11-1-1895

Seventh annual report, Bulletin, no. 31

Murkland, Charles S.

New Hampshire Agricultural Experiment Station

Bulletin 31 November, 1895

NEW HAMPSHIRE COLLEGE

AGRICULTURAL EXPERIMENT STATION

SEVENTH ANNUAL REPORT

BY CHARLES S. MURKLAND

NEW HAMPSHIRE COLLEGE

OF

AGRICULTURE AND THE MECHANIC ARTS

DURHAM, N. H.

NEW HAMPSHIRE COLLEGE

OF

AGRICULTURE AND THE MECHANIC ARTS

AGRICULTURAL EXPERIMENT STATION

DURHAM, N. H.

The Bulletins of this Station are sent to any resident of New Hampshire upon application.

SEVENTH ANNUAL REPORT

The financial report of the New Hampshire College Agricultural Experiment Station covers the year ending June 30, 1895.

The summary of the work done is not necessarily circumscribed by the limits of the fiscal year. It must have some reference to the time when each annual report is published.

The act of congress, establishing agricultural experiment stations, declares that "it shall be the duty of each of said stations annually, on or before the first day of February, to make to the governor of the state in which it is located, a full and detailed report of its operations, including a statement of its receipts and expenditures, a copy of which report shall be sent to each of said stations, to the said commissioner of agriculture, and to the secretary of the treasury of the United States."

For some years it has been our custom to publish the report of the experiment station, together with the other college reports, in one volume. This annual college report was dated, in accordance with the provisions of a state law, November 1.

The act passed at the legislature of New Hampshire at its last session, decreeing that our college reports should hereafter be published biennially, has not greatly affected the case. As in the past, so now, the financial report must cover the year from July 1 to June 30. The report of the station, as a department of the college, must be filed with the secretary of state on or before November 1, of every other year; and on or before February 1 of each year the report of the station must be made to the governor of the state.

The financial statement will be found immediately following this introduction:

The last annual report, being delayed by various causes, included Bulletins 24 and 25, dated respectively February and March, 1895. Beginning with Bulletin 26, published in March, 1895, the station has issued:—

Bulletin 26, March, 1895: Analyses of Fertilizers and Wood Ashes, by F. W. Morse.

Bulletin 27, April, 1895: Spraying Experiments in 1894, by H. H. Lamson.

Bulletin 28, June, 1895: Remedies for the Horse Fly, by Clarence M. Weed.

Bulletin 29, June, 1895: Remedies for Flea Beetles, by Clarence M. Weed.

Bulletin 30, July, 1895: An Experiment in Road-making, by Charles H. Pettee.

These publications cover a period of but eight months, from March to November, 1895; and this present report is to be issued as Bulletin 31, bearing date of November 1, 1895. Hereafter the reports of work done will embrace the year from November 1 to October 31.

August 1, 1895, Mr. Charles D. Howard was engaged as assistant chemist, Mr. E. P. Stone and Mr. F. D. Fuller having severed their connection with the station.

Mr. Leigh Hunt, a graduate of the University of Vermont, class of 1895, was engaged as assistant horticulturist, May 1. Under his supervision a greenhouse has been built, forty-five feet long and twenty-five feet wide, upon the site of the westerly wing of the old barn. This greenhouse is very small, but it will serve for a year or two for both experimental and educational purposes. The piping was put in under the supervision of Professor A. Kingsbury, and is well finished and effective. The cost of the greenhouse was as follows:

Lumber and milling	$ 68.93
Glass, putty, tacks, and tools	152.57
Paint, oil, and brushes	20.82
Hardware	8.45
Piping	118.15
Labor	218.13
Total,	$587.05

Work has been done on the new barn, in such manner as to secure the greatest economy rather than the greatest speed. The barn is now practically finished, and is in full use. The total cost will be not far from $9,000.00.

It has been necessary to secure new farm implements, as the fire, November 3, 1894, consumed nearly everything of that kind.

September 1, 1895, Frank William Rane, M. S., was engaged as agriculturist and horticulturist of the station. Professor Rane was formerly horticulturist at the University of West Virginia.

The time of the entomologist has been largely taken up by college work, but not to so great an extent as formerly. It is intended that still more time be given to this important department of station work. As Professor Weed, of this department, suggests, "The injurious insects of New Hampshire should be studied with reference to the number of broods and times of transformations. At present, only general conclusions can be drawn from the observations in other latitudes, whereas we should be able to state definitely the times at which eggs will hatch or caterpillars transform. This means that observations must be made anew on nearly all our injurious insects, and that facilities for rearing and studying them must be provided.

January 15, 1895, Major Henry E. Alvord entered upon the duties of Agriculturist. June 15, he resigned to accept the position of Chief of the Dairy Division of the Department of Agriculture. During this short time the ripe wisdom and great experience of Major Alvord enabled him to accomplish results of wide and lasting use.

In the entomological calendar on a later page there will be found a record of the more important insect attacks of the year.

It was found, by the tuberculin test applied as a measure of precaution before moving the herd to the new barn, that tuberculosis was not entirely eradicated. Repeated applications of the test, with careful quarantine regulations, have at last, we are assured, given us a herd of healthy animals. And it is the declared purpose of the board of control to enlarge the herd by purchase of thoroughly representative animals of the several breeds most important in New Hampshire.

The work of the separate departments is summarized in the special reports following the financial statement.

CHARLES S. MURKLAND, *Acting Director.*

NEW HAMPSHIRE COLLEGE AGR. EXPERIMENT STATION

In Account with

THE UNITED STATES APPROPRIATION, 1894–5.

DR.

To receipts from the treasurer of the United States as per appropriation for fiscal year ending June 30, 1895, as per act of congress, approved March 2, 1887. .	$15,000 00

CR.

By salaries.		
Director and administrative officers (2)	$1,600.00	
Scientific staff (4)	4,391.43	
Assistants to Scientific Staff (3) . .	1,424.59	
		$7,416.02
Labor.		
Monthly employes (3) average rate, $30.00 .	$1,155.46	
Daily employes (2), average rate, $1.50 .	725.57	
Hourly employes (Students), average rate. 12½ c.	454.93	
		$2,335.96
Publications.		
For printing 7 bulletins, No. of pages, 84, (total edition, 84,000) . . .	$547.38	
For envelopes for bulletins and reports .	70.00	
Other expenses	67.96	
		$685.34
Postage and stationery		114.08
Freight and express		99.21
Heat, light, and water		490.26
Chemical supplies		57.23
Seeds, plants, and sundry supplies.		
Horticulture	$50.15	
Agriculture	100.43	
		$150.58
Fertilizers		64.60
Feeding stuffs		1,020.07
Library.		
Books	$90.64	
Expenses	2.05	
		$92.69
Tools, Implements, and Machinery.		
Little Giant Ross cutter	$64.80	
Wagon scale and extension . . .	154.00	
Warrior harrow	24.50	
Harnesses (including repairs) . . .	22.50	
Gordon speed pulley	21.00	

Champion evaporator	$20.00	
Water barrel and truck	15.00	
Small tools and implements	196.61	
		$518.41
Furniture and fixtures		12.85
Scientific apparatus.		
Meterological installation and app.	$84.95	
Milk heater	10.00	
James Stail 2046	15.00	
Refrigerator	30.00	
Hot-bed sashes	21.00	
Flasks and bottles	35.21	
Platinum cylinders	13.59	
Other apparatus	132.29	
		$342.04
Live stock.		
One bull	$75.00	
Guinea pigs	27.35	
Four horses	425.00	
		$527.35
Travelling expenses.		116.99
Contingent expenses		289.00
Building and repairs.		
Repairs to old barn, made necessary by the fire of November 3, 1894	$350.00	
Screens for Nesmith Hall	57.80	
Capping stone for Experiment station grounds	24.00	
Repairs to room in Bacteriological department	84.21	
Miscellaneous repairs	151.31	
		$667.32
Totals,	$15.000.00	$15,000.00

We, the undersigned, duly authorized auditors of the corporation, do hereby certify that we have examined the books and accounts of the New Hampshire College Experiment Station for the fiscal year ending June 30, 1895; that we have found the same well kept and classified as above, and that the receipts for the year from the treasurer of the United States are shown to have been $15,000.00, and the corresponding disbursements $15,000.00; for all of which proper vouchers are on file and have been by us examined and found correct.

And we further certify that the expenditures have been solely for the purposes set forth in the act of congress approved March 2, 1887.

(Signed)

ALBERT DEMERRITT,
JOHN G. TALLANT,
CHAS. S. MURKLAND,
Auditors.

REPORT OF THE DEPARTMENT OF CHEMISTRY

During the past year, the department has pursued studies of the composition of apples, the amount and composition of the acid in corn ensilage, the fermentation of manure, the flow and composition of maple sap, and methods of chemical analysis.

Some miscellaneous work has been done in connection with dairying and analyses of commercial fertilizers have been performed for the secretary of the board of agriculture. In coöperation with agricultural associations, four tests of dairy herds, competing for prizes, have been conducted by a representative of this department. One hundred miscellaneous samples have been examined for the public at large. Of these samples, thirty-seven were of milk and thirty-three of water, while the remainder included butter, cream, cattle-foods, cider, soils, wood ashes, and various waste materials.

In carrying on the work, the chemist has been assisted by Mr. E. P. Stone, Mr. F. D. Fuller, and Mr. F. W. Howe, who have performed the larger part of the analyses.

Fred W. Morse,
Chemist.

DEPARTMENT OF METEOROLOGY AND AGRICULTURAL ENGINEERING

I.—METEOROLOGY

The work for the year has been largely that of organization. The tower of the experiment station building has been utilized, the room within being set apart for the observer, and the meteorological instruments placed in position on the roof. The present equipment consists of two sets of weather flags and a pole upon which the flags are displayed, a wind vane, an anemometer, and a thermometer shelter containing maximum, minimum, and standard thermometers. A standard barometer is hung upon the wall in the tower room, and a rain gauge is located in a

suitable position in the field, to the east of the station. This property is inventoried at $181.

Observations of the barometer, thermometers, precipitation, wind direction and velocity, and amount of cloudiness, are taken regularly at 8 a. m. and 8 p. m. of each day, and report is made monthly to the U. S. Weather Bureau, which in return supplies the predictions which enable us to display weather flags daily.

Since November 13, 1895, the flags have been displayed at noon and indicate the weather for the twenty-four hour period, commencing at 8 p. m. of the day of issue. This has proved a decided improvement over the former method by which the weather for the day was not announced till nearly noon, when it was too late to be of practical account. As people are getting acquainted with the new system they are expressing their approval of the change. A copy of the local circular, announcing the new regulations, is appended.

"CHANGE IN WEATHER SIGNALS.

Weather flags are displayed each day from a pole on the tower of the experiment station building, and are to be read from the *top downward*. They are placed in position at about 12 noon of each day and will remain in place till noon of the following day.

Hereafter, they will forecast the weather for the twenty-four hours, beginning with 8 p. m. of the day of issue. A succession of weather during such twenty-four hour period will be indicated by a succession of weather flags, read in order from above downward.

The *square white flag* indicates clear or fair weather. The *square blue flag*, rain or snow. The *square flag—half white, half blue*, local rain or snow. This means that light precipitation is anticipated in some part of the area covered by the prediction, though no rain or snow may fall at this place. It may be translated as doubtful weather.

The *black triangular flag* and the *black triangular flag* with *horizontal white stripe* indicate succession of temperatures for the twenty-four hour period. Position above the weather flags

means warmer; position below, colder. When absent, stationary temperature is indicated. If both are present, the all black flag must be read first.

The *square white flag* with *black center* indicates cold wave or the approach of a sudden and decided fall in the temperature. It will be displayed below that weather flag with which it coincides in order of time.

C. H. Pettee,
Meteorologist.

Durham, N. H., November 13, 1895."

During the summer of 1895 weekly crop reports were returned to the New England Weather Bureau at Boston.

The meteorological department needs a considerable increase in equipment, particularly in the line of self-recording apparatus for temperature, sunshine, and wind velocity and direction. This equipment is estimated to cost about $300.

Mr. James A. Foord, New Hampshire College, class of '98, has been the observer since the meteorological instruments were placed in position and has proved himself faithful and efficient. During the summer vacation the work was performed by Mr. E. H. Forristall, New Hampshire College, class of '97.

II.—AGRICULTURAL ENGINEERING

The scope of this department covers all surveys required for the proper division of the college farm into experiment plots, the drainage of the same, the laying out of buildings and roads, and experiments in any of these lines.

During the year calls have been made for surveys along the highway for the location of corner bounds of college land, for surveys of two plats in the so-called black swamp, for levels along the brook south of college buildings for a distance of three fourths of a mile, and for the location of the new barn and its approaches.

In addition, somewhat extensive experiments in road construction have been carried on, including the macadamizing of a section one hundred and twenty-five feet in length by fifteen feet in width. Attention is specially called to the device called a

grade level, which promises to be a tool of great practical utility to highway agents and farmers in general.

Full particulars of all road work will be found in Bulletin 30. The interest manifested in this subject warrants the continuance of the work through another season.

Blank forms were sent early in the year to the highway agents of each town, asking for statistics of the work done the previous year, and of the general condition of the roads of the several towns. Returns were received from about one third of the towns, giving many points of interest which will be utilized in future work.

Popular talks on meteorological subjects and road work have been given on several occasions, in accordance with that clause of the law establishing experiment stations which requires the dissemination of information among the people.

C. H. Pettee,
Meteorologist.

THE INSECT RECORD FOR 1895

BY CLARENCE M. WEED

One of the most noticeable insect attacks during early spring was that of the old and well-known TENT CATERPILLAR,* a pest that for more than a century has periodically appeared along New England highways. Its life-history has been given in previous reports of this station and need not here be recapitulated, but the pest is so easily destroyed when the nests are small, by rubbing them off with a cloth or something similar, that in orchard trees at least they should not be tolerated.

Injury by the CANKER WORM has continued in some localities, although apparently the pest was less abundant than in previous seasons. The methods of preventing such injury by banding

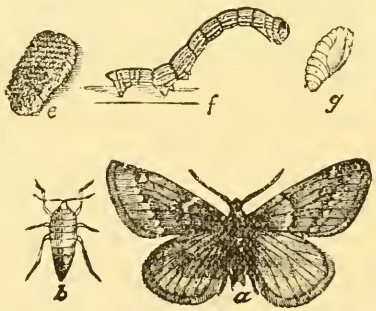

Fig. 1. Canker Worm: *e*, eggs; *f*, larva; *g*, pupa; *a*, male moth; *b*, female moth [after Riley].

the trees or by spraying with paris green when the worms are small are well known and should be resorted to by every orchardist. The spraying method seems, on the whole, the simpler.

The COLORADO POTATO BEETLE† seems to have been unus-

* *Clisiocampa americana.*

† *Doryphora* 10-*lineata.*

ually destructive during the season. But there was no serious injury to fields in which Paris green was promptly applied to check the attack. In gardens near large potato fields some damage to tomatoes and egg-plants was done late in the season, after the potatoes ripened, by beetles migrating from the fields.

At Durham some injury to cabbage and related plants was done by the ZEBRA CATERPILLAR,* an insect at once distinguished from other larvae feeding upon cabbage, by the brilliant yellow and black markings upon its body. It hatches from small spherical eggs, laid in clusters upon the cabbage leaves, by a handsome purplish brown moth (Fig. 2) that appears in early summer. At first the larvae are very dark, and feed together gregariously, but as they develop they become lighter colored

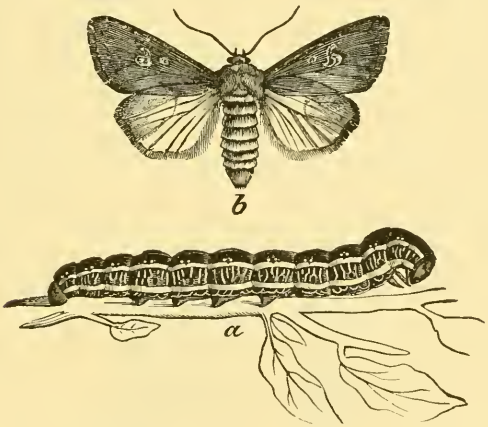

Fig. 2. The Zebra Caterpillar : *a*, larva ; *b*, moth. (After Riley.)

and disperse over the plant. When disturbed they roll up and drop to the ground. They become full-grown (*a*) in three or four weeks, when they are about two inches long, with a wide, longitudinal, velvet black stripe upon the middle of the back, and two bright yellow stripes upon each side, which are connected by fine yellow transverse lines. The caterpillars now construct, slightly beneath the soil surface, loose cocoons composed of particles of earth, fastened together by silken threads in which

**Ceranica picta.*

they change to the pupa state. The moths emerge later. There are usually two broods, the insect passing the winter within the cocoons.

The simplest remedial measure is to pick off the leaf on which the young caterpillars are feeding and crush them. When the caterpillars are older they may be destroyed by insect powder or kerosene emulsion, although they are seldom so numerous but that they can be checked by a little hand picking.

In certain localities in the southern part of the state the ROSE BEETLE or ROSE CHAFER* has been present in sufficient abundance to do considerable damage. This old and well-known pest still continues to be one of the most vexatious of insect enemies, against which satisfactory remedies are yet wanting. The adult beetles appear early in summer about the time the wild roses come into blossom, and attack the leaves and flowers of a great variety of plants; of cultivated fruits they are often exceedingly injurious to apples, pears, plums, peaches, raspberries, blackberries, grapes, and strawberries. The leaves of the latter were seriously attacked during the summer of 1895, in the vicinity of Durham.

The life-history of this insect may be briefly summarized in these words,—The female beetles deposit thirty or more eggs

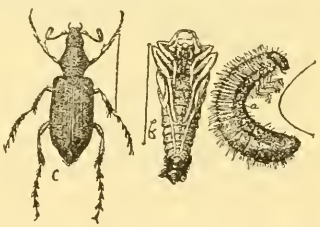

Fig. 3. Rose chafer: *a*, larva; *b*, pupa; *c*, beetle—slightly magnified. [After Riley]

an inch or so beneath the soil surface, preferring for this purpose, according to Dr. Riley's observation, 'low, open meadow land or cultivated fields, particularly where the soil is light and sandy.' In two or three weeks the eggs hatch into grubs that feed upon the roots of grass, and possibly other plants, and become fully grown (*a*) in autumn. As winter approaches they

**Macrodactylus subspinosus.*

go deeper into the soil, coming to the surface again in spring and making for themselves rude, earthen cells in which they change to the pupa state (*b*). Three or four weeks later they again change, and the perfect beetle comes forth. Thus there is but one brood a year. The insect lives in the beetle state about a month.

As already intimated this is a difficult pest to deal with. Spraying or dusting with pyrethrum or insect powder has been found to stupefy the beetles, temporarily, and this substance may occasionally prove useful in protecting fruits. A single rose bush or grape vine may be covered with mosquito netting, but of course this is impracticable on a large scale. In regions where the beetles are not overwhelmingly abundant, thorough spraying of grape vines and fruit trees with a wash made by adding three or four pecks of freshly slacked lime and a quart of crude carbolic acid to fifty gallons of water, has been reported by several fruit growers to be successful, although on the other hand, some have tried it and reported unsuccessful results. A better method, found efficient in Rhode Island, is in the case of grapes to spray the buds before the blossoms open with 1 lb. of Paris green in 50 gallons Bordeaux mixture. In New Jersey hand picking has been resorted to as the only sure remedy, the insect being collected in the cooler hours of the day.

The OYSTER-SHELL BARK-LOUSE* is an old and well-known enemy of the apple tree which seems to be very generally distributed throughout the state, as I have found it destructively abundant as far north as Littleton, and in various parts of the central and southern portions of the state. This insect occurs upon the bark of the trunk, branches, and twigs, appearing as a sort of grayish incrustation, as represented in Fig. 4. If one of these

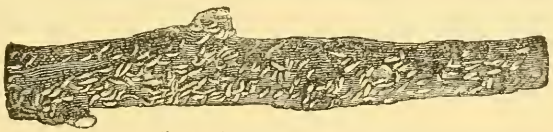

Fig. 4. Oyster-shell bark-louse.

scales be pulled off early in spring, there is likely to be found beneath it a mass of yellowish or whitish eggs.

**Mytilaspis pomorum.*

Late in spring or early in summer these eggs hatch into small lice that appear as mere specks to the unaided eye. These move about over the bark a few days, when they fix themselves upon it by inserting their tiny beaks far enough to reach the sap. In this position they increase gradually in size, and by the end of the season most of them have secreted scaly coverings beneath which the eggs are produced.

In freeing a tree from this pest it is well to proceed as follows: Thoroughly scrub the trunk and larger branches before the first of May with a scubbing brush dipped in a solution made by adding one part of crude carbolic acid to seven parts of a solution made by dissolving one quart of soft soap, or one fourth of a pound of hard soap, in two quarts of boiling water. This is to remove and destroy as many of the scales and eggs as possible. Then in May and June watch for the hatching of the lice, when tiny specks will be seen wandering over the bark, and a few days afterwards spray with kerosene emulsion. Directions for making this will be found in the report of this station for 1894.

The oyster-shell bark-louse seriously interferes with the healthy growth of young trees, and should not be allowed to develop on them.

In the southern part of the state the well-known TOMATO WORM* did some damage to tomatoes. But it was not so abundant that it could not easily be checked by hand-picking.

Fig. 5. Vine Protectors.

As usual the growers of cucumbers, squashes, melons, and other cucurbitaceous plants, were considerably annoyed by the depredations of the STRIPED CUCUMBER BEETLE† and the

**Phlegethontius celeus.* †*Diabrotica vittata.*

SQUASH BUG.* For the former I know of no better preventive in the home garden than the use of some mechanical protective covering like cheese-cloth, or other thin, cheap cloth, over the plants. For the latter the simplest remedy is to trap the bugs under shingles or large chips placed near the plants, and then early in the morning to kill the bugs that seek shelter beneath them.

The attacks of the SIXTEEN-LEGGED MAPLE-BORER† have been noticed in a number of places in the state. This is a small, whitish larva that borrows through the sapwood and inner bark, often doing serious injury to shade trees. Unlike the ordinary wood-boring grubs, this insect has sixteen legs and resembles a small caterpillar: it is about half an inch long; the head is yellow and the legs are reddish. The burrows are filled with brownish castings.

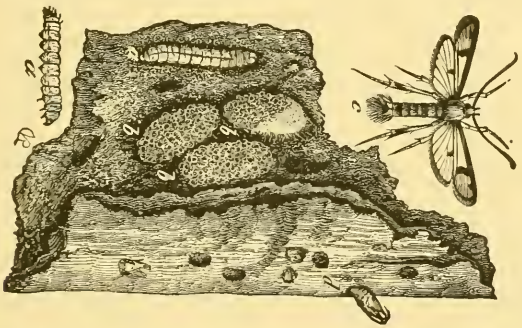

Fig. 6. Maple Borer; *a*, caterpillar; *b*, cocoon; *c*, moth; *d*, pupa case [After Riley]

These borers hatch from eggs laid upon the bark, nearly always where the latter is cracked, bruised, or otherwise injured, by a small, handsome, day-flying moth having transparent wings, and the general form represented in Fig. 6, *c;* the head is reddish, the thorax yellowish, and the abdomen bluish-black, more or less marked with yellow and having a reddish tuft at the hind end. The front wings are bluish black blotched with yellow. The larvæ feed upon the sapwood and inner bark for several months, often girdling the tree, before becoming full grown. They then burrow almost through the outer bark, leaving a thin

**Anasa tristis.* †*Aegeria acerni.*

layer untouched; next they form slight oval silken cocoons (*b*) within the burrows, and inside of these they change to chrysalids. When ready for the final change, each chrysalis wiggles forward, ruptures the thin layer of bark and pushes itself halfway out of the opening; then the chrysalis shell breaks open and the moth emerges leaving the empty case behind it, as shown in *d*, Fig. 6. The moths emerge early in summer, and soon after deposit their eggs.

Keeping the bark smooth and free from cracks or other injuries is an important preventive of the attacks of this insect. It is also stated that their injuries may be prevented by applying to the trunks early in summer a mixture of lye and soft soap, it being more effective if a little Paris green is added. Spraying the trunks thoroughly with the Bordeaux mixture and Paris green combination might prove an effective preventive.

REPORT OF THE BACTERIOLOGIST

During the year ending July 1, 1895, this department has carried on the following work:

In July and August, 1894, experiments were made in the treatment of the early blight of potatoes by spraying with the Bordeaux mixture. The details and results of these experiments together with those of experiments begun previous to July 1, in the treatment of fungous diseases of pears and apples and the disease known as *potato scab*, were published in Bulletin No. 27, April, 1895, of this station.

After the burning of the station barn in November, 1894, the cattle composing the station herd were subjected to the tuberculin test for tuberculosis. Seven animals were condemned. Of these two were killed immediately and found to have tuberculous lesions. The remainder were isolated and experiments were begun to ascertain if the germs of the disease could be detected in their milk. This work consisted in microscopic examination, inoculation of guinea pigs, and the feeding of calves with the milk. In March, 1895, the herd was again tested and two

more cows were condemned; also two of the previously condemned cows were killed and found to be diseased. The details of these experiments will be the subject of a future bulletin.

The treatment of the diseases of the apple was continued. The principal fungous disease to be dealt with is the *apple scab*, but in the previous year a disease differing considerably from the scab was observed especially on Baldwins. This disease, which will be treated of more fully in a future bulletin, produces on the surface of the fruit small brown depressed spots, which after the apples are gathered develop still further, producing a form of rot. This disease produces a very considerable loss. About forty Baldwin apple trees were sprayed with Bordeaux mixture of different strengths and at different times; at two of the sprayings Paris green was added to the Bordeaux mixture for the codling moth. Experiments in the treatment of *potato scab* by soaking the seed potatoes in a solution of corrosive sublimate were continued. It is believed that different forms of fertilizers while they do not cause the disease still have an influence on its development. To investigate this point, plots fertilized respectively with stable manure, with commercial fertilizer, with plaster, and with ashes were planted. One half of each plot was planted with scabby seed, treated by soaking in a solution of corrosive sublimate, one part to one thousand of water, while the other half was planted with scabby seed untreated.

H. H. Lamson,
Bacteriologist.

ADDITIONAL REPORT UPON TUBERCULIN TESTS

It was desired to place ten head of young cattle in the new barn; they were therefore tested for tuberculosis by the injection of tuberculin. The temperatures were taken at 8 p. m. and at 10 p. m. Monday, November 25, between 11 and 11:30 they received an injection of tuberculin, the dose varying according to the size of the animal form 1.75 cc. to 3 c. c. The tuberculin used was a ten per cent. solution obtained from Theodore Metcalfe & Co., Boston. The injections were made under the skin

of the neck on the right side, just in front of the shoulder blade; the skin having first been washed with a one to one thousand solution of corrosive sublimate.

On Tuesday, November 26, the temperatures were taken at 8 and 10 a. m., at 12 m., at 2 and 4 p. m., and at 9 p. m., in case of two of the animals. The temperatures are given in the accompanying table. The figures given indicate the number of degrees and fifths of a degree over 100° F. None of the animals, excepting the bull called Durham No. 1, showed a rise of more than 1 2-5° F. over the average of the two temperatures taken previous to injection of tuberculin; they were therefore considered free from tuberculosis, and admitted to the new barn. Durham No. 1 was retained in old barn for a second test.

TEMPERATURES OF CATTLE TESTED NOV. 25 AND 26.

Reaction.	November 25.				November 26.						
	Designation of Animal.	No.	8 (P.M.)	10 (P.M.)		8 (A.M.)	10 (A.M.)	12 (M.)	2 (P.M.)	4 (P.M.)	9 (P.M.)
2-4	Durham.....	1	0-3	1-4	Injected with tuberculin 11 P. M.	4-	2-2	2-3 3-0	2-3	2-2	2-3½
0-4	Durham.....	2	1-3	1-3		2-2	2-2	2-1½	1-4	2-2	1-3
1-2	Ayrshire.....	25	0-4	0-2		2-	1-3	1-2	1-2	1-2	
1-0	J. D.....	6	1-2	1-2		2-1	2-2	2-1	1-4	1-3	
1-0	Ayrshire.....	5	0-4	0-3		1-3	1-4	1-2	1-2	1-2	
0-3	"	21	1-2	1-2		2-	1-4	1-2	1-2	1-3	
0-2	"	18	1-3	1-3		2-	1-2½	1-2	1-1	1-2	
1-2	"	20	1-2	1-0		2-3	2-2½	2-0	2-0	2-0½	
1-0	"	19	0-4	0-4		1-4	1-3	1-3	1-1	1-3	
	Durham.....	19	1-2	1-4		1-3	2-	2-2	2-3	2-2	

On December 4 and 5, the balance of the young stock and the animals in quarantine were tested. The temperatures are given in the accompanying table. After the test the young animals, with the exception of red bull, from Nora 3d, and D. J., bull calf from Pilot's Lily, were transferred to the new barn. The red bull showed a rise of 2.7° above the average normal, but as one degree of this rise was noted at 4 o'clock

only, he was not condemned but reserved for another test. The D. J. bull calf had a rise of 1.8 above average normal; the greatest rise was noted at 4 o'clock and after. Reserved for another test.

Of the condemned cattle in quarantine the Durham bull, George, showed a rise of only 1.1°. His previous history being taken into consideration, it was thought best to remove him from quarantine and he was placed in the large stable. Pilot's Lily did not show a very marked reaction, having a rise of only 1.7°.

TEMPERATURES OF CATTLE TESTED DEC. 4 AND 5.

The numbers indicate degrees and *fifths* over 100° F.

	9 P. M., Dec. 4.	11 P. M., Dec. 4	8 A. M., Dec. 5.	10 A. M., Dec. 5.	12 M., Dec. 5.	2 P. M., Dec. 5.	4 P. M., Dec. 5.	6 P. M., Dec. 5.	9 P. M., Dec. 5.	Rise above average Normal in degrees and *tenths*.
Red Bull, from Nora 3	1-0	1-1	1-4	2-1½	1-3	1-2	3-4	2-1	2-7	2-7
Red Heifer, from Cathie	2-0	2-0	3-0	2-3	2-4	3-0	3-0	....	....	1.0
Red Heifer, from Sea Breeze	1-0	1-0	2-0	1-3½	1-4	1-3	1-4	....	....	1.0
Red Heifer, from Duchess, 3d	1-4	1-1	2-1½	2-0	1-3	2-0	2-1	....	....	0.8
Red Heifer, from D, No. 6	*	2-2	2-3	2-4	2-4	2-4	2-4	...	....	0.4
Bull Calf, D. J., from Pilot's Lily	*	1-4	2-3	1-4	2-4	2-4	3-3	3-1	3-0	1.8
CATTLE IN QUARANTINE.										
Durham Bull, George	1-3½	1-2	2-0	2-3	2-0½	2-0	2-0	....	....	1.1
Nora, 2d	2-2	1-0	3-0	3-4	3-0	3-2	4-1	....	....	2.6
Durham, No. 6	0-3	0-3½	2-3	2-1½	3-0	3-4	3-3	....	....	3.2
Aurora, 2d	1-0	1-3	4-2	3-3	3-3	4-2	4-0	....	....	3.1
Princess Jr	1-0	1-0	5-1	6-2	6-3	5-4	4-3	....	....	5.6
Pilot's Lily	1-0	1-1	2-1	2-4	2-2	2-3	2-3	....	....	1.7

* Thermometer used found to be faulty.

December 5 and 6, the milch cows were tested, as was also a young calf from A. 15, and the bull D. 1, tested November 25 and 26, and at that time considered suspicious. The temperatures are given in the following table.

Of the milch cows only Sea Breeze and Nora 3d were considered to have passed the test satisfactorily. They were trans-

ferred to the new barn. Bessie was condemned outright and transferred to quarantine. The other cows, unless otherwise noted under the table, were held as suspicious, because their temperatures were maintained so long at or near the maximum. The bull, D. 1, had a rise of only 1.2, and was considered as probably all right.

TEMPERATURES OF CATTLE TESTED DEC. 5 AND 6, 1895.

Numbers indicate *degrees* and *fifths* over 100° F., except where temperature was 99 and a fraction.

	8 P. M., Dec. 5.	10 P. M., Dec. 5.	8 A. M., Dec. 6.	10 A. M., Dec. 6.	12 M., Dec. 6.	3 P. M., Dec. 6.	5 P. M., Dec. 6.	Rise above average normal in degrees and *tenths*.
D, Sea Breeze	1-0	1-0	2-0	2-0	2-0	2-0	2-0	1.0
D 8, Nora, 3d	1-0	1-0	2-2	2-4	2-2	2-1	2-0	1.8
D 11, Cathie	1-0	0-3	2-0	2-0	2-0	1-4	1-3	1.4
D 12, Dorothy	1-0	1-0	2-3	2-1	2-1	2-2	1-4½	1.6
A 1, Alpha	1-1 99-0	99-3	2-1	1-3	1-4	2-1	2-0	2.2 2.9
A 9, Bessie	99-4 1-0	1-0	2-3	3-0	4-4	*5-0	3-4	4.6
A 12, Belle	0-2 99-3	99-3	2-0	2-1	1-3	2-1	1-3½	2.6
A 16, Alpha Frost	0-0 0-3	99-4	1-1	2-0	2-0	2-2½	2-1	†2.4
A 15	99-2½ 0-2	99-1	1-2	2-0	1-2	1-3	1-2	2.6
A 17, Beta Kappa	99-4 0-0	99-4	1-1	1-1	0-4	1-1	†2-4	‡3.4
A 10, Bonnie	1-1 1-0	0-2	2-0	2-1	2-2	2-2	1-3	1.6
Calf from A 15	2-3	2-0	3-1	3-3	4-4	5-2	6-1	§3.9
D 1, Bull (‖)	1-1	1-1	2-2	2-0½	1-2	2-1	1-3	1.2

* Temperature taken by Mr. Pike at 1:30 P. M., 5-3; 2:15, 5-2.
† Probably in heat.
‡ Possibly a mistake in reading thermometer, as the temperature taken thirty minutes later was 1-0.
§ A thermometer was broken in the calf's rectum Dec. 4.
‖ Second test. First test Nov. 25-26.

On December 19 and 20, the suspicious animals were retested. The normal temperatures were taken during a longer period than at any of the previous tests, covering the twelve hours preceding the injection of tuberculin. The temperatures are given in the accompanying table. All were passed with the exception of Bonnie and Red Calf from A. 15. If the reactions are to be taken as evidence, the latter is tuberculous. Bonnie was held not so much on account of her reaction, which was moderate (1.2°), as from the fact that on the morning after injection she had a peculiar cough, as though there were some irritation in her lungs.

January 3 and 4, tested Ayrshire bull, Alton, previous to purchasing.

Normal temperature, January 3.

4 p. m.	5 p. m.	6:30 p. m	7:30 p. m.	9 p. m.	Average
102	101.6	100.8	100.8	100.8	101.2

At 9 p. m. injected 2 c. c. of tuberculin just back of left shoulder blade.

Temperature after injection, January 4.

8 a. m.	9 a. m.	10 a. m.	12 m.	2 p. m.	3 p. m.
101.4	100.8	100	101	101.6	101.6

Highest rise above average normal, 0.4 degree.

H. H. Lamson.

TEMPERATURES OF CATTLE TESTED DECEMBER 19 AND 20.

Normal temperature Dec. 19, in Roman figures. Temperature Dec. 20, after injection in full face type.

	8 A. M.	9 A. M.	10 A. M.	11 A. M.	12 M.	1 P. M.	2 P. M.	3 P. M.	4 P. M.	8 P. M.	9 P. M.	Average normal.	Rise above average normal.
Cathie	1-4	1-4	1-4	....	.....	....	1-2	0-0	1-2	.....	1-0	1.3	0.9
	1-3½	.....	1-1	....	2-0	....	2-1	.....	2-0	1-2	.....	....	.....
Dorothy	2-0	1-4	2-0½	....	.. ..	....	1-1	0-3	1-1½	.....	1-3	1.6	0.7
	2-0	.....	1-4½	....	2-0	.....	2-1	.....	1-4	2-0½	.....	....	.....
Alpha	2-1	.....	2-3	....	2-2	1-4	1-2	1-3	1-1½	.....	0-3½	1.8	0.6
	1-2	1-2½	1-1	1-3	2-2	2-0	2-0	2-0	1-3	.....	.....	....	.....
Belle	2-0½	2-1	.....	....	.....	....	0-4	1-0	0-4½	.....	1-1½	1.4	1.0
	1-4½	.....	1-4½	....	2-1½	....	2-2	.....	1-4	1-1	.....	....	.....
Alpha Frost	1-0	1-2½	2-0	....	.....	....	1-0	1-0	1-1	.....	1-0	1.2	1.0
	1-3½	.....	1-4	....	2-0	....	2-1	.....	1-3½	1-1	.....	....	.....
A 15	.....	.....	.....	....	.....	....	.....	.....	.....	.....	.....	....	.....
	.....	.....	.....	..	.....	....	.....	.....	.....	.....	.....	....	.....
Beta Kappa	1-1	1-0	1-0	....	.....	....	1-0	1-0	0-3½	.....	1-0	0.9	0.9
	1-2	.....	1-2½	....	.....	....	1-4	.....	1-1	1-2	.....	....	.....
Bonnie	2-2	2-0	2-2	....	1-2½	....	1-3½	1-2	1-3	.....	1-3	1.8	1.2
	2-3½	.....	2-3	....	2-4	....	3-0	.....	2-2½	2-1	.....	....	.....
Bull D 1	2-1½	2-0	2-0½	....	.....	....	0-4	1-0	1-3	.....	2-0	1.7	1.3
	3-0	.....	2-2½	....	2-0	....	2-0	.....	1-3	1-3	.....	....	.....
Red Bull from Nora 3	2-2	1-4	2-0	....	.....	....	0-2	1-4	1-2	.....	2-0	1.7	0.7
	2-2	.....	2-0½	....	2-2	....	2-1	.....	2-1	1-2½	.....	....	.....
J. D. Bull	1-3	2-0½	2-3	....	.....	....	2-0	2-0	2-3	.....	3-0	2.2	0.8
	3-0	.....	2-0	...	3-0	....	2-3	.....	3-0	2-2	.....	....	.....
Red Calf from A 15	1-1	1-3½	1-4	....	.....	....	1-4	1-3½	3-0½	.....	2-4	2.0	3.6
	5-0	.....	5-3	....	4-3	....	4-4	.....	4-1	4-2	.....	....	.....
*Bessie	2-2½	.....	1-1	....	.....	....	2-0	1-3	2-1	.....	0-1	1.4	2.0
	2-4	.....	3-0	....	3-2	....	3-1	.....	3-1	2-1	.....	.. ..	.....

*Previously condemned.