, the apparent expense comes rather high, but when this work and materials are paid for by those who receive the benefit, the farm receives its proper credit. While not so designated, it is thus seen that we are really conducting a farm and labor department for the benefit of the entire institution. Such a department has its only excuse in existence in service rendered. That our force, as at present constituted, is highly efficient, has been attested on numerous occasions. The road expert sent here by the U. S. Government to superintend the installation of our experimental road, made the unqualified statement that he had never in all his experience of road building had a force which moved dirt faster or more efficiently than our farm force which did this work upon the experimental road. Our men become trained in making repairs and meeting other emergencies quickly, and we have a force always at hand, so that when emergency exists we can give prompt and efficient action.

One of the first duties which Professor Bainer imposed upon himself was the division of the farm into fields. A map was constructed showing the location and size of each of these fields. In our farm operations an accurate account has been kept of all of the items

of cost entering into the care of each of these fields as well as the returns therefrom.

Total Cost on Fields .....	\$ 2,100.76
Total Returns From Fields .....	3,007.88

Labor charged to the fields and to the various departments was at the rate of 20 cents per hour, for man labor, and 12½c per hour for horse labor.

In addition to the accounts that we are now keeping, an account should be kept of the amount of water used in our irrigating operations. To keep such an account it would be necessary to have measuring weirs or meters to measure the water applied to the land. Our present data with the water data would give us the complete cost of operating land under our conditions. Many problems in Farm Management could be worked out from such data. We would be able to determine in a few years' time with considerable accuracy just how much labor, just how much water, and, indeed, all other factors required in computing the cost of the operation of land under our conditions. Owing to the fact that we are a State Institution, and that our men work only ten hours a day, and that we are doing a large amount of other work which frequently breaks into the continuity of the farm operations, this cost would be somewhat higher than what could be expected upon the average ranches. However, it would furnish a very accurate basis for comparison.

I recommend that the Farm Manager be empowered to adopt a rotation for the college farm, such rotation to be adopted after due consultation with the various departments interested. The object of the rotation being to keep up the fertility of the land and to give the highest service possible to the departments which have experimental or instructional use of the lands. Really the only excuse for the existence of the farm as a farm is the service it can render the college through its instructional work or the station through its experimental work. Rotations should therefore be devised in such a way that they will keep up the fertility of the land and furnish the animal husbandry, the horticultural, and other departments with the very best service consistent with their needs in instruction and experiment.

All grain crops grown in the rotation should be of the best adapted sorts so that the seed thus produced could be sold for seeding purposes. Much of our land needs to be put into rotation in order to clean up obnoxious weeds such as wild oats as well as keep up the fertility.

I recommend that the Farm Manager be empowered to install the necessary weirs and meters required to measure the water applied to the farm lands. These meters and weirs to correspond to specifications agreed upon by the head of the Irrigation Department.

Respectfully submitted,

ALVIN KEYSER, Farm Manager.