TWENTY-THIRD ANNUAL REPORT

OF THE

Maine Agricultural Experiment Station

ORONO, MAINE.

1907

STATE OF MAINE
1908

MAINE
AGRICULTURAL EXPERIMENT STATION
ORONO, MAINE.

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THE STATION STAFF.

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EDITH M. PATCH	*Entomologist*
WARNER J. MORSE	*Vegetable Pathologist*
‖RAYMOND PEARL	*Biologists*
¶FRANK M. SURFACE	*Biologists*
‖REX C. GELLERSON	*Inspector*
ROYDEN L. HAMMOND	*Seed Analyst and Photographer*
ANNIE M. SNOW	*Clerk and Stenographer to the Director*
BLANCHE F. POOLER	*Stenographer*
HENRY A. MILLETT	*Meteorological Observer and Janitor*
**FRANK D. STERRY	*Laboratory Assistant*

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*Term expired April, 1907.
†Since June, 30, 1907.
‡Resigned June 30, 1907.
§Resigned December 31, 1907.
‖Appointed July 1, 1907.
¶Appointed August 1, 1907.
**Appointed October 1, 1907.

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ANNOUNCEMENTS.

THE AIM OF THE STATION.

Every citizen of Maine concerned in agriculture has the right to apply to the Station for any assistance that comes within its province. It is the wish of the Trustees and Station Council that the Station be as widely useful as its resources will permit.

In addition to its work of investigation, the Station is prepared to make chemical analyses of fertilizers, feeding stuffs, dairy products and other agricultural materials; to test seeds and creamery glassware; to identify grasses, weeds, injurious fungi and insects, etc.; and to give information on agricultural matters of interest and advantage to the citizens of the State.

All work proper to the Experiment Station and of public benefit will be done without charge. Work for the private use of individuals is charged for at the actual cost to the Station. The Station offers to do this work only as a matter of accommodation. Under no condition will the Station undertake analyses, the results of which cannot be published, if they prove of general interest.

CORRESPONDENCE.

As far as practicable, letters are answered the day they are received. Letters sent to individual officers are liable to remain unanswered, in case the officer addressed is absent. All communications should, therefore, be addressed to the Director or to the

Agricultural Experiment Station,
Orono, Maine.

The post-office, railroad station, freight, express and telegraph address is Orono, Maine. Visitors to the Station can take the electric cars at Bangor and Old Town.

The Station is connected by telephone.

HISTORICAL NOTES FOR 1907.

Publications.

The Experiment Station publishes during the year second bulletins which make up the annual report for the year. All bulletins isued by the Station are sent to the names upon the official mailing list prepared by the Office of Experiment Stations, to all newspapers of Maine, to libraries and to agricultural exchanges. Bulletins which have to do with general agriculture including feedng stuff, fertilizer and seed inspection are sent to the general maling list. Bulletins having to do with food and drug inspection are sent to a special list of all dealers in Maine. The annual report is sent to directors and to libraries.

The Station prints miscellaneous publications which in the case of newspaper bulletins are sent to the press of the State and exchanges. The other publications are chiefly used in answer to inquiries.

BULLETINS ISSUED DURING 1907.

Bulletin	138.	Seed Inspection,	48	pages
"	139.	Orchard Notes, 1906,	16	"
"	140.	Fertilizer Inspection,	16	"
"	141.	Prevention of Potato Scab,	12	"
"	142.	Feeding Stuff Inspection,	20	"
"	143.	Notes on the Seedling Apples of Maine,	30	"
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"	147.	The Potato Plant Louse,	24	"
"	148.	Insect Notes for 1907,	28	"
"	149.	Potato Diseases, 1907,	44	"
"	150.	Meteorology, Treasurer, Index,	15	"

MISCELLANEOUS PUBLICATIONS FOR 1907.

265 Newspaper notice of bulletins 135 and 136—one page.
266 List of bulletins published in 1903-1906—one page.
267 Newspaper notice of bulletin 138—one page.
268 Newspaper notice of bulletin 139—one page.
269 Circular relative to poultry breeding stock—one page.
270 Circular on poultry publications—one page.
271 Newspaper notice of bulletins 140—one page.
272 Newspaper notice of bulletin 141—one page.
273 Maine Food and Drug Regulations—12 pages.
274 Laws regulating the sale of food and drugs, feeding stuffs, fertilizers, seeds and creamery glassware—20 pages.
275 The Farmer and the Seed Law—one page.
276 Apple Maggot or Railroad Worm—4 pages.
277 The Quality of Grass Seed—one page.
278 Newspaper notice of bulletin 142—one page.
279 Mailing list revision circular and card.
280 Newspaper notice bulletin 143—one page.
281 Newspaper notice of bulletin 144—one page.
282 Samples of foods and drugs for analysis—one page.
283 Sirup standards—one page.
284 Circular to handlers of cotton seed meal in car lots—1 page.
285 Written guaranty the dealers safeguard—one page.
286 Directions for sampling feeding stuffs—2 pages.
287 Newspaper notice of bulletin 145—one page.
288 Labeling soda water and soda water sirups—one page.
289 Notice to druggists—2 pages.
290 Newspaper notice of bulletin 146—one page.
291 Plum curculio—8 pages.
292 Swallow tail butterfly—4 pages.
293 Sphinx chersis—8 pages.
294 Fall web worm—2 pages.
295 Luna moth—4 pages.
296 Tiger moth—4 pages.
297 Bud moth—2 pages.
298 Polyphemus moth—4 pages.
299 Cherry tree ugly nest—2 pages.
300 Io moth—4 pages.
301 Newspaper notice of bulletin 147—one page.
302 Newspaper notice of bulletin 148—one page.

Changes in Station Council.

The term of office of Hon. A. J. Durgin as Trustee of the University of Maine expired in April, 1907. Hon. Samuel W. Gould of Skowhegan, Trustee to the University was appointed in June to be a member of the Station Council in Mr. Durgin's stead.

As noted below, Professor Munson resigned June 30 and Professor Gowell resigned December 31 from the Experiment Station staff and from those dates they were no longer members of the Station Council.

Dr. Raymond Pearl was made a member of the Council dating from July 1, 1907.

Changes in the Station Staff.

Professor Welton M. Munson, Ph. D., resigned June 30 from the Experiment Station as Pomologist to accept a somewhat similar position at the West Virginia Experiment Station and University. Dr. Munson had been connected with the Maine Experiment Station since 1891 and had becomse closely identified with the horticultural interests and particularly the orcharding of Maine.

Professor Gilbert M. Gowell resigned from the teaching force of the University of Maine June 30, 1907, and from the Experiment Station December 31, 1907. Prof. Gowell has long been associated with the agriculture of the University and was one of the first appointments to the Experiment Station staff, being superintendent of field and feeding experiments to the Maine Fertilizer Control and Agricultural Experiment Station which was established in 1885. In the reorganization of the Station, for quite a number of years, Prof. Gowell was connected entirely with the University but in 1896 he became Agriculturist to the Station. During the last ten years his work at the Station has been largely along the lines of poultry investigations, for which work he is best and widely known. During the past three years, Prof. Gowell has developed a very extensive and successful poultry plant at Orono to which he now intends to devote his whole attention.

As stated last year, the Experiment Station Council had decided to very materially develop breeding investigations at the

Experiment Station and for this purpose established the Department of Biology. This action went into actual effect by the appointment (July 1, 1907) of Raymond Pearl, Ph. D., University of Michigan as Biologist, and (Aug. 1, 1907) Frank M. Surface, Ph. D., University of Pennsylvania as associate biologist. The immediate problems which are engaging the attention of the biologists are the breeding of sweet corn and the study of the fndamental principles which underlie animal breeding. The large poultry plant of the Station is being utilized for this purpose.

Buildings.

The Station library had outgrown the shelf room in the director's office and the east room in the upper floor of the north wing of the Station building was fitted up during the summer of 1907 for the library. This is the largest room in the Experiment Station building and is of sufficient capacity to house the library with its normal growth for a number of years.

The west room on the ground floor of the north wing was fitted up during the summer for an office and laboratory for the Biologists.

A two-story wooden building 39 x 40 feet was erected in the fall of 1907 between poultry houses No. 2 and 3. Two-thirds of the first floor is used for the storage of grain, for the heating apparatus and for wash room for poultry appliances. The remainder of the space—three rooms each approximately 10 x 13 have been fitted up for surgical laboratories to be used by the Biologists in poultry investigations. These rooms are heated by hot water, lighted by electricity and provided with hot and cold water for washing; also they have the latest antiseptic devices and are thoroughly equipped with apparatus for surgical work in poultry. The upper floor is used for the storage of poultry appliances.

BULLETIN No. 138.

SEED INSPECTION.

CHAS. D. WOODS, Director.

ROYDEN L. HAMMOND, Analyst.

The Legislature of 1897 enacted a law regulating the sale of agricultural seeds. This law was satisfactory as far as it went, and resulted in an improvement in the character of the seed sold in the State. It did not provide for an inspection and as time passed the moral effect of the law to some extent and with some dealers grew less. To remedy this, the Legislature of 1905 passed an additional section to the law, calling for an inspection somewhat similar in requirements to that of the laws regulating the sale of commercial fertilizers, foods and feeding stuffs. The chief requirements of the law follow. The full text of the law will be sent on application.

CHIEF REQUIREMENTS OF THE LAW.

Kind of Seeds Coming Under the Law. The law applies to every lot of seeds, containing one pound or more, of cereals, grasses, forage plants, vegetable and garden plants, but does not apply to sweet corn, trees, shrubs and ornamental plants.

The Guarantee. Every lot of seed sold, offered or exposed for sale must be accompanied by a written or printed guarantee of the percentage of purity. Dealers may base their guarantee upon tests conducted by themselves, their agents, or by the Director of the Maine Agricultural Experiment Station; *provided, that such tests shall be made under such conditions as the said director may prescribe.* The rules for testing the purity of seeds are given in Bulletin 36, a copy of which will be sent on application to the Station.

TESTING SEEDS AT HOME.

It is important to the user of seeds to know their percentage of purity, what kind of weeds they carry, and their vitality. A seed which carries foreign matter of any kind is correspond-

ingly lowered in value. Furthermore the weed seeds which the seed contains may be pernicious. While it is not easy to make an exact purity test, it is not difficult for a farmer to so acquaint himself with the more common seeds that by the help of an ordinary magnifying glass he will be able to tell whether the seed in question contains any considerable amount of impurities. If the seed is spread out upon a white plate, a little practice will enable the farmer to see whether a given seed is reasonably pure or not, and he will soon learn to detect the more common foreign seeds.

It is much easier for the farmer to test the vitality of seed than to make a purity examination. Bulletin 125 of this Station contains simple directions for performing germination tests at home without any special apparatus, by means of which the farmer can learn for himself whether or not the seed he is using has good vitality.

RESULTS OF THE INSPECTION.

As it was expected would be the case, it was found that only a few dealers were conforming to the requirements of the law. It was also found that much of the seed offered was of inferior quality and that in many instances it contained dangerous weed seeds. No prosecutions have been made for the violations of the law but all dealers whose names appear in the Maine Register have been notified that illegal sales must cease. Further violations of the law will be duly followed up.

The table on pages 3 and 4 summarizes the results of examination of samples of seeds examined by the Station in 1905.

The table on pages 5 to 46 contains the detailed analyses of samples collected by the Station and those sent in by correspondents. *Some of the samples were sent by the dealers and it does not necessarily mean that they were offered for sale in Maine. In some instances it is certain that when the examination showed the seeds to be of low purity, they were not brought into the State.*

The table on pages 47 and 48 contains a list of the weeds obtained from seeds here reported upon. They are arranged alphabetically in accordance with the English name. As the common name differs in different parts of the country, the scientific name is given for the purpose of identification.

Table showing results of examination of samples of seed in 1906.

Names of weeds.	Kinds of seed and number of samples.										
	Red clover.	Alsike clover.	Mammoth clover.	White clover.	Timothy.	Crimson clover.	Redtop.	Alfalfa.	Kentucky bluegrass.	Wood meadow.	Hungarian.
Number of samples examined	60	45	21	3	69	1	25	1	3	1	7
American wild mint	----	2	----	----	2	----	11	----	----	----	----
American pennyroyal	5	2	1	----	1	----	1	----	----	----	----
Arrow-leaved tear thumb	3	----	2	----	----	----	----	----	----	----	2
Borage family	4	1	----	----	----	----	----	----	----	----	----
Bee plant	1	----	----	----	----	----	----	----	----	----	----
Bitter dock	56	40	21	3	16	----	1	1	1	----	1
Black nightshade	5	1	----	----	----	----	----	----	----	----	----
Black mustard	----	1	----	----	1	----	----	----	----	----	----
Black medick	24	13	7	1	2	----	----	----	----	----	----
Bladder katmia	----	----	----	----	----	----	----	----	----	----	1
Bracted plantain	32	----	9	----	3	----	----	----	----	----	----
Bull thistle	13	4	3	----	1	----	----	----	----	----	1
Blue vervain	37	6	11	----	43	----	7	----	----	----	4
Blue weed	2	----	----	----	----	1	----	----	----	----	----
Black or raspberry	----	----	----	----	----	----	----	----	----	----	----
Canadian bluegrass	1	3	----	----	4	----	1	----	----	----	----
Canadian thistle	34	25	11	1	2	----	----	----	----	----	----
Careless weed	1	1	----	----	1	----	1	----	----	----	2
Catnip	24	11	5	1	2	----	----	----	----	----	1
Charlock	11	1	2	----	5	----	----	----	----	----	----
Chicory	6	----	1	1	1	----	----	----	----	1	----
Common chickweed	12	21	2	2	7	1	3	----	1	1	1
Common purslane	1	----	----	----	----	----	----	----	----	----	----
Coin cockle	----	----	----	----	1	----	----	----	----	----	----
Corn gromwell	2	----	----	----	----	----	----	----	----	----	----
Corn mayweed	----	1	----	----	----	----	----	----	----	----	----
Corn spurrey	4	1	----	----	----	----	----	----	----	1	----
Crab grass	31	3	8	----	5	----	----	----	----	----	7
Crane's bill	3	2	1	----	----	----	----	----	----	----	----
Dandelion	3	6	2	----	17	----	4	----	1	----	----
Dodder	----	----	----	----	1	----	----	----	----	----	----
English rye grass	1	2	----	----	----	----	----	----	----	----	----
Ergot (spore clusters)	----	4	----	----	34	----	24	----	----	----	----
Evening primrose	20	12	8	----	60	----	7	----	----	----	----
False flax	----	----	----	----	----	----	----	----	----	----	----
Field pepper grass	12	1	3	----	----	----	----	----	----	----	----
Field scorpion grass	----	----	----	----	----	----	----	----	----	----	----
Fire weed	----	----	----	----	----	----	----	----	1	----	----
Five finger	12	30	1	2	52	----	22	----	----	----	----
Flax	1	----	----	----	----	----	----	----	----	----	----
Golden rod	1	----	----	----	----	----	----	----	----	----	----
Goosefoot	49	39	18	2	41	----	2	1	----	6	----
Green foxtail	56	30	21	----	29	----	1	1	----	----	----
Hairy stick seed	11	2	2	----	----	----	----	----	----	----	----
Hard fescue	----	----	----	----	----	----	1	----	----	----	----
Heal-all	33	13	14	1	15	----	----	----	----	----	----
Hedge mustard	22	31	8	----	18	----	4	----	----	----	----
Horehound	1	----	----	----	----	----	----	----	----	----	----
Knot grass	20	1	3	1	----	----	----	1	----	1	----
Lady's thumb	52	8	18	----	6	----	----	----	----	----	7
Low amaranth	----	----	----	----	1	----	----	----	----	----	----
Marsh elder	2	----	----	----	1	----	----	----	----	----	----
May weed	45	28	15	2	22	----	1	----	----	----	----

Table showing results of examination of samples of seed in 1906.

Names of weeds.	Kinds of seed and number of samples.										
	Red clover.	Alsike clover.	Mammoth clover.	White clover.	Timothy.	Crimson clover.	Redtop.	Alfalfa.	Kentucky bluegrass.	Wood meadow.	Hungarian.
Meadow fescue	----	----	1	----	----	----	----	----	----	----	----
Menzie's pepper grass	----	2	----	----	----	----	----	----	----	----	----
Mint family	----	----	----	----	----	----	2	----	----	----	----
Moth mullein	----	2	----	----	2	----	15	----	----	----	----
Mouse-ear chickweed	6	21	2	1	3	----	10	----	1	----	----
Night-flowering catchfly	48	41	17	3	7	----	2	----	----	----	----
Orange hawk weed	----	----	----	----	----	----	----	----	----	1	----
Ox-eye daisy	9	12	----	----	1	----	1	----	----	----	----
Pale persicaria	1	----	1	----	1	----	----	----	----	1	----
Penny cress	2	3	1	----	----	----	----	----	----	----	----
Pepper grass	26	34	5	2	42	----	14	----	2	----	----
Pigweed	21	18	5	----	3	----	----	----	----	2	----
Plantain	6	16	----	3	16	----	18	----	1	1	----
Poverty weed	2	----	1	1	2	----	----	----	----	----	----
Prickley lettuce	----	----	----	----	----	----	----	----	1	----	----
Prickley poppy	1	----	----	----	----	----	----	----	----	----	----
Ragweed	10	----	1	----	----	----	1	----	4	----	----
Ribgrass	52	27	19	1	11	----	1	----	1	----	----
Rugel's plantain	50	17	18	----	47	----	4	----	----	----	----
Shepherd's purse	----	15	----	3	5	----	8	----	3	----	----
Sheep sorrel	47	4[illegible]	19	3	36	1	13	----	2	----	1
Slender crabgrass	47	13	16	1	11	----	----	----	----	3	----
Sedge family	9	18	2	----	37	----	17	----	3	----	----
Slender fescue	----	----	----	----	----	----	1	----	----	----	----
Smartweed	8	1	5	----	----	----	----	----	----	----	1
Spring-leaved sow thistle	----	----	----	----	1	----	----	----	----	----	----
Sow thistle	3	3	----	----	1	----	----	----	----	----	----
Spurge	14	----	3	----	2	----	----	----	----	----	----
Stringing nettle	2	4	----	1	9	----	2	----	----	----	----
Suckling clover	----	4	----	----	----	----	----	----	----	----	----
Switch grass	1	----	----	----	----	----	----	----	----	----	----
Spearmint	----	----	----	----	----	----	1	----	----	----	----
Tarweed	3	----	----	----	----	----	----	----	----	----	----
Tumbleweed	20	9	8	----	11	----	1	----	----	1	----
Virginia three-seeded mercury	3	----	1	----	----	----	----	----	----	----	----
White vervain	----	----	----	----	1	----	2	----	----	----	----
Wild buckwheat	1	----	----	----	----	----	----	----	----	----	----
Wild lettuce	----	----	----	----	1	----	----	----	----	1	----
Wild turnip	----	----	1	----	----	----	----	----	----	----	----
Willow herb	----	----	----	----	1	----	----	----	----	----	----
Witch grass	41	28	16	----	23	----	14	----	1	7	----
Wormseed mustard	1	7	1	----	----	----	----	----	----	----	----
Yarrow	----	1	----	----	5	----	23	----	----	----	----
Yellow daisy	1	1	----	----	53	----	13	----	----	----	----
Yellow foxtail	35	----	11	----	1	----	----	1	----	3	----
Yellow wood sorrel	1	7	----	----	10	----	1	----	----	----	----
Yellow rocket	----	1	----	----	----	----	----	----	----	----	----

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character. Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	ALSIKE CLOVER. (Trifolium hybridum.)	Per ct.	Per ct.	Per ct.
666	Belfast Grain Co., Belfast, April 12, 1906... **Harmless,**—Timothy, 66,800; white clover, 37,200; red clover, 1,200; Kentucky blue grass, 100; redtop, 100; **Noxious,**—Sheep sorrel, 5,400; black medick, 2,100; mouse-ear chickweed, 3,000; night-flowering catchfly, 1,600; plantain, 700; bitter dock, 600, pepper grass, 400; hedge mustard, 300; shepherd's purse, 300; mayweed, 200; sedge sp., 100; five finger, 100; evening primrose, 100; ribgrass, Canada thistle, witch grass, catnip.	87.6	1.2	11.2
694	A. M. Brown, Augusta, April 21, 1906..... **Harmless,**—Timothy, 8.3 per cent of whole; white clover, 16,200; red clover, 5,100; redtop, 1,200; Canadian blue grass, 6,000; suckling clover, 300. **Noxious,**—Sheep sorrel, 5,600; night-flowering catchfly, 3,500; black medick, 1,400; rugel's plantain, 1,700; hedge mustard, 1,000; five finger, 900; mouse-ear chickweed, 700; ox-eye daisy, 400; evening primrose, 300; bitter dock, 300; goose foot, 300; shepherd's purse, 200; slender crabgrass, 100; American wild mint, mentha canadensis, 100; heal-all, 100; lady's thumb, 100; green foxtail, 100; field pepper grass, 100; ergot, 100; ribgrass, 100; Canada thistle, 100; mayweed, pepper grass, dandelion, pigweed, moth mullein, sow thistle.	84.7	2.1	13.2
616	F. J. Carsley, Dexter, April 9, 1906..... **Harmless,**—Timothy, 12.3 per cent of whole. Redtop, 12,200; red clover, 2,700; alfalfa, 300. **Noxious,**—Sheep sorrel, 20,100; plantain, 2,900; night-flowering catchfly, 2,200; common chickweed, 1,200; mayweed, 900; five finger, 900; goosefoot, 800; green foxtail, 700; dock sp., 600; stringing nettle, 500; pepper grass, 300; witch grass, 300; slender crabgrass, 200; ribgrass, 100; catnip, 100; evening primrose, 100; bull thistle, 100; wormseed mustard, 500; hedge mustard, 1,000; ox-eye daisy, tumble weed.	80.7	2.4	16.9
700	C. M. Conant Co., Bangor, April 24, 1906.... **Harmless,**—Timothy, 3,600; white clover, 3,000; red clover, 800. **Noxious,**—Sheep sorrel, 200; mayweed, 100; bitter dock, 100; green foxtail, goosefoot, witch grass, crabgrass.	98.3	.7	1.0
708	R. B. Dunning & Co., Bangor, April 24, 1906, **Harmless,**—Timothy, 7 per cent of whole; white clover, 44,600; red clover, 3,300; suckling clover, 300; Kentucky blue grass, 200. **Noxious,**—Sheep sorrel, 14,100; night-flowering catchfly, 600; rugel's plantain, 400; black medick, 300; mouse-ear chickweed, 300; mayweed, 200; green foxtail, 200; common chickweed, 200; five finger, 200; goosefoot, 200; pepper grass, 100;	84.5	1.5	14.0

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	ALSIKE—Continued. Canada thistle, 100; bitter dock, 100; witch grass, 100; hedge mustard, 100; pigweed, shepherd's purse, sedge sp., ribgrass, yellow wood sorrel.	Per ct.	Per ct.	Per ct.
712	R. B. Dunning Co., Bangor, April 24, 1906.. **Harmless,**—Timothy, 6,200; white clover, 5,900; red clover, 800. **Noxious,**—Black medick, 1,200; bitter dock, 300; sheep sorrel, 200; green foxtail, 100; pigweed, 100; rugel's plantain, 100; hedge mustard, 100; goosefoot, lady's thumb.	97.0	1.2	1.8
631	G. A. Dustin Co., Dexter, April 9, 1906..... **Harmless,**—Timothy, 50,900; white clover, 23,200; red clover, 2,100; Kentucky blue grass, 400. **Noxious,**—Black medick, 1,800; sheep sorrel, 5,100; night-flowering catchfly, 2,300; hedge mustard, 1,000 wormseed mustard, 300; Canada thistle, 100; bitter dock, ribgrass, green foxtail, goosefoot, pigweed, Borage family, amsinckia intermedia.	90.1	.5	9.4
673	Ben D. Field, Belfast, April 12, 1906..... **Harmless,**—Timothy, 8.1 per cent of whole; white clover, 10,600; red clover, 5,900; Kentucky blue grass, 3,700; redtop, 2,000; suckling clover, 300. **Noxious,**—Plantain, 2,200; sheep sorrel, 2,700; black medick, 2,100; night-flowering catchfly, 900; hedge mustard, 900; bitter dock, 800; five finger, 700; goosefoot, 500; witch grass, 300; sedge sp., 200; mouse-ear chickweed, 400; mayweed, 200; Canada thistle, 100; slender crabgrass, 100; ribgrass, 100; pepper grass, 100; green foxtail, ox-eye daisy, heal-all, blue vervain, evening primrose, dandelion.	85.6	2.5	11.9
553	A. H. Fogg Co., Houlton, April 2, 1906..... **Harmless,**—Timothy, 48,800; alfalfa, 1,000; red clover, 200; redtop, 100. **Noxious,**—Night-flowering catchfly, 1,200; common chickweed, 900; sheep sorrel, 800; dock sp., 400; goosefoot, 300; plantain, 200; stringing nettle, 100; green foxtail, 100; pepper grass, 100; hedge mustard, witch grass, bull thistle.	94.5	.6	4.9
550	A. H. Fogg Co., Houlton, April 2, 1906..... **Harmless,**—Timothy, 20,300; red clover; alfalfa. **Noxious,**—Night-flowering catchfly, 900; pepper grass, heal-all, sheep sorrel, mayweed, hedge mustard.	97.2	.5	2.3
713*	G. H. Freeman Co., Presque Isle, Apr. 26, '06, **Harmless,**—Timothy, 16,000; red clover, 600; alfalfa, 500; redtop. **Noxious,**—Night-flowering catchfly, 1,300; sheep sorrel, 200; hedge mustard, 100; goosefoot, bull thistle.	97.9	.1	2.0

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	ALSIKE—Continued.	Per ct.	Per ct.	Per ct.
718*	G. H. Freeman Co., Presque Isle, Apr. 26, '06, **Harmless,**—Timothy, 83,700; white clover, 67,200; red clover, 1,800; alfalfa, 1,000; redtop, 400. **Noxious,**—Sheep sorrel, 10,-300; night-flowering catchfly, 800; rugel's plantain, 700; hedge mustard, 600; common chickweed, 600; goosefoot, 400; shepherd's purse, 400; pepper grass, 200; stringing nettle, 200; mayweed, 200; green foxtail, 200; ribgrass, 100; tumbleweed, bull thistle, dock sp., five finger, witch grass.	82.1	1.5	16.4
592	French & Elliott, Guilford, April 7, 1906.... **Harmless,**—Timothy, 85,400; white clover, 42,800; red clover, 10,600; alfalfa, 5,900; redtop, 6,800; Kentucky blue grass, 2,800. **Noxious,**—Rugel's plantain, 44,800; sheep sorrel, 78,900; night-flowering catchfly, 7,800; shepherd's purse, 12,200; pepper grass, 6,800; ribgrass, 5,100; mouse-ear chickweed, 7,700; five finger, 5,100; compositae sp., 4,000; goosefoot, 3,300; mayweed, 2,400; corn mayweed, matricaria inodora, 1,300; dock sp., 1,600; green foxtail, 1,100; heal-all, 500; common chickweed, 400; Canada thistle, 400; evening primrose, 300; ergot, 300; corn spurry, 300; yarrow, 300; hedge mustard, 400; tumbleweed, 100; blue vervain, 100; penny cress, 200; crane's bill, 200; sedge sp., 100; American wild mint, 100; slender crabgrass, 200; sow thistle, 200; knot grass, 100; mustard black, 200; ox-eye daisy, crabgrass, hairy stick seed, yellow wood sorrel.	62.1	5.7	32.2
680	H. F. Gilley, Bucksport, April 13, 1906..... **Harmless,**—White clover, 8.1 per cent of whole; timothy, 5.7 per cent of whole; red clover, 5,400; redtop, 5,400; Kentucky blue grass, 2,200. **Noxious,**—Plantain, 17,-400; shepherd's purse, 3,500; pepper grass, 2,300; five finger, 1,400; mayweed, 1,100; night-flowering catchfly, 1,100; goosefoot, 600; witch grass, 500; hedge mustard, 200; black medick, 200; mouse-ear chickweed, 100; slender crabgrass, 100; bitter dock, 100; green foxtail, pigweed, Canada thistle, ribgrass, blue vervain, yellow wood sorrel, heal-all, dandelion, lady's thumb, crane's bill.	73.8	4.1	22.1
609	A. W. Gilman, Foxcroft, April 7, 1907..... **Harmless,**—Timothy, 9.3 per cent of whole; white clover, 26,700; red clover, 4,900; alfalfa, 2,100; redtop, 3,200; Kentucky blue grass, 800. **Noxious,**—Mouse-ear chickweed, 3,200; sheep sorrel, 2,100; plantain, 1,700; dock sp., 800; five finger, 700; goosefoot, 600; hedge mustard, 600; pepper grass, 500; sedge sp., 400; shepherd's purse, 300; mayweed, 200; night-	84.1	1.6	14.3

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	ALSIKE—Continued. flowering catchfly, 100; witch grass, 100; common chickweed, ribgrass, green foxtail, catnip, tumble weed.	Per ct.	Per ct.	Per ct.
559	Jas. H. Glenn, Caribou, April 4, 1906..... **Harmless,**—Timothy, 25,500; white clover, 19,400; alfalfa, 2,200; red clover, 900; redtop, 100. **Noxious,**—Sheep sorrel, 700; night-flowering catchfly, 600; rugel's plantain, 400; witch grass, 100; mayweed, 100; pepper grass, 100; sedge sp., 100; hedge mustard, 100; five finger, pigweed, goosefoot, ribgrass, dock sp., green foxtail.	93.9	1.0	5.1
732*	H. N. Goodhue, Fort Fairfield, May 4, 1906, **Harmless,**—Timothy, 14,600; white clover, 22,900; red clover, 2,000; alfalfa, 600. **Noxious,**—Night-flowering catchfly, 4,900; sheep sorrel, 200; green foxtail, 200; green foxtail, 100; mayweed, 100; goosefoot, 100; common chickweed, 100; dock sp., Canada thistle, pigweed.	93.7	.4	5.9
737*	H. N. Goodhue, Fort Fairfield, May 4, 1906, **Harmless,**—White clover, 14,900; timothy, 4,200; red clover, 1,000; alfalfa. **Noxious,**—Sheep sorrel, 300; dock sp., 200; night-flowering catchfly, 200; goosefoot, 100; rugels plantain.	97.0	.6	2.4
646	J. E. Gray, Corinna, April 10, 1906..... **Harmless,**—Timothy, 81,300; white clover, 54,500; red clover, 3,800; redtop, 2,100; Kentucky bluegrass, 2,100. **Noxious,**—Sheep sorrel, 6,800; mouse-ear chickweed, 2,300; plantain, 1,900; black medick, 1,000; night-flowering catchfly, 1,000; pepper grass, 800; sedge sp., 400; witch grass, 300; shepherd's purse, 300; goosefoot, 200; five finger, 200; mayweed, 200; hedge mustard, 200; lady's thumb, 100; slender crabgrass, 100; pigweed, 100; bitter dock, 100; green foxtail, ribgrass, common chickweed, catnip, Canada thistle, ergot, heal-all, penny cress.	83.7	2.0	14.3
687	Geo. B. Haskell Co., Lewiston, April 21, 1906, **Harmless,**—Timothy, 18,700; white clover, 18,900; red clover, 1,000. **Noxious,**—Night-flowering catchfly, 1,300; black medick, 1,700; sheep sorrel, 1,400; goosefoot, 300; hedge mustard, 200; catnip, 100; common chickweed, 100; bitter dock, mayweed, ox-eye daisy, Canada thistle, green foxtail, pepper grass.	94.7	.5	4.8
535	Oscar Holway Co., Auburn, Feb. 28, 1906.. **Harmless,**—Timothy, 100,100; poa sp., 6,300. **Noxious,**—Sheep sorrel, 17,200; menzies pepper grass, 900; common chickweed, 1,200; compositae, 500; plantain, 9,100; Canada thistle, 100; American pennyroyal,	87.6	1.4	11.00

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	ALSIKE—Continued. 100; five finger, 1,200; witch grass, 100; careless weed, 100; goosefoot, 100; cruciferae, 100; bitter dock, 300.	Per ct.	Per ct.	Per ct.
636	Ireland Bros., Corinna, April 10, 1906..... **Harmless,**—Timothy, 10.6 per cent of whole; white clover, 22,100; red clover, 4,400; redtop, 3,600. **Noxious,**—Black medick, 1,500; mouse-ear chickweed, 3,200; sheep sorrel, 3,000; plantain, 3,000; night-flowering catchfly, 1,300; five finger, 1,100; wormseed mustard, 600; sedge sp., 600; bitter dock, 400; hedge mustard, 400; pepper grass, 400; goosefoot, 400; shepherd's, purse, 300; mayweed, 100; common chickweed, 100; ribgrass, green foxtail, Canada thistle, tumbleweed, ox-eye daisy.	83.9	.9	15.2
652	Judkins & Gilman, Newport, April 10, 1906, **Harmless,**—Timothy, 23,700; white clover, 13,300; red clover, 2,000; redtop, 300; Canadian blue grass, 300. **Noxious,**—Black medick, 10,800; sheep sorrel, 5,300; night-flowering, catchfly, 1,400; bitter dock, 300; hedge mustard, 300; catnip. 100; pepper grass, 100; common chickweed, 100; Canada thistle, 100; goosefoot, 100; mayweed, 100; green foxtail, Lappula texana, hairy stick seed, witch grass, ribgrass, heal-all, mouse-ear chickweed, lady's thumb.	91.2	.8	8.0
525	Kendall & Whitney, Portland, Feb. 20, 1906. **Harmless,**—Timothy, 46,100. **Noxious,**—Canada thistle, 100; common chickweed, 1,300; sheep sorrel, 2,000; menzie's pepper grass, 300; American pennyroyal, 100.	94.4	.8	4.8
622	C. P. McCrellis, Dexter, April 9, 1906..... **Harmless,**—Timothy, 88,500; white clover, 66,600; red clover, 4,400; alfalfa, 800; Kentucky blue grass, 2,800; redtop, 400. **Noxious,**—Sheep sorrel, 6,500; mouse-ear chickweed, 2,900; rugel's plantain, 1,700; pepper grass, 1,200; night-flowering catchfly, 700; five finger, 400; bitter dock, 300; pigweed, 300; hedge mustard, 200; mayweed, 200; sedge sp., 100; smart weed, 100; shepherd's purse, 100; witch grass, ribgrass, Canada thistle, goosefoot, common chickweed, green foxtail, heal-all, yellow wood sorrel, catnip, blue vervain, crabgrass, rye grass.	81.9	1.9	16.2
614	A. J. McNaughton, Foxcroft, April 9, 1906.. **Harmless,**—Timothy, 76,200; white clover, 60,200; red clover, 3,200; alfalfa, 400; Kentucky blue grass, 800; redtop, 200. **Noxious,**—Sheep sorrel, 4,900; night-flowering catchfly, 1,200; mouse-ear chickweed, 700; plantain, 600; pepper grass, 500; five finger, 400; goosefoot, 400;	84.7	1.4	13.9

† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	ALSIKE—Continued. hedge mustard, 200; shepherd's purse, 200; ribgrass, 100; Canada thistle, 100; green foxtail, 100; mayweed, 100; bitter dock, common chickweed, sedge sp., heal-all, witch grass, slender crabgrass, pigweed, ox-eye daisy, evening primrose.	Per ct.	Per ct.	Per ct.
729*	M. P. Moore, No. Anson, May 4, 1906..... **Harmless,**—White clover, 67,100; timothy, 39,300; red clover, 2,300; redtop, 100. **Noxious,**—Sheep sorrel, 3,600; rugel's plantain, 800; dock sp., 300; night-flowering catchfly, 200: pepper grass, 200; witch grass, 100; slender crabgrass, 100; goosefoot, 100; ribgrass, 100; mayweed, green foxtail, five finger.	86.2	1.7	12.1
655	L. H. Mosher, Unity, April 11, 1906..... **Harmless,**—Timothy, 81,800; white clover, 21,400; red clover, 300; Kentucky blue grass, 600. **Noxious,**—Sheep sorrel, 900; mouse-ear chickweed, 1,200; bitter dock, 500; five finger, 400; Canada thistle, 200; witch grass, 100; night-flowering catchfly, plantain, pepper grass, pigweed, common chickweed, evening primrose, goosefoot, hedge mustard, moth mullein, sedge sp., dandelion.	90.0	1.1	8.9
594	Sanders Bros. & Co., Sangerville, April 7, 1906 ..... **Harmless,**—Timothy, 77,500; white clover, 35,000; red clover, 2,600; alfalfa, 500; Kentucky blue grass, 900. **Noxious,**—Sheep sorrel, 4,600; mouse-ear chickweed, 1,200; rugel's plantain, 800; night-flowering catchfly, 700; hedge mustard, 500; pepper grass, 500; goosefoot, 400; shepherd's purse, 300; dock, sp., 300; sedge sp.,, 200; lady's thumb, 100; five finger, 100; common chickweed, 100; dandelion, 100; witch grass, ribgrass, mayweed, evening primrose, Canada thistle, tumbleweed, green foxtail, heal-all, slender crabgrass.	87.4	1.4	11.2
603	Sawyer & Gifford, Dover, April 7, 1906..... **Harmless,**—Timothy, 9.7 per cent of whole; white clover, 28,500; red clover, 7,500; alfalfa, 2,200; redtop, 4,800; Kentucky blue grass, 200. **Noxious,**—Mouse-ear chickweed, 4,300; plantain, 3,500; sheep sorrel, 4,600; pepper grass, 1,400; dock sp., 1,100; night-flowering catchfly, 1,100; sedge sp., 700; hedge mustard, 700; wormseed mustard, 700; five finger, 500; witch grass, 300; goosefoot, 300; shepherd's purse, 300; ribgrass, 200; catnip, 200; green foxtail, 200; common chickweed, 100; mayweed, 100; yellow rocket, 300; heal-all, Canada thistle, lady's thumb, pigweed.	82.6	1.5	15.9

* Not an official sample.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	ALSIKE—Continued.	Per ct.	Per ct.	Per ct.
642	F. B. Shaw, Corinna, April 10, 1906..... **Harmless,**—Timothy, 48,400; white clover, grass, 500. **Noxious,**—Sheep sorrel, 2,700; bitter dock, 600; rugel's plantain, 400; black medick, 400; mouse-ear chickweed, 300; five finger, 200; sedge sp., 100; pigweed, 100; witch grass, 100; pepper grass, night-flowering catchfly, mayweed, ribgrass, worm-seed mustard, blue vervain.	90.1	2.6	7.3
625	S. L. Small, Dexter, April 9, 1906..... **Harmless,**—Timothy, 11 per cent of whole; white clover, 20,900; red clover, 4,700; Kentucky blue grass, 6,800; redtop, 3,500; suckling clover, 400; alfalfa, 300. **Noxious,**—Sheep sorrel, 20,900; night-flowering catchfly, 2,700; goosefoot, 2,200; rugel's plantain, 2,700; mouse-ear chickweed, 1,200; five finger, 900; worm-seed mustard, 900; hedge mustard, 600; pepper grass, 600; bitter dock, 600; green foxtail, 500; mayweed, 500; witch grass, 400; sedge sp., 300; ox-eye daisy, 100; ribgrass, 100; ergot, 100; catnip, 100; lady's thumb, 100; evening primrose, 100; blue vervain, Canada thistle, dandelion, slender crabgrass, sow thistle, yellow wood sorrel, pigweed.	80.5	1.4	18.1
556	A. M. Smith, Presque Isle, April 4, 1906.... **Harmless,**—Timothy, 15,200; white clover, 13,100; alfalfa, 1,700; red clover, 800; redtop, 100. **Noxious,**—Night-flowering catchfly, 2,300; sheep sorrel, 600; ribgrass, 200; hedge mustard, 100; goosefoot, common chickweed, Canada thistle, pepper grass.	95.9	.1	4.0
576	A. M. Smith, Presque Isle, April 5, 1906.... **Harmless,**—Timothy, 87,400; white clover, 51,000; red clover, 2,400; alfalfa, 1,500; redtop, 1,100. **Noxious,**—Sheep sorrel, 9,400; rugel's plantain, 1,400; night-flowering catchfly, 1,300; hedge mustard 700; goosefoot, 600; mouse-ear chickweed, 600; sedge sp., 500; five finger, 200; Canada thistle, 100; slender crabgrass, 100; yellow wood sorrel, 100; heal-all, 100; witch grass, 100; shepherd's purse, 100; dock sp., 100; pigweed, 100; pepper grass, ribgrass, mayweed, green foxtail, ox-eye daisy.	83.7	1.5	14.8
574	A. M. Smith, Presque Isle, April 5, 1906.... **Harmless,**—Timothy, 15,200; white clover, 15,000; alfalfa, 2,100; red clover, 600, redtop. **Noxious,**—Night-flowering catchfly, 1,100; sheep sorrel, 200; ribgrass, 100; goosefoot, 100; hedge mustard, 100; Canada thistle, pepper grass, dock sp., mouse-ear chickweed, green foxtail, ox-eye daisy.	95.9	.1	4.0

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Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character. Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	ALSIKE—Continued.	Per ct.	Per ct.	Per ct.
568	M. C. Smith, Presque Isle, April 5, 1906..... **Harmless,**—Timothy, 26,000; white clover, 16,100; red clover, 2,000; alfalfa, 2,400; redtop, 200. **Noxious,**—Night-flowering catchfly, 1,000; sheep sorrel, 400; mouse-ear chickweed, 200; rugel's plantain, 200; ribgrass, 100; pepper grass, 100; witch grass, 100; green foxtail, 100; hedge mustard, 100; penny cress, 100; dock sp., goosefoot, five finger.	93.9	.8	5.3
567	M. C. Smith, Presque Isle, April 5, 1906.... **Harmless,**—Timothy, 16,500; white clover, 5,800; alfalfa, 1,000; red clover, 900. **Noxious,**—Night-flowering catchfly, 700; tumble weed, 200; goosefoot, 100; sheep sorrel, 100; dock sp., pepper grass, hedge mustard.	96.9	.3	2.8
546*	Soule Bros., Buxton, April 7, 1906..... **Harmless,**—Timothy, 89,400; redtop, 5,000; red clover, 1,100; alfalfa, 800. **Noxious,**—Sheep sorrel, 2,000; plantain, 2,500; wormseed mustard, 400; slender crabgrass, 100; dock sp., 200; common chickweed, 600; goosefoot, 200; five finger, 300; night-flowering catchfly, 300; pepper grass, 100; mayweed, 100; witch grass, 200; Canada thistle, 200; evening primrose, 100; ox-eye daisy, 100; ribgrass, 100; green foxtail, 100; stringing nettle, tumbleweed, catnip, black nightshade.	89.5	2.0	8.5
658	Swan & Sibley, Belfast, April 12, 1906..... **Harmless,**—Timothy, 50,400; white clover, 61,700; red clover, 1,600; Kentucky blue grass, 1,000; redtop, 300. **Noxious,**—Sheep sorrel, 3,200; black medick, 800; night-flowering catchfly, 400; goosefoot, 300; witch grass, 300; hedge mustard, 200; plantain, 200; sedge sp., 200; pigweed, 200; five finger, 200; shepherd's purse, 100; mouse-ear chickweed, 100; pepper-grass, 100; green foxtail, evening primrose, common chickweed, yellow daisy, ox-eye daisy, heal-all, slender crabgrass, bitter dock, mayweed.	87.7	.3	12.0
767*	Swan & Sibley, Belfast, November 1, 1906.. **Harmless,**—White clover, 2,900; timothy, 1,500; red clover, 600; Kentucky blue grass, 200; redtop, 100. **Noxious,**—Sheep sorrel, 200; five finger, 100; night-flowering catchfly, witch grass, pigweed, rugel's plantain.	99.1	.3	.6
766*	Swan & Sibley, Belfast, November 1, 1906.. **Harmless,**—Timothy, 56,800; white clover, 24,700; red clover, 4,900; redtop, 300, **Noxious,**—Canadian blue grass, 1,800; sheep sorrel, 7,200; plantain. 1,600; five	88.8	1.5	9.7

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Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	ALSIKE—Continued. finger, 1,300; night-flowering catchfly, 900; pepper grass, 600; goosefoot, 500; sedge sp., 400; mayweed, 300; witch grass, 300; bitter dock, 300; charlock, 200; pigweed, 100; evening primrose.	Per ct.	Per ct.	Per ct.
765*	Swan & Sibley, Belfast, November 1, 1906.. **Harmless,**—White clover, 12,400; timothy, 8,900; red clover, 700; Kentucky blue grass, 200, redtop. **Noxious,**—Sheep sorrel, 700; pepper grass, 100; night-flowering catchfly, bitter dock, five finger, ribgrass, plantain.	97.0	.7	2.3
764*	Swan & Sibley, Belfast, November 1, 1906.. **Harmless,**—White clover, 44,800; timothy, 28,600; red clover, 700; redtop, 400. **Noxious,**—Sheep sorrel, 3,300; night-flowering catchfly, 600; bitter dock, 200; goosefoot, 200; English rye grass, green foxtail, witch grass, rugel's plantain.	90.3	1.0	8.7
755*	E. W. Walker, Houlton, May 19, 1906..... **Harmless,**—White clover, 4,200; timothy, 3,300; red clover, 900, redtop. **Noxious,**—Sheep sorrel, 100; goosefoot, 100; five finger, 100; dock sp., night-flowering catchfly, pepper grass.	98.7	.2	1.1
754*	E. W. Walker, Houlton, May 19, 1906..... **Harmless,**—Timothy, 42,200; white clover, 20,800; red clover, 1,100; redtop, 200; alfalfa, 100. **Noxious,**—Sheep sorrel, 4,000; rugel's plantain, 200; night-flowering catchfly, 200; dock sp., 100; goosefoot, five finger, Canada thistle, catnip, tumble weed, witch grass, yellow wood sorrel.	93.5	.8	5.7
	CRIMSON CLOVER. (Trifolium incarnatum.)			
527	Kendall & Whitney, Portland, Feb. 20, 1906. **Harmless,**—None. **Noxious,**—Sheep sorrel, 100; common chickweed, blueweed.	99.7	.1	.2
	MAMMOTH CLOVER. (Trifolium pratense perenne.)			
617	F. J. Carsley, Dexter, April 9, 1906..... **Harmless,**—Timothy, 6,800; alsike clover, 6,800; alfalfa, 400. **Noxious,**—Dock sp., 2,300; sheep sorrel, 1,200; green foxtail, 1,100; ribgrass, 1,100; field pepper grass, 700; rugel's plantain, 400; goosefoot, 200; night-flowering catchfly, 200; lady's thumb, 200; heal-all, 100; tumble weed, 100; black medick, 100; knot grass, 100; slender crabgrass, 100; bull thistle, mayweed, blue vervain, witch grass.	94.8	1.4	3.8
701	C. M. Conant & Co., Bangor, April 24, 1906.. **Harmless,**—Timothy, 1,200; white clover, 600; alsike clover, 500. **Noxious,**—Green foxtail, 700; lady's thumb, 300; spurge, 300; ribgrass, 100; crabgrass, 100; slender	97.9	1.3	.8

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	MAMMOTH CLOVER—Continued. crabgrass, 100; tumble weed, 100; mayweed, 100; night-flowering catchfly, 100; bitter dock, 100; rugel's plantain, witch grass, sheep sorrel, heal-all, catnip, goosefoot, blue vervain. (Virginia three seeded mercury, 200.)	Per ct.	Per ct.	Per ct.
703	R. B. Dunning & Co., Bangor, April 24, 1906, **Harmless,**—Alsike clover, 10,100; timothy, 4,000; white clover, 2,900. **Noxious,**—Sheep sorrel, 400; bitter dock, 300; rugel's plantain, 200; green foxtail, 200; catnip, 100; evening primrose, 100; ribgrass, 100; dandelion, 100; heal-all, mayweed, Canada thistle, night-flowering catchfly, lady's thumb, slender crabgrass, pepper grass, pigweed, spurge.	97.1	.8	2.1
629	G. A. Dustin Co., Dexter, April 9, 1906..... **Harmless,**—Timothy, 18,800; alsike clover, 16,800; white clover, 10,100. **Noxious,**—Green foxtail, 4,800; rugel's plantain, 2,000; bitter dock, 600; witch grass, 600; sheep sorrel, 400; ribgrass, 300; slender crabgrass, 300; yellow foxtail, 200; night-flowering catchfly, 200; goosefoot, 100; mayweed, 100; spurge, 100; lady's thumb, crabgrass, hedge mustard, pigweed, bracted plantain, Canada thistle.	92.5	1.0	6.5
551	A. H. Fogg Co., Houlton, April 2, 1906..... **Harmless,**—Timothy, 5,700; alsike clover, 3,500; white clover, 2,800. **Noxious,**—Sheep sorrel, 900; rugel's plantain, 800; witch grass, 600; green foxtail, 500; goosefoot, 400; dock, sp., 600; lady's thumb, 100; night-flowering catchfly, 100; mayweed, 100; tumbleweed, 100; bracted plantain, 100; hedge mustard, 100; ribgrass, slender crabgrass, crabgrass, blue vervain, arrow-leaved tear-thumb.	97.4	.5	2.1
548	A. H. Fogg Co., Houlton, April 2, 1906..... **Harmless,**—Alsike clover, 400; timothy, 200. **Noxious,**—Green foxtail, 700; sheep sorrel, 400; dock sp., 200; night-flowering catchfly, 100; ribgrass, slender crabgrass, lady's thumb.	99.2	.3	.5
560	Jas. H. Glenn, Caribou, April 4, 1906..... **Harmless,**—Timothy, 400; white clover, alsike clover. **Noxious,**—Ribgrass, 500; rugel's plantain, 400; yellow foxtail, 300; goosefoot, 200; crabgrass, 100; witch grass, 100; green foxtail, 100; slender crabgrass, lady's thumb, dock sp., tumbleweed, arrow-leaved tear-thumb, bracted plantain, heal-all.	98.7	.8	.5
735*	H. N. Goodhue, Fort Fairfield, May 4, 1906.. **Harmless,**—Alsike clover, 600; white clover, 200; timothy, 100. **Noxious,**—Green fox-	99.3	.4	.3

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	MAMMOTH CLOVER—Continued. tail, 400; ribgrass, 200; dock sp., 100; rugel's plantain, 100; sheep sorrel, night-flowering catchfly, yellow foxtail.	Per ct.	Per ct.	Per ct.
647	J. E. Gray, Corinna, April 10, 1906..... **Harmless,**—Timothy, 85,600; alsike clover, 69,600; white clover, 9,100. **Noxious,**—Sheep sorrel, 1,000; green foxtail, 900; hedge mustard, 600; bitter dock, 500; witch grass, 400; rugel's plantain, 300; night-flowering catchfly, 300; goosefoot, 200; black medick, 100; ribgrass, 100; evening primrose, 100; catnip, 100; mayweed, 100; slender crabgrass, 100; Canada thistle, blue vervain, yellow foxtail, lady's thumb, bracted plantain, crabgrass.	81.1	1.1	17.8
638	Ireland Bros. Co., Corinna, April 10, 1906.. **Harmless,**—Timothy, 28,600; alsike clover, 31,700; white clover, 5,400, Kentucky blue grass. **Noxious,**—Green foxtail, 6,700; black medick, 1,200; bitter dock, 1,700; sheep sorrel, 1,200; goosefoot, 1,600; lady's thumb, 900; night-flowering catchfly, 800; rugel's plantain, 700; slender crabgrass, 300; ribgrass, 200; Canada thistle, 200; hedge mustard, 100; crane's bill, 100; witch grass, 100; pepper grass, 100; mouse-ear chickweed, 100; pigweed, 100; blue vervain, mayweed, smart weed, sedge sp., bull thistle, heal-all, evening primrose, yellow foxtail.	85.4	2.4	12.2
611	A. J. McNaughton, Foxcroft, April 7, 1906.. **Harmless,**—Timothy, 65,800; alsike clover, 53,400; white clover, 12,600; alfalfa, 100. **Noxious,**—Sheep sorrel, 1,100; green foxtail, 1,000; bitter dock, 500; rugel's plantain, 400; hedge mustard, 300; witch grass, 200; smart weed, 200; bracted plantain, 100; catnip, 100; mayweed, 100; slender crabgrass, 100; night-flowering catchfly, 100; American pennyroyal, 100; goosefoot, Canada thistle, evening primrose, lady's thumb, heal-all, blue vervain.	83.8	1.2	15.0
595	Sanders Bros. & Co., Sangerville, April 7, 1906 ..... **Harmless,**—Timothy, 72,600; alsike clover, 69,800; white clover, 8,600; alfalfa, 200. **Noxious,**—Sheep sorrel, 1,500; dock sp., 700; green foxtail, 800; rugel's plantain, 600; hedge mustard, 300; witch grass, 300; goosefoot, 200; night-flowering catchfly; 200; Canada thistle, 100; lady's thumb, 100; slender crabgrass, 100; black medick, 100; ribgrass, mayweed, yellow foxtail, evening primrose, crabgrass, blue vervain, bracted plantain, heal-all, borage family, smart weed.	81.7	.7	17.6
585	John Scales, Guilford, April 7, 1906..... **Harmless,**—Timothy, 23,800; alsike clover,	86.7	2.5	10.8

† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	MAMMOTH CLOVER—Continued.	Per ct.	Per ct.	Per ct.
	28,500; white clover, 2,500; alfalfa, 800. **Noxious,**—Green foxtail, 8,000; dock sp., 1,700; goosefoot, 1,200; sheep sorrel, 1,200; night-flowering catchfly, 700; ribgrass, 700; lady's thumb, 500; rugel's plantain, 500; witch grass, 300; slender crabgrass, 200; pigweed, 100; Canada thistle ,100; knot-grass, 100; evening primrose, 100; pepper grass, 100; hedge mustard, 100; charlock, 100; blue vervain, mayweed, heal-all, black medick, bull thistle, meadow fescue.			
605	Sawyer & Gifford, Dover, April 7, 1906..... **Harmless,**—Timothy, 13,200; white clover, 9,000; alsike clover, 1,900. **Noxious,**—Green foxtail, 8,300; rugel's plantain, 8,100; sheep sorrel, 4,900; ribgrass, 900; dock sp., 1,100; night-flowering catchfly, 600; slender crabgrass, 600; witch grass, 600; tumbleweed, 600; lady's thumb, 300; goosefoot, 100; Canada thistle, 100; bracted plantain, 100; mayweed, 100; heal-all, 100; poverty weed, 100; hairy stick seed, 100.	90.8	2.0	7.2
747*	Sawyer & Gifford, Dover May 17, 1906..... **Harmless,**—Timothy, 5,100; white clover, 1,100; alsike clover, 900. **Noxious,**—Rugel's plantain, 4,300; ribgrass, 1,900; tumbleweed, 1,300; witch grass, 500; dock sp., 400; crabgrass, 200; goosefoot, 200; sheep sorrel, 200; heal-all, 200; lady's thumb, 100; slender crabgrass, 100; green foxtail, 100; bracted plantain.	95.9	1.8	2.3
601	Sawyer & Gifford, Dover, April 7, 1906..... **Harmless,**—Alsike clover, 34,700; timothy, 25,900; white clover, 5,000; alfalfa 500; redtop, 100. **Noxious,**—Green foxtail, 5,300; goosefoot, 1,400; dock sp., 1,300; sheep sorrel, 1,100; lady's thumb, 500; slender crabgrass, 400; ribgrass, 300; mayweed, 300; rugel's plantain, 300; witch grass, 200; charlock, 100; tumbleweed, 100; common chickweed, 100; evening primrose, 100; night-flowering catchfly, 100; Canada thistle, smart weed, blue vervain, heal-all, sedge sp., yellow foxtail, ragweed, field pepper grass, black medick.	86.6	2.3	11.1
626	S. L. Small, Dexter, April 9, 1906..... **Harmless,**—Alsike clover, 15,100; timothy, 13,500; white clover, 2,300; alfalfa, 200. **Noxious,**—Sheep sorrel, 2,500; bitter dock, 3,700; ribgrass, 3,400; rugel's plantain, 1,100; green foxtail, 900; field pepper grass, 600; Canada thistle, 600; goosefoot, 600; night-flowering catchfly, 300; black medick, 300; yellow foxtail, 300; heal-all, 200; hairy stick seed, 200; lady's thumb,	90.6	2.2	7.2

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	MAMMOTH CLOVER—Continued. 100; mayweed, 200; common chickweed, 100; smart weed, 100; witch grass, 100; catnip, pigweed, chicory.	Per ct.	Per ct.	Per ct.
566	M. C. Smith, Presque Isle, April 5, 1906.... **Harmless,**—Timothy, 200; white clover, 200; alsike, alfalfa. **Noxious,**—Green foxtail, 100; witch grass, 100; dock sp., sheep sorrel, 100; ribgrass, goosefoot.	99.8	.1	.1
758*	E. W. Walker, Houlton, May 19, 1906..... **Harmless,**—Alsike clover, 17,700; timothy, 5,200; white clover, 1,400; alfalfa, 700. **Noxious,**—Goosefoot, 300; dock sp., 300; sheep sorrel, 100; night-flowering catchfly, green foxtail, rugel's plantain, mouse-ear chickweed, mayweed, lady's thumb, ribgrass, heal-all, yellow foxtail, pepper grass, wild turnip.	96.7	.1	3.2
756*	E. W. Walker, Houlton, May 19, 1906..... **Harmless,**—Timothy, 400; alsike clover, 300. **Noxious,**—Green foxtail, 500; dock sp., 200; sheep sorrel, 100; blue vervain, goosefoot, night-flowering catchfly, yellow foxtail.	99.4	.2	.4
751*	E. W. Walker, Houlton, May 19, 1906..... **Harmless,**—Timothy, 15,100; white clover, 12,600; alsike clover, 6,400. **Noxious,**—Rugel's plantain, 2,700; green foxtail, 1,100; sheep sorrel, 600; slender crabgrass, 500; witch grass, 400; yellow foxtail, 300; mayweed, 300; ribgrass, 200; tumbleweed, 200; Canada thistle, 200; dock sp., 200; dandelion, 100; goosefoot, 100; crabgrass, 100; pale persicaria, 100; night-flowering catchfly, blue vervain, mouse-ear chickweed, evening primrose, hedge mustard, lady's thumb, five finger, heal-all, bracted plantain, knot grass, pepper grass, penny cress.	94.3	1.3	4.4
	RED CLOVER. (Trifolium pratense.)			
664	Belfast Grain Co., Belfast, April 12, 1906... **Harmless,**—Alsike clover, 22,500; timothy, 6,200; white clover, 2,900. **Noxious,**—Green foxtail, 3,900; sheep sorrel, 1,000; yellow foxtail, 200; goosefoot, 200; ribgrass, 200; slender crabgrass, 200; knotgrass, 100. Witch grass, night-flowering catchfly, lady's thumb, bitter dock, rugel's plantain, catnip, pig-weed, crabgrass, pepper-grass.	93.8	.6	5.6
678	J. M. Bray & Son, Bucksport, April 13, 1906, **Harmless,**—Alsike clover, 4800; timothy, 4900; white clover, 1100. **Noxious,**—Ribgrass, 2800; rugel's plantain, 1800; green foxtail, 2100; yellow foxtail, 800; sheep sorrel, 700; witch grass, 500; bitter dock, 300; lady's thumb, 200; bracted	95.0	1.6	3.4

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	RED CLOVER—Continued. plantain, 200; charlock, 100; spurge, 100; heal-all, 100; goosefoot, tumble-weed, slender crabgrass, blue vervain, rag-weed, field peppergrass, night flowering catchfly, nightshade, crabgrass, peppergrass, bull thistle.	Per ct.	Per ct.	Per ct.
695	A. M. Brown, Augusta, April 21, 1906..... **Harmless,**—Timothy, 4100; alsike clover, 4900; white clover, 1100; alfalfa, 200; Kentucky blue grass, 100. **Noxious,**—Rugel's plantain, 3700; bitter dock, 1000; ribgrass, 1100; green foxtail, 900; crabgrass, 700; slender crabgrass, 700; field peppergrass, 500; Canada thistle, 300; witch grass, 300; spurge, 300; lady's thumb, 300; goosefoot, 200; pig-weed, 200; yellow foxtail, 100; nightshade, 100; knot-grass, 100; catnip, 100; black medick, heal-all, blue vervain; May-weed, night-flowering catchfly, hairy stick seed.	94.1	2.5	3.4
722*	J. S. Cairns, Hallowell, May 3, 1906..... **Harmless,**—Alfalfa, 700; white clover, 300; **Noxious,**—Ribgrass, 4700; green foxtail, 3,100 ;cranes bill, 500; dock sp., 200; goldenrod, 200; sow thistle, 500; lady's thumb, heal-all, black medick, blue vervain, knot-grass, tumbleweed, chicory.	95.7	2.0	2.3
620	F. J. Crasley, Dexter, April 9, 1906..... **Harmless,**—Timothy, 9800; alsike clover, 9400; white clover, 1700. **Noxious,**—Ribgrass, 3200; dock sp., 2100; sheep sorrel, 1600; green foxtail, 1600; goosefoot, 500; field pepper-grass, 400; rugel's plantain, 400; lady's thumb, 200; mayweed, 200; slender crabgrass, 200; knot grass, 200; black medick, 100; night-flowering catchfly, 100; witch grass, 100; tumbleweed, 100; heal-all, 100; bull thistle, blue vervain.	92.8	2.1	5.1
702	C. M. Conant Co., Bangor, April 24, 1906.... **Harmless,**—Timothy, 1800; alsike clover, 700; white clover, 1200. **Noxious,**—Green foxtail, 700; rugel's plantain, 500; pig-weed, 100; witch grass, 100; Virginia three seeded mercury, 100; ribgrass, lady's thumb, bitter dock, catnip, spurge, yellow foxtail, heal-all.	98.0	1.3	.7
588	H. Douglass & Co., Guilford, April 7, 1906.. **Harmless,**—Timothy, 15800; white clover, 8400; alsike clover, 8400. **Noxious,**—Green foxtail, 7,800; ribgrass, 9,600; sheep sorrel, 4,600; rugel's plantain, 5,400; bracted plantain, 500; dock sp., 1,600; goosefoot, 900; charlock, 700; slender crabgrass, 700; night-flowering catchfly, 500; lady's thumb, 600; five finger, 200; mayweed,	88.1	2.0	9.9

* Sample sent by dealer. See statement on page 2.
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Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	RED CLOVER—Continued. 100; black medick, 100; Canada thistle, pigweed, yellow foxtail, crabgrass, knot-grass, witch grass, heal-all, blue vervain, chicory.	Per ct.	Per ct.	Per ct.
709	R. B. Dunning & Co., Bangor, April 24, 1906. **Harmless,**—White clover, 22600; timothy, 16200; alsike clover, 9800; Kentucky blue grass, 300. **Noxious,**—Sheep sorrel, 1700; rugel's plantain, 2900; plantain, 900; rib-grass, 1300; green foxtail, 1100; witch grass, 900; slender crabgrass, 700; mouse-ear chickweed, 600; goosefoot, 400; night-flowering catchfly, 300; bitter dock, 300; yellow foxtail, 300; spurge, 200; pigweed, 200; lady's thumb, 200; crabgrass, 100; may-weed, 100; smart-weed, 100; bracted plantain, 100; american penny-royal, 100; sedge sp., 100; heal-all, 100; black medick, 100: pepper grass, five finger, Canada thistle, evening primrose, ox-eye daisy, rag-weed, field pepper grass, worm-seed mustard, blue weed.	91.6	1.6	6.8
704	R. B. Dunning & Co., Bangor, April 24, 1906. **Harmless,**—Alsike clover, 9100; timothy, 4500; white clover, 2500. **Noxious,**—Green foxtail, 2200; sheep sorrel, 500; rugel's plantain, 300; bitter dock, 200; may-weed, 100; Virginia three seeded mercury, 200; yellow foxtail, 100; slender crabgrass, ribgrass, goosefoot, spurge, crabgrass, night-flowering catchfly, hedge mustard, lady's thumb, hairy stick seed, pigweed, Canada thistle, blue vervain, evening primrose.	96.8	.5	2.7
630	G. A. Dustin, Dexter, April 9, 1906..... **Harmless,**—Timothy, 500; alsike clover, 200; white clover, 100. **Noxious,**—Green fox-tail, 100; yellow foxtail, 100; pigweed, 100; rugel's plantain, 100; bitter dock, 100; slender crabgrass, ribgrass.	99.2	.6	.2
615	W. J. Eldridge, Foxcroft, April 9, 1906..... **Harmless,**—Alsike clover, 16500; timothy, 6900; white clover, 2100; alfalfa, 700. **Noxious,**—Night-flowering catchfly, 2200; bitter dock, 800; green foxtail, 800; sheep sorrel, 600; goosefoot, 500; ribgrass, 400; heal-all, 300; field pepper-grass, 300; can-ada thistle, 200; charlock, 100; plantain, 100; black medick, 100; compositae sp., 100; witch grass, 100; amsinckia borage 100; witch grass, 100; borage family, lady's thumb, smart weed, slender crab-grass, pigweed, ragweed, mayweed.	92.9	1.9	5.2
672	Ben D. Field, Belfast, April 12, 1906..... **Harmless,**—Timothy, 9900; alsike clover, 15900; white clover, 2600; alfalfa, 300; kentucky blue grass, 200. **Noxious**—Green foxtail, 3500; yellow foxtail, 200; rib-	88.8	3.1	8.1

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Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	RED CLOVER—Continued.	Per ct.	Per ct.	Per ct.
	grass, 4000; bitter dock, 3000; sheep sorrel, 1800; canada thistle, 900; rugel's plantain, 900; night-flowering catchfly, 700; lady's thumb, 600; goosefoot, 500; field pepper grass, 400; black medick, 300; ragweed, 200; witch grass, 100; heal-all, 100; charlock, 100; slender crabgrass, 100; knot grass blue vervain, mayweed, ox-eye daisy, chicory, hairy stick seed.			
552	A. H. Fogg Co., Houlton, April 2, 1906..... **Harmless,**—Timothy, 6800; alsike clover, 1800; white clover, 900. **Noxious,**—Green foxtail, 3800; ribgrass, 600; lady's thumb, 200; rugel's plantain, 300; bull thistle, 100; mayweed, 100; goosefoot, 100; arrow-leaved tear-thumb, 100; dock sp., night-flowering catchfly; slender crabgrass, stringing nettle, hairy stick seed.	96.8	.8	2.4
549	A. H. Fogg Co., Houlton, April 2, 1906..... **Harmless,**—Timothy, 200; white clover, 200. **Noxious,**—Rugel's plantain, 100; green foxtail, 400; sheep sorrel, ragweed, dock sp., night-flowering catchfly, slender crabgrass.	99.5	.2	.3
571	G. H. Freeman Co., Presque Isle, April 5, 1906. **Harmless,**—Timothy, 7,100; alsike clover, 3200; redtop, 200. **Noxious,**—Night-flowering catchfly, 1,200; sheep sorrel, 900; canada thistle, 200; evening primrose, 100; bull thistle, 100; ox-eye daisy, corn spurry, dandelion.	96.9	1.0	2.1
717*	G. H. Freeman Co., Presque Isle, April 26, 1906 **Harmless,**—Timothy, 42800; alsike clover, 23900; white clover, 18300. **Noxious,**—Green foxtail, 2300; witch grass, 1200; sheep sorrel, 1400; rugel's plantain, 1200; goosefoot, 800; ribgrass, 500; night-flowering catchfly, 300; hedge mustard, 300; slender crabgrass, 200; common chickweed, 200; catnip, 100; tumbleweed, 100; dock sp., mayweed, lady's thumb, bull thistle, bracted plantain.	88.2	1.4	10.4
714*	G. H. Freeman Co., Presque Isle, April 26, 1906 ..... **Harmless,**—Timothy, 200. **Noxious,**—Green foxtail, 500; ribgrass, lady's thumb, tumbleweed.	99.4	.4	.2
591	French & Elliott, Guilford, April 7, 1906... **Harmless,**—Timothy, 13000; white clover, 7,100; alsike clover, 5,500; alfalfa, 200, Kentucky bluegrass. **Noxious,**—Rugel's plantain, 22,200; ribgrass, 4,700; green foxtail, 4,100; lady's thumb, 1,600; black medick, 800; sheep sorrel, 3,000; goosefoot, 1,000; bracted plantain, 500; dock sp., 700; slender crabgrass, 800; witch grass, 500; crabgrass, 600; blue vervain, 400; pigweed,	86.4	4.0	9.6

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† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	RED CLOVER—Continued. 700; mayweed, 300; heal-all, 400; american pennyroyal, 100; charlock, 100; five finger, 100; Canada thistle, 100; catnip, 100; corn spurry, 100; night-flowering catchfly, knot grass, yellow foxtail, common chickweed, sow thistle, switch grass.	Per ct.	Per ct.	Per ct.
676*	H. F. Gilley, Bucksport, April 13, 1906... **Harmless,**—Timothy, 20600; white clover, 9200; alsike clover, 9500; redtop, 200. **Noxious,**—Green foxtail, 8900; ribgrass, 7200; rugel's plantain, 7900; plantain, 1800; sheep sorrel, 5100; night-flowering catchfly, 1000; bitter dock, 1100; lady's thumb, 1000; charlock, 800; goosefoot, 800; slender crabgrass, 500; blue vervain, 500; evening primrose, 400; mayweed, 300; pigweed, 300; crabgrass, 300; yellow foxtail, 200; witch grass, 200; hedge mustard, 200; spurge, 200; catnip, 100; bracted plantain, 100; pepper grass, 100; five finger, 100; chicory, 100; knot-grass, 100; nightshade, 100; canada thistle, heal-all bull thistle, ox-eye daisy, penny cress.	85.5	3.6	10.9
608	A. W. Gilman, Foxcroft, April 7, 1906..... **Harmless,**—Alsike clover, 52,000; timothy, 22800; white clover, 18000; alfalfa, 700; kentucky blue grass, 200; redtop, 100. **Noxious,**—Rugel's plantain, 3400; green foxtail, 2300; sheep sorrel, 1900; slender crabgrass, 1400; goosefoot, 900; dock sp., 600; ribgrass, 600; night-flowering catchfly, 500; witch grass, 300; lady's thumb, 300; mouse-ear chickweed, 300; hedge mustard, 200; crabgrass, 200; pepper grass, 200; yellow foxtail, 200; Canada thistle, 200; bracted plantain, 100; mayweed, 100; blue vervain, ox-eye daisy, heal-all, five finger, catnip, charlock.	85.7	1.8	12.5
723*	H. A. Gilman, So. Norridgewock, May 2, 1906 **Harmless,**—Timothy, 2900; alsike clover, 2700; white clover, 1500. **Noxious,**—Green foxtail, 900; night-flowering catchfly, 700; goosefoot, 400; mayweed, 200; dock sp., 200; lady's thumb, 100; borage family.	98.7	.4	.9
736*	H. N. Goodhue, Fort Fairfield, May 4, 1906.. **Harmless,**—Timothy, 300; alsike clover, 100. **Noxious,**—Green foxtail, 700; yellow foxtail, 100; marsh elder, field pepper grass, ribgrass, rugel's plantain, sheep sorrel, dock sp.	99.4	.2	.4
644	J. E. Gray, Corinna, April 10, 1906..... **Harmless,**—Timothy, 33500; white clover 27700; alsike clover, 18200. **Noxious,**—Rugel's plantain, 4100; sheep sorrel, 5700; witch grass, 1600; green foxtail, 1000; night-flowering catchfly, 1100; slender crabgrass, 600; black medick, 400; pig-	88.2	1.2	10.6

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	seed. Pure	Inert matter.	Foreign seeds.
	RED CLOVER—Continued.	Per ct.	Per ct.	Per ct.
	weed, 400; may-weed, 300; bitter dock, 300; ribgrass, 200; goosefoot, 200; pepper grass, 200; bracted plantain, 100; crabgrass, 100; american pennyroyal, 100; spurge, 100; knot-grass, 100; lady's thumb, blue vervain, canada thistle, evening primrose, yellow foxtail, heal-all, hairy stick seed, chicory, common chickweed, alfalfa.			
685	Geo. B. Haskell Co., Lewiston, April 21, 1906 **Harmless,**—Hungarian grass, 1400; alsike clover, 200; timothy. **Noxious,**—Night-flowering catchfly, bitter dock, lady's thumb.	99.1	.4	.5
686	Geo. B. Haskell Co., Lewiston, April 21, 1906 **Harmless,**—Alsike clover, 29800; white clover, 17,000; timothy, 8500. **Noxious,**—Green foxtail, 1900; yellow foxtail, 100; night-flowering catchfly, 1500; rugel's plantain, 700; sheep sorrel, 700; witch grass, 500; ribgrass, 500; goosefoot, 400; bitter dock, 200; slender crabgrass, 100; catnip, 100; lady's thumb, 100; black medick, 100; may-weed, 100; pepper-grass, 100; spurge, 100; blue vervain, 100; sedge sp., 100; canada thistle, tumble weed, hairy stick seed, heal-all, knot grass, bracted plantain.	89.6	1.6	8.8
538*	Geo. B. Haskell Co., Lewiston, Mar. 24, 1906 **Harmless,**—Timothy, 100. **Noxious,**—Green foxtail, 1300; chicory, 900; umbelliferae, 500; yellow foxtail, 200; canada thistle, 300; tar weed, 100; ribgrass, 700; black medick, 200; sheep sorrel, 200; blue vervain, 100; pale persicaria, 100; blue weed, 100; goosefoot, 200; bee-plant, may-weed, wild buckwheat, crane's bill, hedge mustard.	97.3	**1.3	1.4
683*	Oscar Holway & Co., Auburn, April 21, 1906. **Harmless,**—Timothy, 23900; white clover, 9300; alfalfa, 400. **Noxious,**—Ribgrass, 7500; green foxtail, 6500; goosefoot, 3900; sheep sorrel, 4200; night-flowering catchfly, 5000; dock sp., 800; lady's thumb, 800; heal-all, 1100; poverty weed, 1000; blue vervain, 400; tumbleweed, 200; rugel's plantain, 1300; mayweed, 200; bull thistle, 200; witchgrass, 100; evening primrose, 100; common purslane, 100; knot grass, 200; stringing nettle, 200; slender crabgrass, 100; hedge mustard, 400; bracted plantain.	81.4	6.5	12.1
537	Oscar Holway Co., Auburn, Feb. 28, 1906... **Harmless,**—Timothy, 2700; hungarian, 2300; english rye grass, 100. **Noxious,**—Sheep sorrel, 900; rugel's plantain, 400; bracted	96.7	1.0	2.3

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.
**This analysis kept these goods out of Maine.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	RED CLOVER—Continued. plantain, 200; ribgrass, 2800; common chickweed, 600; compositae sp., 300; bitter dock, 100; canada thistle, 100; black medick, 100; slender crabgrass, 500; goosefoot, lady's thumb, sow thistle, cruciferae sp.	Per ct.	Per ct.	Per ct.
637	Ireland Bros. Co., Corinna, April 10, 1906... **Harmless,**—Timothy, 20900; alsike clover, 38300; white clover, 21500; kentucky blue grass, 300; alfalfa, 100; redtop, 100. **Noxious,**—Rugel's plantain, 1800; sheep sorrel, 2200; green foxtail, 2100; goosefoot, 1600; bitter dock, 1200; ribgrass, 1000; night-flowering catchfly, 900; slender crabgrass, 800; mouse-ear chickweed, 400; witch grass, 300; black medick, 300; yellow foxtail, 200; lady's thumb, 200; pepper grass, 200; hairy stick seed, 200; mayweed, 100; five finger, 100; spurge, 100; evening primrose, 100; canada thistle, 100; smart-weed, 100; crabgrass, tumbleweed, blue vervain, hedge mustard, catnip, bracted plantain, ox-eye daisy, sedge sp.	86.8	2.3	10.9
653	Judkins & Gilman, Newport, April 4, 10, 1906 **Harmless,**—Alsike clover, 18,000; timothy, 9800; white clover, 2200. **Noxious,**—Rugel's plantain, 1800; bitter dock, 800; ribgrass, 500; sheep sorrel, 500; green foxtail, 300; night-flowering catchfly, 300; black medick, 200; may-weed, 100; goosefoot, 100; bracted plantain, 100; evening primrose, 100; witch grass, 100; hedge mustard, 100; catnip, 100; canadian blue grass, lady's thumb, canada thistle, heal-all, hairy stick seed, yellow foxtail, smart weed, ox-eye daisy, blue vervain, slender crabgrass.	94.4	1.0	4.6
519	Kendall & Whitney, Portland, Feb. 20, 1906. **Harmless,**—Timothy, 500. **Noxious,**—Rugel's plantain, common chickweed, bitter dock.	99.6	.1	.3
623	C. P. McCrillis, Dexter, April 9, 1906..... **Harmless,**—Timothy, 33100; white clover, 23200; alsike clover, 17000; alfalfa, 400. **Noxious,**—Sheep sorrel, 6000; rugel's plantain, 4400; green foxtail, 1800; witch grass, 1200; night-flowering catchfly, 1200; bitter dock, 800; goosefoot, 500; pig-weed, 300; slender crabgrass, 300; bracted plantain, 300; blue vervain, 200; hedge mustard, 200; evening primrose, 100; crabgrass,100; ribgrass, 100; lady's thumb, 100; pepper grass, 100; spurge, 300; Canada thistle, mayweed, black medick, catnip, heal-all, smartweed, hairy stick seed.	88.3	1.8	9.9
612	A. J. McNaughton, Foxcroft, April 7, 1906.. **Harmless,**—Timothy, 42000; white clover, 32700; alsike clover, 21300; alfalfa, 100.	86.4	1.9	11.7

† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	RED CLOVER—Continued.	Per ct.	Per ct.	Per ct.
	Noxious,—Rugel's plantain, 4900; sheep sorrel, 5200; witch grass, 1900; green foxtail, 1800; slender crabgrass, 900; goosefoot, 500; night-flowering catchfly, 500; ribgrass, 300; bitter dock, 300; evening primrose, 200; hedge mustard, 200; crabgrass, 100; mayweed, 100; mouse-ear chickweed, 100; blue vervain, 100; horehound, 100; lady's thumb, tumbleweed, canada thistle, pigweed, bracted plantain, pepper grass, pennyroyal, black medick, catnip, corn spurry.			
691	Merrill Bros., Augusta, April 21, 1906..... **Harmless,**—Timothy, 12800; alsike clover, 10,000; white clover, 2,000; alfalfa, 600; Kentucky blue grass. **Noxious,**—Green foxtail, 2,900; bitter dock, 3,500; rugel's plantain, 2,600; ribgrass, 2,300; sheep sorrel, 2,100; goosefoot, 700; slender crabgrass, 700; Canada thistle, 400; field pepper grass, 400; black medick, 300; witch grass, 200; night-flowering catchfly, 200; nightshade, 200; lady's thumb, 200; charlock, 100; spurge, 100; knot-grass, 100; evening primrose, 100; blue vervain, 100; crabgrass, bracted plantain, heal-all, mayweed, yellow foxtail, pig-weed, ragweed, crane's bill, corn gromwell.	90.9	2.5	6.6
730*	M. P. Moore, No. Anson, May 4, 1906..... **Harmless,**—Timothy, 8100; alsike clover, 2,400; white clover, 1,500. **Noxious,**—Rugel's plantain, 4,000; ribgrass, 1,800; green foxtail, 1,600; dock sp., 400; slender crabgrass, 400; tumbleweed, 200; crabgrass, 100; sheep sorrel, 300; catnip, 100; flax, 100; goosefoot, witch grass, lady's thumb, heal-all, yellow foxtail, blue vervain, Canada thistle, mayweed, bracted plantain, ragweed.	95.9	1.2	2.9
656	L. H. Mosher, Unity, April 11, 1906..... **Harmless,**—Timothy, 37,800; white clover, 18,900; alsike clover, 24,900; redtop, 300. **Noxious,**—Sheep sorrel, 2700; rugel's plantain, 3100; green foxtail, 2100; witch grass, 2100; slender crabgrass, 900; ribgrass, 800; goosefoot, 400; bitter dock, 300; spurge, 300; night-flowering catchfly, 200; crabgrass, 200; evening primrose, 100; lady's thumb, 100; bracted plantain, yellow foxtail, blue vervain, pigweed, heal-all, hedge mustard, ragweed, canada thistle, bull thistle, pepper grass, catnip, may-weed, common chickweed, mouse-ear chickweed.	88.0	1.0	11.0

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	RED CLOVER—Continued.	Per ct.	Per ct.	Per ct.
582	G. W. Park, Fort Fairfield, April 5, 1906.... **Harmless,**—Alsike clover, 9,900; timothy, 3,700; white clover, 2,100. **Noxious,**—Green foxtail, 2,300; rugel's plantain, 1,100; sheep sorrel, 600; goosefoot, 200; slender crabgrass, 100; pepper grass, 100; night-flowering catchfly, mayweed, catnip, lady's thumb.	96.6	.5	2.9
728*	G. F. Rowe, China, May 9, 1906..... **Harmless,**—Timothy, 49,700; white clover, 34,500; alsike clover, 24,500; alfalfa, 500; redtop, 400. **Noxious,**—Green foxtail, 8,900; sheep sorrel, 3,800; rugel's plantain, 4,400; ribgrass, 2,100; dock sp., 2,300; witch grass, 1,500; lady's thumb, 1,100; goosefoot, 1,700; night-flowering catchfly, 1,200; common chickweed, 1,100; tumbleweed, 800; blue vervain, 500; slender crabgrass, 400; charlock, 300; black medick, 300; mayweed, 300; Canada thistle, 200; pepper grass, 200; five finger, 200; evening primrose, 100; sedge sp., 100; catnip, 100; tar-weed, 100; crabgrass, yellow foxtail, hedge mustard, bracted plantain, corn gromwell, knot grass, poverty weed.	79.2	3.2	17.6
721*	Sawyer & Gifford, Dover, April 27, 1906.... **Harmless,**—Timothy, 29,500; alsike clover, 27,400; white clover, 10,400; alfalfa, 700; redtop, 100. **Noxious,**—Green foxtail, 5,800; goosefoot, 1,500; dock sp., 1,300; lady's thumb, 900; sheep sorrel, 800; night-flowering catchfly, 700; rugel's plantain, 500; slender crabgrass, 400; ribgrass, 300; mayweed, 200; witch grass, 200; bull thistle, 100; catnip, 100; evening primrose, 100; heal-all, 100; pigweed, 100; hedge mustard, blue vervain.	85.5	3.1	11.4
720*	Sawyer & Gifford, Dover, April 27, 1906.... **Harmless,**—White clover, 59,500; alsike clover, 43,200; timothy, 25,100; redtop, 400; alfalfa, 100. **Noxious,**—Green foxtail, 2,400; plantain, 2,900; slender crabgrass, 1,300; sheep sorrel, 1,300; night-flowering catchfly, 1,200; goosefoot, 900; pepper grass, 500; ribgrass, 400; dock sp., 300; lady's thumb, 300; crabgrass, 200; catnip, 200; five finger, 200; mayweed, 100; common chickweed, 100; evening primrose, 100; witch grass, 100; hedge mustard, 100; sedge sp., 100; bull thistle, bracted plantain, ox-eye daisy, heal-all, knot-grass, pigweed.	80.6	3.6	15.8
600	Sawyer & Gifford, Dover, April 7, 1906.... **Harmless,**—Alsike clover, 70,600; timothy, 23,100; white clover, 25,300; alfalfa, 200; Kentucky blue grass, 500. **Noxious,**—	82.1	2.6	15.3

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	RED CLOVER—Continued. Sheep sorrel, 1,200; rugel's plantain, 2,600; green foxtail, 2,200; goosefoot, 1,600; slender crabgrass, 1,500; night-flowering catchfly, 1,100; dock sp., 700; ribgrass, 700; lady's thumb, 500; pepper grass, 300; witch grass, 200; mayweed, 200; smart weed, 100; sedge sp., 100; Canada thistle, 100; dandelion, 100; bracted plantain, crabgrass, tumbleweed, hedge mustard, catnip, evening primrose, five finger, hairy stick seed, yellow foxtail.	Per ct.	Per ct.	Per ct.
719*	Sawyer & Gifford, Dover, April 27, 1906.... **Harmless,**—Timothy, 11,200; white clover, 20,100; alsike clover, 10,400. **Noxious,**—Rugel's plantain, 6,200; night-flowering catchfly, 1,300; green foxtail, 7,200; sheep sorrel, 4,200; ribgrass, 600; witch grass, 500; tumbleweed, 400; goosefoot, 400; dock, sp., 400; lady's thumb, 200; slender crabgrass, 200; mayweed, 100; black medick, 100; knot-grass, 100; crabgrass, bracted plantain, bull thistle.	89.7	1.5	8.8
583	John Scales, Guilford, April 7, 1906..... **Harmless,**—Alsike clover, 70,100; timothy, 22,600; white clover, 17,800; Kentucky blue grass, 300; redtop, 100. **Noxious,**—Green foxtail, 3,000; yellow foxtail, 200; rugel's plantain, 1,900; goosefoot, 1,300; sheep sorrel, 1,000; lady's thumb, 600; ribgrass, 800; slender crabgrass, 1,100; dock sp., 800; night-flowering catchfly, 600; blue vervain, 400; witch grass, 300; pepper grass, 300; hedge mustard, 200; Canada thistle, 200; knot grass, 100; heal-all, 100; mouse-ear chickweed, 100; mayweed, 100; catnip, 100; pigweed, bracted plantain, charlock, ox-eye daisy, crabgrass, yellow-wood sorrel, evening primrose.	83.7	2.1	14.2
640	F. B. Shaw, Corinna, April 10, 1906..... **Harmless,**—Timothy, 14,700; white clover, 5,000; alsike clover, 6,100; Kentucky blue grass. **Noxious,**—Rugel's plantain, 9,100; ribgrass, 2,500; witch grass, 2,000; slender crabgrass, 1,300; green foxtail, 1,100; sheep sorrel, 900; spurge, 800; pigweed, 600; bracted plantain, 200; bitter dock, 200; crabgrass, 100; goosefoot, 100; lady's thumb, 100; blue vervain, yellow foxtail, black medick, mayweed, pepper grass, Canada thistle, night-flowering catchfly, heal-all.	91.5	3.0	5.5
627	S. L. Small, Dexter, April 9, 1906..... **Harmless,**—Timothy, 8,000; alsike clover, 9,700; white clover, 2,400; alfalfa, 300. **Noxious,**—Bitter dock, 3,800; ribgrass, 1,800; sheep sorrel, 1,200; green foxtail,	92.9	1.6	5.5

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	RED CLOVER—Continued.	Per ct.	Per ct.	Per ct.
	1,000; field pepper grass, 500; black medick, 400; rugel's plantain, 400; mayweed, 400; heal-all, 400; lady's thumb, 300; yellow foxtail, 300; witchgrass, 200; Canada thistle, 200; hedge mustard, 100; slender crabgrass, 100; blue vervain, 100; night-flowering catchfly, smart weed, hairy stick seed, pigweed, corn spurry, pepper grass.			
545*	Soule Bros., Buxton, April 7, 1906..... **Harmless,**—Timothy, 11,000; alsike clover, 2,400; alfalfa. **Noxious,**—Rugel's plantain, 8,700; ribgrass, 1,400; dock sp., 800; sheep sorrel, 500; black medick, 300; Canada thistle, 200; slender crabgrass, 1,400; crabgrass, 500; mayweed, 400; witch grass, 200; goosefoot, 200; night-flowering catchfly, 100; heal-all, 200; green foxtail, 900; field pepper grass, 600; yellow foxtail, 100; tumbleweed, 200; lady's thumb, blue vervain, arrow-leaved tear thumb, pepper grass, bracted plantain, yellow daisy, prickly poppy.	93.9	1.9	4.2
577	A. M. Smith, Presque Isle, April 5, 1906... **Harmless,**—Timothy, 44,700; alsike clover, 28,800; white clover, 25,400; alfalfa, 100. **Noxious,**—Green foxtail, 1,600; sheep sorrel, 1,500; rugel's plantain, 1,100; witch grass, 800; ribgrass, 500; dock sp., 400; tumbleweed, 300; Canada thistle, 300; goosefoot, 300; night-flowering catchfly, 200; hedge mustard, 200; slender crabgrass, 100; mayweed, 100; heal-all, 100; crabgrass, lady's thumb, yellow foxtail, evening primrose, common chickweed, blue vervain, bracted plantain, borage family, catnip.	86.8	1.4	11.8
575	A. M. Smith, Presque Isle, April 5, 1906.... **Harmless,**—Timothy, 500; alsike clover, 200. **Noxious,**—Green foxtail, 900; dock sp., 100; field pepper grass, 100; lady's thumb, 100; goosefoot, heal-all, knot grass.	99.1	.4	.5
565	M. C. Smith, Presque Isle, April 5, 1906.... **Harmless,**—Timothy, 2,900; alsike clover, 11,300; white clover, 2,000; redtop, 100. **Noxious,**—Rugel's plantain, 900; green foxtail, 1,100; sheep sorrel, 400; ribgrass, 300; night-flowering catchfly, 100; marsh elder, 100; hedge mustard, dock sp., lady's thumb, goosefoot, crabgrass, slender crabgrass, witch grass, mayweed, heal-all.	96.9	.4	2.7
564	M. C. Smith, Presque Isle, April 5, 1906.... **Harmless,**—Timothy, 44,500; alsike clover, 27,500; white clover, 23,900; alfalfa, 500. **Noxious,**—Green foxtail, 2,000; sheep sor-	86.3	1.6	12.1

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	seed. Pure	Inert matter.	Foreign seeds.
	RED CLOVER—Continued. rel, 2,400; rugel's plantain, 2,100; witch grass, 1,200; goosefoot, 800; night-flowering catchfly, 400; tumbleweed, 300; ribgrass, 300; mayweed, 200; hedge mustard, 100; yellow foxtail, 100; sedge sp., 100; slender crabgrass, 100; dock sp., crabgrass, blue vervain, Canada thistle, common chickweed, lady's thumb, heal-all, catnip, bracted plantain, pepper grass.	Per ct.	Per ct.	Per ct.
563	M. C. Smith, Presque Isle, April 5, 1906.... **Harmless,**—Timothy, 32,700; white clover, 18,200; alsike clover, 19,500; redtop, 200. **Noxious,**—Rugel's plantain, 3,600; sheep sorrel, 3,100; green foxtail, 2,500; slender crabgrass, 1,200; witch grass, 600; ribgrass, 400; black medick, 200; goosefoot, 200; mayweed, 100; yellow foxtail, 100; blue vervain, 100; night-flowering catchfly, 100; dock sp., 100; tumbleweed, crabgrass, lady's thumb, knot-grass, evening primrose, pepper grass, bracted plantain, American pennyroyal, hedge mustard, five finger, Canada thistle.	89.9	.8	9.3
562	M. C. Smith, Presque Isle, April 5, 1906.... **Harmless,**—Timothy, 500; alsike clover, 500; alfalfa, 100; white clover, 100. **Noxious,**—Dock sp., 100; green foxtail, 100; rugel's plantain, night-flowering catchfly, goosefoot, lady's thumb, bull thistle.	99.6	.1	.3
659	Swan & Sibley, Belfast, April 12, 1906..... **Harmless,**—White clover, 27,200; timothy, 11,600; alsike clover, 10,500. **Noxious,**—Sheep sorrel, 6,900; green foxtail, 4,000; rugel's plantain, 3,700; witch grass, 1,600; plantain, 1,400; ribgrass, 1,100; slender crabgrass, 1,100; spurge, 800; pigweed, 700; bitter dock, 500; goosefoot, 400; night-flowering catchfly, 400; nightshade, 400; pepper grass, 300; yellow foxtail, 200; crabgrass, 200; blue vervain, 100; bracted plantain, 100; evening primrose, 100; Canada thistle, 100; lady's thumb, mayweed, heal-all, rag-weed.	88.2	2.8	9.0
762*	Swan & Sibley, Belfast, November 1, 1906.. **Harmless,**—Timothy, 3,200; alsike clover, 2,800; white clover, 1,200. **Noxious,**—Green foxtail, 700; lady's thumb, 400; goosefoot, 200; sheep sorrel, 200; slender crabgrass, 100; bitter dock, 100; mayweed, 100; rugel's plantain, 100; ribgrass, night-flowering catchfly, crabgrass, yellow foxtail, pepper grass, knot grass.	98.5	.2	1.3
761*	Swan & Sibley, Belfast, November 1, 1906.. **Harmless,**—None. **Noxious,**—Green foxtail, 500; bitter dock, 200; ribgrass, 100; rugel's plantain, lady's thumb, blue vervain, smart weed.	99.4	.4	.2

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	RED CLOVER—Continued.	Per ct.	Per ct.	Per ct.
763*	Swan & Sibley, Belfast, November 1, 1906.. **Harmless,**—Timothy, 6,500; white clover, 3,500; alsike clover, 2,000. **Noxious,**—Bitter dock, 1,000; goosefoot, 600; mayweed, 600; green foxtail, 500; rugel's plantain, 400; bracted plantain, 100; sedge sp., 100; five finger, 100; lady's thumb, 100; catnip, 200; blue vervain, Canada thistle, ribgrass, yellow foxtail, knot grass, sheep sorrel, bull thistle.	97.5	.3	2.2
725*	W. R. Ward, China, April 25, 1906..... **Harmless,**—Timothy, 35,500; white clover, 25,900; alsike clover, 18,300; alfalfa, 500; redtop, 700. **Noxious,**—Green foxtail, 10,300; sheep sorrel, 1,900; dock sp., 1,800; ribgrass, 1,400; plantain, 1,200; goosefoot, 1,300; witch grass, 1,100; slender crabgrass, 800; lady's thumb, 800; night-flowering catchfly, 800; common chickweed, 300; five finger, 300; arrow-leaved tear-thumb, 400; blue vervain, 400; charlock, 300; catnip, 200; tarweed, 100; dandelion, 100; crabgrass, 100; wormseed mustard, 100; sedge sp., 100; tumbleweed, 100; Canada thistle, 100; mayweed, Amcinckia Borage family, intermedia, pepper grass, black medick, field pepper grass, penny cress.	83.6	2.5	13.9
757*	E. W. Walker, Houlton, May 19, 1906..... **Harmless,**—Timothy, 3,000; alsike clover, 10,100; white clover, 1,100. **Noxious,**—Witch grass, 300; rugel's plantain, 300; sheep sorrel, 300; slender crabgrass, 200; tumbleweed, 100; mayweed, 100; dock sp., 100; green foxtail, night-flowering catchfly, goosefoot, ribgrass, yellow foxtail, crabgrass.	97.8	.3	1.9
753*	E. W. Walker, Houlton, April 19, 1906.... **Harmless,**—Timothy, 3,600; alsike clover, 10,900; white clover, 3,500; alfalfa, 200. **Noxious,**—Dock sp., 400; slender crabgrass, 300; ribgrass, 200; rugel's plantain, 200; goosefoot, 200; green foxtail, 200; sheep sorrel, 200; mayweed, 100; bracted plantain, 100; night-flowering catchfly, 100; witch grass, pepper grass, yellow foxtail, heal-all.	96.9	.6	2.5
749*	E. W. Walker, Houlton, May 19, 1906..... **Harmless,**—Timothy, 12,900; white clover, 10,300; alsike clover, 10,500; redtop, 100. **Noxious,**—Rugel's plantain, 1,400; green foxtail, 2,000; sheep sorrel, 900; slender crabgrass, 500; ribgrass, 400; goosefoot, 300; witch grass, 200; heal-all, 100; dock sp., 100; catnip, 100; lady's thumb, 100; mayweed, 100; night-flowering catchfly, pepper grass, crabgrass, hedge mustard, tumbleweed, bracted plantain, blue vervain, Canada thistle, common chickweed.	94.7	.7	4.6

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	WHITE CLOVER. (Trifolium repens.)			
	WHITE CLOVER. (Trifolium repens.)			
541*	Mt. Desert Nurseries, Wm. Miller, Mgr., Bar Harbor, April 7, 1906 ..... **Harmless,**—Timothy, 5,600; redtop, 3,600; red clover, 800. **Noxious,**—Plantain, 21,300; pepper grass, 400; five finger, 500; sheep sorrel, 800; mayweed, 200; night-flowering catchfly, 200; dock sp., 100; shepherd's purse, 500; common chickweed, 400; stringing nettle, 100; black medick, 100; poverty weed, 200; amaranth sp., 100; Canada thistle, goosefoot, knot grass, slender crabgrass, catnip.	97.1	1.2	1.7
740*	Mt. Desert Nursery, Bar Harbor, May 5, 1906 ..... **Harmless,**—Alsike clover, 1,900; alfalfa, 1,200; redtop, 700. **Noxious,**—Sheep sorrel, 4,600; plantain, 3,400; mouse-ear chickweed, 3,600; ribgrass, 2,200; common chickweed, 800; night-flowering catchfly, 200; heal-all, 100; chickory, dock sp., shepherd's purse.	97.8	.8	1.4
739*	Mt. Desert Nursery, Bar Harbor, May 5, 1906 ..... **Harmless,**—Timothy, 3,800; alsike clover, 1,400; red clover, 400; redtop, 100; alfalfa, 100. **Noxious,**—Plantain, 2,400; sheep sorrel, 1,700; night-flowering catchfly, 300; pepper grass, 300; five finger, 200; dock sp., 200; goosefoot, 100; mayweed, shepherd's purse.	98.7	.5	.8
	ALFALFA. (Medicago sativa.)			
689	Geo. B. Haskell Co., Lewiston, Apr. 21, 1906, **Harmless,**—Red clover, 400; alsike clover, timothy. **Noxious,**—Goosefoot, 300; dock sp., 100; green foxtail, yellow foxtail, knot grass, ragweed.	99.5	.3	.2
	KENTUCKY BLUE GRASS. (Poa pratensis.)			
543*	Mt. Desert Nurseries, Bar Harbor, April 7, 1906 ..... **Harmless,**—Alsike clover, 1,000. **Noxious,**—Common chickweed, 3,800; shepherd's purse, 4,000; sheep sorrel, 1,800; pepper grass, 600; sedge sp., 1,400; compositae sp., 600.	96.7	2.6	.7
	KENTUCKY BLUE GRASS—Continued.	Per ct. Per ct.	Per ct. Per ct.	Per ct. Per ct.
744*	Mt. Desert Nurservies, Bar Harbor, May 5, 1906 ..... **Harmless,**—Timothy, 600, white clover. **Noxious,**—Sedge sp., 200; shepherd's purse, 200.	98.3	1.4	.3

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	REDTOP. (Agrostis alba vulgaris.)			
665	Belfast Grain Co., Belfast, April 12, 1906.. **Harmless,**—Timothy, 16.5 per cent of whole. **Noxious,**—Five finger, 32,200; ergot, 22,200; yarrow, 5,400; pepper grass, 800; yellow daisy, 800; American wild mint, 400; blue vervain, 400; mouse-ear chickweed, 200; sorrel, 200; plantain, 200; sedge family, 900.	77.2	5.2	17.6
696	A. M. Brown, Augusta, April 21, 1906..... **Harmless,**—Timothy, 11.6 per cent of whole; Kentucky blue grass, 400. **Noxious,**—Ergot, 93,200; five finger, 38,800; yarrow, 9,800; plantain, 7,200; moth mullein, 600; sedge sp., 400; pepper grass, 400; yellow daisy, 200; yellow wood sorrel, 200; witch grass, 200; evening primrose, 200; hedge mustard, 200; sedge family, 12,200.	79.7	5.3	15.0
699	C. M. Conant Co., Bangor, April 24, 1906.... **Harmless,**—Timothy, 9.8 per cent of whole; alsike clover, 200; white clover, 200; **Noxious,**—Yarrow, 7,400; ergot, 2,800; plantain, 1,000; American wild mint, 800; pepper grass, 800; sorrel, 800; moth mullein, 600; five finger, 400; mouse-ear chickweed, 400; shepherd's purse, 200; sedge family, 400.	81.0	8.4	10.6
587	H. Douglass & Co., Guilford, April 7, 1906.. **Harmless,**—Timothy, 136,000; red clover. **Noxious,**—Five finger, 4.6 per cent of whole; rugel's plantain, 56,200; ergot, 7,200; yarrow, 6,200; shepherd's purse, 2,400; mouse-ear chickweed, 2,200; moth mullein, 2,400; yelow daisy, 600; evening primrose, 600; blue vervain, 200; hedge mustard, 200; sedge sp., 200; pepper grass, witch grass.	81.5	6.8	11.7
707	R. B. Dunning Co., Bangor, April 24, 1906.. **Harmless,**—Timothy, 10.9 per cent of whole; Canadian blue grass, 200. **Noxious,**—Five finger, 113,600; ergot, 46,800; yarrow, 7,000; plantain, 6,600; moth mullein, 1,000; evening primrose, 800; sedge sp., 800; yellow daisy, 600; American wild mint, 400; shepherd's purse, 400; pepper grass, 400; yellow-wood sorrel, 200; mouse-ear chickweed, 200.	75.2	10.4	14.4
706	R. B. Dunning & Co., Bangor, April 24, 1906. **Harmless,**—Timothy, 11.6 per cent of whole. **Noxious,**—Ergot, 42,000; yarrow, 11,000; plantain, 800; American wild mint, 600; moth mullein, 400; five finger, 400; sorrel, 200; witch grass, 200; mouse-ear chickweed, 200; sedge, 400.	84.2	2.8	13.0

† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	REDTOP—Continued.	Per ct.	Per ct.	Per ct.
648	G. A. Dustin Co., Dexter, April 9, 1906.... **Harmless,**—Timothy, 16.1 per cent of whole; alsike clover. **Noxious,**—Five finger, 19,400; ergot, 16,000; yarrow, 4,800; grass, 600; American wild mint, 400; moth mullein, 200; yellow daisy, 200; evening primrose, 200; ribgrass, 200; sorrel, witch grass.	78.0	4.5	17.5
671	Ben D. Field, Belfast, April 12, 1906..... **Harmless,**—Timothy, 10.9 per cent of whole; Kentucky blue grass, 600; alsike clover, 200. **Noxious,**—Ergot, 56,400; five finger, 23,000; yarrow, 9,000; plantain, 1,400; sedge sp., 600; yellow daisy, 400.	83.4	3.9	12.7
590	French & Elliott, Guilford, April 7, 1906.... **Harmless,**—Timothy, 55,200; white clover, 4,600; Kentucky blue grass, 200. **Noxious,**—Ergot, 57,400; five finger, 10,400; yarrow, 6,800; rugel's plantain, 4,400; witch grass, 1,600; blue vervain, 600; sheep sorrel, 1,000; sedge sp., 400; white vervain, 1,000; evening primrose, 200; slender fescue, 400.	83.1	12.2	4.7
645	J. E. Gray, Corinna, April 10, 1906..... **Harmless,**—Timothy, 12.7 per cent of whole; alsike clover, 200. **Noxious,**—Five finger, 76,600; ergot, 67,000; yarrow, 4,600; plantain, 6,400; sorrel, 1,800; yellow daisy, 1,200; witch grass, 800; sedge sp., 600; pepper grass, 600; American wild mint, 200; hedge mustard, 200; evening primrose, 200.	75.2	8.5	16.3
688	Geo. B. Haskell Co., Lewiston, Apr. 21, 1906, **Harmless,**—Timothy, 16,200. **Noxious,**—Yarrow, 10,600; ergot, 4,200; spearmint, 2,600; mouse-ear chickweed, 1,200; hard fescue, 800; moth mullein, 200; witch grass, 200; five finger, 200.	97.1	1.7	1.2
536	Oscar Holway & Co., Auburn, Feb. 28, 1906. **Harmless,**—Timothy, 45,200; white clover, 5,600. **Noxious,**—Ergot, 27,200; five finger, 6,800; plantain, 2,800; witch grass, 1,400; sheep sorrel, 1,000; yellow daisy, 800; moth mullein, 200; sedge, 200; yarrow, 2,200.	84.6	10.3	5.2
635	Ireland Bros., Corinna, April 10, 1906..... **Harmless,**—Timothy, 12.4 per cent of whole. **Noxious,**—Five finger, 19,800; yarrow, 5,600; plantain, 1,400; yellow daisy, 600; stringing nettle, 600; common chickweed, 400; ergot, 25,600.	82.5	4.3	13.2
650	Judkins & Gilman, Newport, April 10, 1906. **Harmless,**—Timothy, 14.6 per cent of whole. Kentucky blue grass, 600; alsike	70.7	12.8	16.5

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	REDTOP—Continued. clover, 600; white clover. **Noxious,**—Five finger, 39,000; yarrow, 20,800; ergot, 8,600; plantain, 2,000; moth mullein, 1,600; mouse-ear chickweed, 1,200; sorrel, 1,800; mentha canadensis, American wild mint, 400; yellow daisy, 200; mayweed, 200; dandelion, 200; pepper grass, 200; sedge sp., 200; green foxtail, hedge mustard, shepherd's purse, blue vervain, witch grass, ox-eye daisy.	Per ct.	Per ct.	Per ct.
528	Kendall & Whitney, Portland, Feb. 20, 1906. **Harmless,**—Timothy, 15 per cent of whole. **Noxious,**—Five finger, 113,800; plantain, 16,200; stringing nettle, 1,000; careless weed, 400; witch grass, 200; blue vervain, 800; pepper grass, 400; pennyroyal, 600; moth mullein, 600.	74.2	6.2	19.6
692	Merrill Bros., Augusta, April 21, 1906..... **Harmless,**—Timothy, 6,000. **Noxious,**—Ergot, 67,400; yarrow, 3,600; plantain, 400; five finger, 200.	83.1	14.6	2.3
657	L. H. Mosher, Unity, April 11, 1906..... **Harmless,**—Timothy, 13.1 per cent of whole; alsike clover, 400; Kentucky blue grass, 200. **Noxious,**—Five finger, 80,800; ergot, 74,200; plantain, 7,800; yarrow, 5,600; witch grass, 1,200; pepper grass, 800; sorrel, 800; shepherd's purse, 600; American wild mint, 400; yellow daisy, 400; moth mullein, 400; sedge sp., 400.	74.8	7.8	17.4
742*	Mt. Desert Nurseries, Bar Harbor, May 5, 1906 ..... **Harmless,**—Timothy, 1,200. **Noxious,**—Yarrow, 8,400; mint, 200; ergot, 31,600; five finger.	96.8	2.3	.9
743*	Mt. Desert Nurseries, Bar Harbor, May 5, 1906 ..... **Harmless,**—Timothy, 8,600. **Noxious,**—Yarrow, 4,800; mint, 1,200; plantain, 400; mouse-ear chickweed, 200; ergot, 1,800; pepper grass.	97.0	2.1	.9
544*	Mt. Desert Nurseries, Bar Harbor, April 7, 1906 ..... **Harmless,**—Timothy, 800. **Noxious,**—Yarrow, 4,400; polygonum sp., 7,800; common chickweed, 1,200; ergot, 14,600.	96.8	2.1	1.1

* Not an official sample.

593	Sanders Bros. Co., Sangerville, April 7, 1906. **Harmless,**—Timothy, 12.6 per cent of whole. Kentucky blue grass, 600; white clover, 200. **Noxious,**—Ergot, 65,400; five finger, 64,800; rugel's plantain, 7,000; yarrow, 5,600; sedge sp., 600; yellow	75.7	8.4	15.9

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	REDTOP—Continued. daisy, 400; shepherd's purse, 400; American wild mint, 400; night-flowering catchfly, 400; sorrel sp., 800; dandelion, 200; moth mullein, 200; tumbleweed, 200; pepper grass, 200; blue vervain, 200; witch grass.	Per ct.	Per ct.	Per ct.
602	Sawyer & Gifford, Dover, April 7, 1906.... **Harmless,**—Timothy, 16.5 per cent of whole; red clover, 800; Kentucky blue grass, 600; alsike clover, 400. **Noxious,**—Five finger, 134,000; ergot, 41,200; yarrow, 7,400; rugel's plantain, 5,400; pepper grass, 2,600; sedge sp., 1,600; yellow daisy, 600; moth mullein, 600; mentha canadensis, 600; shepherd's purse, 400; sorrel, 400; catchfly, 400; evening primrose, 200; goosefoot, 200; dandelion, 200; blue vervain, 200.	70.1	9.5	20.4
606	Sawyer & Gifford, Dover, April 7, 1906.... **Harmless,**—Timothy, 800. **Noxious,**—Yarrow, 8,800; white vervain, 2,400; common chickweed, 400; witch grass, 200; plantain, 200; sheep sorrel, 200; ergot, 67,600.	90.4	7.1	2.5
641	F. B. Shaw, Corinna, April 10, 1906..... **Harmless,**—Timothy, 13.2 per cent of whole; Kentucky blue grass, 400. **Noxious,**—Five finger, 41,200; ergot, 31,000; yarrow, 13,200; plantain, 2,600; moth mullein, 2,000; shepherd's purse, 1,000; American wild mint, 400; pepper grass, 400; dandelion, 200; mouse-ear chickweed, sedge sp., 5,600.	73.3	12.1	14.6
660	Swan & Sibley, Belfast, April 12, 1906..... **Harmless,**—Timothy, 9.3 per cent of whole; alsike clover, 200; white clover, 200; Kentucky blue grass, 200. **Noxious,**—Ergot, 9,000; yarrow, 6,600; five finger, 4,400; sorrel, 2,000; plantain, 1,000; mouse-ear chickweed, 400; witch grass, 400; moth mullein, 200; sedge, 600.	86.4	3.5	10.1
	TIMOTHY. (Phleum pratense.)			
663	Belfast Grain Co., Belfast, April 12, 1906... **Harmless,**—Redtop, 38000; Canadian blue grass, 700;; white clover, 700; alsike clover, 300; red clover, 100; alfalfa. **Noxious,**—Five finger, 5200; rugel's plantain, 1300; evening primrose, 800; ergot, 700; yellow daisy, 400; sedge sp., 400; witch grass, 100; American wild mint, 100; goosefoot, tumbleweed, sheep sorrel, blue vervain, green foxtail, pepper grass, bitter dock.	98.2	.4	1.4
677	J. M. Bray & Son, Bucksport, April 13, 1906. **Harmless,**—Redtop, 15,400; white clover, 1,700; alsike clover, 1,300; red clover, 500; Kentucky blue grass, 200. **Noxious,**—Five	98.6	.4	1.0

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Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	TIMOTHY—Continued. finger, 1000; sheep sorrel, 600; pepper grass, 500; yellow daisy, 500; rugel's plantain, 500; evening primrose, 200; sedge sp., 100; ergot, 100; goosefoot, green foxtail, crabgrass, ribgrass, hedge mustard.	Per ct.	Per ct.	Per ct.
693	A. M. Brown, Augusta, April 21, 1906..... **Harmless,**—Redtop, 7400; white clover, 800; red clover, 200; alsike clover, 100; Kentucky blue grass, 300. **Noxious,**—Five finger, 1700; evening primrose, 400; rugel's plantain, 400; sedge sp., 200; yellow daisy, 200; blue vervain, 100; tumble weed, 100; heal-all, ergot.	99.5	.3	.2
619	F. J. Carsley, Dexter, April 9, 1906..... **Harmless,**—Redtop, 9300; alsike clover, 5500; white clover, 3700; redclover, 1500. **Noxious,**—Hedge mustard, 7800; rugel's plantain, 1700; five finger, 1500; goosefoot, 1200; mayweed, 900; pepper grass, 600; evening primrose, 500; sheep sorrel, 500; witch grass, 400; blue vervain, 200; stringing nettle, 200; tumbleweed, 100; ribgrass, 100; common chickweed, 100; bull thistle, night-flowering catchfly, heal-all, green foxtail, dock sp.	96.2	1.0	2.8
618	F. J. Carsley, Dexter, April 9, 1906..... **Harmless,**—Redtop, 9200; alsike clover, 3800; white clover, 900; red clover, 600. **Noxious,**—Five finger, 2200; rugel's plantain, 1500; evening primrose, 1200; yellow daisy, 700; stringing nettle, 500; blue vervain, 200; sheep sorrel, 100; tumble weed, 100; witch grass, 100; pepper grass.	98.5	.5	1.0
697	C. M. Conant Co., Bangor, April 24, 1906... **Harmless,**—Redtop, 1900; white clover, 400; Kentucky blue grass, 200; redclover. **Noxious,**—Rugel's plantain, 3200; five finger, 900; sedge sp., 600; witch grass, 400; crabgrass, 100; blue vervain, evening primrose, goosefoot, yellow daisy, spurge, sheep sorrel, pepper grass, green foxtail.	99.3	.4	.3
698	C. M. Conant Co., Bangor, April 24, 1906.... **Harmless,**—Redtop, 1200; white clover, 900; red clover, 300; alsike clover, 100; Kentucky blue grass, 300. **Noxious,**—Ergot, 800; sedge sp., 200; five finger, 200; pepper grass, 100; green foxtail, bitter dock, sheep sorrel.	99.5	.3	.2
540*	L. Decker & Son, Clinton, March 29, 1906... **Harmless,**—Redtop, 95100; white clover, 1600. **Noxious,**—Five finger, 8100; rugel's plantain, 2900; evening primrose, 900; yellow daisy, 700; sheep sorrel, 600; blue vervain, 500; pepper grass, 400; stringing	92.6	2.3	5.1

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Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	TIMOTHY—Continued.	Per ct.	Per ct.	Per ct.
	nettle, 600; ribgrass, 100; American wild mint, 100; mayweed, 100; goosefoot, 100; common chickweed, 200; spring leaved sow thistle, slender crabgrass.			
539*	L. Decker & Son, Clinton, March 29, 1906... **Harmless,**—White clover, 1,600; redtop, 1400. **Noxious,**—Evening primrose, 200; rugel's plantain, 100; five finger, 100; yellow daisy; pepper grass, nignt-flowering catchfly, heal-all, sheep sorrel.	99.1	.3	.6
586	H. Douglass & Co., Guilford, April 7, 1906.. **Harmless,**—Redtop, 32100; white clover, 400; alsike clover, 300; red clover, 200; Kentucky blue grass, 700. **Noxious,**—Five finger, 18500; rugel's plantain, 2100; ergot, 600; evening primrose, 600; yellow daisy, 300; goosefoot, 100; pepper grass, 100; hedge mustard, 100; green foxtail, witch grass, bracted plantain, sedge sp., dock sp.	98.7	.3	1.0
710	R. B. Dunning & Co., Bangor, April 24, 1906 **Harmless,**—Redtop, 9400; white clover, 1800; alsike clover, 1600; Kentucky blue grass, 1300; red clover, 300. **Noxious,**—Five finger, 5600; rugel's plantain, 900; yellow daisy, 800; ergot, 700; plantain, 600; evening primrose, 400; sedge sp., 300; pepper grass, 300; bitter dock, 100; yarrow, 100; night-flowering catchfly, 100; lady's thumb, 100; sheep sorrel, 100; goosefoot, 100; mouse-ear chickweed, 100; charlock, 100; pigweed, 100; witch grass, 100; ribgrass, common chickweed, green foxtail, blue vervain, hedge mustard.	98.0	1.2	.8
711	R. B. Dunning & Co., Bangor, April 24, 1906 **Harmless,**—Redtop, 2600; white clover, 500; Kentucky blue grass, 500; alsike clover, 200; red clover, 200. **Noxious,**—Evening primrose, 700; yellow daisy, 500; ergot, 500; rugel's plantain, 400; five finger, 400; blue vervain, 200; dandelion, 100; sedge sp.	99.2	.6	.2
705	R. B. Dunning & Co., Bangor, April 24, 1906. **Harmless,**—White clover, 400; red clover, 300; Kentucky blue grass, 100; redtop. **Noxious,**—Rugel's plantain, 200; ergot, 200; sedge sp., 100; dandelion, 100; pepper grass, evening primrose, heal-all.	99.5	.4	.1
632	G. A. Dustin Co., Dexter, April 9, 1906..... **Harmless,**—Redtop, 17,200; Kentucky blue grass, 1100; white clover, 1100; alsike clover, 600; red clover, 500. **Noxious,**—Five finger, 2000; plantain, 1400; yellow daisy, 700; evening primrose, 700; sedge sp., 400; ergot, 300; dandelion, 100; witch grass, 100; sheep sorrel, bitter dock, pepper grass, yellow wood sorrel, blue vervain.	97.9	1.0	1.1

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Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	TIMOTHY—Continued.	Per ct.	Per ct.	Per ct.
561	H. A. Edward, Caribou, April 4, 1906..... **Harmless,**—Redtop, 4400; white clover, 900; red clover, 400; alsike clover. **Noxious,**—Rugel's plantain, 200; yellow daisy, 100; ergot, 200; goosefoot, five finger, green foxtail, slender crabgrass, sedge sp., pepper grass, dock sp.	99.4	.4	.2
670	Ben D. Field, Belfast, April 12, 1906..... **Harmless,**—Redtop, 10200; alsike clover, 3700; white clover, 1100; Kentucky blue grass, 1200; red clover, 400. **Noxious,**—Five finger, 3600; evening primrose, 2000; rugel's plantain, 1100; yellow daisy, 900; ergot, 800; blue vervain, 300; tumble weed, 200; yellow wood sorrel, 100; sheep sorrel, 100; pepper grass, 100; witch grass, 100; mouse-ear chickweed, 100; sedge sp., goosefoot, hedge mustard.	97.8	1.0	1.2
554	A. H. Fogg Co., Houlton, April 2, 1906..... **Harmless,**—Redtop, 10,200; red clover, 600; white clover, 400. **Noxious,**—Evening primrose, 500; plantain, 300; five finger, 300; yellow daisy, 200; stringing nettle, 100; blue vervain, 100; wild lettuce, 100; ergot, 300; sheep sorrel.	99.3	.4	.3
555	A. H. Fogg Co., Houlton, April 2, 1906..... **Harmless,**—Redtop, 700; white clover, 400; red clover. **Noxious,**—Green foxtail, rugel's plantain.	99.5	.3	.2
716*	G. H. Freeman Co., Presque Isle, April 26, 1906 ..... **Harmless,**—Redtop, 300; alsike clover, 200. **Noxious,**—Evening primrose, 1500; plantain, 200; five finger, 200; pepper grass, 100; stringing nettle, blue vervain.	99.4	.2	.4
715*	G. H. Freeman Co., Presque Isle, April 26, 1906 ..... **Harmless,**—Alsike clover, 1100; red clover, redtop. **Noxious,**—Evening primrose, 100; rugel's plantain, 100; sheep sorrel, 100; witch grass.	99.6	.3	.1
589	French & Elliott, Guilford, April 7, 1906.... **Harmless,**—Redtop, 6900; white clover, 2000; red clover, 1600; Kentucky blue grass, 700; alsike clover, 600. **Noxious,**—Five finger, 3,100; rugel's plantain, 1,400; sedge sp., 500; sheep sorrel, 100; yellow daisy, 100; peppergrass, yellow wood sorrel, evening primrose, blue vervain, dock sp., ribgrass.	98.4	.8	.8
679	H. F. Gilley, Bucksport, April 13, 1906..... **Harmless,**—Redtop, 21400; alsike clover, 1600; red clover, 300; Kentucky blue grass, 700. **Noxious,**—Five finger, 5300; plantain, 1200; ergot, 1000; yellow daisy, 400;	98.1	.7	1.2

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Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	TIMOTHY—Continued.	Per ct.	Per ct.	Per ct.
	goosefoot, 400; evening primrose, 300; green foxtail, 200; pepper grass, 100; spurge, 100; blue vervain, sedge sp., bitter dock, sheep sorrel, pigweed, mayweed, heal-all, catnip, ox-eye daisy.			
604	A. W. Gilman, Foxcroft, April 7, 1906..... **Harmless,**—Alsike clover, 1500; white clover, 1100; redtop, 400; red clover, 200; Kentucky blue grass, 100. **Noxious,**—Rugel's plantain, 600; blue vervain, 600; evening primrose, 400; ergot, 200; yellow daisy, 200; five finger, 200; slender crabgrass, 100; sedge sp., sheep sorrel, peppergrass, mayweed, goosefoot, green foxtail.	99.1	.5	.4
724*	H. A. Gilman, So. Norridgewock, May 2, 1906 ..... **Harmless,**—Redtop, 15,400; white clover, 1800; red clover, 800; alsike clover, 300. **Noxious,**—Five finger, 1700; rugel's plantain, 600; yellow daisy, 500; evening primrose, 300; blue vervain, 100; sheep sorrel, 100; lady's thumb, 100; sedge sp., 200; yellow wood sorrel, 100; green foxtail, sow thistle.	98.3	.8	.9
557	Jas. H. Glenn, Caribou, April 4, 1906..... **Harmless,**—Alsike clover, 500; white clover, 300; redtop, 200; red clover, 100. **Noxious,**—Goosefoot, 100; five finger, 100; yellow daisy, 100; rugel's plantain, evening primrose, dandelion.	99.7	.1	.2
558	Jas. H. Glenn, Caribou, April 4, 1906..... **Harmless,**—White clover, 500; alsike clover, 300; redtop, 300; red clover, 100. **Noxious,**—Evening primrose, 600; yellow daisy, 100; goosefoot, 100; hedge mustard, 200; rugel's plantain, five finger, mayweed, green foxtail, dock sp., blue vervain, slender crabgrass, pepper grass.	99.6	.1	.3
738*	H. N. Goodhue, Fort Fairfield, May 4, 1906.. **Harmless,**—Redtop, 100; white clover, 100; red clover. No noxious seeds found.	99.7	.2	.1
734*	H. N. Goodhue, Fort Fairfield, May 4, 1906.. **Harmless,**—Redtop, 300; white clover, 200; alsike clover, 100; red clover, 100. **Noxious,**—Ribgrass, yellow daisy.	99.7	.2	.1
733*	H. N. Goodhue, Fort Fairfield, May 4, 1906.. **Harmless,**—Redtop, 400; alsike clover, 100; red clover. **Noxious,**—Green foxtail, evening primrose, sedge, sp.	99.5	.4	.1
643	J. E. Gray, Corinna, April 10, 1906..... **Harmless,**—Redtop, 18,900; white clover, 1200; red clover, 300; alsike clover, 300; Kentucky blue grass, 800. **Noxious,**—Five finger, 7200; rugel's plantain, 1400; goose-	97.7	1.4	.9

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Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	TIMOTHY—Continued. foot, 700; ergot, 400; yellow daisy, 300; evening primrose, 200; mayweed, 100; shepherd's purse, 100; hedge mustard, 100; dandelion, 100; pepper grass, blue vervain, heal-all, green foxtail, yellow wood sorrel, sheep sorrel, witch grass, sedge sp., slender crabgrass.	Per ct.	Per ct.	Per ct.
684	Geo. B. Haskell Co., Lewiston, April 21, 1906 **Harmless,**—Redtop, 8300; white clover, 2600; alsike clover, 1400; red clover, 500; Kentucky blue grass, 700. **Noxious,**—Rugel's plantain, 2500; five finger, 1600; ergot, 400; plantain, 400; evening primrose, 300; heal-all, 200; sheep sorrel, 200; yarrow, 100; goosefoot, 100; sedge sp., 100; yellow wood sorrel, 100; peppergrass, 100; yellow daisy, blue vervain, mayweed, witch grass, green foxtail, slender crabgrass.	98.6	.4	1.0
682	Geo. B. Haskell Co., Lewiston, April 21, 1906 **Harmless,**—Redtop, 2300; alsike clover, 400; red clover, 200; white clover, 100; Kentucky blue grass. **Noxious,**—Ergot, 300; goosefoot, 100; rugel's plantain, 100; five finger, evening primrose, pepper grass, yellow daisy.	99.4	.5	.1
681	Geo. B. Haskell Co., Lewiston, April 21, 1906 **Harmless,**—Red clover, 200; alsike clover 200; redtop 100; Kentucky blue grass, 100; white clover. **Noxious,**—Goosefoot, 100; sheep sorrel, 100; ergot, 100; mayweed, evening primrose, rugel's plantain, black medick.	99.5	.4	.1
534	Oscar Holway Co., Auburn, February 28, 1906 ..... **Harmless,**—Alsike clover, 3200; red clover, 1,100. **Noxious,**—Five finger, 13,000; plantain, 11,700; pepper grass, 1,600; sheep sorrel, 1100; blue vervain, 400; goosefoot, 300; evening primrose, 800; willow herb, 100; common chickweed, 100; marsh elder, 200; stringing nettle, 500; dodder, 100; mayweed, 200; yellow daisy, 100; yarrow, 100; black medick, 100; yellow foxtail, 400; lady's thumb, bitter dock, pale persicaria.	95.4	2.0	2.6
634	Ireland Bros., Corinna, April 10, 1906..... **Harmless,**—Redtop, 9400; alsike clover, 1200; red clover, 200. **Noxious,**—Five finger, 2900; plantain, 700; pepper grass, 400; yellow daisy, 200; evening primrose, 200; mayweed, 200; shepherd's purse, 200; green foxtail, 100; goosefoot, 100; tumbleweed, 100; blue vervain, 100; sheep sorrel, 100; stringing nettle, poverty weed.	99.1	.6	.3

† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	TIMOTHY—Continued.	Per ct.	Per ct.	Per ct.
607	Ireland Bros., Corinna, April 7, 1906..... Harmless,—Alsike clover, 700; redtop, 200. **Noxious,**—Evening primrose, 500; yellow daisy, 400; plantain, 300; witch grass, 100; common chickweed, 100; pepper grass, slender crabgrass.	99.3	.4	.3
524	Kendall & Whitney, Portland, February 20, 1906 ..... **Harmless,**—Red clover, 300. **Noxious,**—Crabgrass, 300; pepper grass, rugel's plantain, stringing nettle.	99.4	.3	.3
523	Kendall & Whitney, Portland, February 20, 1906 ..... **Harmless,**—Red clover, 700; alsike clover, 200. **Noxious,**—Common chickweed, 100; hedge mustard, 100; poverty weed, 100; careless weed, rugel's plantain, lady's thumb, bitter dock.	99.5	.3	.2
651	Judkins & Gilman, Newport, April 10, 1906. **Harmless,**—Canadian blue grass, 17,100; redtop, 13,800; alsike clover, 13,400; white clover, 4,700; red clover, 1,500; alfalfa, 100. **Noxious,**—Black medick, 1,100; five finger, 1,000; shepherd's purse, 900; hedge mustard, 800; sedge sp., 800; plantain, 700; ribgrass, 600; sheep sorrel, 500; ergot, 500; yellow daisy, 500; dandelion, 400; goosefoot, 400; green foxtail, 400; mouse-ear chickweed, 300; Canada thistle, 300; night-flowering catchfly, 300; evening primrose, 200; blue vervain, 100; pepper grass, 100; mayweed, 100; bitter dock, 100; heal-all, catnip.	94.8	.9	4.3
624	C. R. McCrellis, Dexter, April 9, 1906..... **Harmless,**—Redtop, 32400; alsike clover, 1200; Kentucky blue grass, 500; white clover, 400; red clover, 100. **Noxious,**—Five finger, 2600; rugel's plantain, 1200; ergot, 900; yellow daisy, 800; evening primrose, 400; sedge sp., 200; blue vervain, 400; sheep sorrel, 200; dandelion, ribgrass, goosefoot.	98.4	.4	1.2
613	A. J. McNaughton, Foxcroft, April 9, 1906.. **Harmless,**—Redtop, 45300; alsike clover, 2300; white clover, 700; red clover, 300; Kentucky blue grass, 500. **Noxious,**—Five finger, 2700; ergot, 1700; rugel's plantain, 1300; evening primrose, 600; yellow daisy, 500; sheep sorrel, 300; sedge sp., 200; blue vervain, 100; pigweed, 100; goosefoot, hedge mustard, dandelion, witch grass, heal-all.	97.7	.5	1.8
746*	Merrill, Runnells & Mayo Co., Waterville, May 16, 1906..... **Harmless,**—Redtop, 35100; alsike clover,	98.1	.5	1.4

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Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	TIMOTHY—Continued. 1100; white clover, 800; red clover, 100. **Noxious,**—Five finger, 5800; evening primrose, 1300; rugel's plantain, 800; sedge sp., 500; sheep sorrel, 100; blue vervain, 100; hedge mustard, 100; chicory, 100; yellow daisy, pepper grass, mayweed.	Per ct.	Per ct.	Per ct.
690	Merrill Bros., Augusta, April 21, 1906..... **Harmless,**—Redtop, 2500; red clover, 1000; alsike clover, 600; white clover, 100; Kentucky blue grass, 100. **Noxious,**—Five finger, 700; rugel's plantain, 700; evening primrose, 600; sedge sp., 500; ergot, 300; goosefoot, 100; charlock, 100; blue vervain, 100; yellow daisy, moth mullein.	99.3	.2	.5
731*	M. P. Moore, No. Anson, May 4, 1906..... **Harmless,**—Redtop, 13200; white clover, 1800; alsike clover, 1900; red clover, 1100. **Noxious,**—Five finger, 1600; plantain, 800; yellow daisy, 300; sheep sorrel, 300; evening primrose, 200; tumbleweed, 200; ribgrass, 100; witch grass, 100; goosefoot, 100; sedge sp., 100; dandelion, 100; pepper grass, blue vervain, green foxtail.	98.0	.8	1.2
654	L. H. Mosher, Unity, April 11, 1906..... **Harmless,**—Redtop, 25400; alsike clover, 700; white clover, 800; Canadian blue grass, 500; red clover, 400. **Noxious,**—Five finger, 2300; rugel's plantain, 1100; evening primrose, 1000; yellow daisy, 700; ergot, 600; pepper grass, 300;blue vervain, 400; night-flowering catchfly.	98.4	.6	.1
542*	Mt. Desert Nursery, Wm. Miller, Mgr., Bar Harbor, April 7, 1906..... **Harmless,**—White clover, 2600; redtop, 400. **Noxious,**—Witch grass, 300; pepper grass, 100; goosefoot, 100; bracted plantain, 100; sheep sorrel, 100; low amaranth.	99.2	.4	.4
580	G. W. Park, Fort Fairfield, April 5, 1906.... **Harmless,**—White clover, 1900; redtop, 1200; alsike clover, 1000; red clover, 600. **Noxious,**—Yellow daisy, 300; evening primrose, 200; rugel's plantain, 200; five finger, heal-all, night-flowering catchfly green foxtail, goosefoot, blue vervain.	99.2	.3	.5
578	G. W. Park, Fort Fairfield, April 5, 1906.... **Harmless,**—Redtop, 1600; alsike clover, 700; white clover, 100; red clover. **Noxious,**—Green foxtail, 200; charlock sp., 200; goosefoot, 100; evening primrose, 100; rugel's plantain, blue vervain, sedge sp.	99.4	.4	.2
581	G. W. Park, Fort Fairfield, April 5, 1906.... **Harmless,**—Kentucky blue grass, 300; white clover, 100; alsike clover, 100; red clover, 100; redtop, 100. **Noxious,**—Yellow	99.8	.1	.1

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	seed. Pure	Inert matter.	Foreign seeds.
	TIMOTHY—Continued.	Per ct.	Per ct.	Per ct.
	daisy, 100; tumbleweed, 100; goosefoot, 100; mayweed, 100; blue vervain, evening primrose.			
726*	T. L. Prescott, Waterville, April 10, 1906... **Harmless,**—Redtop, 4.2 percent of whole; alsike clover, 5500; white clover, 2400; red clover, 1000. **Noxious,**—Ergot, 3800; five finger, 21,600; rugel's plantain, 14,800; sheep sorrel, 2600; evening primrose, 2100; blue vervain, 1100; goosefoot, 1200; yellow daisy, 500; pepper grass, 400; witch grass, 300; dandelion, 300; hedge mustard, 300; yarrow, 200; green foxtail, 200; sedge sp., 2200; tumble weed, 100; charlock, 100; slender crabgrass, 100; common chickweed, 100; mayweed, 200; lady's thumb.	88.7	4.3	7.0
760	Sanders Bros. & Co., Sangerville, April 7, 1906 ..... **Harmless,**—Redtop, 33100; alsike clover, 1200; white clover, 1500; red clover, 300; Kentucky blue grass, 300. **Noxious,**—Five finger, 2300; rugel's plantain, 900; yellow daisy, 600; ergot, 500; evening primrose, 300; sedge sp., 300; hedge mustard, 100; sheep sorrel, 100; heal-all, 100; witch grass, 100; blue vervain, goosefoot, pepper grass, dandelion, mayweed.	98.4	.2	1.4
599	Sawyer & Gifford, Dover, April 7, 1906..... **Harmless,**—Redtop, 400; redclover, Kentucky blue grass, white clover. **Noxious,**—Evening primrose, 900; yellow daisy, 100; rugel's plantain, ergot, five finger, heal-all.	99.6	.2	.2
584	John Scales, Guilford, April 7, 1906..... **Harmless,**—Redtop, 1300; white clover, 900; alsike clover, 900; red clover, 100; Kentucky blue grass, 100. **Noxious,**—Evening primrose, 800; five finger, 500; blue vervain, 200; slender crabgrass, 100; sheep sorrel, 100; ergot, 100; yellow daisy.	99.2	.5	.3
639	F. B. Shaw, Corinna, April 10, 1906..... **Harmless,**—Redtop, 1800; white clover, 900; red clover, 800; alsike clover, 300; Kentucky blue grass, 200. **Noxious,**—Five finger, 27800; rugel's plantain, 2200; evening primrose, 1,500; goosefoot, 600; pepper grass, 300; yellow daisy, 200; sorrel, 200; lady's thumb, 100; dandelion, 100; ergot 100; green foxtail, 100; blue vervain, may weed, heal-all, bitter dock, corn cockle.	97.9	.8	1.3
628	S. L. Small, Dexter, April 9, 1906..... **Harmless,**—Redtop, 6700; white clover; 1500; Kentucky blue grass, 1500; alsike, clover, 1700; red clover, 900. **Noxious,**—Five finger, 2200; evening primrose, 2000;	98.5	.5	1.0

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† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	TIMOTHY—Continued. rugel's plantain, 1100; yellow daisy, 500; ergot, 400; sedge sp., 400; pepper grass, 300; hedge mustard, 300; blue vervain, 100; tumbleweed, witch grass, yellow wood sorrel.	Per ct.	Per ct.	Per ct.
573	A .M. Smith, Presque Isle, April 5, 1906.... **Harmless,**—Alsike clover, 600; white clover, 100, red clover. **Noxious,**—Evening primrose, 200; yellow daisy, 100; plantain, 100; dock sp., blue vervain.	99.6	.2	.2
572	A. M. Smith, Presque Isle, April 5, 1906.... **Harmless,**—Redtop, 400; alsike clover, 300; red clover, 100, white clover. **Noxious,**—Evening primrose, 1400; five finger, 100; rugel's plantain, 100; charlock, 100; green foxtail, sedge sp., goosefoot, blue vervain, witch grass, crabgrass.	99.3	.5	.2
570	M. C. Smith, Presque Isle, April 5, 1906.... **Harmless,**—Alsike clover, 800; redtop, 400; white clover, 300; red clover, 100. **Noxious,**—Yellow daisy, 500; evening primrose, 200; rugel's plantain, 200; goosefoot, 200; green foxtail, 100; witch grass, 100; heal-all, 100; pepper grass, five finger.	99.5	.3	.2
569	M. C. Smith, Presque Isle, April 5, 1906.... **Harmless,**—Alsike clover, 500; red clover, 100; white clover, 100; redtop. **Noxious,**—Evening primrose, 200; yellow daisy, 100; goosefoot.	99.6	.2	.2
547*	Soule Bros., Buxton, April 7, 1906..... **Harmless,**—Redtop, 11700; white clover, 2700. **Noxious,**—Five finger, 1500; plantain, 1300; evening primrose, 800; yellow daisy, tumbleweed, stringing nettle, blue vervain.	98.8	.4	.8
768*	Swan & Sibley, Belfast, November 1, 1906.. **Harmless,**—Alsike clover, 2900; redtop, 500; white clover, 400; red clover, 100; Kentucky blue grass. **Noxious,**—Rugel's plantain, 300; evening primrose, 300; ergot, 100; goosefoot, 100; yellow daisy, mayweed, slender crabgrass, hedge mustard.	99.3	.1	.6
769*	Swan & Sibley, Belfast, November 1, 1906.. **Harmless,**—Redtop, 80700; alsike clover, 3500; white clover, 3100; red clover, 500; Kentucky blue grass, 5200. **Noxious,**—Five finger, 21200; ergot, 3100; plantain, 3400; rugel's plantain, 3,300; sheep sorrel, 1,800; evening primrose, 1800; hedge mustard, 1200; yellow daisy, 1000; pepper grass, 700; goosefoot, 600; sedge sp., 600; witch grass, 400; mayweed, 300; dandelion, 200; white vervain, 200; shepherd's purse, 100; heal-all, 100; ribgrass, 100; yellow	93.5	2.2	4.3

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	TIMOTHY—Continued. wood sorrel, 100; blue vervain, green foxtail.	Per ct.	Per ct.	Per ct.
770*	Swan & Sibley, Belfast, November 1, 1906.. **Harmless,**—Redtop, 7900; white clover, 1300; red clover, 800; alsike clover, 200; Kentucky blue grass, 600. **Noxious,**—Five finger, 3300; rugel's plantain, 2000; ergot, 1100; yellow daisy, 900; evening primrose, 400; sedge sp., 300; goosefoot, 100; pepper grass, 100; witch grass, 100; blue vervain, hedge mustard, may weed, yellow wood sorrel, dandelion.	97.9	1.2	.9
771*	Swan & Sibley, Belfast, November 1, 1906.. **Harmless,**—Redtop, 37,400; alsike clover, 2600; red clover, 1900; white clover, 900; Canadian blue grass, 700. **Noxious,**—Five finger, 4700; rugel's plantain, 1600; sedge sp., 1200; evening primrose, 700; yellow daisy, 700; plantain, 500; blue vervain, 300; ergot, 100; dandelion, 100; may weed, 100; pepper grass, green foxtail, goosefoot.	97.0	1.0	2.0
772*	Swan & Sibley, Belfast, November 1, 1906.. **Harmless,**—Redtop, 36,400; alsike clover, 1,100; red clover, 500; white clover, 500; Kentucky blue grass, 800. **Noxious,**—Ergot, 3,700; five finger, 3,100; rugel's plantain, 2,900; yellow daisy, 1,000; pepper grass, 600; sedge sp., 500; evening primrose, 300; green foxtail, 200; moth mullein, 200; mayweed, 100; hedge mustard, 100; goosefoot, dandelion, sheep sorrel.	97.1	1.1	1.8
752*	E. W. Walker, Houlton, May 19, 1906..... **Harmless,**—Alsike clover, 100; white clover, 100; redtop. **Noxious,**—Five finger, 100; ergot, 100; blue vervain, goosefoot, sedge sp.	99.7	.2	.1
750*	E. W. Walker, Houlton, May 19, 1906..... **Harmless,**—White clover, 300; alsike clover, 200; red clover, 100. **Noxious,**—Green foxtail, 100; night-flowering catchfly, 100; sheep sorrel, 100; yellow daisy, 100; evening primrose, pepper grass.	99.5	.2	.3
748*	E. W. Walker, Houlton, May 19, 1906..... **Harmless,**—Alsike clover, 1,500; white clover, 700; redtop, 900, red clover. **Noxious,**—Plantain, 300; evening primrose, 300; five finger, 100; sedge sp., 100.	99.1	.5	.4
759*	E. W. Walker, Houlton, May 29, 1906..... **Harmless,**—Redtop, 4.7 per cent of whole; red clover, 8,200; alsike clover, 6,400; white clover, 1,900; Kentucky blue grass, 18,900. **Noxious,**—Five finger, 27,400;	84.5	5.1	10.4

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	TIMOTHY—Continued.	Per ct.	Per ct.	Per ct.
	rugel's plantain, 11,200; evening primrose, 3,400; witch grass, 900; ribgrass, 200; goosefoot, 3,500; yellow daisy, 2,900; blue vervain, 2,600; pepper grass, 1,200; American pennyroyal, 300; sedge sp., 1,000; sheep sorrel, 600; dock sp., 500; yarrow, 300; dandelion, 200; bracted plantain, 100; yellow wood sorrel, 100; crabgrass, 100; shepherd's purse, 100; slender crabgrass, 100; mayweed, 100; green foxtail, Canada thistle.			
	WOOD MEADOW.			
741*	Mt. Desert Nurseries, Bar Harbor, May 5, 1906 ..... **Harmless,**—None. **Noxious,**—Orange hawkweed, 3,400; prickly lettuce, 600; chicory, 400; corn spurry, 200; common chickweed.	98.6	.9	.5
	HUNGARIAN.			
518	Kendall & Whitney, Portland, Feb. 20, 1906. **Harmless,**—None. **Noxious,**—Lady's thumb, 400; pigweed, 200; sheep sorrel, 100; crabgrass, 900; witch grass, Pennsylvania persicaria.	99.3	.4	.3
533	Oscar Holway Co., Auburn, Feb. 29, 1906.. **Harmless,**—Timothy, 400. **Noxious,**—Crabgrass, 2,600; lady's thumb, 1,300; arrow-leaved tear thumb, 100; careless weed, 200; witch grass, 400; ragweed, 300; bull thistle, 100; goosefoot, 400; bladder ketmia, wild lettuce, blue vervain.	98.7	.4	.9
531	C. B. Cummings & Sons, Norway, February 24, 1906 ..... **Harmless,**—Timothy, 100; red clover, 100. **Noxious,**—Goosefoot, 3,000; crabgrass, 200; witch grass, 300; lady's thumb, bitter dock, arrow-leaved tear-thumb, careless weed, common chickweed, plantain, catnip.	98.9	.5	.6
596	Sanders Bros., Co., Sangerville, April 7, 1906 **Harmless,**—Red clover. **Noxious,**—Witch grass, 700; goosefoot, 700; smart weed, 200; lady's thumb, 200; slender crabgrass, 200; yellow foxtail, 100; blue vervain, crabgrass, ragweed, ribgrass.	99.3	.3	.4
633	G. A. Dustin Co., Dexter, April 9, 1906.... **Harmless,**—Alsike clover, 100. **Noxious,**—Witch grass, 2,200; crabgrass, 600; lady's thumb, 300; slender crabgrass, 100; goosefoot, 100; meadow fescue, 100; blue vervain, ragweed, pigweed.	99.1	.4	.5
661	Swan & Sibley, Belfast, April 12, 1906.... **Harmless,**—Timothy, 300. **Noxious,**—Goosefoot, 3,000; witch grass, 2,600; crabgrass, 1,300; pale persicaria, 900; lady's	98.4	.3	1.3

* Sample sent by dealer. See statement on page 2.
† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
		Per ct.	Per ct.	Per ct.
	thumb, 400; tumbleweed, 300; knot grass, 200; slender crabgrass, 100; blue vervain, 100; fireweed, ragweed, yellow foxtail.			
674	A. A. Howes & Co., Belfast, April 12, 1906.. **Harmless,**—None. **Noxious,**—Lady's thumb, 1,600; goosefoot, 1,000; crabgrass, 400; witch grass, 300; yellow foxtail.	99.1	.4	.5
	JAPANESE MILLETT.			
532	C. B. Cummings & Sons, Norway, February 24, 1906 ..... **Noxious,**—Yellow foxtail, 800; goosefoot, 100; ragweed, 100; lady's thumb, mustard.	99.2	.3	.5
529	Kendall & Whitney, Portland, Feb. 20, 1906. **Harmless,**—None. **Noxious,**—Yellow foxtail, 5,400; ragweed, 2,600; arrow-leaved tear-thumb, 200; lady's thumb, 100; flax, 100; goosefoot, 100.	94.2	0.0	5.8
	FOUR-ROWED BARLEY.			
530	C. B. Cummings Sons, Norway, February 24, 1906 ..... **Harmless,**—Oats, 300; spring wheat, 200. **Noxious,**—Corn cockle, 100; lady's thumb.	96.6	.6	2.8
	TWO-ROWED BARLEY.			
522	Kendall & Whitney, Portland, Feb. 20, 1906. **Harmless,**—Spring wheat, 100; American banner oats.	99.5	.0	.5
621	F. J. Carsley, Dexter, April 9, 1906..... **Harmless,**—American banner oats, 400; spring wheat, silver hull buckwheat. **Noxious,**—Wild buckwheat, charlock.	98.1	.0	1.9
649	Judkins & Gilman, Newport, April 10, 1906. **Harmless,**—American banner oats. **Noxious,**—Wild buckwheat, 200; charlock, 100.	99.7	.0	.3
	JAPANESE BUCKWHEAT.			
526	Kendall & Whitney, Portland, Feb. 20, 1906.	100.0	.0	.0
	AMERICAN BANNER OATS.			
662	Swan & Sibley, Belfast, April 12, 1906.... **Harmless,**—Wheat, 800.	94.6	.5	4.9
	SPRING RYE.			
520	Kendall & Whitney, Portland, Feb. 20, 1906. **Harmless,**—Spring wheat, 200; American banner oats, winter oats. **Noxious,**—Wild buckwheat, 100; flax, ragweed.	99.1	.4	.5
	SPRING WHEAT.			
521	Kendall & Whitney, Portland, Feb. 20, 1906.	100	.0	.0
	GARDEN PEA.			
667	Ben D. Field, Belfast, April 12, 1906.....	100	.0	.0
668	Ben D. Field, Belfast, April 12, 1906.....	100	.0	.0

† No number is given if there were less than 100 seeds in one pound.

Analysis of seeds. 1906.

Sample number.	Source of Sample, and Character, Kind and Number of Foreign Seeds in one Pound.†	Pure seed.	Inert matter.	Foreign seeds.
	GARDEN PEA—Continued.	Per ct.	Per ct.	Per ct.
669	Ben D. Field, Belfast, April 12, 1906.....	100	.0	.0
598	W. A. Hill, Sangerville, April 7, 1906.....	100	.0	.0
597	W. A. Hill, Sangerville, April 7, 1906.....	100	.0	.0
	CANADA FIELD PEA.			
675	A. A. Howes & Co., Belfast, April 12, 1906..	100	.0	.0
610	A. W. Gilman, Foxcroft, April 7, 1906..... **Harmless,**—Oats, 100.	99.2	.0	.8

† No number is given if there were less than 100 seeds in one pound.

A list of weed seeds found in seeds examined in 1906.

Common name.	Scientific name.
American pennyroyal.	Hedeoma pulegioides, (L) Pers.
American wild mint.	Mentha canadensis, L.
Arrow-leaved tear-thumb.	Polygonum sagittatum, L.
Bee plant.	Cleome integrifolia, Torr & Gray.
Bitter dock.	Rumex obtusifolius, L.
Black medick.	Medicago lupulina, L.
Black mustard.	Brassica nigra, Koch.
Black nightshade.	Solanum nigrum, L.
Bladder ketmia.	Hibiscus trionum, L.
Blackberry or raspberry.	Rubus sp.
Blue vervain.	Verbena hastata, L.
Blueweed.	Echium vulgare, L.
Borage family.	Amsinckia intermedia, F. & M.
Bracted plantain.	Plantago aristata, Michx.
Bull thistle.	Carduus lanceolatus, L.
Canadian bluegrass.	Poa compressa, L.
Canadian thistle.	Carduus arvensis, (L) Robs.
Careless weed.	Amaranthus hybridus, L.
Catnip.	Nepeta cataria, L.
Charlock.	Brassica sinapistrum, Boiss.
Chicory.	Cichorium intybus, L.
Common chickweed.	Alsine media, L.
Common purslane.	Portulaca oleracea, L.
Corn cockle.	Agrostemma githago, L.
Corn gromwell.	Lithospermum arvense, L.
Corn mayweed.	Matricaria inodora, L.
Corn spurrey.	Spergula arvensis, L.
Crabgrass.	Panicum sanguinale, L.
Crane's-bill.	Geranium maculatum.
Dandelion.	Taraxacum taraxacum (L) Karst.
Dodder.	Cuscuta epithymum, Bab.
English ryegrass.	Lolium perenne, L.
* Ergot (spore clusters).	
Evening primrose.	Oenothera biennis, L.

* Ergot is a disease affecting grain and grasses. The disease is very fatal to the plants attacked and ergotised grain is dangerous and sometimes fatal to man and animals.

A list of weed seeds found in seeds examined in 1906.

Common name.	Scientific name.
False flax.	Camelina sativa, (L) Crantz.
Field peppergrass.	Lepidium campestre, R. Br.
Field scorpion grass.	Myosotis arvensis.
Fire-weed.	Erigeron canadensis, L.
Five-finger.	Potentilla monspeliensis, L.
Flax.	Linum usitatissimum, L.
Goldenrod.	Solidago canadensis, L.
Goosefoot.	Chenopodium album, L.
Green foxtail.	Chaetochloa viridis, L.
Hairy stickseed.	Lappula texana, Britton.
Hard fescue.	Festuca ovina duriuscula, L.
Heal-all.	Brunella vulgaris, L.
Hedge mustard.	Sisymbrium officinale, L.
Hoarhound.	Marrubium vulgare, L.
Knot-grass.	Polygonum aviculare, L.
Lady's thumb.	Polygonum persicaria, L.
Low amaranth.	Amaranthus blitoides.
Marsh elder.	Iva xanthiifolia, (Fresen) Nutt.
Mayweed.	Anthemis cotula, L.
Meadow fescue.	Festuca elatior pratensis.
Menzie's peppergrass.	Lepidium menziesii, D. C.
Mint family.	Labiatae.
Moth mullein.	Verbascum blattaria, L.
Mouse-ear chickweed.	Cerastium vulgatum, L.
Night-flowering catchfly.	Silene noctiflora, L.
Orange hawkweed.	Hieracium aurantiacum, L.
Ox-eye daisy.	Chrysanthemum leucanthemum, L.
Pale persicaria.	Polygonum lapathifolium, L.
Pennsylvania persicaria.	Polygonum pennsylvanicum, L.
Pennycress.	Thlaspi arvense, L.
Peppergrass.	Lepidium virginicum, L.
Pigweed.	Amaranthus retroflexus, L.
Plantain.	Plantago major, L.
Poverty weed.	Iva axillaris, Pursh.
Prickly lettuce.	Lactuca scariola, L.
Prickly poppy.	Argemone hispida, Gray.
Ragweed.	Ambrosia artemisiaefolia, L.
Ribgrass.	Plantago lanceolata, L.
Rugel's plantain.	Plantago rugelii, Dec.
Rutabaga.	Brassica campestris, L.
Sheep sorrel.	Rumex acetosella, L.
Shepherd's purse.	Bursa pastoris, L.
Sedge family.	Eleocharis.
Slender crabgrass.	Panicum filiforme, L.
Slender fescue.	Festuca ovina tenuifolia.
Smartweed.	Polygonum hydropiper, L.
Sow thistle.	Sonchus oleraceus, L.
Spring-leaved sow thistle.	Sonchus asper, (L) All.
Stinging nettle.	Urtica dioica, L.
Spurge.	Euphorbia nutans, Lag.
Suckling clover.	Trifolium filiforme, L.
Switch grass.	Mentha viridis, L.
Spearmint.	Panicum virgatum, L.
Tarweed.	Madia sativa, L.
Tumbleweed.	Amaranthus albus, L.
Virginia three-seeded mercury.	Acalypha virginica.
White vervain.	Verbena urticaefolia, L.
Wild buckwheat.	Polygonum convolvulus, L.
Wild lettuce.	Lactuca spicata, Lam.
Wild turnip.	Brassica campestris, L.
Willow herb.	Epilobium adenocaulon, Haussk.
Witch grass.	Panicum capillare, L.
Worm-seed mustard.	Erysimum cheiranthoides, L.
Yarrow.	Achillea millefolium, L.
Yellow daisy.	Rudbeckia hirta, L.
Yellow foxtail.	Chaetochloa glauca, L.
Yellow rocket.	Barbarea vulgaris, R. Br.
Yellow wood-sorrel.	Oxalis corniculata, L.

FIGURE 1. Ben Davis, 14 years old, top-worked to Jonathan, May, 1904.

FIGURE 2. Tree shown in Figure 1, after 2½ years, October, 1906. The tree bore one peck of fruit. (See page —.)

BULLETIN No. 139.

ORCHARD NOTES. 1906.

W. M. Munson.

The orchard work of the season of 1906 is a continuation of that detailed in Bulletins 89, 122, and 128, and is considered in the same general way. The season of 1906 was unusual, by reason of extreme wetness previous to August 1, followed by extreme drought after that date. Despite these conditions, however, the Baldwins never before yielded such fair, smooth, handsome fruit. The Tolmans were not quite so good, and were noticeably attacked by codling moth. In addition to the usual field work at Manchester and New Gloucester, the orchards were all thoroughly pruned this season, and some notes and suggestions relative to pruning are given herewith. A study of seedling apples native to the State has also been made, and it is planned later to publish notes and descriptions of these.

CULTURE AND FERTILIZATION.*

The comparative study of cultivation and mulch, as treatment for a young bearing orchard, showed results somewhat different in the season of 1906 from those obtained the previous season. The growth of trees was essentially the same as in previous years; but the yield of fruit was, in some cases at least, better from the mulched trees. There is less tendency to deterioration, *i. e.* there are fewer dead or dying trees, among the Gravensteins on the mulched area than on the cultivated, possibly due to the fact that growth had been less vigorous, and the wood had more nearly matured previous to the recent severe winters. Little difference was noticed in this respect in the relative effects of the use of stable manure and concentrated fertilizers.

The unfertilized trees at the end of the orchard show a decided falling off. The rotting turf, which furnished nourishment for the first few years of the experiment, has been exhausted, and the trees now have the yellow, half starved appearance too common in New England orchards. Of the 11 unfertilized

* See Bulletin 122 of this Station, p. 182.

trees on the cultivated section of the orchard, 7 produced fruit this year, yielding a total of 20 baskets (10 bushels); while of the 11 unfertilized mulched trees, 4 produced fruit, yielding a total of 22 baskets (11 bushels). Of the 7 cultivated trees mentioned, however, all but one produced fruit the previous year (a total of 14 bushels); while of the 4 mulched trees only one produced fruit in 1905, (a total of 2 bushels). It should further be stated that of the mulched trees mentioned more than half of the fruit (13 baskets) came from one tree, No. 49, previously noted as particularly and unaccountably thrifty and productive. The most casual observer can but note the need of additional plant food.

On the fertilized portion of the orchard the difference between the culture and the mulch was, this year, about as 1 to 2 1-2, with the Tolmans, but was quite the opposite with the Gravensteins, the ratio being 3.4 to 1. In other words, while the average yield of 11 Tolman trees on the cultivated section was *one bushel* per tree, the average of the corresponding number of trees on the mulched section was *one barrel* per tree. Of 14 Gravenstein trees on the cultivated area, on the other hand, the average yield was 4.8 baskets as compared with 1.4 baskets on the mulched area. As a matter of fact, the difference is even more striking than this, for of the 14 cultivated trees 10 bore fruit, the minimum crop being 2 baskets and the maximum 13; while of the mulched trees but 2 bore fruit, one giving 1 1-2 baskets, and the other 10 baskets.

In comparing the yields of both Tolmans and Gravensteins for two or three seasons past, there is an apparent advantage from the use of stable manure. This advantage, which lies partly in the added amount of humus and, doubtless, partly in an actually larger amount of plant food per tree, is not sufficient, however, to pay the extra expense of hauling the manure for the considerable distance which is necessary in this, as in most orchards. Where stable manure is readily obtainable, and need not be hauled long distances, or over rough roads, there is nothing better for use in the average Maine orchard; but in very many cases the use of concentrated fertilizers is more economical, and will give equally as good results.

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† See plan of orchard Bulletin 122, this Station, p. 183.

ORCHARD RENOVATION.*

The work in the "renovation orchard" for the season of 1906 consisted of the usual plowing and harrowing, and the application of the same amounts of fertilizers as in 1905, *i. e.* two-thirds the amount given during the first three years of the experiment; or at the rate of about 133 pounds nitrate of soda, 200 pounds of muriate of potash, and 200 pounds acid phosphate per acre, in varying combinations, on the different plots.

The effect of the treatment given this orchard is visible as far as the orchard can be seen, and from a hillside one-half mile distant the different plats can readily be distinguished by reason of difference in color and vigor of foliage. On those plats from which nitrogen has been withheld, there is now a decided lack of color and a weak growth indicative of neglect; while on the plats receiving nitrogen, whether alone or in combination, a vigorous growth and rich deep green foliage are evident. On this particular hillside, nitrogen is the one thing lacking; potash and phosphoric acid, either alone or in combination, giving no better results than are found with the check trees. The plat receiving all three elements, however, is decidedly the best in the lot, although if there is any difference in soil, this is the poorest corner of the orchard.

The data given in the tables on pages 54 and 55, continued from last year,* are suggestive. As previously noted, the winters of 1903-4, and of 1904-5, were both exceptionally severe, and many trees were badly injured. While the trees under observation are making a strong effort at recovery, and, in nearly every instance, are forming new tops where the injured portions have been cut away, there was not sufficient vitality in the trees to make this recovery and to form fruit buds in the fall of 1905 for last season's crop. Hence the apparent falling off in productiveness, as shown in column five of the tables. An examination of the trees late this fall, however, indicates every prospect for a full crop again next year.

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* See Bulletin 89 of this Station, p. 18; Bulletin 122, p. 190.

* Bulletin 122 of this Station, p. 193.

Orchard Renovation—Annual Yield.

Plat and number of tree.	Yield per Tree, in Barrels.				Remarks.
	1903.	1904.	1905.	1906.	
Plat I. Tree No.					
11	4.5	1.0	2.8	0.0	
12	3.5	0.0	2.6	0.0	
13	3.5	3.3	2.4	0.0	
14	2.0	3.0	3.4	.2	
15	6.5	1.7	3.0	0.0	
21	3.0	2.8	1.9	1.4	
22	3.0	6.0	1.0	3.8	
23	4.0	1.6	3.2*	0.0	*Extra good fruit, 1905.
24	.5	3.0	.6	2.4	
25	8.5	4.0*	4.8*	0.8*	*Extra good fruit.
Check Row Tree No.					
31	3.5	6.1	.1	2.8	
32	5.0	3.9	2.1	2.2	
33	1.5	2.0*	2.1	0.0	*Extra good type.
34	1.5	4.2	0.0	0.0	
35	1.5	1.7*	1.5	0.0	*Extra good type.
Plat II. Tree No.					
41	.....	.....	...	.....	Vacant.
42	3.0	8.7	....0.0	0.0	Nearly killed, winter of 1904-5, recovering.
43	0.0	2.5	0.0	1.0	
44	3.5	4.1	0.0	0.8	
45	1.0	5.4	1.2	0.0	
51	4.5	5.9*	2.4*	1.4*	*Extra good type of fruit.
52	1.0	3.4	0.0	0.0	
53	5.0	2.7*	3.3	0.0	*Extra good type.
54	.5	4.7	0.0	0.0	
55	.5	3.7	.1	0.6	
Check Row Tree No.					
61	.....	1.5	0.0	1.0	
62	2.5	3.8	0.0	5.0*	*Extra good type.
63	1.0	4.5	.1	4.4	
64	1.0	6.4	0.0	0.0	
65	2.0	4.0	0.0	0.0	
Plat III. Tree No.					
71	5.5	.4	2.1	0.0	
72	6.5	.0	3.4	0.0	
73	1.5	.4	1.7	0.0	
74	1.0	1.5	.5	1.0	
75	0.0	.8	1.0	0.0	
81	6.0	2.9 †	1.5	1.9	†Nearly all the fruit on this plat dropped early, in 1904, remainder was soft and worthless as in April or May.
82	2.5	1.0	3.2	0.0	
83	3.5	1.5	2.6	0.3	
84	4.0	.9	4.8	0.0	
85	4.0	1.1	4.1	0.0	
Check Row Tree No.					
91	.....	3.5	.6	0.0	
92	.....	1.8	.5	0.0	
93	.....	3.0	2.3	0.0	
94	.....	5.4	3.6	0.0	
95	.....	.....	.....	.....	

Orchard Renovation—Annual Yield—Concluded.

Plat and number of tree.	Yield per Tree, in Barrels.				Remarks.
	1903.	1904.	1905.	1906.	
Plat IV. Tree No.					
16	1.5	1.3	1.0	0.0	
17	2.0	6.5*	.5	3.8*	*Extra good type.
18	.0	.4	.9	0.0	
19	0.0	2.5	.7	0.2	
20	7.0	5.8*	1.3	3.0*	*Extra good type.
26	.0	2.5	.1	0.0	
27	1.5	5.0	1.9	0.8	
28	.0	3.7	.4	0.0	
29	.0	5.1	2.3	0.0	
30	4.0	2.4	3.4	0.0	
Check Row Tree No					
36	.....	.....	.....	.....	Vacant.
37	.0	5.0	.2	1.6	
38	.0	2.4	1.0	0.0	
39	.0	5.8	.3	1.8	
40	.0	.4	.1	0.0	Almost dead.
Plat. V. Tree No.					
46	2.0	4.2	.0	0.0	
47	5.0	5.8	3.4	2.2*	*Extra good type.
48	.0	2.2	1.6	0.0	
49	.0	2.5	1.2	0.0	
50	.0	1.8	1.0	0.0	
56	.....	.....	.....	.....	Gravenstein.
57	.0	.0	.9	0.0	Tree broken; only one limb, extra fine fruit
58	.....	.....	.....	.....	Gravenstein.
59	.....	.....	.....	.....	Gravenstein.
60	.....	.....	.....	.....	Gravenstein.
Check Row Tree No.					
66	1.5	2.4	1.6	0.0	
67	2.0	2.3	.8	1.4	
68	2.5	1.3	.2	0.0	
69	.....	.....	.....	.....	Gravenstein.
70	.....	.....	.....	.....	Gravenstein.
Plat VI. Tree No.					
76	3.0	1.0	1.0	.2	
77	6.5	0.0	1.3	0.0	
78	.0	.0	.1	0.0	
79	.....	.....	.....	.....	Gravenstein.
80	.....	.....	.....	.....	Gravenstein.
86	3.0	.7	1.6*	0.0	*Also .8 bbl. Starkey on portion of tree.
87	4.0	.0	2.8	0.0	
88	3.5	2.8	3.5	1.6	†Condition of this fruit similar to that of plat 3.
89	.0	1.1	.5	0.0	
90	1.0	3.2	.9	1.1	
Check Row Tree No.					
96	.....	7.0	.0	0.0	
97	.....	2.6	1.0	0.2	
98	.....	3.4*	2.0	0.0	*Extra good fruit.
99	.....	.5	1.0	0.0	
100	.....	4.2	1.1	0.0	

Another feature worthy of note is the continued exhibition of individuality of character suggested last year.* Certain trees, as is the case with certain hens in a flock, or certain cows in a herd, are more or less uniformly productive, while others are uniformly unproductive, or are erratic. Compare, for example, Numbers 17, 20, 21, 22, 25, 32, 47, 51, 67, and 81, with 16, 28, 43, 50, 52, 54, 64, 68, 73, and 78. During the four seasons since the records have been kept, the first 10 trees, representing all of the different plots, have yielded an aggregate of *131 barrels* of fruit. During the same period the second 10 trees, representing the same plots, have produced an aggregate of *39 barrels.* Continuous records of these trees will be kept, and cions from each engrafted upon a uniform foundation stock for comparison.

Most of the trees formerly designated as bearing an "extra good type" of fruit, so far as they produced fruit at all, this year, showed the same desirable characteristics. This is particularly true of numbers 17, 20, 25, and 51. Cions from these trees, also, will be made the basis of comparison with cions from less desirable types.

It is generally believed that by selecting cions from trees of productive habit and desirable type, the character of a young orchard may be correspondingly improved; but no accurate data are available to substantiate this claim. The fact of bud variation is admitted, and the results obtained by George T. Powell,† and others, point to the practice of cion selection as one of probable importance. One of the aims of the station in conducting the work here described is, if possible, to answer definitely the questions involved.

THE TOP-WORKED ORCHARD.*

While conclusions cannot yet be drawn from the work in top-grafting, it is of interest to note that all trees of Jonathan, both those from nursery stock and those from bearing trees, bore some fruit this year. The yield was not large—1-2 peck to one peck on each tree—but for trees engrafted but 2 1-2

* Bulletin 122 of this Station, pp. 194, 195.

† Trans. Maine Pom. Soc., 1899, p. 44.

* See Bulletin 122 of this Station, pp. 198, 199.

years, the start is satisfactory. The cuts, figures 1 and 2, show the Jonathan trees as they appeared after grafting, in May, 1904, and at the time of harvest, October, 1906. None of the other varieties, Baldwin, Sutton or Spitzenburg, have yet produced fruit. The original Ben Davis trees, left for comparison, produced from 1 to 2 bushels of fruit each.

The early part of the season was so very wet that cultivation of this orchard was impossible in 1906. Accordingly neither culture nor fertilizers were applied. The witch grass, which is very abundant here, grew luxuriantly and was mown, in August, and left upon the ground. In 1907 the usual clean culture will be practiced and fertilizers at the rate of 500 pounds per acre will be applied.

COVER CROPS.†

The chief advance made in the work with cover crops during the past year, has been the practical demonstration of the value of rye and spring vetch for such purposes in a region where they had not hitherto been used. On a dry, rather steep hillside, on the farm of Mr. John W. True, in New Gloucester, stands a thrifty young Ben Davis orchard, which is just coming into full bearing. This orchard is thoroughly enriched every year, either with stable manure or with concentrated fertilizers, and besides growing some very thrifty trees, has for several years produced alternate crops of silage corn and of potatoes.

In the late summer of 1905, at the time of the last cultivation of the silage corn, this orchard was divided into 3 plats, upon the first of which spring vetch was sown at the rate of 1 1-2 bushels per acre; upon the second winter rye, at the same rate; and upon the third or check plat no cover crop was used. Owing to the shade of the growing corn, the vetch plants made but little growth and a poor stand was secured. The rye, while weak and drawn at the time the corn was cut, thickened and made a good cover before the close of the season.

On May 12 the orchard was inspected and it was found that the upper plat, upon which vetch had been sown, was but slightly protected and that gullies, in some places a foot deep, had been washed between the trees. The second plat, on which

† See Bulletin 122 of this Station, p. 201-203.

the rye was used as a cover crop, showed no tendency to form gullies, and the land was left in good condition. The line between the two plats was sharply drawn by the protecting action of the rye. Below, on the check plat, the washing commenced again, and the soil was left as in the first plat. In some cases a regular network of roots was exposed to sun and drying winds. On May 15 the whole orchard was plowed, and no ill effects consequent upon growing a spring crop upon the dry hillside followed.

While not of scientific importance, this demonstration of a principle which has so frequently been urged by the Experiment Station has done more than mere words and reports can ever do to induce practical farmers to follow the method suggested, and thus prevent alike the washing of cultivated hillsides in winter, and the drying out of the land by leaving the cover crop too late in the spring.

SPRAYING NOTES.

Owing to the unusually favorable conditions during the past few seasons, the practice of spraying orchards for insect and fungous pests has been somewhat neglected. Apple scab, formerly so destructive, has given very little trouble, and Maine has not to contend with the dreaded bitter rot of the South and West. At no time for the past 10 years, however, has the codling moth been so abundant as in 1906, and it is reasonable to expect even greater trouble next season; while a warm, moist spring is almost certain to develop a serious outbreak of apple scab.

As repeatedly shown by the publications of this Station, both the scab and the insect pests—codling moth, canker worm, bud moth, and tent caterpillars—may readily be held in check by a timely and thorough spraying with Bordeaux mixture and Paris green, or Bordeaux mixture and arsenate of lead. As a matter of insurance, therefore, wherever it is possible, every orchard should be sprayed in April, before the buds open, again just before the blossoms open, and at least once after the fruit sets. If any application is to be omitted let it not be the first one, as experience has shown that this application is specially valuable in checking apple scab, while this is also the time—and the only possible time—to fight the bud moth.

The fact of the financial gain to be derived from rational spraying is no longer in doubt. Therefore, experiments by the Station along this line are unnecessary. A circular of information, "How to Fight Apple Enemies," will be sent to anyone interested in the matter, however.

DWARF PEARS.

Owing to the natural conditions in northern New England, little attention has been given to the growing of dwarf fruits. Considerable interest is evinced in the subject, however, and inquiries concerning the merits of the dwarfs are frequently received.

The experiment station of a neighboring state is making a somewhat extended study of dwarf fruits, including apples, pears, and others, and results of these trials are awaited by the fruit growers of all New England.

For purposes of demonstration and study a small orchard of dwarf pears was planted at the Station in 1903. This orchard, consisting of 100 trees, is not yet in bearing; though some of the trees blossomed in 1906. The following varieties are included in the orchard, 5 to 10 trees of each being planted: Koonce, Angouléme, Flemish Beauty, Seckel, Manning Elizabeth, Howell, Louise Bonne of Jersey, Anjou, Lincoln, Mount Vernon. Besides these, 2 trees each of Fame, King Karl, and Triumph, have been received for trial. Most of the trees are making a vigorous growth, and give every indication of making a valuable addition to the Station's collection of fruits.

While for most commercial purposes the standard pears are usually preferred to the dwarfs, the latter are often desirable for amateur uses, or in special locations where but a small amount of land is available. Among the advantages of the dwarfs are: Small size, and consequent large number of trees that may be grown upon a given area; habit of early bearing; adaptation to unfavorable soil conditions; ease of caring for the trees and of harvesting the crop. One of the best dwarf pear orchards in the country is more than 50 years old, and the trees have been so managed that all of the fruit may still be harvested from a step ladder. The trees may be planted 8 feet apart each way, cutting out alternate rows in each direction as they begin to crowd.

As a rule, dwarf pears will come into bearing at from 3 to 5 years from planting; the check to growth, resulting from the slow growing quince roots, having the usual effect of inducing fruit production. Heavy clay soils, if well drained, will sustain the quince roots, and produce vigorous healthy trees; while on pear roots the results would often be unsatisfactory. Care must be used in planting, however, and the annual growth must be cut back at least one-half every year. The ease of managing these small trees, and of harvesting the fruit is self evident.

Despite the attractive features of the dwarfs, in very many cases only failure and disappointment will result from their use. That this failure is, in many cases, preventable, is shown by the results in the Station orchard.

The requisites to success in the management of dwarf pears may be briefly summarized as follows. (1) Set with care, on well drained soil, digging large deep holes, and setting the trees so that the point of union between the cion and the quince root is at least 4 or 5 inches below the surface of the ground, when the holes are filled. (2) Prune the tops back to mere stubs at time of setting, and each year remove at least half of the annual growth. This annual pruning may be done at any time in the late fall, winter, or early spring. (3) Cut, at least a foot below point of apparent injury, and burn *at once,* every branch that shows indications of pear blight. (4) Spray, at least 3 times during the season, with Bordeaux mixture and arsenate of lead as indicated in the circular if information, "How to Fight Apple Enemies."

PRUNING NOTES.

One of the most important characteristics of any plant is the fact that its various parts are unlike; that each branch is, in a measure, independent and capable of becoming a new individual. On this fact rests the whole philosophy of the pruning of plants.

A tree is essentially a colony of individuals. Every branch is endeavoring to do what every other branch does,—that is, to bear leaves, flowers and fruit. So every branch competes with every other branch, and there are more branches, or germs of branches—buds—than can possibly be supported upon any tree. There is, then, a struggle among the branches; all are not necessary to the life of the tree and the removal of the useless

ones will serve to the improvement of the remaining ones. In other words, pruning is a necessity, and the pruning given by nature in a neglected orchard or forest is more severe than the average man would dare to attempt.

It is often urged that pruning should be commenced when the tree is planted and continued annually throughout the life of the tree. It may be a question, if a proportionate amount of time is really saved, however, or a better growth of the trees secured, by early pruning. In other words, it is doubtful whether equally good or better results may not be obtained by removing superfluous branches at 4, 5, or 6 years of age, rather than by severe pruning very early in the lifetime of the tree. This question is under consideration at the Experiment Station at the present time.

Owing to the natural balance between the foraging capacity of the plant and its superficial growth, if the root system of a tree is active and effective, the top will be correspondingly large. If a large part of the top is removed, there is at once an endeavor to restore the balance by an unusually rapid growth, and the development of a large number of dormant buds in the form of "water sprouts." Pruned trees are almost always more vigorous than unpruned ones, because the food taken up by the roots is concentrated into a smaller number of branches. Pruning must, in a measure, then, have the same effect as manuring, since the stimulating effect of the new growth must be felt in a reflex manner upon the root system also, causing a rapid extension into new foraging grounds. If, then, in combination with the stimulative pruning, the new foraging grounds reached are provided with suitable plant food for the nourishment of the trees, the best possible conditions for rapid development are provided.

A common, though erroneous, notion is that the removal of large limbs from a tree is necessarily injurious. In the practical operations of orcharding, as is well known, the removal of large limbs is frequently a necessity. A plant is largely what food supply and other environments make it. The removal of a portion of it, therefore, cannot be injurious unless the portion cut away is so great as to interfere with the nutrition of the remaining parts. The vitality of a plant is largely determined

by the conditions under which it grows—the soil, the surroundings, the treatment. Other things being equal, therefore, so far as an injurious effect upon the tree is concerned, it makes little difference whether a large limb or numerous individual small limbs are removed in the process of pruning. It is always advisable, however, to paint the wounds made by the removal of large limbs, and thus exclude the spores of parasitic diseases which may cause decay and death of the tree.

It is astonishing to find how little the average orchardist thinks, when pruning his trees, of the actual problems at issue. The important effect of pruning upon the vigor of the tree has already been suggested. Pruning is also practiced to produce larger and better fruits and flowers; to keep the plant within manageable limits; to remove superfluous or injurious parts; to facilitate spraying, tillage, and harvesting; to train the plant to some desired form. One of the noticeable effects of severe pruning, and the consequent disturbed equilibrium of the plant, is the formation of water sprouts. The appearance of the water sprouts seems to be influenced more by the vigor of the plant and the amount of pruning than by the season of the year in which the pruning is done. It is probable, however, that fewer water sprouts will arise if pruning is done after midsummer, since at that time the growth of the season is completed. In any case, water sprouts may be regarded as weeds in the tree top and should usually be treated as such. In some cases, however, in old trees with long, bare limbs, a few of these sprouts may well be left as a protection to the limbs and as an aid in harvesting. In a few years these sprouts will usually develop into bearing branches,—although there is a common notion that water sprouts never bear fruit.

The tendency of plants is to grow from the uppermost buds. By pruning in one way this tendency is augmented, in another way it is checked. As a rule, in dealing with fruit trees, the latter end is desired, since the principle that "checking growth induces fruitfulness" is universally recognized. The heading in of young growths tends to develop lateral and dormant buds, or to thicken the top; so that the question of heading resolves itself into a question of personal ideals. To secure thick topped trees, heading is necessary. It has, however, the further very marked advantage of inducing the development of fruit buds

near the body of the tree, rather than far out on the limbs. This, in the case of plums and other tender wooded plants, is an important consideration.

Fruit bearing is determined more by habitual performance, and by the condition of the plant, than by the kind and extent of pruning. In other words, it is to a certain extent an individual characteristic, as pointed out on page 56. Pruning, however, may be made a means of thinning the fruit, and thus improving both the size and quality of that which remains, by removing superfluous shoots upon which fruit buds are borne.

But here it is important that the operator should know the manner in which the plant bears its flower buds. Heading back the annual growth thins peaches, quinces, raspberries, blackberries, black currants, and to a certain extent red and white currants and grapes, all of which develop flower buds on the wood of the last season. With the apple, pear and plum, which produce fruit on spurs or miniature branches, on wood of more than one season's growth, older limbs must, of course, be removed in order to effect the desired thinning.

Pruning, by thinning the fruit, may have a very important, though indirect, effect in controlling the bearing year of plants. If an individual fruit spur be carefully studied it will be seen that there is usually an alternation in fruit bearing, for the reason that demands made by the fruit are so great that the fruit bud cannot develop the same year. In the bearing year the leaf bud develops to continue the spur the following year, and in the following or barren year, the fruit bud is again developed for the succeeding year. Fruit bearing on alternate years is, then, largely a question of food supply. To make a tree bear every year it is necessary either to supply more food material or to remove a portion of the fruit. The latter alternative may be accomplished by pruning.

Since in large fruits one spur usually bears one fruit, the alternate bearing of individual spurs will continue, and it will be necessary to remove all of the fruit from individual spurs, thereby allowing a portion of the spurs to bear one year and others the next. It is doubtful, however, if any amount of thinning can produce an annual bearing habit unless the trees receive other necessary good care. It is probable that the better

course to pursue, in attempting to get fruit every year, is to change the bearing year of entire plants throughout the orchard and allow these to bear one year and others the next. It is not to be understood that these results will always follow, but the tendency is in the direction indicated.

The season in which pruning is done has some influence on fruit bearing, since winter pruning tends to produce wood while summer pruning does not. The healing of the wound is, however, but slightly affected by the season in which the cut is made. Theoretically, the best time to make the cut, so far as healing is concerned, is in the early part of the season, since the healing process then begins without delay. More work can be accomplished in the longer, warmer days of April and May, but many prefer to go through the orchard on the crust of a deep snow.

Too much emphasis cannot be laid upon the importance of the manner of severing limbs. The wound made by removing the limb heals best if the cut is made close to the trunk or branch. A stub two or three inches long seldom or never heals, and becomes a lodging place for spores of fungi and bacteria which cause decay and death of the tree. Wounds of any considerable size should be given a coating of paint or some other suitable substance. A suitable dressing must contain two distinct properties. It must check the weathering of the wound and prevent the growth of bacteria and fungi, and it must be of such a nature as not to injure the surrounding bark. The dressing is of no value in the healing of the wound, except that it prevents decay.

For general purposes a pure white lead paint is satisfactory. It is an antiseptic and it adheres closely to the wood. Wax, shellac, tallow, etc., are lacking in these respects. Bordeaux mixture would be an admirable material for these purposes were it more durable.

BULLETIN No. 140.

FERTILIZER INSPECTION.

CHAS. D. WOODS, Director.

J. M. BARTLETT, Chemist in Charge of Inspection Analyses.

The law regulating the sale of commercial fertilizers in this State calls for two bulletins each year. The first of these contains the analyses of the samples received from the manufacturer, guaranteed to represent, within reasonable limits, the goods to be placed upon the market later. The second bulletin contains the analyses of the samples collected in the open market by a representative of the Station.

In the tables which follow the discussion there are given the results of the analyses of the manufacturers' samples of licensed brands. The tables include all the brands which have been licensed to March 1, 1907. Dealers are cautioned against handling any brands not given in this list without first writing the Station.

The figures which are given as the percentages of valuable ingredients guaranteed by the manufacturers are the minimum percentages of the guarantee. If, for instance, the guarantee is 2 to 3 per cent of nitrogen, it is evident that the dealer cannot be held to have agreed to furnish more than 2 per cent, and so this percentage is taken as actual guarantee. The figures under the head of "found" are those showing the actual composition of the samples.

FERTILITY AND PLANT FOOD.

To produce profitable crops and at the same time to maintain and even to increase the productive capacity of the soil may rightly be termed "good farming." Many farmers are able to do this, and the knowledge of how to do it has been largely acquired through years of experience, during which the character of the soil, its adaptability for crops, and the methods of its management and manuring have been made the subjects of careful study, without, however, any definite and accurate knowledge concerning manures and their functions in relation to soils and crops. Those who desire to study these questions, are

invited to write the Dean of the College of Agriculture, University of Maine, Orono, Maine, who will gladly send a list of suitable books and give full information relative to corespondence courses on this subject.

Soils vary greatly in their capabilities of supplying food to crops. Different ingredients are deficient in different soils. The way to learn what materials are proper in a given case is by observation and experiment. The rational method for determining what ingredients of plant-food a soil fails to furnish in abundance, and how these lacking materials can be most economically supplied, is to put the questions to the soil with different fertilizing materials and get the reply in the crops produced. How to make these experiments is explained in Circular No. 8 of the Office of Experiment Stations of the U. S. Department of Agriculture. A copy of this circular can be had by applying to the Secretary of Agriculture, Washington, D. C.

The chief use of fertilizers is to supply plant-food. It is good farming to make the most of the natural resources of the soil and of the manures produced on the farm, and to depend upon artificial fertilizers only to furnish what more is needed. It is not good economy to pay high prices for materials which the soil may itself yield, but it is good economy to supply the lacking ones in the cheapest way. The rule in the purchase of costly commercial fertilizers should be to select those that supply, in the best forms and at the lowest cost, the plant-food which the crop needs and the soil fails to furnish.

Plants differ widely with respect to their capacities for gathering their food from soil and air; hence the proper fertilizer in a given case depends upon the crop as well as upon the soil. The fertility of the soil would remain practically unchanged if all the ingredients removed in the various farm products were restored to the land. This may be accomplished by feeding the crops grown on the farm to animals, carefully saving the manure and returning it to the soil. If it is practicable to pursue a system of stock feeding in which those products of the farm which are comparatively poor in fertilizing constituents are exchanged in the market for feeding stuffs of high fertilizing value, the loss of soil fertility may be reduced to a minimum, or there may be an actual gain in fertility.

Constituents of Fertilizers.*

The only ingredients of plant-food which we ordinarily need to consider in fertilizers are potash, lime, phosphoric acid, and nitrogen. The available supply of lime is often insufficient; hence one reason for the good effect so often observed from the application of lime, and of plaster, which is a compound of lime and sulphuric acid. The remaining substances, nitrogen, phosphoric acid and potash, are the most important ingredients of our common commercial fertilizers, both because of their scarcity in the soil and their high cost. It is in supplying these that phosphates, bone manures, potash-salts, guano, nitrate of soda, and most other commercial fertilizers are chiefly useful.

The term "form" as applied to a fertilizing constituent has reference to its combination or association with other constituents which may be useful, though not necessarily so. The form of the constituent, too, has an important bearing upon its availability, and hence upon its usefulness as plant food. Many materials containing the essential elements are practically worthless as sources of plant-food because the form is not right; the plants are unable to extract them from their combinations; they are "unavailable." In many of these materials the forms may be changed by proper treatment, in which case they become valuable not because the element itself is changed, but because it then exists in such form as readily to feed the plant.

Nitrogen is the most expensive of the three essential fertilizing elements. It exists in three different forms, organic nitrogen, ammonia and nitrate.

Organic nitrogen exists in combination with other elements either as vegetable or animal matter. All materials containing organic nitrogen are valuable in proportion to their rapidity of decay, because change of form must take place before the nitrogen can serve as plant food. Organic nitrogen differs in availability not only according to the kind of material which supplies it, but according to the treatment it receives. The nitrogen in the

* Farmers Bulletin 44 of the U. S. Dept. of Agriculture. "Commercial Fertilizeres, Composition and Use," can be had free by applying to your Congressman. Bulletin 107, Home Mixed Fertilizers, of this Station will be sent on application.

tables of analyses marked "insoluble in water" is organic nitrogen.

Nitrogen as ammonia usually exists in commercial manures in the form of sulphate of ammonia and is more readily available than organic nitrogen. While nitrogen in the form of ammonia is extremely soluble in water, it is not readily removed from the soil by leaching, as it is held by the organic compounds of the soil.

Nitrogen as nitrate exists in commercial products chiefly as nitrate of soda. Nitrogen in this form is directly and immediately available, no further changes being necessary. It is completely soluble in water, and diffuses readily throughout the soil. It differs from the ammonia compounds in forming no insoluble compounds with soil constituents and may be lost by leaching. The "Nitrogen soluble in water" of the tables includes both the nitrogen as ammonia and as nitrate.

Phosphoric acid is derived from materials called phosphates, in which it may exist in combination with lime, iron, or alumina as phosphates of lime, iron or alumina. Phosphate of lime is the form most largely used as a source of phosphoric acid. Phosphoric acid occurs in fertilizers in three forms: That soluble in water and readily taken up by plants; that insoluble in water, but still readily used by plants, also known as "reverted;" and that soluble only in strong acids and consequently very slowly used by the plant. The "soluble" and "reverted" together constitute the "available" phosphoric acid. The phosphoric acid in natural or untreated phosphates is insoluble in water, and not readily available to plants. If it is combined with organic substance, as in animal bone, the rate of decay is more rapid than if with purely mineral substances. The insoluble phosphates may be converted into soluble forms by treatment with strong acids. Such products are known as acid phosphates or superphosphates. The "insoluble phosphoric acid" of a high cost commercial fertilizer has little or no value to the purchaser because at the usual rate of application the quantity is too small to make any perceptible effect upon the crop, and because its presence in the fertilizer excludes an equal amont of more needful and valuable constituents.

Potash in commercial fertilizers exists chiefly as muriates and sulphates. With potash the form does not exert so great an

influence upon availability as is the case with nitrogen and phosphoric acid. All forms are freely soluble in water, and are believed to be nearly if not quite equally available as food. The form of the potash has an important influence upon the quality of certain crops. For example, the results of experiments seem to indicate that the quality of tobacco, and certain other crops is unfavorably influenced by the use of muriate of potash, while the same crops show a superior quality if materials free from chlorides have been used as the source of potash.

Valuation of Fertilizers.

The agricultural value of any fertilizing constituent is measured by the value of the increase of the crop produced by its use, and is, of course, a variable factor, depending upon the availability of the constituent, and the value of the crop produced. The form of the materials used must be carefully considered in the use of manures. Slow-acting materials cannot be expected to give profitable returns upon quick growing crops, nor expensive materials profitable returns when used for crops of relatively low value.

The agricultural value is distinct from what is termed "commercial value," or cost in market. This last is determined by market and trade conditions, as cost of production of the crude material, methods of manipulation required, etc. Since there is no strict relation between agricultural and commercial or market value, it may happen that an element in its most available form, and under ordinary conditions of high agricultural value, costs less in market than the same element in less available forms and of a lower agricultural value. The commercial value has reference to the material as an article of commerce, hence commercial ratings of various fertilizers have reference to their relative cost and are used largely as a means by which the different materials may be compared.

The commercial valuation of a fertilizer consists in calculating the retail trade-value or cash-cost at freight centers (in raw material of good quality) of an amount of nitrogen, phosphoric acid and potash equal to that contained in one ton of the fertilizer. Plaster, lime, stable manure and nearly all of the less expensive fertilizers have variable prices, which bear no close relation to their chemical composition, but guanos, superphos-

phates, and similar articles, for which $20 to $45 per ton are paid, depend for their trade value exclusively on the substances, nitrogen, phosphoric acid and potash, which are comparatively costly and steady in price. The trade-value per pound of these ingredients is reckoned from the current market prices of the standard articles which furnish them to commerce. The consumer, in estimating the reasonable price to pay for high-grade fertilizers, should add to the trade-value of the above-named ingredients a suitable margin for the expenses of manufacture, etc., and for the convenience or other advantage incidental to their use.

For many years this Station has not printed an estimate of the commercial value of the different brands licensed in the State. If anyone wishes to calculate the commercial value he can do so by using the trade values adopted for 1907 by the Experiment Stations of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, Rhode Island and Vermont. These valuations represent the average retail prices at which these ingredients could be purchased during the three months preceding March 1, 1907, in ton lots at tide water in the states named. On account of the greater distance from the large markets the prices for Maine at tide water would probably be somewhat higher than those quoted.

TRADE VALUES OF FERTILIZING INGREDIENTS FOR 1907.

	Cents per pound.
Nitrogen in nitrates	18½
in ammonia salts	17½
Organic nitrogen in dry and fine ground fish, meat and blood, and in mixed fertilizers	20½
in fine bone and tankage	20½
in coarse bone and tankage	15
Phosphoric acid, water-soluble	5
cirate-soluble	4½
in fine ground bone and tankage	4
in coarse bone and tankage	3
in cotton seed meal, castor pomace and ashes	4
in mixed fertilizers, if insoluble in ammonium citrate	2

Potash as high grade sulphate and in forms free from muriate or chlorides	5
as muriate	4¼

The commercial valuation will be accurate enough as a means of comparison if the following rule is adopted:

RULE FOR CALCULATING VALUATION OF FERTILIZERS.

The commercial valuation will be accurate enough as a means of comparison if the following rule is adopted:

Multiply 4.1 by the percentage of nitrogen.

Multiply 0.9 by the percentage of available phosphoric acid.

Multiply 0.4 by the percentage of insoluble phosphoric acid.

Multiply 1.0 by the percentage of potash.

The sum of these 4 products will be the commercial valuation per ton on the basis taken.

Illustration. The table of analyses shows a certain fertilizer to have the following composition: Nitrogen 2.00 per cent; Available phosphoric acid 8.50 per cent; Insoluble phosphoric acid 3.50 per cent; Potash 3.25 per cent. The valuation in this case will be computed thus:

Nitrogen,	4.1×2.00,	$8 20
Available phosphoric acid,	0.9×8.50,	7 65
Insoluble phosphoric acid,	0.4×3.50,	1 40
Potash,	1.0×3.25,	3 25
		$20 50

Since this rule assumes all the nitrogen to be organic and all the potash to be in the form of the sulphate, it is evident that the valuations thus calculated must not be taken as the only guide in the choice of a fertilizer. In every case the farmer should consider the needs of his soil before he begins to consider the cost. In many instances a little careful experimenting will show him that materials containing either nitrogen, potash, or phosphoric acid alone will serve his purpose as fully as a "complete fertilizer," in which he must pay for all three constituents, whether needed or not.

Descriptive List of Manufacturers' Samples, 1907.

Station number.	Manufacturer, place of business and brand.
	AMERICAN AGRICULTURAL CHEMICAL CO., NEW YORK, N. Y.
1717	A. A. C. Co's Aroostook Complete Manure
1718	A. A. C. Co's Aroostook High Grade
1719	A. A. C. Co's Northern Maine Potato Special
1720	Bradley's Alkaline Bone with Potash
1721	Bradley's Complete Manure for Potatoes and Vegetables
1722	Bradley's Complete Manure with 10 per cent Potash
1723	Bradley's Corn Phosphate
1724	Bradley's Eureka Fertilizer
1725	Bradley's Niagara Phosphate
1726	Bradley's Potato Fertilizer
1727	Bradley's Potato Manure
1728	Bradley's X. L. Superphosphate of Lime
1729	Clark's Cove Bay State Fertilizer
1730	Clark's Cove Bay State Fertilizer G. G.
1731	Clark's Cove Bay State Fertilizer for Seeding Down
1732	Clark's Cove Defiance Complete Manure
1733	Clark's Cove Great Planet Manure AA
1734	Clark's Cove King Phillip Alkaline Guano
1735	Clark's Cove Potato Fertilizer
1736	Clark's Cove Potato Manure
1737	Cleveland Fertilizer for all Crops
1738	Cleveland High Grade Potato Manure
1739	Cleveland Potato Phosphate
1740	Cleveland Seeding Down Fertilizer
1741	Cleveland Superphosphate
1742	Complete Manure with 10 per cent Potash
1743	Crocker's Ammoniated Corn Phosphate
1744	Crocker's Aroostoook Potato Special
1745	Crocker's Grass & Oats Fertilizer
1746	Crocker's High Grade
1747	Crocker's New Rival Ammoniated Superphosphate
1748	Crocker's Potato, Hop and Tobacco
1925	Crocker's Special Potato Manure
1749	Cumberland Potato Fertilizer
1750	Cumberland Seeding Down Manure
1751	Cumberland Superphosphate
1752	Darling's Blood, Bone and Potash
1753	Fine Ground Bone
1754	Grass and Lawn Top Dressing
1755	Great Eastern General
1756	Great Eastern Grass and Oats Fertilizer
1757	Great Eastern High Grade Potato Manure
1758	Great Eastern Northern Corn Special
1759	Great Eastern Potato Manure
1760	Great Eastern Potato Special

Analysis of Manufacturers' Samples, 1907.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
			Total.					Available.		Total.			
	Soluble in water.	Insoluble in water.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
1717	1.01	1.40	2.41	2.47	3.08	3.20	2.00	6.28	6.00	8.28	-----	10.04	10.00
1718	2.88	1.62	4.50	4.12	4.31	2.21	2.83	6.52	7.00	9.35	-----	7.60	7.00
1719	2.42	1.98	4.40	3.70	5.31	2.09	1.53	7.40	7.00	8.93	-----	9.85	10.00
1720	-----	-----	-----	-----	5.34	4.18	3.64	9.52	11.00	13.16	12.00	2.49	2.00
1721	2.57	1.37	3.94	3.30	5.49	2.08	2.72	7.57	8.00	10.29	9.00	6.52	7.00
1722	1.99	1.31	3.30	3.30	3.59	3.19	2.44	6.78	6.00	9.22	7.00	11.20	10.00
1723	0.66	1.42	2.08	2.06	7.05	2.55	2.56	9.60	8.00	11.16	10.00	2.01	1.50
1724	0.11	1.06	1.17	1.03	5.93	2.35	1.55	8.28	8.00	9.83	10.00	2.32	2.00
1725	0.40	0.64	1.04	.82	5.41	3.15	1.38	8.56	7.00	9.94	8.00	1.49	1.00
1726	1.64	0.62	2.26	2.06	5.85	1.89	2.67	7.74	8.00	10.41	10.00	3.13	3.00
1727	1.29	1.44	2.73	2.50	5.42	0.79	2.48	6.21	6.00	8.69	8.00	4.96	5.00
1728	1.45	1.13	2.58	2.50	6.62	2.54	3.25	9.16	9.00	12.41	11.00	2.34	2.00
1729	1.45	1.07	2.52	2.50	6.67	2.39	3.59	9.06	9.00	12.65	11.00	2.34	2.00
1730	1.58	0.74	2.32	2.06	5.42	2.39	3.32	7.81	8.00	11.13	10.00	1.85	1.50
1731	0.41	0.74	1.45	1.03	5.93	2.80	2.42	8.73	8.00	11.15	10.00	2.57	2.00
1732	0.40	0.68	1.08	.82	5.24	2.74	1.48	7.98	7.00	9.46	8.00	1.59	1.00
1733	1.88	1.52	3.40	3.30	5.20	3.01	1.96	8.21	8.00	10.17	9.00	7.43	7.00
1734	0.43	0.68	1.11	1.03	5.71	2.67	1.47	8.38	8.00	9.85	10.00	2.12	2.00
1735	1.76	0.56	2.32	2.06	5.92	1.98	2.74	7.90	8.00	10.64	10.00	3.30	3.00
1736	0.56	2.11	2.67	2.50	3.96	3.03	3.49	6.99	6.00	10.48	8.00	5.59	5.00
1737	0.34	0.72	1.06	1.03	5.50	2.87	2.60	8.37	8.00	10.97	10.00	2.30	2.00
1738	2.32	1.33	3.65	3.30	5.63	2.11	2.69	7.74	8.00	10.43	9.00	6.74	7.00
1739	1.63	0.56	2.19	2.06	6.06	1.74	2.73	7.80	8.00	10.53	10.00	3.17	3.00
1740	0.11	1.06	1.17	1.03	5.79	2.89	1.27	8.68	8.00	9.95	10.00	2.20	2.00
1741	0.66	1.40	2.06	2.06	7.17	2.35	2.62	9.52	8.00	12.14	10.00	2.03	1.50
1742	1.99	1.46	3.45	3.30	4.31	1.95	2.07	6.26	6.00	8.33	7.00	9.55	10.00
1743	0.26	2.06	2.32	2.06	4.52	3.65	3.87	8.17	8.00	12.04	-----	2.26	1.50
1744	0.81	1.29	2.10	2.06	5.17	3.33	2.03	8.50	8.00	10.53	-----	6.61	6.00
1745	-----	-----	-----	-----	7.54	4.28	1.79	11.82	11.00	13.61	-----	2.03	2.00
1746	1.79	1.52	3.31	3.29	5.87	2.41	2.50	8.28	8.00	10.78	-----	7.41	7.00
1747	0.23	1.14	1.37	1.03	4.82	3.70	2.47	8.52	8.00	10.99	-----	2.12	2.00
1748	1.10	1.10	2.20	2.06	5.98	2.07	2.68	8.05	8.00	10.73	-----	3.34	3.00
1925	2.01	1.30	3.31	3.29	3.84	3.29	2.34	7.13	6.00	9.47	-----	10.80	10.00
1749	0.72	1.34	2.06	2.06	6.13	4.17	2.33	10.30	8.00	12.63	10.00	3.38	3.00
1750	0.44	0.72	1.16	1.03	5.42	2.98	2.53	8.40	8.00	10.93	10.00	2.53	2.00
1751	1.64	0.74	2.38	2.08	5.30	2.56	3.18	7.86	8.00	11.04	10.00	1.89	1.50
1752	2.76	1.40	4.16	4.10	4.98	1.90	2.48	6.88	7.00	9.36	8.00	7.16	7.00
1753	-----	-----	2.50	2.47	-----	-----	-----	-----	-----	25.31	22.80	-----	-----
1754	4.44	0.08	4.52	3.91	1.03	5.16	0.97	7.69	5.00	8.66	6.00	3.56	2.00
1755	0.52	0.96	1.48	0.82	5.17	2.42	3.05	7.59	8.00	10.64	-----	4.73	4.00
1756	-----	-----	-----	-----	4.11	6.88	4.08	10.99	11.00	15.07	-----	2.15	2.00
1757	2.38	1.00	3.38	3.29	4.87	3.25	1.86	8.12	6.00	9.98	-----	10.64	10.00
1758	0.42	1.84	2.26	2.06	5.02	4.60	2.35	9.62	8.00	11.98	----	2.26	1.50
1759	0.85	1.23	2.08	2.06	5.92	2.31	2.76	8.23	8.00	10.99	-----	3.37	3.00
1760	1.68	1.62	3.30	3.29	5.87	2.27	2.56	8.14	8.00	10.70	-----	7.57	7.00

Descriptive List of Manufacturers' Samples, 1907.

Station number.	Manufacturer, place of business and brand.
1761	High Grade Fertilizer with 10 per cent Potash
1762	High Grade Sulphate of Potash
1763	Lazaretto Aroostook Potato Guano
1764	Lazaretto Corn Guano
1765	Lazaretto High Grade Potato Guano
1766	Lazaretto Propellor Potato Guano
1767	Lazaretto Special Potato Guano
1768	Muriate of Potash
1769	Nitrate of Soda
1770	Otis' Potato Fertilizer
1771	Otis' Superphosphate
1772	Pacific Dissolved Bone and Potash
1773	Pacific Grass and Grain
1774	Pacific High Grade General Fertilizer
1775	Pacific Nobsque Guano
1776	Pacific Potato Special
1777	Packer's Union Animal Corn Fertilizer
1778	Packer's Union Economical Vegetable Guano
1779	Packer's Union Gardener's Complete Manure
1780	Packer's Union High Grade
1781	Packer's Union Potato Manure
1782	Packer's Union Universal Fertilizer
1783	Packer's Union Wheat, Oats and Clover Fertilizer
1784	Plain Superphosphate
1785	Quinnipiac Climax Phosphate for all Crops
1786	Quinnipiac Corn Manure
1787	Quinnipiac Market Garden Manure
1788	Quinnipiac Mohawk Fertilizer
1789	Quinnipiac Potato Manure
1790	Quinnipiac Potato Phosphate
1791	Read's Farmers' Friend
1792	Read's High Grade Farmers' Friend
1793	Read s Potato Manure
1794	Read's Practical Potato Special
1795	Read's Standard Superphosphate
1796	Read's Sure Catch Fertilizer
1797	Read's Vegetable and Vine Fertilizer
1798	Soluble Pacific Guano
1799	Standard A Brand
1800	Standard Bone and Potash
1801	Standard Complete Manure
1802	Standard Fertilizer
1803	Standard Guano for all Crops
1804	Standard Special for Potatoes
1805	William's & Clark Americus Ammoniated Bone Superphosphate
1806	William's & Clark Americus Corn Phosphate
1807	William's & Clark Americus High Grade Special
1808	William's & Clark Americus Potato Manure

Analysis of Manufacturers' Samples, 1907.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
			Total.					Available.		Total.			
	Soluble in water.	Insoluble in water.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
1761	1.50	1.03	2.53	2.40	5.82	1.76	2.63	7.58	6.00	10.21	7.00	10.44	10.00
1762	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	49.80	48.00
1763	0.19	0.78	0.97	.8235	5.69	3.36	2.11	9.05	8.00	11.16	.....	4.57	4.00
1764	0.95	1.02	1.97	1.64	4.47	3.20	2.74	7.67	8.00	10.41	.....	2.53	2.00
1765	1.21	1.82	3.03	3.29	4.00	1.90	2.27	5.90	6.00	8.17	.....	10.60	10.00
1766	0.70	1.30	2.00	2.06	5.69	2.56	2.88	8.25	8.00	11.13	.....	6.52	6.00
1767	1.69	1.56	3.25	3.29	5.85	2.27	2.55	8.12	8.00	10.67	.....	7.70	7.00
1768	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	49 63	50.00
1769	15.12	.....	15.12	15.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
1770	1.74	0.58	2.32	2.06	5.74	2.28	2.46	8.02	8.00	10 48	10.00	3.05	3.00
1771	0.68	1.38	2.06	2.06	6.94	2.92	2.43	9.86	8.00	12.29	10.00	2.16	1.50
1772	.....	.....	.....	.....	5.98	4.81	1.91	10.70	10.00	12.70	11.00	2.43	2.00
1773	0.42	0.64	1.06	.82	5.46	3.01	1.43	8.47	7.00	9.90	8.00	2.99	1.00
1774	2.13	1.41	3.54	3.30	5.15	2.92	2.14	8 07	8.00	10.21	9.00	7.18	7.00
1775	0.45	0.80	1.25	1.03	5.53	2.31	2.73	7 84	8.00	10.57	10.00	2.14	2.00
1776	0.76	1.34	2.10	2.06	5.69	4.27	2.70	9.96	8.00	12.66	10.00	3.15	3.00
1777	0.31	2.10	2.41	2.47	5.64	3.22	3.46	8.86	9.00	12.32	.....	1.91	2.00
1778	0.26	1.42	1.68	1.25	4.65	2.55	2.15	7.20	6.00	9.35	.....	3.59	3.00
1779	1.38	1.16	2.54	2.47	5.58	0.47	2.06	6.05	6.00	8.11	.....	10.99	10.00
1780	1.75	1.56	3.31	3.29	5.85	2.41	2.55	8.26	8.00	10.81	.....	7 53	7.00
1781	0.96	1.10	2.06	2.06	4.85	3.16	1.85	8.01	8.00	9.86	.....	6.54	6.00
1782	0.25	0.96	1.21	0.82	6.05	3.22	1.46	9.27	8.00	10.73	.....	5.04	4.00
1783	.....	.....	.....	.....	.....	.....	1.20	10.92	11.00	12.12	.....	2.39	2.00
1784	.....	.....	.....	.....	10.21	3.91	1.30	14.12	14.00	15.42	15.00	.....	.....
1785	0.39	1.06	1.45	1.03	5.10	3.54	1.63	8.64	8 00	10.27	10.00	2.91	2.00
1786	0.67	1.38	2.05	2.06	6.69	2.63	2.41	9.32	8.00	11.73	10.00	1.95	1.50
1787	2.19	1.08	3 58	3.30	4.23	4.67	1.47	8.90	8.00	10.37	9.00	7.57	7.00
1788	0.03	0.83	0.86	.82	2.60	4.87	3.86	7.47	7.00	11.33	8.00	1.58	1.00
1789	1.03	1.50	2 53	2.50	2.55	4.03	3.06	6.58	6.00	9.64	8.00	5.15	5.00
1790	0.74	1.30	2.04	2.06	5.61	4.71	2.36	10.32	8.00	12.68	10.00	3.34	3.00
1791	1.57	0.62	2.19	2.06	5.84	2.08	2.59	7.92	8.00	10.51	10.00	3.11	3.00
1792	2.23	1.48	3.71	3.30	3.96	2.13	2.08	6.09	6.00	8.17	7.00	9.59	10.00
1793	0.42	2.28	2.70	2.40	4.59	1.89	1.25	6.48	6.00	7.73	7.00	10.94	10.00
1794	0.42	0.74	1.16	.82	1.64	2.56	1.99	4.20	4.00	6.19	5.00	8.03	8.00
1795	0.10	0.94	1.04	.82	5.87	2.89	2 23	8.76	8.00	10.99	10.00	4.81	4.00
1796	.....	.....	.....	.....	5.42	3.90	3.09	9.32	10.00	12.41	11.00	2.59	2.00
1797	0.32	1.80	2.12	2.06	5.94	2.25	1.38	8.29	8.00	9.67	10.00	6.35	6.00
1798	1.58	0.80	2.38	2.06	5.18	2.81	3.01	8.09	8.00	11.10	10.00	1.89	1.50
1799	0.31	0.90	1.21	.82	3.64	4.10	2.08	7.74	7.00	9.82	8.00	1.56	1.00
1800	.....	.....	.....	.....	7.66	2.60	1.96	10.26	10.00	12.22	11.00	2.08	2.00
1801	2.40	0.90	3.30	3.30	7.02	1.99	1.04	8.81	8.00	9.85	9.00	7.56	7.00
1802	1.60	0.78	2.38	2.06	5.14	2.41	3.36	7.55	8.00	10.91	10.00	1.70	1.50
1803	0.37	0.70	1.07	1.03	5.31	3.03	1.44	8.34	8.00	9.74	10.00	2.10	2.00
1804	1.68	0.62	2.30	2.06	5.82	2.22	2.45	8.04	8.00	10.49	10.00	3.17	3.00
1805	1.40	1.35	2.75	2.50	5.52	2.65	3.44	8.17	9.00	11.61	11.00	2.78	2.00
1806	1.35	0.76	2.11	2.06	5.58	2.78	3.04	8.36	8.00	11.40	10.00	1.99	1.50
1807	2.36	1.33	3.69	3.30	5.57	2.56	2.48	8.13	8.00	10.61	9.00	6.54	7.00
1808	1.68	0.60	2.28	2.06	6.17	2.02	2.48	8.19	8.00	10.67	10.00	3.28	3.00

Descriptive List of Manufacturers' Samples, 1907.

Station number.	Manufacturer, place of business and brand.
1809	William's & Clark Royal Bone Phosphate for all Crops
	ARMOUR FERTILIZER WORKS, BALTIMORE, MD.
1810	All Soluble
1811	Armour's Complete Potato
1812	Bone, Blood & Potash
1813	Fruit and Root Crop Special
1814	Grain Grower
1815	High Grade Potato
1816	Wheat Corn and Oats Special
	BOWKER FERTILIZER CO., BOSTON, MASS.
1817	Bowker's Bone and Potash Square Brand
1818	Bowker's Bone, Blood and Potash
1819	Bowker's Complete Manure for Potatoes and Vegetables
1820	Bowker's Corn Phosphate
1821	Bowker's Early Potato Manure
1822	Bowker's Farm and Garden Phosphate
1823	Bowker's Fresh Ground Bone
1824	Bowker's Hill and Drill Phosphate
1825	Bowker's Market Garden Phosphate
1826	Bowker's Potash Bone
1827	Bowker's Potash or Staple Phosphate
1828	Bowker's Potato and Vegetable Fertilizer
1829	Bowker's Potato and Vegetable Phosphate
1830	Bowker's 6 per cent Potato Fertilizer
1831	Bowker's Superphosphate with Potash for Grass & Grain
1832	Bowker's Sure Crop Phosphate
1833	Bowker's Ten Per Cent Manure
1834	Monticello Grange Chemical
1835	Special Potato Manure for the Grange
1836	Stockbridge's Manure "A" for Potatoes, etc
1837	Stockbridge's Special Complete Manure for Corn and all Grain Crops
1838	Stockbridge's Special Complete Manure for Grass and Top Dressing, etc.
1839	Stockbridge's Special Complete Manure for Permanent Dressing, Seeding Down, etc.
1840	Stockbridge's Special Complete Manure for Potatoes and Vegetables
	COE-MORTIMER CO., NEW YORK, N. Y.
1841	E. Frank Coe's Celebrated Special Potato Fertilizer
1842	E. Frank Coe's Columbian Corn Fertilizer
1843	E. Frank Coe's Columbian Potato Fertilizer
1844	E. Frank Coe's Double Strength Potato Manure
1845	E. Frank Coe's Excelsior Potato Fertilizer
1846	E. Frank Coe's Famous Prize Brand Grain and Grass Fertilizer
1847	E. Frank Coe's High Grade Ammoniated Bone Superphosphate
1848	E. Frank Coe's High Grade Potato Fertilizer
1849	E. Frank Coe's New Englander Corn and Potato Fertilizer
1850	E. Frank Coe's Red Brand Excelsior Guano
1851	E. Frank Coe's Special Grass and Grain Fertilizer
	HUBBARD FERTILIZER CO., BALTIMORE, MD.
1856	Hubbard's Bone, Blood and Potash
1857	Hubbard's Farmer's I. X. L. Superphosphate
1858	Hubbard's Royal Ensign

Descriptive List of Manufacturers' Samples, 1907.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	Soluble in water.	Insoluble in water.	Total.		Soluble.	Reverted.	Insoluble.	Available		Total.		Found.	Guaranteed.
			Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.		
1809	0.29	0.82	1.11	1.03	5.47	3.14	2.55	8.61	8.00	11.16	10.00	2.59	2.00
1810	1.93	1.64	3.57	2.88	7.70	1.19	0.54	8.89	8.00	9.43	10.00	4.40	4.00
1811	1.56	2.06	3.62	3.28	5.85	1.67	0.57	7.52	6.00	8.09	8.00	10.94	10.00
1812	2.34	2.21	4.55	4.11	6.67	1.47	1.01	8.24	8.00	9.25	10.00	8.40	7.00
1813	.75	1.06	1.81	1.65	7.78	0.35	0.47	8.13	8.00	9.60	10.00	5.93	5.00
1814	0.94	0.72	1.60	1.65	5.61	2.35	1.26	7.96	8.00	9.22	10.00	2.51	2.00
1815	.94	.96	1.90	1.65	8.05	1.08	0.50	9.13	8.00	9.63	10.00	10.70	10.00
1816	0.22	0.60	0.82	.82	5.04	2.24	2.02	7.28	7.00	9.30	9.00	1.24	1.00
1817	1.03	0.81	1.84	1.65	1.04	3.68	7.10	4.72	6.00	11.82	7.00	2.34	2.00
1818	2.59	2.02	4.61	4.10	6.28	1.47	1.37	7.75	7.00	9.12	9.00	6.67	7.00
1819	1.59	1.64	3.23	3.29	4.66	1.58	2.58	6.24	6.00	8.82	7.00	10.51	10.00
1820	0.40	1.14	1.54	1.65	2.27	5.90	2.19	8.17	8.00	10.36	9.00	2.52	2.00
1821	2.32	.94	3.26	3.29	6.78	1.40	1.02	8.18	8.00	9.20	9.00	7.60	7.00
1822	0.52	1.16	1.68	1.65	2.20	6.62	2.50	8.92	8.00	11.42	9.00	2.80	2.00
1823	-----	-----	2.53	2.47	-----	-----	-----	-----	-----	21.42	22.80	-----	-----
1824	0.71	1.73	2.44	2.47	3.27	5.48	2.76	8.75	9.00	11.51	10.00	2.16	2.00
1825	1.59	0.79	2.38	2.47	5.55	2.12	1.34	7.67	6.00	9.01	7.00	9.85	10.00
1826	0.90	-----	0.90	.82	3.05	1.93	3.03	4.98	6.00	8.01	8.00	2.10	2.00
1827	0.18	0.74	0.92	.82	1.69	6.43	2.15	8.12	8.00	10.27	9.00	3.37	3.00
1828	0.61	1.73	2.34	2.47	7.26	2.32	0.83	9.58	8.00	10.41	10.00	4.30	4.00
1829	0.30	1.18	1.48	1.65	2.28	6.79	2.31	9.07	8.00	11.38	9.00	2.32	2.00
1830	0.35	0.65	1.00	.82	1.39	4.82	3.05	6.21	6.00	9.26	7.00	6.48	6.00
1831	-----	-----	-----	-----	4.39	5.30	1.71	9.69	10.00	11.40	11.00	2.84	2.00
1832	0.35	0.72	1.07	.82	4.93	3.50	2.42	8.43	8.00	10.88	9.00	2.37	2.00
1833	0.17	0.69	0.86	.82	1.29	3.92	1.99	5.21	5.00	7.20	6.00	10.34	10.00
1834	1.15	1.09	2.24	2.50	5.34	2.80	1.67	8.14	8.00	9.81	12.00	4.17	4.00
1835	1.21	.90	2.11	1.65	5.76	6.30	2.74	12.06	9.00	14.80	12.00	9.75	12.00
1836	1.60	2.64	4.24	4.11	4.31	2.77	1.93	7.08	7.00	9.01	8.00	11.11	10.00
1837	1.93	1.40	3.30	3.29	7.89	2.30	0.91	10.19	10.00	11.10	11.00	7.39	7.00
1838	3.18	1.88	5.06	4.93	3.01	2.69	2.26	5.70	4.00	7.96	6.00	6.11	6.00
1839	0.79	1.59	2.38	2.47	2.97	2.88	4.24	5.85	6.00	10.00	9.00	10.04	10.00
1840	1.32	1.88	3.20	3.29	2.57	3.54	2.27	6.11	6.00	8.38	7.00	10.34	10.00
1841	1.26	0.62	1.88	1.65	7.34	1.19	2.71	8.53	8.00	11.24	10.00	4.73	4.00
1842	0.60	0.74	1.34	1.23	7.29	2.77	2.53	9.46	8.50	12.01	10.50	2.98	2.50
1843	0.54	0.80	1.34	1.23	6.30	2.16	2.49	9.46	8.50	11.95	10.50	3.08	2.50
1844	2.62	1.14	3.76	3.70	4.88	2.37	2.40	7.25	7.00	9.65	8.50	11.75	10.00
1845	1.46	0.96	2.41	2.47	6.03	1.97	2.22	8.00	7.00	10.22	9.00	9.35	8.00
1846	-----	-----	-----	-----	6.64	3.96	3.06	10.55	10.50	13.61	12.00	2.59	2.00
1847	1.02	1.06	2.08	1.85	6.76	2.26	2.30	9.02	9.00	11.32	11.00	3.09	2.25
1848	1.68	0.92	2.60	2.40	7.15	1.53	2.76	8.68	8.00	11.44	10.00	6.48	6.00
1849	0.63	0.70	1.33	0.80	7.15	2.42	2.60	9.57	7.50	12.17	9.00	3.11	3.00
1850	2.30	1.07	3.37	3.30	7.59	2.14	1.77	9.73	9.00	11.50	10.00	6.74	6.00
1851	0.07	0.73	0.80	0.80	6.73	2.57	2.81	9.30	8.50	12.11	10.00	2.28	1.50
1856	1.60	2.12	3.72	3.29	9.14	0.48	0.76	9.62	8.00	10.38	9.00	9.09	7.00
1857	1.06	0.90	1.96	1.65	7.35	1.43	0.96	8.78	8.00	9.74	9.00	2.53	2.00
1858	1.58	1.36	2.94	2.47	8.80	1.08	0.55	9.88	8.00	10.43	9.00	4.55	4.00

Descriptive List of Manufacturers' Samples, 1907.

Station number.	Manufacturer, place of business and brand.
	JOHN WATSON CO., HOULTON, ME.
1859	Watson's Improved High Grade Manure
	LISTER'S AGRICULTURAL CHEMICAL WORKS, NEWARK, N. J.
1860	Lister's Bone and Potash
1861	Lister's Bone Meal
1862	Lister's High Grade Special for Spring Crops
1863	Lister's Oneida Special
1864	Lister's Potato Manure
1865	Lister's Special Corn
1866	Lister's Special Potato
1867	Lister's Success
1868	Lister's 10 per cent Potato Grower
	NATIONAL FERTILIZER CO., BRIDGEPORT, CONN.
1869	Chittenden's Complete Root Fertilizer
1870	Chittenden's Excelsior Potato Fertilizer
1871	Chittenden's Eureka Potato Fertilizer
1872	Chittenden's Market Garden Fertilizer
	NEW ENGLAND FERTILIZER CO. BOSTON, MASS.
1881	New England Complete Manure
1873	New England Corn & Grain Fertilizer
1874	New England Corn Phosphate
1875	New England High Grade Potato Fertilizer
1876	New England High Grade Special
1877	New England Market Garden Manure
1879	New England Potato Fertilizer
1878	New England Potato Grower
1880	New England Superphosphate
	PARMENTER & POLSEY FERTILIZER CO., PEABODY, MASS.
1882	A. A. Brand
1883	Aroostook Special
1884	Maine Potato Fertilizer
1885	Plymouth Rock
1886	Special Potato Fertilizer
	PORTLAND RENDERING CO. PORTLAND ME.
1889	Bone Dust Tankage
	R. T. PRENTISS CO., PRESQUE ISLE, ME.
1890	Prentiss' Aroostook Complete
1891	Prentiss' Aroostook Standard
	PROVINCIAL CHEMICAL CO., ST. JOHN, N. B.
1892	Special Potato Phosphate
1893	10 per cent Complete "Aroostook" Potato
	P. H. REED, FT. FAIRFIELD, ME.
1894	Reed's Potato Grower
	TUSCARORA FERTILIZER CO., BALTIMORE, MD.
1895	Tuscarora Aroostook Special
1896	Tuscarora Complete Potato
1897	Tuscarora Fruit and Potato
1898	Tuscarora Trucker
	RUSSIA CEMENT CO., GLOUCESTER, MASS.
1899	Essex A1 Superphosphate
1900	Essex Aroostook County Special Potato Manure
1901	Essex Complete Manure for Aroostook County Crops
1902	Essex Complete Manure for Corn, Grain and Grass
1903	Essex Complete Manure for Potatoes, Roots and Vegetables
1904	Essex Market Garden and Potato Manure
1905	Essex XXX Fish and Potash

Analysis of Manufacturers' Samples, 1907.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
			Total.					Available.		Total.			
	Soluble in water.	Insoluble in water.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
1859	2.30	1.30	3.60	3.00	4.69	1.37	1.63	6.06	6.00	7.69	7.00	5.25	5.00
1860	.....	.....	.....	.....	6.44	3 84	2.19	10.28	11.00	12.47	13.00	2.26	2.00
1861	.....	.....	3.70	2.68	.....	.....	.....	.....	.....	25.33	23.00	.....	.....
1862	0.45	1.50	1.95	1.65	3.75	4.34	3.07	8.09	8.00	11.16	10.00	11.16	10.00
1863	0.34	0.83	1.17	.83	4.42	3.71	2.48	8.13	7.00	10.61	8.00	1.16	1.00
1864	1.92	1.25	3.17	3.30	5.50	2.46	3.09	7.96	8.00	11.05	9.00	7.22	7.00
1865	0.70	1.12	1.82	1.65	5.63	3.72	2.39	9.35	8.00	11.74	9.00	3.66	3.00
1866	0.64	1.22	1.86	1.65	5.66	3.94	2.19	9.60	8.00	11.79	9.00	3.52	3.00
1867	0.31	0.99	1.30	1.24	6.16	3.02	2.58	9.18	9 00	11.76	11.00	2.37	2.00
1868	1.36	1.64	3.00	3.29	4.39	2.17	2.58	6.56	6.00	9.14	7.00	9.57	10.00
1869	1.71	1.73	3.44	3.30	6.51	1.49	1.78	8.00	8.00	9.78	10.00	6.01	6.00
1870	1.80	1.76	3.56	3.30	4.08	1.88	1.85	5 96	6.00	7.81	8.00	10.56	10.00
1871	0.85	1.78	2.63	2.40	4.19	1.46	1.75	5.65	6.00	7.40	8.00	10.48	10.00
1872	1.16	1.26	2.42	2.40	3.70	2.49	2.17	6.19	6.00	8.36	8.00	5.63	5.00
1881	1.91	1.48	3.39	3.28	3.45	3.14	3.57	6.59	6.00	10.16	7.00	10.04	10.00
1873	0.44	0.76	1.20	1.23	5.66	1.40	0.55	7.06	7.00	7.61	8.00	2.05	2.00
1874	0.76	1.02	1.78	1.64	3.85	4.93	1.33	8.78	8.00	10.11	9.00	3.23	3.00
1875	1.28	1.20	2.48	2.46	5.65	2.38	2.16	8.03	8.00	10.19	9.00	6.18	6.00
1876	2.32	1.40	3.72	3.69	5.38	3.53	1.17	8.91	7.00	9.08	8.00	10.54	10.00
1877	2.07	2.22	4.29	4.10	5.95	1.16	1.91	7.11	7.00	9.02	8.00	7.91	7.00
1879	0.88	0.88	1.76	1.64	3.46	4.89	0.98	8.35	7.00	9.33	8.00	4.28	4.00
1878	1.38	1.16	2.54	2.46	3.45	2.59	2.40	6.04	6.00	8.44	7.00	10.33	10.00
1880	.88	1.60	2.48	2.46	5.66	1.93	3.77	7.59	8.00	11.36	10.00	4.34	4.00
1882	2.11	2.44	4.55	4.10	5.93	1.86	1.67	7.79	7.00	9.46	8.00	7.64	8.00
1883	2.70	1.26	3.96	3.69	5.33	1.95	2.64	7.28	7.00	9.92	8 00	10.18	10.00
1884	2.38	1.26	3.64	3.29	5.10	0.99	1.85	6.09	6.00	7.94	7.00	10.90	10.00
1885	.96	1.62	2.58	2.47	4.86	2.75	3.67	7.61	8.00	11.28	9.00	4.11	4.00
1886	2.00	1.36	3.36	3.29	6.09	1.04	1.53	7.13	8.00	8.66	9.00	7.06	7.00
1889	1.00	3.74	4.74	5.00	.....	.....	.....	.....	.....	17.86	16.00	.....	.....
1890	3.07	.46	3.53	3.29	3.35	2.99	0.84	6.34	6.00	7.18	8.00	12.89	10.00
1891	.92	.70	1.62	1.62	5.02	1.55	2.07	6.57	8.00	8.64	10.00	10.61	10.00
1892	1.06	1.08	2.14	2.08	7.73	1.13	4.30	8.86	8.00	13.16	12.00	6.15	6.00
1893	3.39	0.76	4.15	3.29	6.83	1.11	0.87	8.00	8.00	8.87	8.87	11.15	10.00
1894	2.02	1.88	3.90	3.29	7.15	0.83	1.03	7.98	7.00	9.01	8.00	9.07	8.00
1895	1.45	1.16	2.61	2.47	6.94	1.18	0.89	8.12	7.00	9.01	8.00	9.23	8.00
1896	1.66	1.96	3.62	3.29	5.73	1.04	1.06	6.77	6.00	7.83	7.00	10.78	10.00
1897	.74	1.02	1.76	1.65	7.89	0.98	1.08	8.87	8.00	9.95	9.00	11.40	10.00
1898	2.64	2.12	4.76	4.12	7.93	0.93	0.63	8.86	8.00	9.49	9.00	7.35	7.00
1899	0.18	1.34	1.52	1.00	1.96	5.32	4.93	7.29	7.00	12.22	9.00	2.11	2.00
1900	1.03	1.64	2.67	2.40	1.71	4.14	4.48	5.85	7.00	10.33	8.00	4.65	5.00
1901	.99	2.30	3.29	3.30	5.26	1.81	5.29	7.07	7.00	12.36	9.50	8.82	9.50
1902	0.97	2.91	3.88	3.30	5.90	3.75	1.50	9.65	7.00	11.15	9.50	9.36	9.50
1903	0.96	3.22	4.18	3.70	6.33	2.62	3.14	8.95	7.00	12.09	9.00	8.39	8.50
1904	0.79	1.55	2.34	2.00	5.25	5.17	2.65	10.42	8.00	13.07	10.00	5.06	5.00
1905	0.56	1.82	2.38	2.10	6.14	2.70	3.28	8.84	9.00	12.12	12.00	4.11	2.25

Descriptive List of Manufacturers' Samples, 1907.

	SAGADAHOC FERTILIZER CO., BOWDOINHAM, ME.
1906	Acid Phosphate
1907	Aroostook Potato Manure
1908	Dirigo Fertilizer
1909	Muriate of Potash
1910	Nitrate of Soda
1911	Sagadahoc High Grade Superphosphate
1912	Sagadahoc Special Potato Fertilizer
1913	XX Chemical Fertilizer
1914	Yankee Fertilizer
	SWIFT'S LOWELL FERTILIZER CO., BOSTON, MASS.
1926	3-6-And 10 Fertilizer
1927	4-6-And 10 Fertilizer
1915	Swift's Lowell Animal Brand
1916	Swift's Lowell Bone Fertilizer
1917	Swift's Lowell Cereal Fertilizer
1918	Swift's Lowell Dissolved Bone and Potash
1919	Swift's Lowell Empress Brand
1920	Swift's Lowell Potato Manure
1921	Swift's Lowell Potato Phosphate
1922	Swift's Potato Grower
1923	Swift's Special Vegetable Manure
1924	Swift's Superior Fertilizer

Analysis of Manufacturers' Samples, 1907.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	Soluble in water.	Insoluble in water.	Total		Soluble.	Reverted.	Insoluble.	Available.		Total.		Found.	Guaranteed.
			Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.		
1906	.....	.....	.....	..	16.86	0.95	0.80	17.81	16.00	18.61	17.00	.....	.....
1907	0.92	0.08	1.00	1.05	7.11	1.44	0.45	8.55	6.00	9.00	7.00	4.97	4.00
1908	0.13	0.44	0.57	.85	6.62	0.89	5.46	7.51	6.00	12.97	9.00	3.32	3.00
1909	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	53.20	50.00
1910	15.58	.....	15.58	15.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
1911	1.54	0.38	1.92	1.85	6.86	1.14	3.50	8.00	7.00	11.50	8.00	4.37	3.00
1912	1.33	0.58	1.91	2.00	4.63	1.66	4.54	6.29	7.00	10.83	8.00	9.83	8.00
1913	7.03	1.07	8.10	7.00	.....	.....	3.76	4.29	3.00	8.05	7.00	10.05	8.00
1914	0.35	0.41	0.76	0.40	7.30	2.73	1.04	10.03	7.00	11.07	8.00	3.05	2.00
1926	1.73	.80	2.53	3.25	3.11	1.56	1.98	4.67	5.00	6.65	7.00	10.18	10.00
1927	2.65	.80	3.45	2.35	3.19	3.75	1.70	6.94	5.00	8.64	7.00	10.57	10.00
1915	1.04	1.54	2.58	2.46	4.66	4.69	3.97	9.35	8.00	13.32	10.00	4.19	4.00
1916	0.73	0.94	1.67	1.64	5.26	2.76	1.79	8.02	8.00	9.81	9.00	3.20	3.00
1917	0.34	0.50	0.84	.82	5.22	1.76	1.32	6.98	7.00	8.30	8.00	1.18	1.00
1918	.72	1.04	1.76	1.64	8.21	1.80	1.15	10.01	9.00	11.16	10.00	2.35	2.00
1919	.87	.54	1.41	1.23	4.85	2.50	2.32	7.35	7.00	9.67	8.00	2.15	2.00
1920	.69	.94	1.63	1.64	4.55	2.10	2.17	6.65	7.00	8.82	8.00	4.07	4.00
1921	1.31	1.16	2.47	2.42	5.66	2.49	1.71	8.15	8.00	9.86	9.00	6.35	6.00
1922	2.14	1.42	3.56	3.28	4.99	1.51	1.35	6.50	6.00	7.85	7.00	10.53	10.00
1923	1.88	1.48	3.36	3.28	5.95	1.38	1.68	7.33	8.00	9.01	9.00	7.10	7.00
1924	2.52	1.28	3.80	3.69	5.60	1.98	1.30	7.58	7.00	8.88	8.00	10.23	10.00

BULLETIN No. 141.

THE PREVENTION OF POTATO SCAB.

W. J. Morse.

From the evidence at hand it appears that the amount of potato scab in certain portions of Maine is rapidly increasing. Many bushels of otherwise excellent potatoes are now annually sent to the starch factory, thus materially reducing the profit of the grower. This rapid increase of scab is very evident in Aroostook county. Never has the Station received so many complaints from growers with regard to losses from this cause as was the case last season. An explanation of this condition of affairs is not hard to find. Two years ago on account of the scarcity and consequent high price of seed many farmers planted the scabby tubers which were unfit for market. Very frequently experienced growers are met who advocate this practice, claiming from mistaken observation that there is no danger from the use of scabby seed, thus assisting indirectly in the propagation and spread of the disease. This indicates that the nature of the disease and the importance of planting clean, disinfected seed to insure a clean crop and to guard against infection of the soil is not realized by many growers.

In view of the fact there are still large areas which are free from scab or which are but slightly infected, and each year a considerable amount of previously uncultivated soil is added to the potato growing acreage of the state, it is highly important that ample precautions be taken to prevent the introduction of scab germs into this clean soil.

PURPOSE OF THIS BULLETIN.

The object of this bulletin is to warn growers of the gravity of the situation, to point out the material and lasting injury which will surely result to the potato industry unless proper

attention is given to the control of this disease, and to describe the methods by which it may be held in check.

The writer has drawn largely upon the publications of other stations and upon the results of his own experience and investigations most of which have already been published.*

In this connection it should be stated that this is by no means the first time that this Station has called the attention of the Maine growers to this disease. An examination of the files shows that 19 years ago the botanist made quite an extended study of the subject in an effort to determine the cause of the malady and two years later he reported that its parasitic nature had been demonstrated elsewhere. Additional reports were made in 1893 and 1894. In the spring of 1905 a circular letter was sent to the newspapers circulating in Aroostook county and in 1906 a special bulletin was sent to all of the newspapers of the State briefly stating the essential facts as to the nature and cause of the disease, the ways in which the soil becomes infected, the conditions favoring development and spread, and a summary of the best methods of its control. Especial attention was called to the danger of using infected seed and to the lack of appreciation on the part of the growers of the importance of the disease.

PLANTS AFFECTED BY SCAB.

The roughened, scabby, pitted surface of potato tubers affected with scab is too well known to require description. It is probable that no other potato disease has a wider distribution. In addition to being disseminated throughout this country it occurs in various parts of Europe and different writers have reported it in South Africa and New Zealand as well. It probably occurs wherever the potato is grown.

In addition to the potato, beets, mangels, turnips and rutabagas are quite susceptible to the disease. It has also been found on cabbage and carrot roots and possibly may develop in a slight degree on radish, salsify and parsnips. It is possible that the fungus has still other hosts, for as shown later it is able to persist in the soil for some years without the presence of any of the above mentioned crops.

* Vt. Exp. Sta. Reps. 15, p. 225, (1902); 16, p. 165, (1903); 17. p. 397, (1904); 18, p. 287, (1905).

CAUSE OF SCAB.

Contrary to the opinion frequently expressed by practical growers, the cause of the potato scab is a specific organism, and is not due as a first cause to any character or condition of the soil. The amount of moisture, nature of the fertilizer used, the alkalinity or acidity of the soil may and do influence to a large degree the *amount* of scab present on a given crop, but if the germs of the disease are not in the soil or introduced into it by means of infected seed tubers or from some other outside source these factors alone are unable to produce the disease. Ashes, lime, stable manure and chip dirt are of themselves incapable of producing scab, but if the land or the seed is already infected their action upon the soil is such that favorable conditions are produced for the development of the scab fungus which manifests itself upon the crop. For this reason a belief that these materials themselves produce the disease is more or less held by practical growers.

The real cause of potato scab was unknown up to 1890 when Dr. Roland Thaxter of the Connecticut experiment station discovered the fungus, to which he afterwards gave the name *Oospora scabies,* and demonstrated the true relationship between the fungus and the disease. Since that date his conclusions have been accepted quite generally by American plant pathologists.

Experiments have shown repeatedly that scab does not develop on new land unless it is infected from some outside agency. If clean seed is used and other precautions are taken a clean crop will result. If scabby seed is used a more or less scabby crop is almost sure to be produced. Because of the readiness with which the disease may thus be spread it follows that most of the infection of new areas comes from scab infested seed. It is probable that scab germs are sometimes introduced into the soil by means of tools or manure and one case is recorded where soil plainly became infected by the water draining off from a potato field on higher ground.*

* Minn. Exp. Sta. Bul. 32, p. 223, (1893),

Once the soil is contaminated there are two possible sources of infection of the growing crop; first from the seed, and secondly from the soil itself. The amount of scab which may develop on the crop is influenced by a variety of conditions, as well as by the number of scab germs already present in the soil or introduced with the seed. For example scabby seed planted on soil where conditions are unfavorable for the development of scab may give a comparatively clean crop, while on the other hand relatively clean seed may produce an exceedingly scabby crop, especially the second year, if the soil conditions are favorable to the scab fungus. This, of course, is due to the fact that the soil is already contaminated. Infested soil may be expected to produce a more or less scabby crop even though clean seed is planted.

CONDITIONS FAVORABLE TO SCAB.

Scab thrives best on an alkaline soil or in the presence of certain fertilizers or chemical substances which tend to promote alkalinity, while acid soils and the presence of certain other chemical salts are unfavorable to its development. Dr. Wheeler of the Rhode Island station has made an extensive study of this subject, and summarizes his conclusions as follows:*

"The materials which favor the scab and which are at times applied to land are: stable manure of all kinds, wood ashes, air-slacked or caustic lime and carbonates of soda (soda-ash), potash, lime and magnesia."

"The materials which do not tend to make the scab worse and which may decrease it are: most commercial fertilizers, seaweed, potash salts (excepting potassium carbonate), land plaster, common salt and ammonium sulphate. Sodium nitrate (Chili salt-peter) if used in large quantities may favor scab eventually, but from the amount usually applied no serious results would be expected to follow. In case a soil were badly contaminated and favorable to the disease, superphosphate, ammonium sulphate, kainite, sulphate and muriate of potash are materials which, applied as fertilizers, would tend gradually to alleviate the conditions."

Heavy moist soils appear to be more favorable to scab than those which are light and dry. It is maintained by some that in

* R. I. Exp. Sta. Bul 40, p. 95, (1896).

like manner a given soil is more likely to produce a badly scabbed crop in a wet season than in a dry season.

The treatment or control of the disease naturally divides itself into two main problems, namely: What measures can be taken to decrease or eradicate the germs from soil already infected and how can the infection of clean soil be prevented?

MANAGEMENT OF INFECTED SOILS.

Various methods of soil disinfection have been attempted, usually by rolling the seed in some chemical disinfectant, mixing the chemical with the soil or scattering it along the row, but this is expensive and has usually resulted in partial or entire failure. At one time it was thought that a practical treatment had been discovered by Halsted of the New Jersey station in using sulphur applied to the soil at the rate of 300 pounds per acre. The results obtained on the station grounds were very satisfactory. Favorable results from the use of sulphur were also obtained by the Delaware station.*

Many others have reported failure with this treatment, so that the general consensus of opinion is that it cannot be relied upon for constant results on all soils. Wheeler suggests that the beneficial results obtained from the use of sulphur is due to its gradual oxidation in the soil and consequent production of acid.† If such is the case it would seem that the sulphur treatment is most likely to prove beneficial on a neutral or slightly alkaline soil. Many Aroostook soils are slightly acid already so that the use of sulphur there might prove positively harmful to succeeding crops like oats.‡

It has been found that most field crops do better on a neutral or slightly alkaline soil and that a large amount of soil acidity may be exceedingly detrimental. In fact the potato itself does better in a slightly alkaline soil, such as is most favorable to the development of the scab. Fortunately it is not so sensitive as the scab fungus, and the amount of acidity developed by green manuring is often sufficient to be very detrimental to the fungus and not materially affect the growth or yield of the potato.

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* Del. Exp. Sta. Bul. 34, p. 19, (1896); Rep. 10, p. 45, (1898).

† R. I. Exp. Sta. Rep. 12, p. 164, (1899).

‡ R. I. Exp. Sta. Rep. 12, p. 165, (1899).

It is not known how long the fungus will remain active in the soil without the presence of a susceptible crop. Various writers have reported a large amount of infection on land where no root crop has been grown for from 5 to 7 years and Jones and Edson* cite a case of probable slight soil infection after a lapse of presumably 25 or more years.

However, by rotation of crops, and proper attention to soil management and fertilization it is possible to materially decrease the amount of scab in an infected soil. Land which has produced a crop of badly scabbed potatoes should at once be given over to other crops as corn, grains, grasses and clovers, for as long a time as possible. Wood ashes or lime should not be applied and such commercial fertilizers as are used should be selected, as far as possible, from the materials mentioned on page 84 as not tending to increase scab. "Souring" the soil by green manuring or plowing under of a green crop such as clover should be resorted to, especially just before a crop of potatoes is again to be grown upon the soil. This has been practiced successfully by Alva Agee of Ohio, using rye as the green crop.† He reports growing 7 successful crops of potatoes on land which in the beginning was so badly infected with scab that the crop was unmarketable. Winter rye was sown in the fall and turned under the first warm days in the spring when about a foot high. Each year the conditions of the crop improved till the third year the appearance of the tubers was excellent and on the seventh year 285 bushels per acre were raised and those nearly free from scab. Aside from the cover crop no fertilizer was used except phosphoric acid in the form of acid phosphate. This system would produce best results on a neutral or slightly alkaline soil and probably would not be entirely successful on a soil which is strongly alkaline, as the decaying crop would very likely not produce acid enough to leave an excess in the soil. Failures in the use of rye in this manner for one season have been reported,‡ but it may be that the soil was too alkaline to produce the required effect.

There it not sufficient experimental evidence to say how nearly an infected soil can be cleared of scab germs or how soon pota-

* Vt. Exp. Sta. Rep. 14, p. 232, (1901).

† Penn Dept of Agr. Bul. 105, p. 84, (1902).

‡ Mass. Exp. Sta. Rep. 8, p. 217, (1890); N. Y. (Geneva) Exp. Sta. Bul. 138, p. 629, (1897).

toes may be included in the rotation without the danger of a large amount of infection. There is reason to believe that possibly the latter can be done in from 3 to 5 years on many soils which are not too strongly alkaline. It is a question which must be settled by the individual grower on his own land. However, if one has a piece of badly infested soil the chances of success are sufficient so that it is well worth while to select fertilizers which do not tend to increase scab, to practice rotation with oats, grass, clover, etc., and to frequently plow under a green crop such as clover, rye or buckwheat.

MANAGEMENT OF CLEAN SOILS.

On clean soils we are not so restricted with regard to the nature of the fertilizers, except that the manure of animals which have been fed on uncooked scabby potatoes or in which the uncooked refuse or skins have been thrown, should not be applied.

There is some difference of opinion on the question of the ability of the scab fungus to pass through the digestive tract of animals without being destroyed. Be this as it may there is practically a certainty that the litter from the mangers and some pieces of unconsumed tubers bearing the spores of the fungus will find their way into the manure, and thus make it a constant source of danger.

For seed *select tubers which are free from scab and disinfect by one of the methods described below.* While very satisfactory results have been obtained in the disinfection of badly scabbed potatoes no method has been devised which will guarantee an absolutely clean crop from scabby seed. Untreated, healthy tubers having been in contact with diseased tubers are almost sure to carry sufficient scab germs to infect the soil.

Bags, baskets, barrels, etc., which have been used for scabby potatoes should not be used for clean or disinfected seed tubers without first being disinfected with formaldehyde gas or solution.

Plows, harrows, planters, cultivators and other implements should be thoroughly cleaned of all particles of dirt, etc., preferably with a stream of water from a garden hose, when changing to clean from infected tubers or land.

DISINFECTING AGENTS.

Corrosive sublimate and formaldehyde (usually sold under the name of formalin) are so far the only agents found to be satisfactory for tuber disinfection. These chemicals as well as the potassium permanganate which is used with formalin to generate formaldehyde gas can be supplied by any druggist.

Corrosive sublimate is a white crystalline powder. It is a deadly poison if taken internally, but is safe to handle provided care is taken to keep the treated tubers and solution away from stock and children. It is a good disinfectant, but on account of its poisonous nature it is doubtful if it would have come into so general use if the value of formaldehyde had been demonstrated earlier. Corrosive sublimate costs about 15 cents per ounce and should be purchased for $1.50 or less per pound.

Formalin is a liquid having a sharp, pungent odor. It is a solution of formaldehyde gas, the best grades containing about 40 per cent. The ordinary commercial goods should show at least 35 per cent, and should not be accepted unless the dealer will guarantee that percentage of formaldehyde, subject to analysis. Compared with corrosive sublimate formalin is equally effective as a disinfectant for scab and possesses the advantage of being absolutely safe to handle. Good formalin should be obtained at from 40 to 50 cents per pint, or even less if bought in any quantity.

Commercial potassium permanganate comes in the form of small, glistening, purple-brown crystals. It is sold for about 30 cents per pound.

METHODS OF DISINFECTION OF SEED POTATOES.

I. *Soaking seed in a disinfecting solution.* Applicable where the acreage is small but impracticable for the large grower or dealer.

(*a*) Formalin solution. Add one-half pint of commercial formalin to 15 gallons of water, stir thoroughly, and soak uncut tubers 2 hours in this solution.

(*b*) Corrosive sublimate solution. In a wooden or earthern vessel (metal vessels cannot be used on account of the corrosive action of the chemical) dissolve 2 ounces of corrosive sublimate in 2 gallons of hot water, and then dilute to 15 gallons with cold water. Place uncut tubers in a sack and soak 1½ hours in this solution.

Either solution can be used repeatedly, fresh being added as fast as it is used up. Mr. Agee recommends, as a time saver, the use of barrels with a spigot at the bottom and placed on boxes. The barrels are filled with potatoes and the solution poured over. When the time of disinfection is passed the solution is drawn off and poured into other barrels, already filled, and the treated potatoes dumped out on the ground to dry. This should be done on a clean grass sod and not on plowed land or in any other place where the treated seed will be exposed to reinfection.

II. *Exposure of dry seed to formaldehyde gas.* Applicable where large quantities, up to car load lots are to be treated at one time.

Place seed tubers in bushel crates or shallow slat-work bins in a tight room. For each 1000 cubic feet of space spread 23 ounces of potassium permanganate evenly over the bottom of a large, flaring pan or pail placed in the middle of the room. Pour over this 3 pints of formalin. Close room at once and do not open for 24 to 48 hours. (See details of method described below.)

During the last decade formalehyde gas has, on account of its merits, become the leading disinfectant for use in rooms following contagious diseases. The most common way of generating the gas has been to place the liquid in a dish over an oil stove or other fire lasting sufficient time to vaporize the entire amount of liquid formalin used, then close the room tightly and leave till the period of disinfection was over. The Vermont experiment station has been trying this method with considerable success in the disinfection of scabby potatoes. The writer has had the immediate oversight of the details of these trials for the past 5 years and is satisfied that the results from this process are fully equal to those obtained by soaking, either in corrosive sublimate or formalin solutions. Certain difficulties were experienced with the process, the chief of which was the element of danger from leaving the fire in the disinfecting room for some hours without attention and the comparatively slow evolution of the formaldehyde gas. In 1905 our attention was called to the potassium permanganate method of generating the

gas as described by Messrs. Evans and Russell of the Maine Laboratory of Hygeine.*

By this method all danger from fire is eliminated as the heat required for the liberation of the gas is generated by the chemical action of the potassium permanganate upon the formaldehyde in the solution. It is true that some of the formaldehyde is used up in the reaction but this is more than offset by the fact that within 5 minutes 80 to 85 per cent of the available gas is liberated, and in this manner the maximum strength of formaldehyde is acting upon the fungus almost at once. Where the gas is liberated by boiling it comes off more slowly, there is constant loss by leakage from the room and at no time is the maximum amount of available gas present in the disinfecting chamber. The results of hundreds of tests with various pathogenic bacteria by Evans and Russell and of one test with potato scab by the writer indicate that gas generated by the permanganate method is equally if not more effective than that generated in other ways.

The disinfection of seed potatoes with formaldehyde gas has not been tried on a commercial basis but the results of repeated trials on a small experimental scale with the gas generated by various means are such that it is believed worthy of recommendation, especially where a convenient and rapid method of treating large quantities of seed at one time is desired.

The room in which the work is to be done should be made as tight as possible and be provided with a tightly fitting door. The conditions which obtain in a good potato house intended for winter storage would doubtless meet the requirements. On account of the large amount of space in the open house it would probably be more economical to partition off an end or a corner for the disinfecting room. This partition need not be of expensive material provided care is taken to make it tight by the use of weather strips and pasting builders' or other heavy paper over the cracks and openings.

While it is known that formaldehyde gas has considerable penetrating power† there is no experimental evidence as to how

* Me. State Bd. Health Rep. 13, p. 234, (1904).

† Me. State Bd. Health Rep. 14, (1906). (Evans' experiments here recorded indicate that the gas can penetrate from one to four thicknesses of silk, cotton flannel and ticking and still be perfectly effective upon pathogenic bacteria.)

deep the tubers may be piled and still have the gas effective on all. Until this is determined it would be best to pile not over one foot deep. Bushel crates made on the open slat-work plan make admirable containers, provided they are stacked up loosely in the disinfecting room after being filled with potatoes. Shallow, slat-work bins could also be built one above the other. If one has only a few bushels of seed to disinfect, a large box tightly covered and provided with slat shelves might serve the purpose. It would be better if the box had a small door at the bottom which can be opened to introduce the disinfecting materials and then quickly and tightly closed.

The process of generating the gas is very simple. For each 1000 cubic feet of space use 23 ounces of potassium permanganate crystals and 3 pints of formalin. Place a large flaring pan or pail in the center of the disinfecting chamber and spread the permanganate evenly over the bottom. Pour the formalin quickly over the permanganate, give the dish one rapid tilt to make sure of thorough mixing, then leave and close the room as quickly as possible. When first mixed no change is apparent but soon a vigorous foaming and boiling is set up, hence it is important that the dish used be of sufficient size to prevent running over. A broad, shallow dish like a dishpan has been found to be more satisfactory than a deep one. "The dishes used need not have sides more than 8 inches in height, *but must have wide bottoms.* A good rule to follow in deciding on the size of the dish to be used is to choose one whose bottom is such that it will just be hidden from sight when the requisite amount of permanganate is poured in and evenly distributed." Tin or galvanized iron dishes are better than earthern jars. The disinfecting chamber should remain closed for 24 to 48 hours. The amount of formalin recommended is three times as much and the time of exposure several times longer than that recommended for killing bacteria, but it will not injure the potato tubers in the least. How much the amount of formalin used and the time of exposure can be cut down and still be sure of destroying the scab germs must be determined by future experimentation.

The seed potatoes can be disinfected some little time before planting provided they are not allowed to come in contact with undisinfected bags, barrels, bins, tools, etc., which have been used for untreated potatoes.

SUMMARY.

The use of untreated seed and the too common practice of reserving unsalable, scabby tubers for planting has resulted recently in a rapid increase of potato scab in Maine. Page 81.

Scab is caused by a minute parasitic fungus. Soil conditions, the application of lime, ashes, chip dirt, etc., may favor the development of scab but are incapable of causing it. Page 83.

Crop infection on old land may come from the soil, from the seed, or from both. On new land the source is largely from undisinfected seed. Page 84.

Alkaline soils, the use of stable manure, lime, ashes, and certain chemicals of an alkaline nature favor the fungus. Acid soils and certain other chemicals are unfavorable to it. Page 84.

Beets and the roots of a few other vegetables are attacked by the disease but the fungus may persist in infected soil for several years without the presence of known host plants. Pages 82 and 86.

Badly infested soils should be devoted to such crops as grains, grasses and clovers, for as long a time as possible. Fertilizers favorable to scab should be avoided and "souring" the soil by green manuring is recommended. Page 86.

On clean soils, only healthy, disinfected seed tubers should be used. Manure containing uncooked scabby potatoes or refuse should be avoided but no other precautions as to fertilizers are necessary. Clean soil may be infected by means of tools, bags, baskets, etc., which have been in contact with infected land or tubers. Page 87.

Small amounts of seed are best disinfected by soaking: (a) 2 hours in solution of one-half pint formalin to 15 gallons water, or (b) one and one-half hours in 2 ounces of corrosive sublimate dissolved in 15 gallons of water. Page 88.

For large quantities of seed, formaldehyde gas, generated by the use of potassium permanganate, is the most practical disinfecting agent. Place seed tubers in bushel crates or shallow, slat-work bins in a tight room. For each 1,000 cubic feet of space spread 23 ounces of potassium permanganate evenly over the bottom of a large pan or pail in center of room. Pour over this 3 pints of formalin, leave room at once and allow to remain tightly closed for 24 to 48 hours. Page 89-91.

BULLETIN No. 142.

FEEDING STUFF INSPECTION.

CHAS. D. WOODS, Director.

J. M. BARTLETT, Chemist in charge of inspection analyses.

CHIEF REQUIREMENTS OF THE LAW.

The points of the law of most interest both to the dealer and consumer concisely stated, follow.

Kinds of Feed Exempt Under the Law. The law applies to all feeding stuffs *except* the following: hays and straws; whole seeds, meals, brans and middlings of wheat, rye, barley, oats, Indian corn, buckwheat and broom corn, sold separately; wheat bran and middlings mixed together and pure grains ground together.

Kinds of Feed Coming within the Law. The principal feeds coming under the provisions of the law are linseed meals, cottonseed meals, cottonseed feeds, pea meals, cocoanut meals, gluten meals, gluten feeds, maize feeds, starch feeds, sugar feeds, dried brewer's grains, dried distiller's grains, malt sprouts, hominy feeds, cerealine feeds, rice meals, oat feeds, corn and oat chops, corn and oat feeds, corn bran, ground beef or fish scraps, foods, poultry foods, stock foods, patented, proprietary and trade-mark stock and poultry foods, mixed feeds other than those composed solely of wheat bran and middlings mixed together or pure grains ground together, and all other materials of similar nature.

The Brand. Each package of feeding stuffs coming within the law shall bear, conspicuously printed, the following statements:

The number of net pounds contained in the package.

The name or trade mark under which it is sold.

The name of the manufacturer or shipper.

The place of manufacture.

The place of business of manufacturer or shipper.

The percentage of crude protein.

The percentage of crude fat.

The Adulteration of Feeding Stuffs. If any foreign substances are added to whole or ground grain or wheat offals, the true mixture must be plainly marked upon the packages.

Duties of the Director. The Director shall in person or by deputy analyze at least one sample of each feeding stuff coming within the requirements of the law, and publish the results with such additional information as circumstances advise. He shall diligently enforce the provisions of the law and, in his discretion, prosecute offenses against the law.

Penalties. The sale or offering for sale of feeding stuffs not properly branded, or containing a smaller percentage of protein and fat than are guaranteed, or of adulterated feeding stuffs, is punishable by a fine not exceeding $100 for the first, and $200 for each subsequent offense.

Results of the Inspections for 1906-7.

The last bulletin on feeding stuff inspection was published in April, 1906. Prior to 1904 it had been the custom of the Station to collect a large number of samples of the feeding stuffs offered in the State for the purpose of analyses. With few exceptions the feeding stuffs are running fairly constant in composition, and for the past two years, greater attention has been paid to proper inspection than to the analyses. At least one sample has been drawn of each of the commercial feeding stuffs offered in the State, so far as they have been found by the inspector. There is an evident desire on the part of nearly all of the dealers, large and small, to conform to the requirements of the law, and with the exception of cotton seed meal (see discussion page 104), there is every reason to feel satisfied with the quality of the concentrated commercial feeding stuffs upon the market.

The table on pages 95 to 103 gives the results of the analyses. These results are discussed on pages 104 and beyond. Protein was determined in each sample. Fat was determined in a composite sample of the samples taken by the inspector.

Analyses of Samples of Feeding Stuffs.

Name of Feed and Manufacturer or Shipper.	Source of sample.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
COTTON SEED MEAL.						
Extra Prime Cotton Seed Meal	C	40.81	38.65	-	-	2248
F. W. Brodie & Co., Memphis, Tenn.						
Cotton Seed Meal	O	37.00	41.00	10.15	9.00	2311
H. E. Bridges & Co.						
Extra Prime Cotton Seed Meal	O	37.88	38.65	-	-	2440
F. W. Brode & Co.	O	37.25	38.65	-	-	2446
	O	43.06	38.65	-	-	2436
Average	O	39.39	38.65	10.09	-	-
Cotton Seed Meal	D	45.63	38.50	-	9.00	2560
Chapin & Co., Boston.						
Cotton Seed Meal	D	40.25	41.00	-	9.00	2276
Chas. M. Cox Co., Boston	O	39.56	38.00	8.18	9.00	2424
Dixie Brand Cotton Seed Meal	C	34.14	41.00	-	9.00	2277
Humphreys-Godwin Co.	C	33.31	41.00	-	9.00	2337
	C	35.19	41.00	-	9.00	2338
	C	37.63	41.00	-	9.00	2356
	D	35.19	41.00	-	9.00	2302
	D	38.50	41.00	-	9.00	2406
	O	41.19	41.00	-	9.00	2269
	O	37.06	41.00	-	9.00	2439
	O	36.88	41.00	-	9.00	2443
	O	38.75	41.00	-	9.00	2550
	O	36.88	41.00	-	9.00	2552
Average	O	38.14	41.00	8.71	9.00	-
Green Diamond Cotton Seed Meal	O	40.50	41.00	-	9.00	2288
Chapin & Co.	O	37.75	41.00	-	9.00	2419
	O	37.13	41.00	-	9.00	2421
	O	43.00	41.00	-	9.00	2427
	O	39.94	41.00	-	9.00	2449
	O	39.75	41.00	-	9.00	2470
Average	O	39.66	41.00	9.39	9.00	-
Cotton Seed Meal	C	38.88	41.00	-	7.00	2505
Hunter Bros. Milling Co., St. Louis.						
Prime Cotton Seed Meal	O	41.63	41.00	-	9.00	2546
Hunter Bros. Milling Co., St. Louis	O	38.75	41.00	-	9.00	2547
Average	O	40.19	41.00	10.98	9.00	-
K. & B. Prime Cotton Seed Meal	D	20.75	41.00	-	9.00	2403
Kaiser & Brown, Memphis	O	22.25	41.00	-	9.00	2312
	O	19.38	41.00	-	9.00	2417
	O	21.00	41.00	-	9.00	2467
	O	20.63	41.00	-	9.00	2479
Average	O	20.82	41.00	5.41	9.00	-
Magnolia Cotton Seed Meal	O	36.38	41.00	-	7.00	2465
Chas. M. Cox Co.	O	32.50	41.00	-	7.00	2479
	O	39.69	41.00	-	7.00	2488
Average	O	35.19	41.00	7.94	7.00	-

C, from the feeder; D, from the dealer; M, from the manufacturer; and O, the inspector's sample.

Analyses of Samples of Feeding Stuffs.

Name of Feed and Manufacturer or Shipper.	Source of samples.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
Old Gold Cotton Seed Meal	C	40.44	41.00	-	9.00	2357
T. H. Bunch	O	42.25	41.00	-	9.00	2270
	O	40.19	41.00	-	9.00	2399
	O	39.50	41.00	-	9.00	2457
	O	36.75	41.00	-	9.00	2536
	O	46.50	41.00	-	9.00	2557
Average	O	41.04	41.00	9.19	9.00	-
Owl Brand Cotton Seed Meal	C	42.75	41.00	-	9.00	2239
F. W. Brode & Co.	C	36.25	41.00	-	7.00	2300
	D	39.50	41.00	-	7.00	2373
	O	41.88	41.00	-	7.00	2280
	O	37.19	41.00	-	7.00	2293
	O	36.06	41.00	-	7.00	2375
	O	42.63	41.00	-	7.00	2390
	O	37.94	41.00	-	7.00	2430
	O	36.44	41.00	-	7.00	2512
	O	38.06	41.00	-	7.00	2553
	O	41.00	41.00	-	7.00	2537
Average	O	38.90	41.00	8.74	7.00	-
Phoenix Brand Cotton Seed Meal	C	36.38	41.00	-	9.00	2304
D. L. Marshall Co., Boston	C	32.50	41.00	-	7.00	2494
	D	34.94	41.00	-	7.00	2335
	D	19.81	41.00	-	9.00	2366
	D	31.38	41.00	-	9.00	2384
	D	33.94	41.00	-	9.00	2561
	D	37.88	41.00	-	9.00	2405
	D	39.13	41.00	-	9.00	2447
	D	32.75	41.00	-	9.00	2503
	D	31.75	41.00	-	9.00	2542
	D	34.94	41.00	-	9.00	2543
	M	40.88	41.00	-	-	2423
	O	36.90	41.00	-	9.00	2314
	O	30.13	41.00	-	9.00	2344
	O	31.75	41.00	-	9.00	2374
	O	39.13	41.00	-	9.00	2413
	O	33.81	41.00	-	9.00	2455
	O	33.00	41.00	-	9.00	2475
	O	35.44	41.00	-	9.00	2485
	O	37.81	41.00	-	9.00	2511
	O	39.94	41.00	-	9.00	2558
Average	O	35.32	41.00	9.02	9.00	-
Cotton Seed Meal	C	36.56	38.60	-	-	2301
Piedmont Oil & Refining Co.	C	38.94	38.60	-	-	2305
	D	38.13	38.60	-	-	2256
	D	39.94	38.60	-	-	2261
	O	39.00	38.63	-	-	2294
	O	39.69	38.63	-	-	2391
	O	38.50	38.63	-	-	2441
	O	40.25	38.63	-	-	2445
Average	O	39.36	38.63	8.98	-	-
Star Brand Cotton Seed Meal	C	37.00	41.00	-	9.00	2303
J. Lindsay Wells Co., Memphis	C	37.88	41.00	-	9.00	2306
	C	38.88	41.00	-	9.00	2334
	D	34.75	41.00	-	9.00	2246
	D	40.88	41.00	-	9.00	2249

C, from the feeder; D, from the dealer; M, from the manufacturer; and O, the inspector's sample.

Analyses of Samples of Feeding Stuffs.

Name of Feed and Manufacturer or Shipper.	Source of sample.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
Star Brand Cotton Seed Meal	D	38.56	41.00	-	9.00	2250
J. Lindsay Wells Co., Memphis	D	38.81	41.00	-	9.00	2251
	D	37.75	41.00	-	9.00	2252
	D	38.25	41.00	-	9.00	2253
	D	37.81	41.00	-	9.00	2254
	D	37.44	41.00	-	9.00	2255
	D	37.63	41.00	-	9.00	2257
	D	39.75	41.00	-	9.00	2258
	D	38.63	41.00	-	9.00	2299
	D	35.44	41.00	-	9.00	2336
	D	43.50	41.00	-	9.00	2382
	D	35.50	41.00	-	9.00	2383
	D	20.63	41.00	-	9.00	2496
	O	40.31	41.00	-	9.00	2286
	O	35.25	41.00	-	9.00	2292
	O	38.88	41.00	-	9.00	2319
	O	34.38	41.00	-	9.00	2433
	O	38.25	41.00	-	9.00	2444
	O	38.88	41.00	-	9.00	2452
	O	38.38	41.00	-	9.00	2473
	O	40.13	41.00	-	9.00	2481
	O	34.50	41.00	-	9.00	2517
	O	35.50	41.00	-	9.00	2522
	O	39.88	41.00	-	9.00	2528
Average	O	37.72	41.00	9.35	9.00	-
Sun Brand Extra Prime Cotton Seed Meal	D	35.00	38.00	-	9.00	2386
J. Lindsay Wells Co.	O	36.56	38.00	8.61	9.00	2466
Cotton Seed Meal	C	37.50	41.20	-	-	2274
L. Lindsay Wells Co.						
COTTON SEED FEED.						
Glenwood Cotton Seed Feed	D	23.13	22.00	5.13	5.00	2243
D. L. Marshall Co., Boston.						
Scoco Cotton Seed Feed	D	21.56	23.00	5.81	4.00	2259
Southern Cotton Oil Co., Memphis, Tenn.						
LINSEED OIL MEAL.						
Ground Oil Cake	O	31.69	30.00	10.93	7.00	2295
Red Wing Linseed Mills.						
Linseed Oil Meal	O	35.88	38.00	-	1.00	2271
American Linseed Oil Co.	O	35.19	36.00	-	1.00	2291
	O	35.19	36.00	-	1.00	2296
	O	36.06	36.00	-	1.00	2343
	O	34.19	36.00	-	1.00	2345
	O	34.75	36.00	-	1.00	2410
	O	36.31	36.00	-	1.00	2435
	O	35.63	36.00	-	1.00	2459
	O	35.13	36.00	-	1.00	2478
	O	36.13	36.00	-	1.00	2514
Average	O	35.45	36.00	3.43	1.00	-
Old Process Linseed Meal	O	35.75	32.00	8.27	5.00	2549
American Linseed Oil Co.						

C, from the feeder; D, from the dealer; M, from the manufacturer; and O, the inspector's sample.

Analyses of Samples of Feeding Stuffs.

Name of Feed and Manufacturer or Shipper.	Source of sample.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
Old Process Linseed Meal	O	36.13	35.95	8.30	6.51	2516
Henenstein & Co.						
GLUTEN FEED AND MEAL.						
Bay State Gluten Feed	O	20.44	24.00	-	3.00	2263
J. E. Soper & Co., Boston	O	20.38	24.00	-	3.00	2404
	O	23.13	24.00	-	3.00	2548
Average	O	21.32	24.00	2.83	3.00	-
Buffalo Gluten Feed	D	25.25	25.00	-	2.50	2297
Glucose Sugar Refining Co.	O	22.69	25.00	-	2.50	2281
	O	24.13	24.00	-	-	2378
	O	23.69	24.00	-	2.50	2393
	O	25.63	25.00	-	2.50	2431
	O	25.00	25.00	-	2.50	2438
	O	23.56	24.00	-	2.50	2442
	O	26.69	25.00	-	2.50	2456
	O	24.38	25.00	-	2.50	2482
	O	25.63	25.00	-	2.50	2509
	O	24.38	24.00	-	2.50	2523
	O	25.00	25.00	-	2.50	2551
Average	O	24.62	-	5.10	2.50	-
Continental Gluten Feed	O	31.00	35.00	-	12.00	2434
Continental Cereal Co.						
Jenks Gluten Feed	O	21.94	27.00	-	7.50	2283
Huron Milling Co.	O	26.00	27.00	-	7.50	2422
	O	28.06	27.00	-	7.50	2531
Average	O	25.33	27.00	11.95	7.50	-
Jenks Gluten Meal	O	38.88	36.00	8.00	5.00	2268
Huron Milling Co.						
Tiger Gluten Feed	O	24.94	25.00	5.15	2.75	2355
St. Louis Syrup & Preserving Co.						
Warner's Gluten Feed	D	27.06	25.00	-	3.00	2298
Warner Sugar Refining Co., Waukegan, Ill.	O	25.50	25.00	-	3.00	2309
	O	24.88	25.00	-	2.50	2322
	O	23.44	24.00	-	2.50	2409
	O	25.50	24.00	-	2.50	2426
	O	24.50	24.00	-	2.50	2469
Average	O	24.76	24.00	4.98	2.50	-
DISTILLERS' GRAINS.						
Anchor Distillers' Grains	O	15.88	15.00	-	8.00	2379
C. A. Krause Grain Co.	O	15.75	15.00	-	8.00	2484
	O	15.75	15.00	-	8.00	2535
Average	O	15.80	15.00	3.95	8.00	-
Ajax Flakes	O	34.25	33.00	-	12.00	2325
Ajax Milling & Feed Co.	O	30.53	33.00	-	12.00	2387
	O	32.00	33.00	-	12.00	2389
	O	29.50	33.00	-	12.00	2400
	O	31.56	33.00	-	12.00	2458
	O	35.00	33.00	-	12.00	2539
Average	O	32.14	33.00	14.68	12.00	-

C, from the feeder; D, from the dealer; M, from the manufacturer; and O, the inspector's sample.

Analyses of Samples of Feeding Stuffs.

Name of Feed and Manufacturer or Shipper.	Source of sample.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
Fourex	O	32.50	33.00	-	11.00	2310
J. W. Biles & Co.	O	30.38	33.00	-	11.00	2317
	O	29.44	33.00	-	11.00	2394
	O	31.06	33.00	-	11.00	2454
	O	33.56	33.00	-	11.00	2464
	O	33.13	33.00	-	11.00	2489
	O	31.13	33.00	-	11.00	2527
Average	O	31.60	33.00	13.63	11.00	-
BREWERS' GRAINS.						
Brewers' Grains	O	30.56	24.00	-	7.50	2342
Anheuser-Bush Brewery Assn.	O	23.63	24.00	-	7.50	2381
Average	O	27.10	24.00	8.00	7.50	-
Brewers' Grains	C	20.38	25.00	-	7.00	2544
C. A. Krause Grain Co.	D	24.44	25.00	-	7.00	2498
	O	25.38	25.00	7.03	7.00	2483
MISCELLANEOUS NITROGENOUS FEEDS.						
Alfalfa Meal Flint Mill Co.	O	21.31	20.00	4.48	4.00	2416
H-O Butter Feed H-O Company, Buffalo, N. Y.	O	19.94	18.00	5.08	4.50	2285
Protena Dairy Feed	O	19.75	20.00	-	3.50	2425
Purina Mills	O	20.13	20.00	-	3.50	2529
Average	O	19.94	20.00	5.05	3.50	-
Purina Mill Feed Alfalfa Meal Ralston Purina Mills, St. Louis.	O	15.38	16.00	2.07	2.40	2540
Rye Protegran	M	21.69	22.00	6.33	10.00	2247
Union Grains	C	24.55	24.00	-	7.00	2448
J. W. Biles Co.	O	23.81	24.00	-	7.00	2267
	O	23.31	24.00	-	7.00	2341
	O	23.63	24.00	-	7.00	2453
	O	23.25	24.00	-	7.00	2513
	O	23.44	24.00	-	7.00	2545
Average	O	23.41	24.00	7.63	7.00	-
Wonder Poultry Feed Flint Milling Co.	O	19.69	22.00	6.73	4.00	2316
MOLASSES AND SUGAR FEEDS.						
Green Diamond Sugar Feed Chapin & Co.	O	15.50	16.50	2.86	3.50	2323
Hammond Dairy Feed Western Grain Products Co.	O	14.81	17.00	6.63	3.00	2349
Molasses Grains E. P. Mueller, Milwaukee, Wis.	C	18.44	†23.00	4.68	-	2260

C, from the feeder; D, from the dealer; M, from the manufacturer; and O, the inspector's sample.
† Protein and fat.

Analyses of Samples of Feeding Stuffs.

Name of Feed and Manufacturer or Shipper.	Source of sample.	Protein. Found — per cent.	Protein. Guaranteed — per cent.	Fat. Found — per cent.	Fat. Guaranteed — per cent.	Station number.
Molac Molasses Dairy Feed	O	14.13	16.00	-	3.00	2272
American Cereal Co.	O	14.63	15.50	-	3.00	2415
	O	16.81	16.00	-	3.00	2520
Average	O	15.19	-	6.18	3.00	-
Sucrene Dairy Feed	O	16.50	16.50	-	3.50	2289
American Milling Co.	O	17.63	16.50	-	3.50	2532
Average	O	17.07	16.50	6.6	3.50	-
CORN AND OAT FEEDS.						
Boss Corn and Oat Feed	O	7.94	8.50	6.75	3.50	2278
Great Western Cereal Co.						
Durham Corn and Oat Feed	O	8.88	8.27	5.88	3.64	2377
Great Western Cereal Co.						
Empire Feed for Stock	C	8.00	7.63	-	3.97	2358
Empire Mills, Olean, N. Y.	O	8.25	7.63	-	3.97	2265
	O	8.63	7.63	-	3.97	2468
	O	8.50	7.63	-	3.97	2519
	O	8.50	7.63	-	3.97	2521
	O	8.75	7.63	-	3.97	2559
Average	O	8.52	7.63	5.43	3.97	-
Haskell's Stock Feed	D	8.75	10.00	-	6.25	2504
W. H. Haskell Co.	O	8.88	10.00	-	6.25	2264
	O	8.04	10.00	-	6.25	2320
	O	9.00	10.00	-	6.25	2510
	O	8.75	10.00	-	6.25	2524
Average	O	8.67	10.00	7.58	6.25	-
Ideal Corn and Oat Feed	C	8.19	9.00	-	3.28	2359
E. T. & H. K. Ide, St. Johnsbury, Vt.	O	7.94	9.00	-	3.28	2554
Average		-	-	5.23	3.28	-
N-E-Stock-Food	O	10.00	9.00	5.83	4.00	2460
H O Company Mills, Buffalo.						
O. O. Yellow Feed	O	10.25	10.51	7.38	5.75	2370
Diamond Elevator & Milling Co.						
Pearl Cooked Horse and Cow Feed	O	8.25	10.00	-	6.00	2287
Flint Milling Co.	O	8.81	10.00	-	6.00	2432
Average	O	8.53	10.00	5.75	6.00	-
Pioneer Corn, Oats and Barley Feed	O	11.44	13.00	-	3.50	2321
Pioneer Cereal Co.	O	11.13	13.00	-	3.50	2526
Average	O	11.28	13.00	4.55	3.50	-
Schumacher's Stock Feed	C	10.00	11.00	-	4.00	2385
American Cereal Co.	O	9.00	11.00	-	4.00	2360
	O	10.19	11.00	-	4.00	2376
	O	9.25	11.00	-	4.00	2392
	O	10.19	11.00	-	4.00	2414

C, from the feeder; D, from the dealer; M, from the manufacturer; and O, the inspector's sample.

Analyses of Samples of Feeding Stuffs.

Name of Feed and Manufacturer or Shipper.	Source of sample.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
Schumacher's Stock Feed	O	10.13	11.00	-	4.00	2428
American Cereal Co.	O	9.25	11.00	-	4.00	2518
	O	10.25	11.00	-	4.00	2530
	O	8.94	11.00	-	4.00	2556
Average	O	9.65	11.00	4.85	4.00	-
Sunshine Feed Hunter Bros. Milling Co., St. Louis.	D	15.88	15.00	-	4.00	2506
Victor Corn and Oat Feed	O	8.81	9.00	-	4.00	2318
American Cereal Co.	O	7.25	9.00	-	4.00	2339
	O	8.00	9.00	-	4.00	2429
	O	8.13	7.50	-	3.00	2515
	O	7.25	9.00	-	4.00	2555
Average	O	7.89	-	4.22	4.00	-
Victoria Chop	O	7.56	8.11	-	3.05	2534
Royce & Coon Grain Co., Bowling Green, O.	O	7.63	8.11	-	3.05	2538
Average	O	7.60	8.11	4.48	3.05	-
OAT FEEDS.						
O. M. Feed Regular-Oat Feed	O	6.38	6.00	-	2.00	2418
Chas. M. Cox Co.	O	6.75	6.00	-	2.00	2420
	O	6.75	6.00	-	2.00	2474
Average	O	6.63	6.00	3.84	2.00	-
HOMINY FEEDS.						
Keystone Hominy Feed M. F. Baringer.	O	10.25	10.50	8.63	7.90	2351
Wirthmore Hominy Feed	O	9.69	9.50	-	7.50	2350
Chas. M. Cox Co.	O	11.38	9.50	-	7.50	2388
	O	12.88	9.50	-	7.50	2436
Average	O	11.32	9.50	10.55	7.50	-
MISCELLANEOUS STARCHY FEEDS.						
Flaked Wheat Feed Quaker Oats Co.	O	13.63	12.00	-	1.75	2346
Peerless Mixed Feed	C	14.38	15.22	-	5.47	2354
(Not a wheat product)	O	14.25	15.22	-	5.47	2380
	O	14.19	15.22	-	5.47	2525
Average	O	14.22	15.22	4.65	5.47	-
Queen Stock Feed Brown Milling Co.	O	8.88	9.20	4.78	4.10	2480
"Sharps" Middlings	C	14.88	-	-	-	2492
WHEAT OFFALS.						
Acme Feed Acme Milling Co., Indianapolis.	O	16.69	-	-	-	2490
Acme Mixed Feed	O	13.56	-	-	-	2371
J. H. Hale & Sons	O	14.44	-	-	-	2476
Badger Flour Middlings Berger Crittenden Milling Co.	O	16.38	17.00	-	4.00	2326

C, from the feeder; D, from the dealer; M, from the manufacturer; and O, the inspector's sample.

Analyses of Samples of Feeding Stuffs.

Name of Feed and Manufacturer or Shipper.	Source of sample.	Protein.		Fat.		Station number.
		Found—per cent.	Guaranteed—per cent.	Found—per cent.	Guaranteed—per cent.	
Blish White Middlings Blish Milling Co.	D	15.38	-	-	-	2328
Stotts Bran David Stotts Flouring Mills, Detroit.	O	15.38	-	-	-	2398
Adrian Pure Winter Wheat Bran Detroit Milling Co.	O	14.56	-	-	-	2327
Shorts Dwight Flour Mills, Minn.	O	15.38	12.00	-	3.00	2340
Fancy Middlings Geo. Tileston Milling Co.	O	18.19	15.00	-	3.00	2369
Fancy Low Grade Flour Geo. Tileston Milling Co.	D	16.50	-	-	-	2501
Hubbard's Fancy Flaked Bran Hubbard Milling Co.	O	14.63	14.50	-	4.80	2368
Standard Fine Middlings Hubbard Milling Co.	O	18.56	14.00	-	5.10	2372
Pure Winter Wheat Bran	O	15.38	14.00	-	3.50	2315
Hunter Bros. Milling Co.	O	16.00	14.00	-	3.50	2347
	O	14.38	14.00	-	3.50	2471
Security Mixed Feed Hunter Bros.	O	15.88	15.00	-	4.00	2367
Sunshine Mixed Feed	O	16.50	15.00	-	4.00	2282
Hunter Bros.	O	15.63	15.00	-	4.00	2348
Boston Mixed Feed Imperial Milling Co.	O	16.31	16.00	-	4.50	2290
Pyramid Mixed Feed	O	15.56	-	-	-	2437
Lexington Mixed Feed Lexington (Ky.) Roller Mills Co.	O	15.19	-	-	-	2477
Bran Northwestern Con. Milling Co.	O	15.25	14.25	-	4.00	2412
Fancy Feed Oakes Milling Co., Oakes, N. D.	C	17.38	-	-	-	2495
Esmeralda Mixed Feed Ohio Cereal Co., Cincinnati.	O	17.00	-	-	-	2407
Esmeralda Bran	O	15.63	15.10	-	3.45	2408
Champion Mixed Feed Portland Milling Co.	O	15.63	-	-	-	2373
Monarch Ground Wheat Feed F. W. Stock & Sons.	O	16.56	-	-	-	2395

C, from the feeder; D, from the dealer; M, from the manufacturer; and O, the inspector's sample.

Analyses of Samples of Feeding Stuffs.

Name of Feed and Manufacturer or Shipper.	Source of sample.	Protein. Found—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
Farmers' Favorite Mixed Winter Wheat Cow Feed Valley City Milling Co.	O	15.19	-	-	-	2352
Michigan Winter Wheat Bran Valley City Milling Co.	O	15.25	-	-	-	2450
Mixed Feed Voight Milling Co., Grand Rapids.	D	15.25	-	-	-	2262
Voight's Winter Mixed Feed Voight Milling Co., Grand Rapids.	O	15.13	-	-	-	2396
Voight's Middlings Voight Milling Co., Grand Rapids.	O	15.38	-	-	-	2397
Pillsbury's B Middlings Washburn-Pillsbury Co.	O	17.00	14.00	-	4.50	2324
ADULTERATED WHEAT OFFALS.†						
Indiana Mixed Feed	C	11.38	12.05	-	3.20	2491
Indiana Milling Co.	O	10.88	12.05	-	3.20	2279
	O	11.00	12.05	-	3.20	2462
	O	13.50	12.05	-	3.20	2533
	O	13.25	12.05	-	-	2541
Average	O	12.16	12.05	4.15	3.20	-
Jersey Mixed Feed	O	12.56	12.05	-	3.20	2266
Indiana Milling Co.	O	11.25	12.05	-	3.20	2461
Average	O	11.91	12.05	4.08	3.20	-
BEEF SCRAPS.						
Beef Scraps American Agricultural Chemical Co.	O	51.94	30.00	17.40	20.00	2411
First Grade Beef Scraps Carrol S. Page, Hyde Park, Vt.	M	64.56	60.00	29.30	22.00	2365
Beef Scraps Portland Rendering Co.	O	42.00	40.00	18.30	15.00	2284

C, from the feeder; D, from the dealer; M, from the manufacturer; and O, the inspector's sample.

† The sale of adulterated wheat offals is lawful when the "adulteration thereof is plainly marked or indicated upon the packages."

COTTONSEED MEAL.

Analyses pages 95-97.

Cottonseed meal is a by-product from the manufacture of cottonseed oil. After the cotton has been taken from the seed in the cotton gin, the remaining down or " linters " and the hard black seed coats or hulls are removed by machinery. The remainder of the seed is cooked and the oil expressed by high pressure. The resulting cottonseed cake is ground into the bright, yellow cottonseed meal of commerce. Such a meal made from good seed would carry from 40 to 50 per cent of protein. With improvements in the process of manufacture, it is now possible to extract the oil without making all the separations formerly needed. Hence it has come about that the cottonseed meal now offered in the market is as a rule of lower protein content than was the case 10 years ago.

The shippers of cottonseed meal up to about two years ago guaranteed 43 per cent protein and 9 per cent fat. A large part of the cottonseed meal is used for fertilizing purposes and its nitrogen is guaranteed in the form of ammonia. The Interstate Cotton Seed Crushers Association in May, 1906, established the following grades for cottonseed meal.

Choice cottonseed meal must be finely ground, perfectly sound and sweet in odor, free from excess of lint and hulls and by analysis must show at least 8 per cent ammonia, equivalent to 41.15 per cent protein.

Extra prime cottonseed meal must be finely ground, of sweet odor, reasonably bright in color, yellow not brown or reddish, and by analysis must contain at least 7.5 per cent of ammonia, equivalent to 38.50 per cent protein.

Prime cottonseed meal must be finely ground of sweet odor, reasonably bright in color and by analysis must contain at least 7 per cent ammonia, equivalent to 36 per cent protein.

"*Off*" meal is any cottonseed meal which is distinctly deficient in any of the requirements of prime quality, either in color, odor, texture or analysis, or all. "Off" meal should only be sold by sample.

As is shown in the table on page 112, there is about 2 dollars a ton difference in value between each of these grades of cottonseed meal as a source of protein. Choice cottonseed meal at $32 a ton is as economical a source of protein as prime meal at 28 dollars per ton. The cost of protein in each case would be 3.9 cents a pound.

The hulls and cotton which should be removed from the seed before it is crushed and pressed, have but little feeding value. A little of these materials has always been present in the meal; with the present processes of manufacture, there is probably more of these materials present than formerly. The demand from feeders for cottonseed meal has so increased the value of this by-product, that the temptation to include as much of the hulls and cotton as practicable is great. The processes of manufacture in different mills also vary so that the meal from some mills will contain more of the dark hulls which gives the dark colored meal of inferior feeding value.

Strictly first-class cottonseed meal is always bright and yellow and should have a pleasant nutty flavor. Not all dark colored cottonseed meal is necessarily adulterated. The spontaneous heating of the seed in the field, or over cooking of the "meats" may render the meal dark in color without changing its composition. Such meal is not first quality, however, and should be sold at a lower price.

Because of the differences in the behavior of hulls, the finely ground cottonseed meal, and the cotton when wet up with water, the presence of undue amounts of hull and cotton can be readily detected by stirring a little of the meal in a tumbler of water. The hulls, unless they are very finely ground, settle out first and on top of these will come the finer portions of the meal, and finally the cotton by itself. By testing a meal of high grade in comparison with a poor quality meal, one can so familiarize himself with this test as to quite readily and accurately distinguish the quality of cottonseed meal.

The cottonseed meal situation has been a very unfortunate one in Maine the present year. In the late fall the cotton crop was very seriously damaged by a storm which resulted in a smaller yield of cottonseed than was anticipated, and also made considerable dark colored meal. This shortage materially advanced the price of choice cottonseed meal and increased the

quantity of meal that was below prime in quality. Apparently the orders for meal were solicited by out of state dealers, in Maine during the summer of 1906. The offers were made and the orders placed at a low price so that when it came time to deliver the goods, choice cottonseed meal had advanced materially beyond this price. Apparently these Maine orders, in many instances, were filled from inferior goods. Evidently the dealers in Maine were imposed upon,, and the jobbing houses claim that they were also imposed upon and that they were not aware that the meal which they were giving to their Maine customers was of such bad quality. Many of the dealers, as soon as they received the meal, submitted samples to the Station for analysis and wherever the analysis has shown the material to be inferior the dealers have promptly changed the guarantees upon the goods which they had in stock, to correspond with fact. As there was no evidence that there was any intentional fraud on the part of Maine dealers, no prosecutions have been made; the trouble apparently lying entirely outside of the State. As the market is becoming exhausted of these summer bought goods, cottonseed meal of much better quality is now appearing, samples having been submitted which carry as high as 46 per cent protein.

The meal bearing the tags of Kaiser & Brown, Memphis, and one lot of Phœnix brand and one dealers sample of Star brand cottonseed meal were particularly bad goods, having about the composition of so-called Sea Island cottonseed meal, and closely resembling cottonseed feed in appearance. The great majority of the cottonseed meals sold in the State during the late fall and early winter seem to run about as prime meal instead of choice as the dealers were expecting.

COTTONSEED FEED.

Analyses page 97.

Two samples of cottonseed feed were sent to the Station by dealers. These were approximately correctly guaranteed as to their percentages of protein and fat. They are, however, not economical feeds unless they can be bought for half the price of choice cottonseed meal. A ton of choice cottonseed meal carries 820 pounds of total and 680 pounds of digestible protein and while a ton of cottonseed feed carries 440 pounds of total, it has only 340 pounds digestible protein.

LINSEED MEAL.

Analyses pages 97 and 98.

Linseed meal is made by grinding flax seed from which the oil has been more or less completely removed. Most of the oil meal now on the market is new process meal in which the fat is removed by the use of naphtha. New process linseed meal is generally somewhat lower in fat and higher in protein than old process. The amount of linseed oil meal found in the market in Maine has considerably increased. This is probably due to the poor quality of the cottonseed meal. Linseed oil meal is a safer and in some respects a better feed than cottonseed meal. The small amount available and its formerly higher price, led to its lessened use. It will be noted that the goods run quite nearly in accordance with the guarantees.

GLUTEN MEALS AND FEEDS.

Analyses page 98.

Gluten meals and feeds are the by-products left in the manufacture of starch and glucose from Indian corn. Corn consists largely of starch. The waste product in the manufacture of starch and sugar is relatively richer in oil and protein than is corn. Most factories remove part of the corn oil from the waste so that nearly all the gluten meals carry less oil than they did a few years ago.

Gluten feeds differ from gluten meals in that they contain considerably more of the corn bran and hence relatively less protein, fat and digestible carbohydrates, and more of the indigestible woody fiber. Gluten products which were formerly quite extensively used in Maine, came to be regarded as rather unsatisfactory forms of concentrated feeds, chiefly because of their uneven composition.

The gluten products are desirable sources of protein and now that the manufacturers are placing guarantees upon their goods, much more nearly corresponding to fact, this class of feeding stuffs may become again as popular as they were a few years ago. There is apparently much more of the Buffalo gluten feed used in Maine than other makes and it will be noted that this runs pretty even in composition and for the most part well up

to guarantee. The Bay State gluten feed did not come up to its guarantee. The Jenks gluten feed is guaranteed higher than the other gluten feeds but the 3 samples examined varied greatly in composition,—one falling markedly below, while the two other samples were practically in accord with the guarantee. A good gluten feed can be expected to carry about 24 per cent protein. Only two lots of gluten meal were found in the State.

DISTILLERS GRAINS.

Analyses pages 98 and 99.

In composition, dried distillers grains resemble the gluten feeds. They are derived from corn from which the starch is removed by fermentation. They are more bulky than the gluten feeds and for the most part run higher in protein. A feeding test with distillers grains was reported in Bulletin 92 of this Station. The Anchor Distillers Grains are low grade goods and it is hoped that they will not be offered further in the State. Ajax Flakes and Fourex are running a little below their guarantees in protein, but are well up in fat.

BREWERS GRAINS.

Analyses page 99.

Brewers Grains are not largely used or sold in Maine. The two brands that were offered in the State were of good quality, free from acidity and were up to their guarantees in protein and in fat.

MISCELLANEOUS NITROGENOUS FEEDS.

Analyses page 99.

The Union Grains are quite largely used in the State. It is probable that the other nitrogenous feeds here classed are not so extensively used. It is interesting to note, however, that practically all of these feeding stuffs come up to their guarantees. A feeding test with Union Grains was reported in bulletin 106 of this Station.

MOLASSES AND SUGAR FEEDS.

Analyses pages 99 and 100.

Feeding experiments with molasses feeds have shown them to be fairly economical. They, however, are not used very much in this State and should not be purchased by the ordinary farmer since they are low in protein and high in carbohydrates. Feeders who find it necessary to purchase nearly all of their food may find these molasses feeds economical.

The molasses and sugar feeds carry on the average about 15 to 16 per cent of protein. It is to be remembered, however, that this class of feeds are sold not as a source of protein but for the soluble carbohydrates which they carry, and the lower protein means more of the carbohydrates. The Molac Molasses Dairy feed in two instances fell below the guarantee. Sucrene Dairy feed was up to the guarantee.

REFUSES FROM MILLING OATS, CORN, ETC.

Analyses pages 100 and 101.

The market still carries a large number of oat feeds, corn chops, corn and oat feeds and similar offals by themselves and blended with concentrated feeds. They vary in composition from the straight oat hull refuse with perhaps 6 per cent protein, to the blends that carry from 15 to 18 percent of protein. For the most part these goods are fairly well up to their guarantee and no fault can be found with the manufacturer for desiring to sell these waste products. Few or no claims are made for nutrients which the goods do not actually carry. The feeder has himself to blame if, with barns filled with hay, corn stalks and silage, he buys feeds low in protein instead of those high in protein. An oat feed with 6 per cent protein is no better feed nor is it any better digested than a coarse fodder with the same protein content. This class of foods can probably be economically used only by feeders who find it necessary to buy "roughage" as well as concentrates.

Many of these corn and oat feeds run up to the guarantee, but others of them, such as Haskell's Stock feed, Shumachers Stock feed, and Victor Corn and Oat feed run constantly below their guarantee in protein. Why anyone should care to buy a

feeding stuff like the O. M. Feed Regular (Oat feed) with about the same protein content as oat straw, is difficult to understand.

WHEAT BRAN AND MIDDLINGS.

Anlyses pages 101-103

The refuses from the milling of wheat vary, as is to be expected, quite largely in composition. A good quality mixed feed or wheat bran should carry 15 per cent protein and as noted in the table some of them ran considerably above that. While the feeding stuffs law of this State does not require straight wheat refuses to be guaranteed many of the manufacturers are now placing guarantees for both protein and fat upon the various wheat offals.

There is no class of feeding stuffs in which the consumer needs to use greater care at present than in the purchase of mixed feeds. While the regular brands are all right, as they have been in the past, there are some spurious articles in the market.

There is so much profit in selling ground corn cobs and broom corn at the price of wheat bran that the consumer must ever be on the watch against this fraud. The safest thing is to buy only well known, reliable brands of this class of goods. The bulletin gives the names and analyses of many manufacturers of high class brans and other wheat offals. If consumers will see to it that all of this class of feeds which they buy carries the name of the miller there will be little likelihood of their being defrauded. In case of any doubt, mail a sample to the Station and an analyses will be made and the results reported promptly and without charge.

ADULTERATED WHEAT OFFALS.

Analyses page 103.

With the exception of the mixed feeds from Kentucky, sold chiefly under the names of Jersey mixed feed and Indiana mixed feed, no adulterated wheat offals have been found upon the market. Most of these goods offered in the State are properly tagged, carrying not only the percentage of protein and fat, but the statement of their composition showing the

materials that have been added to the wheat bran. In only one instance, and that is now being investigated, has there apparently been fraud in the offering of these adulterated feeds. Their sale is perfectly proper under the law when they are correctly labeled. There is, however, practically no feeding value in corn cobs and as these adulterated wheat offals are sold for only one dollar or so per ton below the price of a straight wheat bran, they are expensive feeds.

BEEF SCRAPS.

Analyses page 103.

Ground beef scraps are used chiefly for feeding poultry and while they are more or less generally distributed, the sales are small as compared with other materials coming under the feeding stuffs law. In some instances, at any rate, the guarantee as placed upon the goods is only a very general guide to the actual composition.

The Kind of Concentrated Feeding Stuffs to Purchase.

The crops grown upon the farm are rich in carbohydrates and poor in protein. Clover will help supply the needed protein, and home grown grains will help out toward a balanced ration. But after growing all the food that can be produced economically on the farm, the dairyman will usually find that he needs to supplement the home grown food by the purchase of concentrated commercial feeding stuffs.

As the farm produces or can be made to produce all the starch, sugar and fiber that are needed, it is not necessary to take these constituents into account in the purchase of supplementary food materials. While they have a part, and a necessary part, in the ration, it is protein that is needed to supplement the home grown foods, hence the cost per pound of the protein in a given feeding stuff is of more importance than the ton price. A ton of cottonseed meal costs more than a ton of oat feed, but the protein in the former costs less than 4 cents a pound and 10 or more in the other. The table on the following page shows the number of pounds of protein that a ton of a few average feeding stuffs carries, and the cost of a pound of protein at the usual range in selling price.

Cost of one pound protein in different feeding stuffs at different prices per ton.

Kind of feeding stuff.	Protein in ton.	At $18 per ton.	At $20 per ton.	At $26 per ton.	At $28 per ton.	At $30 per ton.	At $32 per ton.
	Pounds.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.
Choice cottonseed meal	820	.....	.....	.....	3.3	3.6	3.9
Extra prime cottonseed meal	770	.....	.....	.....	3.6	3.9	4.2
Prime cottonseed meal	720	.....	.....	3.6	3.9	4.2	4.5
Cottonseed feed	440	4.1	4.6	6.0	6.5	.....	.....
New process linseed meal	750	.....	.....	3.4	3.7	4.0	4.3
Old process linseed meal	640	.....	.....	4.1	4.4	4.7	5.0
Gluten meal	680	.....	.....	3.8	4.1	4.4	4.7
Gluten feed	520	.....	.....	5.0	5.4	5.8	.....
Distillers grains	660	.....	.....	3.9	4.2	4.5	4.8
Union grains	480	.....	.....	5.4	5.8	6.2	.....
Wheat middlings	360	5.0	5.4	.....	.....	.....	.....
Wheat bran	300	6.0	5.7	.....	.....	.....	.....
Jersey mixed feed	240	7.5	8.3	.....	.....	.....	.....
Oat feed 7.5 per cent protein	150	12.0*	.....	.....	.....	.....	.....

* At $12 per ton, a pound of protein will cost 8 cents.

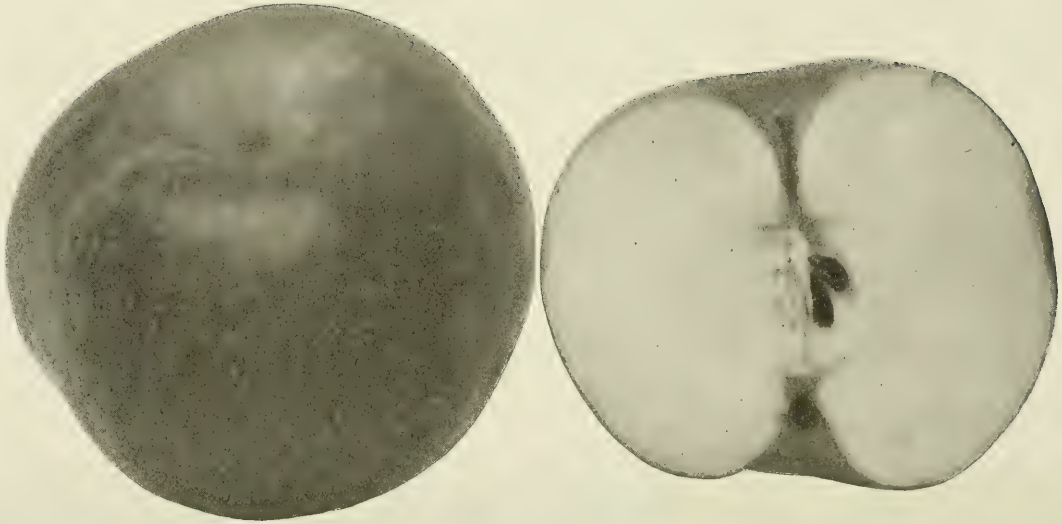

Figure 3. Rolfe. See page 130.

PRELIMINARY NOTES ON THE SEEDLING APPLES OF MAINE.

W. M. Munson.

In 1845 Charles Downing wrote: "New varieties of apples are constantly springing up in this country from seed, in favorable soils; and, when of superior quality may, as a general rule, be considered much more valuable for orchard culture than foreign sorts, on account of their greater productiveness and longevity. Indeed every state has some fine apples peculiar to it, and it is therefore impossible, in the present state of pomology in this country, to give a complete list of the finest apples of the United States."

Among the earliest Maine apples to attract attention were several varieties originating in the town of Winthrop, on the farm at present owned by John Stanley and Wyman Hanson. These apples sprang from seed brought to Winthrop before 1800 by Ichabod Howe, to whom is due the credit of planting the first orchard in the town of Winthrop. The seeds were brought from Ipswich, Massachusetts, and from the miscellaneous collection of seedlings produced, several valuable sorts were selected; among them being Winthrop Greening, which was first brought to notice by Jacob Nelson of Winthrop, who owned the Howe farm in the year 1808. Nelson, Lambert and many other varieties of local importance were also included.

In 1850, 10 of the 167 varieties deemed worthy of special mention for New England, by the author of Cole's American Fruit Book, were natives of Maine. The names and descriptions of 7 of these were furnished to the author by Dr. Ezekiel Holmes, at that time Secretary of the Maine Pomological and Horticultural Society, and were as follows: Bailey Golden, Briggs Auburn, Fairbanks, Moses Wood, Stevens Gilliflower, Winn Russett, and Winthrop Pearmain. The other three sorts named were Cole Quince, Table Greening, and Winthrop Greening.

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* Fruits and Fruit Trees of America (1872), p. 70.

Every year there are shown at the various state and local fairs and grange exhibitions of Maine certain apples of considerable merit but only of local repute. Some few of these have reached the officers of the State Pomological Society, or the Experiment Station, and have thus been brought to public notice, others have never been distributed beyond the limits of the town where they were first produced. The purpose of the present notes is to call general attention to those varieties of Maine origin which are worthy of wider dissemination and to record, as accurately as possible, the history of such varietes. In securing data for the subsequent notes of this bulletin, the officers and members of the Maine Pomological Society, as well as other well posted fruit growers, have been freely consulted, and their aid is hereby gratefully acknowledged.

While Baldwin, Greening and other standard varieties, mostly of New England origin, will doubtless remain for many years the leading market sorts, new and valuable types are continually appearing, and these will be most likely to excel near their native home, or in their native state. In order to test such of the Maine seedlings as may be of merit, the Station has established a " Maine Orchard " where such new native sorts as come under observation are, if considered worthy, top-grafted into bearing trees for immediate and careful inspection. Many of the sorts named below are now included in the Station collection, and others are being added from year to year. Fruit growers in the State who have seedlings of special merit are urged to forward specimens of the fruit to the Experiment Station for inspection.

From the earliest times apples have been raised in Maine, and the quality of the fruit produced has always been recognized as of the best, but the farmers of the State have been slow to take advantage of the natural conditions offered. The various county and local agricultural and horticultural societies offered premiums before 1850. The Maine Pomological and Horticultural Society was organized in 1847, though it lived but a few years. In 1873 the State Pomological Society was incorporated. From the first, this society has encouraged the development and dissemination of meritorious seedlings.

Nurseries have at various times been established in the State, notably those of Colby, in Limerick, Bowman, in Sidney and Meritt, in Houlton. The deep snows, however, which in set-

tling strip the limbs from the young trees, and the mice, which also work havoc in young orchards, have combined to render the nursery business risky and unprofitable.

The catalog of Maine seedlings, though necessarily incomplete, includes all of the best known sorts, and some which, though listed by Downing, Cole and others, have been discarded. The fact that a variety has been called to public attention in fruit lists and pomological manuals, is deemed sufficient reason for consideration at this time. Doubtless many sorts have been omitted, and it is hoped that these, with other corrections, may be included in a subsequent and more complete list.

Besides the varieties above mentioned, are several more or less obscure ones, listed at different times by Downing, Thomas, Cole, and others, and mentioned in reports of the Maine Pomological Society. Many of these were simply of local importance and were never generally propagated. Others were more or less widely distributed about 50 years ago, but have been superseded by the sorts more commonly grown in the New York nurseries. Among these varieties may be named: Blake, Chase Seedling, Childs, Dayton, Kennebec Russet, Lambert, Peachblow, Rockwood, Smith Favorite, Table Greening. As these are now wholly, or practically extinct, descriptions are omitted.

TERMS USED IN DESCRIBING APPLES.

In describing the apples named below, the usual technical terms are employed:

The *base* is the "stem end"; the *apex,* the end opposite the stem or stalk, in other words the "blossom end"; the *cavity,* the hollow in which the stem or stalk is inserted; the *basin,* the depression at the apex, in which is the calyx.

A fruit is *round* when nearly spherical, as in Fameuse or McIntosh; *oblate* or *flat* when the breadth is greater than the length, as in Maiden's Blush; *conical,* when tapering from base to apex, as in Bullock, and in a common type of Baldwin or Ben Davis; *round-conical,* as in Red Canada; *oblong-conical,* as in Yellow Bellflower; *oblate-conical,* as in Rhode Island Greening. Various other combinations of forms are mentioned, but the terms used are perhaps sufficiently obvious.

The terms used in describing color, texture, and flavor, are self explanatory. Quality is designated as "good," "very good," and "best," in accordance with the usual custom. A fruit rated only as "good," must have some other very desirable qualities, as earliness, hardiness, productiveness or beauty, to warrant its continuance in cultivation; such for example as Ben Davis, Red Astrachan, Pewaukee, etc. "Very good"

includes most of the commercial varieties, like Rhode Island, Baldwin, Roxbury, Hubbardston, etc. "Best" includes the choicest dessert apples, like Dyer, Grimes, Jonathan, and Mother. Fruits in this class may not be valuable commercially, and still may be well worthy of a place in the home fruit garden.

DESCRIPTIVE LIST OF MAINE SEEDLING APPLES.

AROOSTOOK.—Origin, farm of Silas S. Stiles, Mapleton, Aroostook county, Me., about 1870, from seeds of a "Greening" apple brought from Cumberland county, Me.

Tree vigorous, hardy, productive, even in Northern Aroostook.

Fruit small, roundish conical, light golden russet; fine grained, sweet. Good. "Keeps till July 1 in Aroostook county."

First brought to public notice by the Maine Experiment Station in 1902.*

AUGUST GREENING.—Originated in the garden of General Nowell, near Kenduskeag bridge, Bangor, Me., about 1850.

Tree hardy, spreading, productive.

Fruit large, roundish conical, dark green with reddish blotches; flesh rich, tender, juicy, sprightly acid. Good. August to September.

Said to be specially valuable for pies, being ready for this purpose, as early as July 20. The apple has been exhibited at State and local fairs by F. E. Nowell of Fairfield for more than 30 years. Mr. Nowell claims to have sold $25 to $30 worth of fruit from a single tree in one year.

BAILEY GOLDEN. (Bailey's Golden Sweet, Bailey's Golden Winter).—Origin, orchard of Paul Bailey, Sidney, Maine, before 1850.

As described by Cole, the fruit is very large, oblate, yellow with russet spots; cavity medium, broad; basin broad and shallow; flesh white, rather coarse but of excellent sweet flavor. Season "November and nearly through winter."

Bailey Golden as described by Downing, is said to be of oblong form, though flattened at the base and crown, and to be sub-acid in flavor; in season January to March; and in the Transactions of the Maine Pomological Society,† Cole is said to be in error, as to flavor.

The writer has never seen this variety on exhibition in Maine.

BLACK OXFORD.—Originated in Paris, Oxford county, Maine, about 120 years ago. The tree is hardy, an abundant annual bearer, and is specially adapted to rather moist locations.

Fruit medium, roundish-oblate, or slightly conical, yellow, nearly covered with shades of deepest crimson, and numerous small light colored dots. Flesh whitish, compact, rather dry, mild sub-acid. Good. February to May.

This variety was found as a seedling by Nathaniel Haskell, on the Valentine farm, now owned by John Swett.‡ A portion of the original

* An. Rept. Maine Agr. Expt. Sta. 1902, p. 91.

† Trans. Me. Pom. Soc'y, in Agr. of Maine, 1853, p. 404.

‡ Personal letter, J. G. Swett, March 4, 1907.

Figure 4. Black Oxford.
See page 118.

Figure 5. Cherryfield.
See page 121.

tree is still standing. It is a beautiful apple, of good quality, when in season, and highly prized by many as a late winter variety. It is not considered a good cooking apple, however, and is not being widely planted at the present time. For Maine conditions this apple may prove more valuable than those of the Ben Davis type. It sells well in local markets but is not yet popular in Boston.

BRIGGS, (Briggs Auburn).—Originated in Auburn, Maine, and was introduced by Mr. John C. Briggs before 1850.*

Tree vigorous, hardy and productive.

Fruit large, oblate, light yellow, with slight blush in the sun; stem long, in a broad, deep, flaring cavity; basin broad, shallow; flesh white, fine in texture, pleasant sub-acid. Very good. September and October.

A good variety for the season. According to Mr. I. T. Waterman of East Auburn, this variety is a chance seedling originating on the farm of Thomas Record of the town of Minot, then part of Auburn. The apple had a good local reputation and was freely grafted by neighboring farmers. Specimens were taken from Mr. Waterman's orchard to Dr. Ezekiel Holmes, secretary of the Maine Pomological Society, by Mr. John C. Briggs of Auburn,—hence the name. Well known throughout western Maine.

CHERRYFIELD, (Collins).—A chance seedling on the farm of the late Wyman B. Collins, Cherryfield, Me., about 50 years ago. Original tree still standing.

Tree vigorous, hardy, spreading and productive.

Fruit large, roundish conical, yellowish green, washed and splashed on sunny side with crimson. Stem medium, stout, inserted in a moderately deep, flaring, regular cavity; basin small, irregular; calyx closed; flesh greenish white, crisp, tender, fine grained, mild acid. Good. Season November to February.

Mr. David W. Campbell of Cherryfield, Me., who sends this apple, writes that it has been extensively grafted into all kinds of apple trees in the vicinity of Cherryfield, and that it proves hardy, a good bearer, and of excellent quality. It is a favorite variety in that locality. Under ordinary conditions it keeps through January, and has been kept in good condition until April. The variety is known locally as Collins, because of its original home. This name, however, is already in use for a variety originating in Arkansas, hence the change indicated. Promising.

DEANE, (Nine Ounce).—Originated in the town of Temple, Me., on the farm of Cyrus Deane, before 1874. (See Transactions of Maine Pomological Society, 1874-5, p. 125).

Tree vigorous, spreading, hardy, productive; bearing on alternate years.

Fruit medium, oblate or roundish conical, sometimes a little angular, and flattened at the base; skin whitish, shaded and obscurely splashed and mottled with red, with numerous yellowish dots; stem short, small, inserted in a rather large, greenish cavity; calyx closed; basin medium.

* Trans. Me. Pom. Soc'y, in Agr. of Me., 1853, p. 402.

slightly corrugated; flesh white, fine grained, tender, juicy, with a sprightly vinous or sub-acid flavor. September and October.

One of the best of its season, and highly prized where known. In 1889 the Deane was listed by Shurtleff * in the transactions of the Maine Pomological Society as "One of the most profitable, and one of the best autumn apples." Like other varieties of this season, however, it is subject to the ravages of the trypeta.

DUDLEY (Dudley's Winter, North Star).—A seedling of Oldenburg, grown by John W. Dudley, Mapleton, Aroostook county, Me., in 1875. "The original tree bore its first apples in 1880, and has borne a full crop every year since." †

Tree very vigorous, spreading, hardy and productive, with large, luxuriant foliage.

Fruit large, roundish oblong, greenish yellow, washed and splashed with crimson; stem medium, inserted in a deep cavity; calyx partly open, basin large; flesh yellowish, crisp, breaking, rather coarse, brisk sub-acid. Good to very good. September to January—later in Aroostook county.

This variety is, perhaps more widely grown than any other of the newer sorts originating in northern New England. It is being disseminated by a New York nursery firm under the name North Star—an unfortunate circumstance, as there is another and very different variety bearing that name by right of priority. It is a valuable acquisition as a winter fruit for the northern parts of the State, where it is extensively planted, but as grown at Orono it is decidedly a fall variety.

EMERY (Emery Sweet).—Described by Maine Pomological Society, 1849, as follows: "Fruit medium, globular, russet, washed and streaked with red; Stalk slender, set in a narrow, moderately deep cavity; calyx small; flesh white, fine-grained, rich, sweet. Keeps till May.

"This apple was brought to notice by Judge Emery of Paris, Me., who obtained the cions from Stephen Chase of Fryeburg. It seems never to have been widely disseminated, however." ‡

FAIRBANKS.—Origin, farm of Elijah Fairbanks, Winthrop, Me., during the revolution.

Tree vigorous, hardy, upright, productive.

Fruit medium, light yellow, obscurely striped, with patches of russet; stem medium; cavity broad, moderately deep; flesh yellowish, fine grained, juicy, sub-acid. Good. September to December. The original tree was planted the day that Castine was captured by the British.

Not generally planted at present.

FRANKLIN SWEET.—Origin, Franklin county, Maine. (?)

Tree vigorous, spreading, productive.

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* Maine Pomological Society, 1889, p. 135.

† Personal letter from the originator, Jan. 25, 1907.

‡ Trans. Me. Pom. Soc'y, in Agr. of Maine, 1853, p. 403.

Figure 6. Dudley.
See page 122.

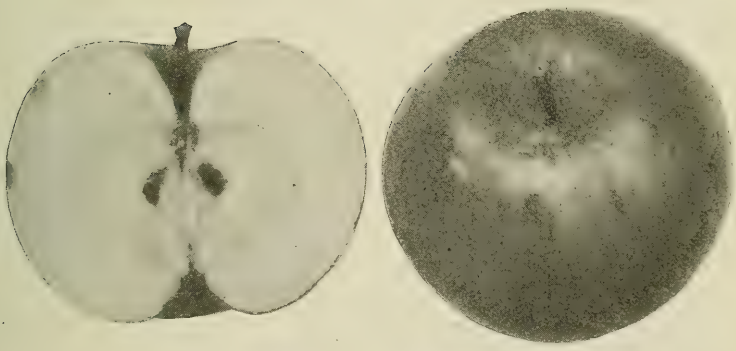

Figure 7. Franklin.
See page 122.

Fruit large, roundish conical, regular, whitish yellow overlaid with crimson, with stripes and splashes of deeper crimson. Stem medium, ¾ inch, inserted in a medium, slightly russeted cavity; basin medium, regular; calyx closed. Flesh white, tender, sweet, rather dry; core small. Good. Season September.

A favorite with many for baking and dessert. Largely planted 50 years ago, but seldom found at the present time.

HARMON.—Originated with J. H. Harmon, Buxton, Me., about 20 years ago. Tree "hardy as a maple and very productive."

Fruit medium, oblate, washed and overlaid with red, with splashes of deep crimson, and numerous large, greyish dots; cavity medium, wide; stem medium, ½ inch long; basin wide, shallow, slightly irregular; calyx small, closed; flesh yellowish, crisp, tender, rather rich, but sharp acid. Good. December to February.

From appearance, the fruit may be a possible seedling of St. Lawrence, but it lacks the fine white flesh of that variety. An attractive appearing apple, now being studied at the Station.

The originator says: "The original tree came up in my garden about 20 years ago. When old enough to transplant it was removed to where it now stands. Though not of first quality it is much better than many other varieties which are largely planted;—notably Ben Davis, Mann, Pewaukee, and American Blush, which last it so much resembles in color and shape as to be hardly distinguishable from it." * (Just which of several forms designated as "American Blush" the originator has in mind is uncertain. It certainly is quite different from the American Blush of Western New York, which is a synonym of Hubbardston.—W. M. M.)

HAYFORD SWEET.—A popular sweet apple in northern Aroostook county, where it originated on the farm of C. Hayford of Maysville, about 35 years ago.

Tree hardy, vigorous, spreading.

Fruit small to medium, oblate-conical, washed, splashed, and, on sunny side, deeply overlaid with crimson. Stem medium, short, inserted in a rather deep, narrow cavity; calyx small, open, in a deep, abrupt, slightly plaited basin; core small; flesh fine grained, rich, sweet but rather dry. Good. October to January, and in Aroostook county until March.

Although small and not very juicy, this variety is prized in northern Maine where there are very few winter apples which will withstand the climate. It is not of value where Tolman, and Munson Sweet thrive.

This variety first bore fruit in 1870, and the original tree is still standing in the garden of Mr. Hayford. It was first brought to public notice in the report of the Maine Experiment Station for 1893.†

HAYNES SWEET.—Origin, Swanville, Waldo county, Maine, on the farm of a Mr. Haynes, adjoining the Searsport line, about 70 years ago.

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* Personal letter, December 22, 1905.

† An. Rept. Maine Agr. Expt. Sta., 1893, pp. 129 and 132.

Tree vigorous, spreading, hardy.

Fruit large, oblong, yellow, washed and splashed with scarlet; stem short, stout, inserted in a broad, shallow, slightly russet cavity; calyx open, basin shallow, slightly irregular; core large; flesh yellowish, coarse grained, sweet. Good. September to January.

This variety, brought to the writer's attention by John Nickels, Searsport, is perfectly hardy and vigorous as far north as Caribou. Its color is not bright enough to make it a valuable market sort, however.

King Sweet (King Sweeting; Summer Sweet; Sidney Sweet; (incorrectly) Hightop Sweet).—Origin, farm of Ichabod Thomas, Sidney, Me., about one hundred years ago.

Tree hardy, vigorous, upright, compact, very productive on alternate years.

Fruit small to medium, roundish, conical, or frequently oblong-conical and nearly truncate; apple yellow, with a delicate blush on sunny side; stem short, small, inserted in a medium cavity; calyx closed, basin rather deep; flesh white, fine grained, tender, juicy, rich, very sweet; core small. Very good. September and October.

This variety is often confused with Hightop, which is a native of Massachusetts, and an entirely different apple. The true Hightop is roundish, or roundish conical, greenish yellow with numerous green dots, and is without the blush cheek. It also has a medium stalk, inserted in a narrow russeted cavity; while the basin is shallow and slightly furrowed. It likewise matures 2 or 3 weeks earlier than the King Sweet. Wherever known this variety is highly prized, but like all early sweet apples it is subject to trypeta attack.

Legacé.—Seedling raised by Jules Legacé, Van Buren, Aroostook county, Me. Parentage uncertain, apparently Oldenburg.

Tree vigorous, spreading, very productive.

Fruit medium, roundish oblate, washed with red, and with splashes of deeper crimson. Stem 1 inch, inserted in a rather deep, somewhat russeted cavity; basin wide, rather shallow, slightly corrugated; calyx closed; flesh white, tender, juicy, pleasant sub-acid. Good, September and October; later at the north.

For southern Maine possesses no superior merit; apparently good for northern localities.

Litchfield Pippin.—A seedling raised by William Hutchings, Litchfield, Me., introduced to public notice by Dr. Ford. (See Transactions of Maine Pomological Society, Agriculture of Maine, 1853, page 406).

The fruit is described as large, oval, somewhat irregular, yellow, with a deep blush on the sunny side; stem short; cavity narrow, shallow; basin broad, rather deep, somewhat corrugated; flesh white, sub-acid.

This variety seems to have disappeared from public notice.

Marlboro.—Origin, farm of S. H. Remick, Marlboro, Me.

Fruit medium, oblate-spherical, yellowish green overlaid with rich crimson on the sunny side, with numerous small dark dots; cavity

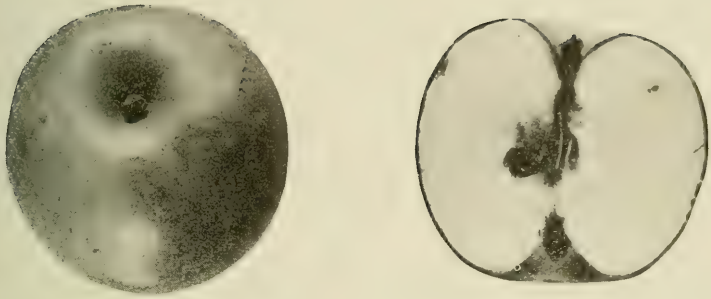

Figure 8. Hayford.
See page 125.

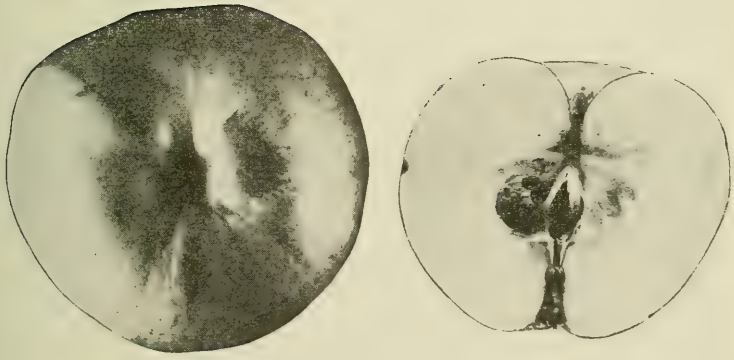

Figure 9. Haynes.
See page 125.

medium, flaring, regular, slightly russeted; stem slender, ½ to ¾ inch; basin very wide, shallow, plaited; calyx partly closed; flesh white, crisp, juicy, fine grained, very firm, pleasant acid; core small. Good. January to May.

In March specimens of this variety were received from Mr. Remick, and they were in prime condition, with a rich aroma.

Monroe Sweet.—Origin, Aroostook county, Me.*

Fruit medium, roundish conical, greenish yellow, washed and splashed with crimson; stem long, slender, inserted in a deep, narrow, slightly russeted cavity; calyx large, partly closed, in a shallow, slightly irregular basin; flesh greenish white, rather dry, sweet. Season, in northern Maine, October to December. Good.

Frequently met in Aroostook county. It possesses no special merit, however.

Moses Wood.—Originated on the farm of Moses Wood (now owned by M. M. Bailey) of Winthrop, Me., before 1850.

Tree vigorous, hardy, productive.

Fruit medium, roundish, light yellow, striped with red; cavity and basin shallow; flesh white, tender, juicy, pleasant sub-acid. Good. September to October.

Still found in old orchards in central Maine, but not now planted. Like most apples of its class and season, it is badly attacked by the apple maggot.

Narragansett.—Originated on the farm of Jacob H. Harmon, Buxton, Me., in 1873.

The tree is reported as a free grower and very hardy; but rather a shy bearer.

Fruit medium to large, conical, pale-yellow, washed and splashed with crimson, and heavily overlaid with a deeper shade of crimson on the sunny side, with numerous small white dots; cavity deep, flaring; stem short, stout; basin medium, slightly corrugated; calyx small, closed; flesh white, tender, rather dry, mild sub-acid; core small. Good. November and December.

This apple has a strong resemblance to Mother in size, form and general color, but is a darker crimson—almost as dark as Black Oxford in some cases—and the flavor is not as good as that of Mother.

Nelson.—Seedling from the farm of Mr. Elihu Wood, Winthrop, Me.

Fruit medium, oblong conical, pale yellow with numerous small grey dots; stem short, inserted in a moderately deep, narrow cavity; basin medium, regular; calyx small, open; flesh tender, juicy, sub-acid. Good. September.

Little known outside of its original immediate locality. Subject to trypeta attack.

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* An. Rept. Maine Agr. Expt. Sta. 1893, p. 133; also 1902, p. 93.

NUTTING (Bumpus).—Seedling of Oldenburg, originated by the late James Nutting, Perham, Aroostook county, Me.

Tree hardy, vigorous, very productive, highly prized by the originator.

Fruit large, smooth, regular, uniform, roundish-conical, yellowish green with faint washing or penciling of dull red on sunny side; stem long, slender, inserted in a deep, regular cavity; basin medium, rather large, closed; flesh greenish white, tender, juicy, mild acid. Good. September to December.

In general appearance and quality this apple somewhat resembles Northwestern Greening, except for the blush. It is a much earlier apple, however. Its principal value is that it is "ironclad."

QUINCE, (Cole's Quince).—Origin, Cornish, Maine, on farm of Captain Henry Cole, about 60 years ago.

Tree vigorous, spreading, hardy, productive and comes into bearing early.

Fruit large, oblate conical, ribbed, bright yellow or occasionally brownish in the sun; stem short, in a narrow, deep basin; flesh white, tender, juicy, aromatic, pleasant sub-acid. Very good. August and September.

A very good variety for home use. Not extensively grown for commercial purposes, because of its season of maturity.

First described in a meeting of Oxford county (Me.) Agricultural Society in 1849.*

ROLFE, (Macomber).—Originated in the town of Guilford about 1820.

Fruit medium to large, oblate, often angular, yellowish, shaded and striped with red; stalk short, inserted in a large cavity; calyx large, closed, in a rather large, regular basin; flesh white, fine-grained, tender, juicy, sub-acid; core small. Good to very good. November to January.

Though comparatively an old variety, the Rolfe is not as widely known as it should be. The variety originated on high land in the town of Guilford, about a mile from the Piscataquis river. The seed from which it sprang was brought from Western Maine to that place by a Mr. Rolfe.† About 1820 the original tree, together with several other young seedlings, was given to Rev. Thomas Macomber—hence the name, Macomber, applied to this variety by Downing. A sprout from the original tree is still standing on the Macomber farm, and produces annual crops of fruit. The late H. L. Leland of East Sangerville had more than a hundred trees of this variety in his orchard, and in a personal letter to the writer said: "The Rolfe, in our local markets, sells better and at bigger prices than any other variety that we grow. It sells well as a shipping apple, though not much known." The variety is hardy in sheltered localities as far north as Presque Isle, and it is

* Agriculture of Maine, 1850, p. 319.

† Some claim that seeds of Blue Pearmain were planted on the farm afterwards purchased by Mr. Rolfe. See Trans. Me. Pom. Soc'y 1888, p. 120.

Figure 10. Legacé.
See page 126.

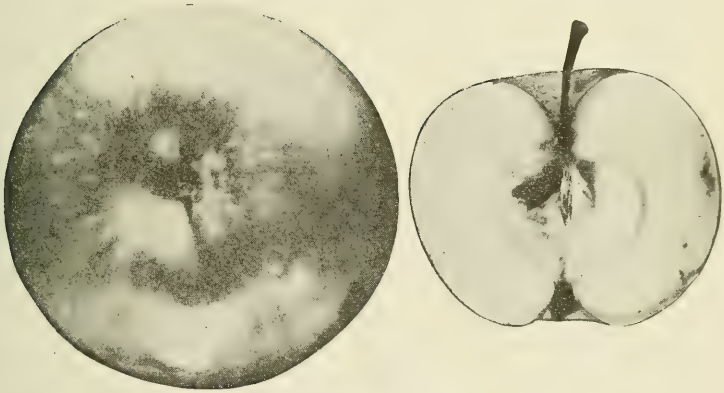

Figure 11. Nutting.
See page 130.

regarded highly wherever known. It is now being somewhat extensively top-grafted in the orchards of western Maine.

RUNNELS.—Origin, farm of John Runnels, Clinton, Me.

Tree hardy, very productive.

"Fruit medium, roundish, deep green, mostly covered with purplish brown; flesh firm. Good. April to June."—Downing.

Profitable as a market fruit from its great productiveness and long keeping qualities.—Downing; Thomas.

This variety has never come under the observation of the writer and is apparently abandoned. Its color is objectionable for market purposes.

RUSSELL.—Originated on the farm formerly owned by Captain William Russell of Farmington, more than 70 years ago.

Tree spreading, vigorous, hardy, productive.

Fruit large, roundish ovate, often flattened at the base; bright yellow, washed and obscurely striped with red on the sunny side; surface waxy; stem short, in a small, narrow cavity; basin small; calyx closed; core small; flesh yellow, fine grained, juicy, crisp, mild sub-acid. Best. September.

It is said that Captain Russell, one of the early settlers of Farmington, brought from Massachusetts, in his pocket, the seed from which this, and other seedlings, originated. The first cions were taken from the tree by Elias Eaton, and later by James Scales, and from these cions the variety was mainly disseminated—(Report Maine Pomological Society, 1889, 136).

The apple is well known and highly prized in Franklin county, where it is regarded as one of the best early autumn varieties.

SARAH.—Origin, farm of John Tufts, East Wilton, Me.

Tree very vigorous, spreading, productive, an annual bearer and comes into bearing early.

Fruit large, oblate-conic, yellow, shaded and mottled with light red, with stripes and splashes of darker red and a few light dots; stalk short, small, inserted in a broad, deep cavity; calyx nearly closed, basin medium, slightly corrugated; flesh whitish, coarse, tender, juicy, brisk, sub-acid; core medium. October.—(Downing).

Though still grown locally, this variety has been superseded by Gravenstein. It is apparently distinct from another local variety found in the same vicinity under the name of "Sally."

STANLEY, (Stanley's Winter Sweeting).—Origin, the orchard of J. L. Stanley, Winthrop, Me.

This variety is described as large, oblate, red, streaked and splashed with purple, with a bluish bloom; flesh white, juicy, sweet. Keeps till March. Described by Maine Pomological Society, 1850,—(Transactions of Maine Pomological Society, in Agriculture of Maine, 1853, page 407).

Listed by Downing,* but apparently unknown at the present time.

* Downing, Fruits and Fruit Trees of America (1872), p. 360.

STARKEY.—Originated in the town of Vassalboro, on the farm of Moses Starkey, before 1800. Apparently a Seedling of Ribstone.

Tree is hardy, vigorous, spreading; a regular and abundant bearer.

Fruit medium, oblate, slightly conic, regular; skin pale yellow, shaded, striped and splashed with light and dark red, with numerous greyish dots; the ¾-inch stalk is small, inserted in a medium cavity, which is sometimes slightly russeted; flesh whitish, tender, juicy, mild sub-acid. Very good. October to January.

Where known the variety is highly esteemed, both for home and for market, because of its beautiful color and excellent quality.

Mr. E. H. Cook of Vassalboro, who raises large quantities of these apples, shipped two car-loads to Liverpool the past season. The net returns were $2.40 per barrel, which was more than was received from anything else on the market except Kings.

Concerning the origin and merits of this variety, Mr. Cook writes as follows: "The original tree is not now living, but there is a tree near at hand that never was grafted, since its sprouts bear Starkey apples. The apple originated not less than 125 years ago. There are Starkey trees on my farm which are known to have been set 97 years ago and they are grafted to Starkey in the trunk. * * * Nothing is known of its origin, but I have no doubt it is a seedling of the Ribstone Pippin. * * * The Starkey is a remarkably good bearer, and will bear every year if well fertilized, but the trees will not stand neglect as well as Baldwins. From 50 Starkey trees, in the last two years, I have received 300 barrels of apples averaging 3 barrels per tree per year, and the average price was $2.00 per barrel."

The variety is entirely distinct from Stark, with which it is often confused, and is deserving of more attention on the part of Maine fruit growers.

STEVENS GILLIFLOWER.—Origin, orchard of Mrs. Olive Stevens, Sweden, Oxford county, Maine.

Fruit medium, roundish conical, somewhat irregular, whitish, striped with red, the stripes radiating from the stem, covered with a fine bloom; cavity and basin shallow; flesh white, tender, fine grained, juicy, pleasant sub-acid. November to February.

This variety is a seedling of the Red Gilliflower, the seed having been brought from Massachusetts by Mrs. Olive Stevens about 1785 or 6 and planted by her in the town of Sweden, Oxford county, Me. (See Transactions of Maine Pomological Society, in Agriculture of Maine, 1853, page 403).

The variety seems to have disappeared, and has never been seen by the writer.

STOWE, (Stowe's Winter).—Originated in Perham, Aroostook county, Me., about 1875.

Tree vigorous, spreading, very hardy; an annual bearer.

Figure 12. Starkey.
See page 134.

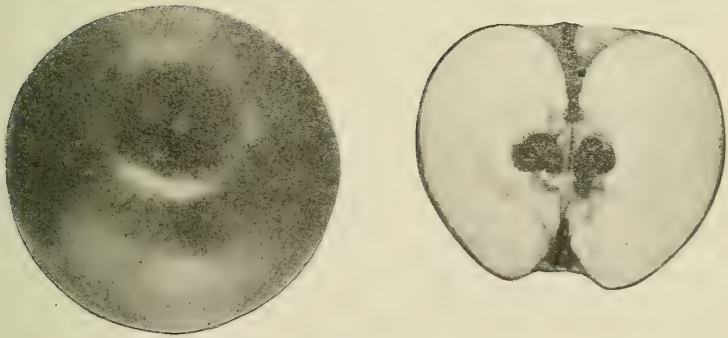

Figure 13. Stowe.
See page 134.

Fruit medium to large, roundish-conical, greenish yellow with blush cheek, and with many small whitish dots. Stem short, slender, inserted in a medium cavity. Calyx partly open; basin rather shallow. Flesh yellowish, tender, juicy, sub-acid, almost sweet. Core small. Good. October to February or even later in Aroostook county; much earlier at Orono.

This variety has never attracted the attention of nurserymen, but has had a good local reputation for several years. It is well worthy of general dissemination as a valuable "ironclad" variety. Its history, as given in the report of the Maine Pomological Society for 1895, is essentially as follows: Seed was brought to Perham from Massachusetts by Francis Stowe about 1862, and the variety in question was one of the resulting seedlings. The tree was isolated in 1875 and has been known locally for several years as Stowe's Winter. Mr. Rufus L. Stowe, son of the originator, writes that it "will keep longer than anything except Ben Davis and is nearly equal to that." *

SOMERSET, (Downs Somerset).—Origin, orchard of Albert J. Downs, Mercer, Somerset county, Me.

Fruit large, roundish ovate, yellow, washed and striped with red; stem long; basin broad and shallow; calyx shallow; sprightly sub-acid. Very good. September, October.

This variety was described by the Maine Pomological Society in 1849.† It is an excellent apple and, when known, is highly prized as an early market variety. It is showy and sells well but drops badly from the tree, and is subject to attacks by the trypeta.

This variety is entirely distinct from the Somerset of New York, described by Downing in 1869.

TABOR.—Originated with S. W. Tabor, Washburn, Me.

Fruit medium, oblate, yellowish green, washed and splashed with crimson; stem slender, inserted in a medium, widely flaring cavity, from which radiate 5 or 6 distinct furrows, making well marked segments; calyx small, closed, in a medium, abrupt, slightly plaited basin; core rather large; flesh greenish white, fine grained, tender, rather dry, sweet. Good. October to January.

If it does not occupy the same place as Hayford Sweet, it may prove an acquisition for northern Aroostook where winter sweet apples are scarce.

WINN RUSSET.—Origin, Sweden, Oxford county, Me., from seeds brought by John Winn, one of the early settlers of the town, from Woburn, Mass.

"Tree hardy, productive, but rather a slow grower."

"Fruit large, dark russet, distinctly striped with red with occasional greyish spots; cavity broad, deep; calyx medium; basin broad, shallow;

* Personal letter. See An. Rept. Maine Agr. Expt. Sta., 1902, p. 92.

† Trans. of Maine Pom. Soc'y, in Agr. of Maine, 1853, p. 408.

flesh fine grained, sub-acid. Good to very good. Keeps till May."—Transactions of Maine Pomological Society, in Agriculture of Maine, 1853, p. 412.

This variety is thought to be a seedling of Roxbury Russett. Seeds were brought to the town of Sweden very early, though the original tree was still standing in 1846. Its identity is lost at the present time.

WINTHROP GREENING.—Origin, the farm of Ichabod Howe, Winthrop, Me., who brought the seeds from Ipswich, Mass., before 1800. Introduced by Jacob Nelson, about 1808.

Tree vigorous, spreading, hardy, productive.

Fruit large, oblate conical, greenish yellow, shaded with red on the sunny side, with small greyish dots; stem medium, set in a broad, deep cavity; calyx short, large, in a wide basin; flesh fine grained, crisp, juicy, pleasant sub-acid. Very good. October to December.

This apple has been widely planted through central and western Maine. Its good quality, both for dessert and for cooking is generally recognized, but it is badly attacked by the trypeta, and it drops somewhat badly early in the autumn. The apple has been called by some "Lincoln Pippin," it having been grafted by R. G. Lincoln of Hallowell and subsequently distributed by him. There is no doubt, however, as to the origin of the apple. It has been dropped from the list of the American Pomological Society, where it was first entered in 1854. In the absence of trypeta, it is still a valuable late fall and early winter apple.

WINTHROP PEARMAIN.—Origin, farm of Col. John Fairbanks, Winthrop, Me. Described by the Maine Pomological Society, as follows:

"Fruit large, ovate, yellow, indistinctly striped with red, especially about the base. Stalk medium, set in a narrow, moderately deep cavity; basin narrow, shallow; flesh white, fine grained, juicy, pleasant sub-acid; skin tough. Good. October to February."—Agriculture of Maine, 1853, p. 401.

Cole's American Fruit Book in 1850, gives the season as September to November, and characterizes the tree as a constant bearer.

As far as the writer is aware, this variety has dropped from notice.

ZACHARY PIPPIN.—Origin, according to Downing,* farm of John Burbank, Belgrade, Me. Discovered and introduced by the late Joseph Taylor of Belgrade, in 1852. Named in honor of President Zachary Taylor.

Tree vigorous, spreading, productive, but not an early bearer.

Fruit large, oblate, angular; skin greenish yellow, striped, splashed and mottled with light and dark red; stalk short, rather small; cavity large, deep, slightly russet; calyx closed; basin medium, slightly corrugated; flesh whitish, rather coarse, tender, moderately juicy, sub-acid. November, December.

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* Downing, Fruits and Fruit Trees of America, 2d appendix 1876), page 72.

Very similar in general characteristics to Sarah. Not planted at the present time; though several trees are still standing in the orchard of the introducer.

OBSCURE OR OBSOLETE VARIETIES.

Of the varieties described in the foregoing pages the following are either wholly or practically extinct; though at one time of considerable importance: Bailey Golden, Fairbanks, Nelson, Runnels, Stevens Gilliflower, Winn Russet, Winthrop Pearmain, Zachary Pippin.

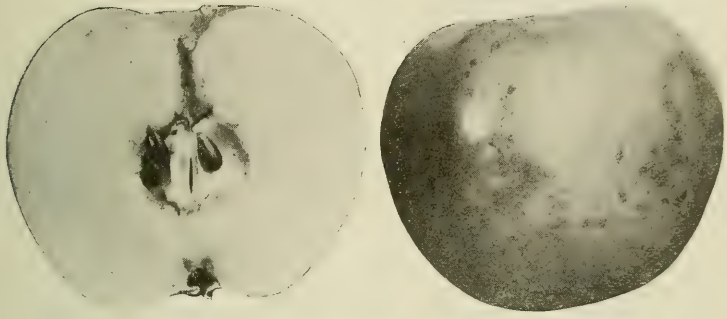

Figure 14. Winthrop (Greening).
See page 138.

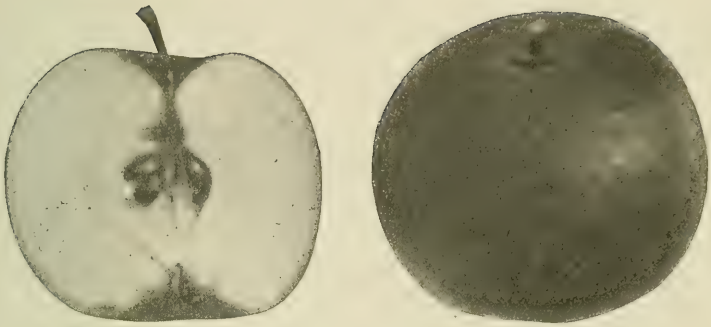

Figure 15. Marlboro.
See page 126.

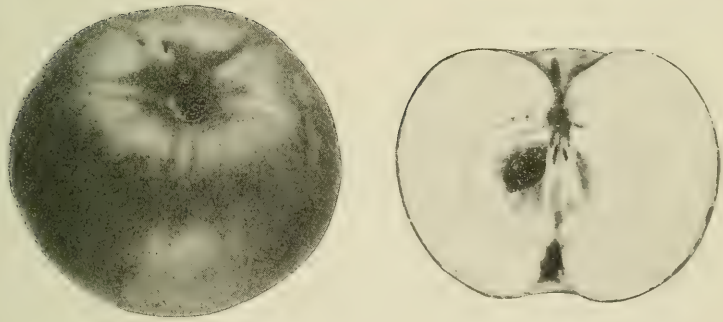

Figure 16. Tabor.
See page 137.

Figure 17. Chickens on the Range. See page 151.

POULTRY EXPERIMENTS, 1906-7.

G. M. Gowell.

[The poultry work of the Experiment Station was undertaken primarily to study breeding for egg production and has been in progress for several years. Three years ago the Bureau of Animal Industry of the U. S. Department of Agriculture desired to cooperate in the work and is now contributing $1,000 per year to assist in the carrying forward of the breeding and housing experiments. Considerable unpublished data from these experiments have accumulated, but it has been decided to hold this matter until the experiments shall be so far advanced that the results shall be conclusive.

The following papers on poultry experiments have been published. These are no longer available for distribution. A summary bulletin bringing the work up to 1906 has been issued by the Bureau of Animal Industry of the U. S. Department of Agriculture. This can be obtained by addressing the Secretary of Agriculture, Washington, D. C.

Number of Laying Hens that can be profitably kept in one Pen, Annual Report for 1898.
Feeding Chickens for Growth, Bulletin 64.
Breeding for Egg Production, Bulletin 64.
Feeding Chickens for Growth, Bulletin 79.
Experiments in Incubation, Bulletin 79.
Breeding for Egg Production, Bulletin 79.
Breeding for Egg Production, Bulletin 93.
Floor Space, etc., in relation to Egg Production, Bulletin 93.
Poultry Management as practiced at the Maine Station, Bulletin 100.
Poultry Experiments, 1903-5, Bulletin 117.
Poultry Experiments, 1905-6, Bulletin 130.

This bulletin (144) in addition to containing accounts of experimental work, supplements bulletins 100, 117 and 130 by outlining the methods of housing and handling the stock that have been adopted since those bulletins were issued.—C. D. W.]

POULTRY HUSBANDRY.

Poultry husbandry is a legitimate agricultural industry. It is as well grounded as dairying, animal raising, fruit or crop growing. It occupies a special place in agriculture, and it will never displace other work except on limited areas. It requires large quantities of grains and concentrated feeding material and but small quantities of bulky foods. Larger animals must

always occupy the farms and prepare the coarser crops of the land for market, and upon their number and quality depends the prosperity of agriculture.

Poultry is kept in small numbers on almost every farm as gleaners or scavengers. Hatched and brooded by natural means, practically unrestrained, they find the exercise necessary for their existence, and such varieties of food as are common about the farm are condusive to their welfare. If the food supplies are generous and shelter and shade sufficient, life with them is at its best and it is doubtful if returns from any other source come to the farmer with so little expenditure of material, work and thought.

With this common knowledge of the earnings of birds, has come the desire to increase their numbers and make their keeping a department of the farm or a special extensive industry. That this is practicable is demonstrated by the many plants in successful operation. The factor that has brought success to these plants is the skill of the operators.

The skill required in successfully rearing and keeping birds in large numbers, by artificial means, for continuous years, is not beyond what may be acquired by the common person, provided he will train himself to see and do what should be done. Great skill is not secured in a single year but it comes to those who try. The purpose of this, and other bulletins issued by this Station on poultry matters is to make known our methods of work and the results of the investigations conducted.

It is not claimed that our systems are perfect, or better than all others, but they are the best, for us, of any that we know. We are constantly trying to learn more about every phase of the industry and the information gained is given to the public in these bulletins, as it is secured. Some of the matter in this issue has been given in a previous bulletin, but as the supplies of that issue are exhausted and the calls for the matter so great, it is rewritten and printed again.

BROODER HOUSES.

Portable brooder houses of several different sizes and styles of construction are in use, sufficient to accommodate 2,000 chickens to maturity. The style of house that has proved most satisfactory, with us, is here described.

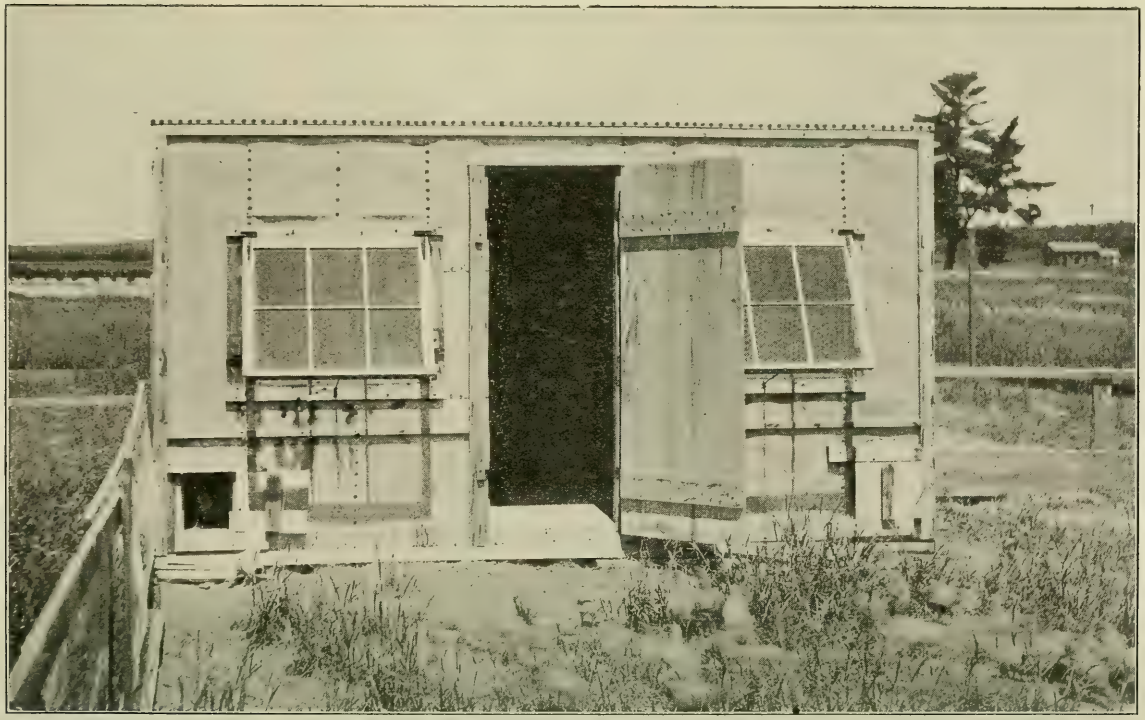

Figure 18. Movable brooder house. See page 146.

Each of the houses accommodate 125 or 150 chicks from the time brooding commences until they are moved into winter quarters. They are large enough so the necessary work can be done comfortably in them. During rainy days, when the birds must be kept indoors, there is room for them, and they will not suffer seriously if the floors are generously covered with cut clover or chaff. The birds in them are safe at night from storms, and all thieves that walk on four feet, crawl, or fly. They are built on shoes so that they can be drawn near together for convenience in the brooding season, during April, May and June, and then to the grass fields for the range season.

Such houses are almost indespensable to the person who raises few or many chickens. Their use removes many of the obstacles that tend to annoy and defeat chicken raisers.

Each house is 12 feet long and 7 feet wide. The front wall is 6 feet 2 inches high, and the back 4 feet 2 inches high from floor to roof, inside. This allows a full grown person to stand erect in the front part of the house. The two shoes on which it is built are 4 by 6 inches in size and lie flat. Their ends are chamfered on the under side so as to give them a sled runner turn. They are 14 feet long, and extend a foot outside of each end of the building. An inch auger hole slanting backward, and outward, is bored through each end of the shoes. For convenience in moving the houses, a short chain with an eye bolt in each end, which can be slipped through the auger holes and keyed, is used.

The floors are of two thicknesses of boards, breaking joints so as to preent the air from drawing through. The walls and roof are boarded and covered with one of the better qualities of sheet roofing materials. A door 2 feet wide and 6 feet high is placed in the center of the front wall with a window on each side of it. Each window contains 6 lights of 10 by 12 glass in one sash. It is hinged at the top and turns out, like an ordinary storm window. It is either closely buttoned down, or held open at different spaces, by hooks of various lengths. The longest opening is a foot, which leaves the window slanting out at an angle sufficient to give plenty of fresh air in warm weather when both windows are open, and the house full of birds. The advantages of hinged, over sliding windows, are that in stormy weather, rains and winds do not beat in to wet or annoy the

birds, and free ventilation is not interfered with. The window openings are covered with wire netting on the inside. A slide door, a foot square, is made down at the floor, near each end of the front of the building, for the chicks to pass through. A temporary board partition about 15 inches high divides the building crosswise into halves. Two No. 4 Peep-O'-Day brooders * are used in each of these houses. They are put about 2 inches away from the back wall so as to allow the free passage of air to the intake openings in the sides of the brooders. They set about a foot away from each end of the building, and this space is filled in with an elevated platform and incline, which allows the chicks to go out through the brooder door and down a broad easy grade to the floor. The Peep-O'-Day brooders * are all made alike, with the lamp door at one side and the chick door at the other. They are located so that the lamp doors are towards the middle of the building and about 4 feet from each other, which gives about 2 feet between the lamp door and the temporary partition, sufficient room in which to attend to the lamps. The hinges to the brooder cover are put at the back, which allows the cover to turn up against the back wall out of the way.

These portable brooder houses are well made, of good material, and if the shoes are kept blocked up from the ground, they should last as long as other farm buildings. When they are drawn to the range for the warm season, they are turned back to the south, so that the sun may not shine in the windows to heat the house and make it uncomfortable for the birds. Facing the north, the houses furnish good cool shelter during the heat of the day.

The houses which the pullets occupy are blocked up about a foot and a half and the open space between the house and the ground gives cool shelter which the birds enjoy. The pullets do not trouble about going under the house to spend the night, but the cockerels do, and we find it necessary to board around the cockerel houses and deny them the cool retreat. As the cockerels develop in September and October, they become quar-

* No extended tests of incubators, brooders, and other appliances have been made at the Maine Station. In this bulletin the makes that are in use at this Station are named. These may not be the best of their classes but have worked satisfactory here.

relsome and there are bullies among them, at every house, that domineer over their mates during the day, and stand guard at the doors at dark. With such fellows in the way it is difficult getting the underling into the house at shutting up time at night, if they have a chance to skulk under the building.

When the houses are drawn to the fields, they each contain from 50 to 75 pullets, as they are relieved of their brothers who are taken out and put into the fattening pens a few days previously. If the houses are located near to each other the chickens are liable to collect in some of them at nightfall and neglect others as the season advances, but if the houses are separated from each other by a distance of 100 feet, or thereabouts, the birds keep, for the most part, to their own homes.

When the houses are drawn to the fields, small yards about 12 feet square are made in front of them, in which the birds are confined for a few days, so as to get them acquainted with the new location of their homes, rather than let them go out into the new neighborhood at once, with the liability of their getting confused and lost.

A wagon load of fine sand is deposited at one end of each house on the ground, and 2 or 3 shovelfuls of it are spread on the floor each day as soon as the houses are cleaned out.

There is nothing in the houses on which the young things can roost and they all have to sit on the floor until their breast bones are hard enough so that they will not become crooked by pressing on the roosts while the birds are young and soft. Sometimes sitting on the floor will cause the breast bones of fast growing, fleshy chickens to crook. This condition may be prevented by bedding the houses with a little straw or chaff.

The daily cleanings from the floor are put into barrels which stand at the ends of the buildings, out of door, and as often as necessary the barrels are drawn to the fields, emptied of their contents, and returned for use again. Care is exercised that none of the floor cleanings are spilled near the houses to contaminate the ground and make it unsanitary. A rain storm or considerable shower will cause the partially filled barrels of manure to ferment and the odor from it is very strong and disagreeable. Whenever this occurs the barrels should be emptied without delay. We know that mites breed and multiply in fermenting poultry voidings, and we have much reason for believing that

hens and chickens are annoyed by certain rank odors, sometimes so much so that they will abandon their homes for more decent ones.

UTILIZING THE BROODER HOUSES DURING WINTER.

These houses are used by chickens from about the first week in April to the last of October. The rest of the year—from November to April—they have not been used. At Go-well Farm, last October, when the houses were empty, a temporary roost platform about 6 feet long and 2 feet wide was arranged inside, along the back of each house. It was 2½ feet above the floor, and a curtain, made from bran sacks was hung in front of the platform to shut it off from the rest of the room so it might be warmer during the night. The curtain had a stick nailed to its lower edge and was readily hooked up during the day time to allow the bedroom to dry out. There were no roosts on the platform. The birds just sat down on it, as it was thought they would keep warmer in this way than if on elevated roosts. Six darkened nests were arranged under the platform. A feed trough was hung on the wall within easy reach of the birds. It had separate places for bone, shell, grit, charcoal, and the dry meal mixture. These fixtures were coarse, yet strongly made, so that they could be removed in the spring and put in again the following fall without much tearing apart and remaking. One of the windows was opened out and hasped, leaving a space a foot wide at the bottom, and triangular shaped at the sides. This space, at the sides and bottom of the window, was covered with one thickness of burlap, taken from bran sacks. It was fastened to the sash and building by carpet tacks. The air could pass through the burlap and ventilate the room during nights and stormy days, and the snow or rain could not sift or beat through it into the house. The other window was shut during nights, but it was kept turned up—wide open—all days when the weather was not stormy, or dark and severely cold.

Sixteen of the houses were fixed up in this way and drawn up handy to the barn. They were put end to end about 2 feet apart—as near as the projecting runners would permit. Seventeen pullets were put in each house the first of November and kept there without going out of doors during the winter. Each 100 birds were fed 2 quarts whole corn and 2 quarts wheat mixed together, on the floor litter early in the morning, and

again at 10 o'clock. They were constantly supplied with the dry mash, bone, shell, grit and charcoal with limited quantities of mangolds. The bedding kept dry and the birds were in good health and vigor. Eleven of the 272 birds thus housed died during the winter. The pens were very small and the population dense—4¼ feet of floor surface to each bird. They did not lay as well as their sisters in any of the pens in the large house and there was some egg eating, which reduced their record yields.

The houses had to be available for brooder chicks early in April, so the hens were dressed and marketed the first of that month and the houses were thoroughly cleaned and painted inside, with kerosene and carbolic acid, to destroy any lice that the hens might have left.

During the 5 months—November 1 to March 31—the birds yielded 1057 dozen eggs, which, had we no other market for them, would have sold in the open Boston market at 33 cents per dozen net easily, yielding $348. The food eaten by these birds during the period cost $175 which leaves a balance of $173 to pay for their care. While $173 is not a great amount of money, it paid well for the labor required in caring for the birds, which was done in connection with other work. The houses were not noticeably injured by their winter's use. The birds when dressed and sold brought as much money as they would have done in the previous October, including those that were lost.

The reasons for this test were to learn if these small houses, which are used only in summer as homes for growing chickens, could be utilized during winter with some profit.

HOUSES FOR THE LAYING AND BREEDING HENS.

Two styles of houses are in use at the Station. One is a thoroughly made double walled building, 16 by 150 feet in size. It is always kept above freezing by a water heater and a flow and return, two-inch pipe, running the length of the building. This building was constructed with special reference to comfort, health and productiveness. Small, well made houses with single walls had formerly been in use, but they would get white with frost in cold weather, if shut up close enough so the birds did not suffer from cold during winter nights. When the weather

moderated the white frost would change to water and the straw litter on the floor would become damp and clammy. The birds showed their dislike for the damp straw by keeping off from it as much as they could. Such houses were unsatisfactory, and so the large warmed house was built. It was a decided improvement over the cold ones, because it could be ventilated and the birds not suffer with the cold. But it was not possible to secure sufficient ventilation, even though the house was moderately warmed, to prevent the presence of considerable moisture in the bedding.

Good yields of eggs were obtained from hens kept in that house and the losses of birds were not excessive. The hens showed, however, that they were not in the best condition, by a little lack of color in comb, and energy in action. This house has not been abandoned, and is highly prized for laying hens. Since breeding cockerels cannot be carried in the other houses, without danger of chilled combs, they are wintered in this warmed house until danger from chilling is past.

In seeking for some better system of housing the birds one of the small close houses, formerly used, was changed into an open house. The building was 10 feet wide and 25 feet long. An opening 3 feet wide and 15 feet long was made close up under the plate, and was left open every day in winter, except when the snow or rain blew in. At night the opening was covered with a framed curtain made of cotton cloth. An elevated roosting closet along the entire length of the back of the building was made warm, by packing the walls with hay. A close fitting frame-cloth curtain shut them in at night.

It did not freeze in the closet and the birds apparently did not suffer from lack of air. They seemed to enjoy coming out of the warm sleeping closet, down into the cold straw, which was never damp, as the whole house was open to the outside air and sun every day. There were no shut off corners of the floor, or closet that were damp. This building was used through three winters with 50 hens in it each year and did not have a sick bird in it. Not a case of cold or snuffles developed from sleeping in the closet with its cloth front, and then going directly down into the dry straw, in the cold room, and spending the day in the open air.

The birds laid as well as did their mates in the large warmed house. Their combs have been red and plumage bright and they

have given every evidence of perfect health and vigor. While they are on the roosts they are warm. They come down to their breakfasts and spend the day in the open air. Such habits of life seem to work equally well with brute or man.

After having used this so-called Pioneer house one year, a house was constructed 12 feet wide and 68 feet long. Its front and back walls were 5 feet high and the roof was evenly divided. It was divided into two rooms, each 34 feet long. The elevated roosting closets extended along the entire backs of each room and they were constructed in the same manner as the one in the Pioneer house. The partition between the 2 rooms was made of 2 inch mesh poultry netting. There were 4 openings in the front of the building, 2 in each room, equal distances apart. Each opening was 3½ by 8 feet in size, fitted with frame cloth curtains, to be used only on winter nights and stormy days, in the same way that they were in the Pioneer house. These openings were put close up to the plates and came down to within 1½ feet of the floor. There were no glass windows in the building.

This house was not satisfactory. There were currents of air from one end of the building to the other, even when there was little wind outside, and when the wind was high in winter the loose snow would be sifted in and distributed over a large part of the floor, dampening the litter and making life uncomfortable for the birds. The wire partition between the pens was replaced with one of close boards, and conditions were bettered; but each of the pens still had 2 openings, about 8 feet apart, and the same troubles from currents of air and sifting of snow continued, although somewhat lessened. One of the openings was closed by screwing glass windows on the outside. This left each of the rooms with one opening and one large glass window.

This change entirely corrected strong air currents through the building and sifting snow, except in heavy storms when the wind is strong from the south. Of course the large opening allows the wind to blow into the room, but as there is no outlet for it except where it came in, there are no drafts of air across the birds to cause them to be uncomfortable and take colds.

Another difficulty remained; the opening came down to within 1½ feet of the floor, and the birds, sunning themselves on the floor or scratching in the litter, were in the direct course of the

outside air as it came into the room and they tried to find sheltered corners where they might be more comfortable. On this account the width of the opening was reduced from 3½ feet to 2 feet by ceiling up the lower part of it. This gave a bulkhead 3 feet high, sufficient to protect the birds on the floor from the direct inflow of out door air, and they were happy.

One objection to this house still remains; its front wall is too low to allow room for a large opening, high enough so that the sun can shine in and back across the floor to the back wall during the short days in winter, when the sun runs low. This feature in construction, seems to be of the utmost importance, for dependenec is had upon the sunshine and pure outside air, to keep the floor litter dry and the elevated roosting closet clean. The entire front of the roosting closet being open, leaves no dark corners where the air and light cannot do their thorough cleansing.

Experience with the house showed its several bad features. On the other hand, the Pioneer house, which had been in use for three years, gave great satisfaction, and the same general plan was adopted in the construction of a large house.

This house designated as House No. 2, was built 4 years ago. It is 12 feet wide and 150 feet long and is divided into 7, twenty feet sections. In each section, with its floor surface of 240 feet, 50 pullets have been wintered each year, most successfully.

Three years ago another house was built on the same plan, except that it is 16 feet wide instead of 12. It is 120 feet long and consists of 4 sections or houses, each 16 by 30 feet in size. There is no separate walk through the building, but in the close board partition separating the pens, are doors, hung with double acting hinges, which allow them to swing both ways, and close automatically, after the attendant passes through. Each pen has a floor surface of 480 feet and gives ample accommodation to 100 hens. All of the hens in these 2 open front houses, in flocks of 50 or 100, averaged laying about 144 eggs each last year, and the birds were in excellent health. The front curtains were open all of the time every day, except the stormiest in winter.

While the same plan is common to all of these open front houses, the width has been increased in each succeeding one built. The first house was 10 feet wide, the second 12 feet, the third 16 feet in width. The house which Professor Gowell

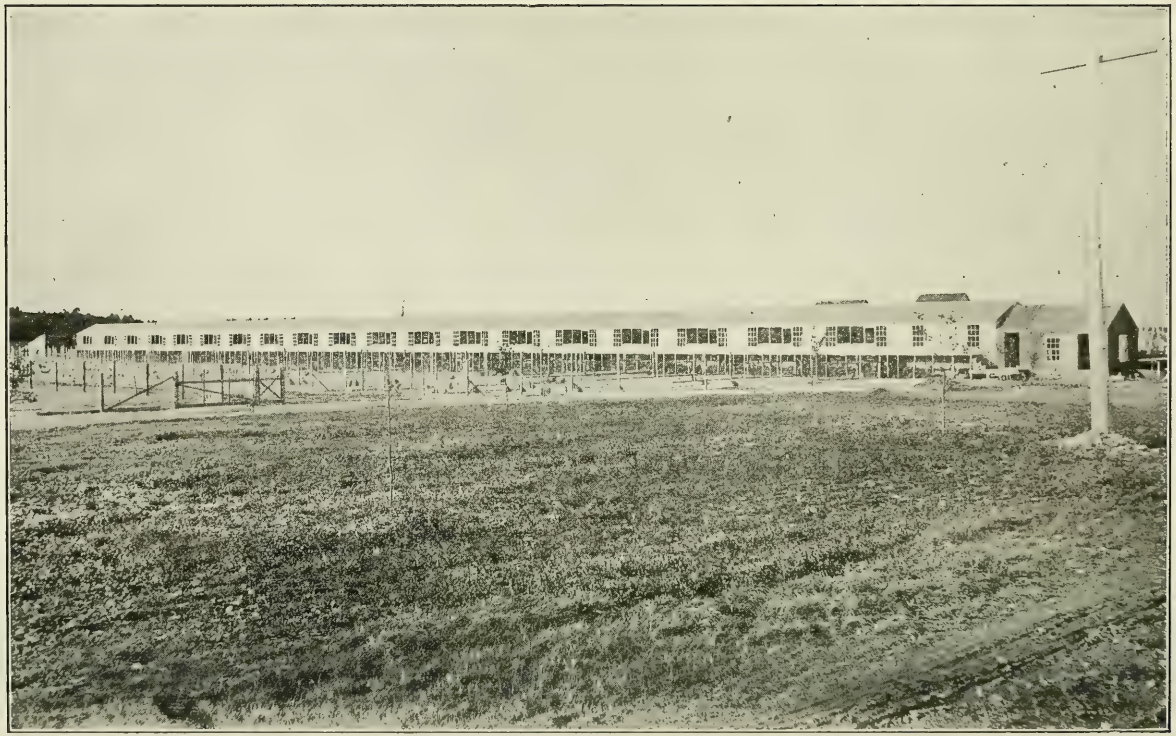

Figure 19. Laying and breeding house at Go-well farm. See page 159.

erected at his farm is 20 feet wide and is the best one with which we are acquainted as it is typical of those already described, and in addition embodies other features which make it more comfortable for the birds and lessens the labor required in their care.

During the summer of 1905 a laying house was built to accomodate 2,000 hens. It is 20 feet wide and 400 feet long. It is on the same general plan as House No. 2 and 3 at the Experiment Station. House No. 2 is 12 feet wide; House No. 3 is 16 feet wide, and this one at Go-well farm is 20 feet wide. The widths have been increased in the last 2 houses, as experience has shown the advisability of it. At first it was thought that the houses should be narrow so they might dry out readily, but the widest house dries out satisfactorily as the opening in the front is placed high up, so that in the shortest winter days the sun shines in on the floor to the back.

Nearly 2 years use of this wide house shows its advantage over the narrow ones to be greater than was anticipated when it was planned. Its great width and the low down door in the back wall make it much cooler in hot weather.

During July and August the birds go into the yards early in the morning but they nearly all come back into the house as the day gets warm, and remain on the floor in the back part of the room, apparently enjoying the shade and the cool air which draws across the floor, even when the air seems very still outside.

The differences in the temperature of the wide and narrow houses is very great, and the birds show what they think about it by staying in the yards in preference to the narrow houses. Of course, the comfort of the birds is not greater than when they have good shade out of door but the runs have not trees or shrubs sufficient to furnish shelter.

The economy in the cost of the wide house over the narrow ones, when space is considered, is evident. The front and back walls in the narrow house cost about as much per lineal foot as those in the wide house, and the greatly increased floor space is secured by building in a strip of floor and roof, running lengthwise of the building. The carrying capacity of a house 20 feet wide is 66 per cent greater than that of a house 12 feet wide, and is secured by building additional floor and roof space only. The walls, doors and windows remain the same as in the narrow

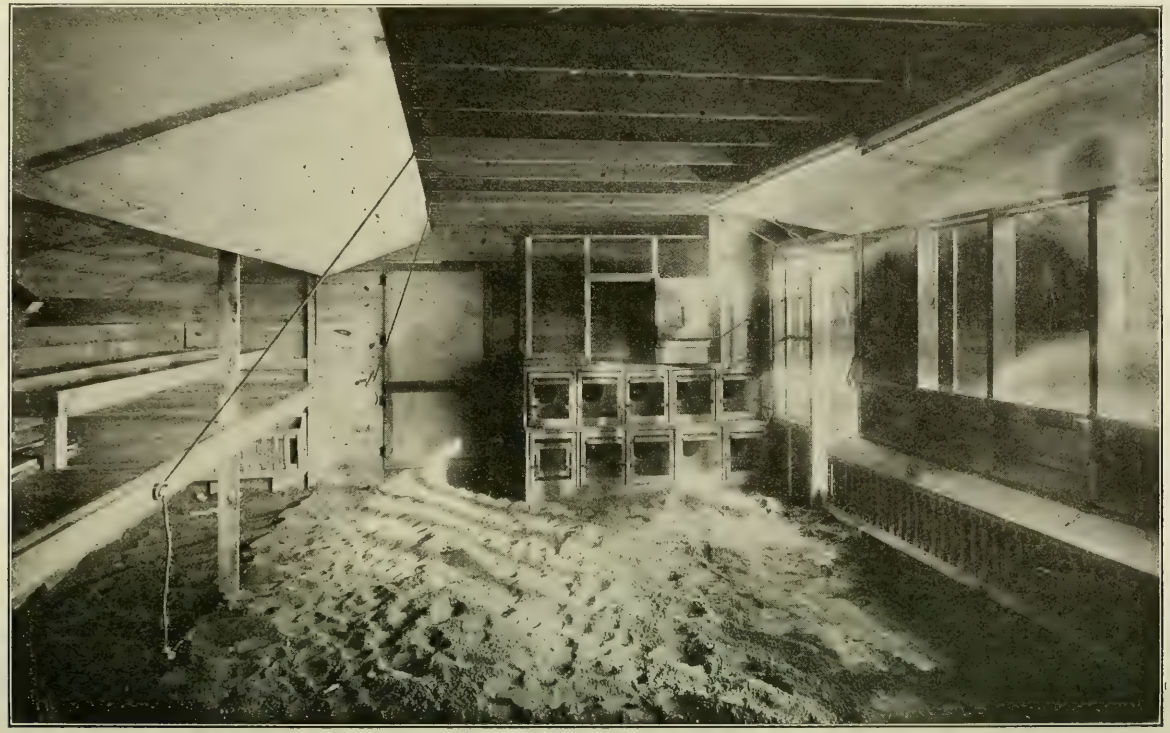

Figure 20. Interior of one section of curtain front house. See page 162.

house, except that the front wall is made a little higher. Three sills which are 6 inches square run lengthwise of the house, the central one supporting the floor timbers in the middle. They rest on a rough stone wall, high enough from the ground so that dogs can go under the building to look after rats and skunks that might incline to make their homes there. The stone wall rests on the surface of the ground. The floor timbers are 2 by 8 inches in size and rest wholly on top of the sills. All wall studs rest on the sills; the front ones are 8 feet long and the back ones 6 feet 6 inches long. The roof is unequal in width, the ridge being in 8 feet from the front wall. The height of the ridge from the sill to the extreme top is 12 feet 6 inches. All studding is 2 by 4 in size and the rafters are 2 by 5. The building is boarded with inch boards and papered and shingled with good cedar shingles on walls and roof. The floor is of 2 thicknesses of hemlock boards, which break joints well in the laying.

The building is divided by tight board partitions into 20 sections, each section being 20 feet long. All of the sections are alike in construction and arrangement. The front side of each section has two windows of 12 lights of 10 by 12 glass, screwed on, upright, 2 feet 8 inches from each end of the room. They are 3 feet above the floor. The space between the windows is 8 feet 10 inches long, and the top part of it down from the plate, 3½ feet, is not boarded, but left open to be covered by the cloth curtain when necessary. This leaves a tight wall, 3 feet 10 inches high, extending from the bottom of the opening down to the floor, which prevents the wind from blowing directly on to the birds when they are on the floor. A door is made in this part of the front wall for the attendant to pass through when the curtain is open. A door 16 inches high and 18 inches wide is arranged under one of the windows for the birds to pass through to the yards in front. It is placed close down to the floor. A similar door is in the center of the back wall to admit them to the rear yard when that is used.

A light frame, made of 1 by 3 inch pine strips and 1 by 6 inch cross ties, is covered with 10 ounce white duck, and hinged at the top of the front opening, which it covers when closed down. This curtain is easily turned up into the room where it is caught and held by swinging hooks until it is released.

The roost platform is made tight and extends along the whole length of the room against the back wall. It is 4 feet 10 inches wide and 3 feet above the floor, high enough so that a person can get under it comfortably when necessary to catch or handle the birds. There are three roosts framed together in two 10 feet sections. They are one foot above the platform and hinged to the back wall so they may be turned up out of the way when the platform is being cleaned. The back roost is 12 inches from the wall, and the spaces between the next two are 16 inches. They are made of 2 by 3 inch spruce stuff, placed on edge, with the upper corners rounded off. The roosting closet is shut off from the rest of the room by curtains, similiar to the one described above. For convenience in handling, there are 2 of them, each 10 feet long. They are 3 feet wide and are hinged at the top so as to be turned out and hooked up. The space above this curtain is ceiled up and in it are two openings each 3 feet long, and 6 inches wide, with slides for ventilating the closet when necessary. There is a door in every partition, placed 5 inches out from the edge of the roost platform. They are 3 feet wide and 7 feet high; they are divided in the middle, lengthwise, and each half is hung with double acting spring hinges, allowing them to swing open both ways, and close.

Ten nests are placed against the partition in each end of the room, in 2 tiers. They are of ordinary form, each nesting space being one foot wide, one foot high and 2 feet long, with the entrances near the partition, away from the light, and with hinged covers in front for the removal of the eggs. Each section of 5 nests can be taken out, without disturbing anything else, and cleaned and returned. In constructing the house it was designed to use these nests only one year. At the end of that time they were removed and 400 trap nests substituted for them.

Troughs are used for feeding the mixtures of dry meals, shell, bone, grit and charcoal. The bottoms are made of boards 7 inches wide; the ends being of the same width and 18 inches high. The back is of boards and the cover is of the same material and slopes forward sufficiently so the birds cannot stay on it. A strip 5 inches wide is nailed along the front edge of the bottom to make the side of the trough. Pieces of lath are nailed upright on the front, 2 inches apart, between which the hens reach through for the food. A thin strip 2 inches wide is

fastened to the front of the trough at an angle of about 45 degrees to catch the fine meal that the birds pull out and would otherwise waste. They clear it up from this little catchall and so waste is mostly prevented.

Two lines of 4 by 4 inch spruce are arranged as an elevated track above the doors. The track extends the entire length of the building and being faced with narrow steel bands on top, a suspended car is readily pushed along, even when heavily loaded. The platform of the car is 2 by 8 feet in size and is elevated a foot above the floor. All food and water are carried through the building on this car. The 10 iron baskets, into which the roost platforms are cleaned every morning, are put on the car and collections made as the car passes through the pens to the far end of the building, 400 feet away, where the roost cleanings are dumped into the manure shed. As the car is pushed along, the guard at the front end comes in contact with the doors and pushes them open and they remain so until the car has passed through, when the spring hinges force them to close again. This car is a great labor saver as it does away with nearly all lugging by the workmen. It has enabled one man to take good care of the 2,000 hens throughout the year, except on Saturdays when the litter has been removed and renewed by other men.

At one end of the building there is a temporary food and water house for dish washing and scalding and where the car remains when not being used.

There is a walk outside of the building extending along its entire front. It is 4 feet wide and is made of 2 inch plank; it is elevated 2 feet above the floor of the building, which allows the doors, through which the birds pass to the front yards, to be opened and closed without interferences. The door which opens out of each room through the curtain section, is above the outside walk and necessitates stepping up and down when passing through, which is not a very serious objection, as the door is used but little in the daily work, but mostly in cleaning out and renewing the floor litter. A guard of wire poultry netting, a foot wide along the outside of the walk, prevents the birds from flying from the yards up to the walk. The advantage of the elevated walk, over one on a level with the sill of the building is that it is unobstructed by gates, which would be necessary were the low walk used, to prevent the birds from passing from one yard to another.

YARDS AND GREEN FOOD.

The yards conform in width to the 20 foot sections of the house and are 100 feet deep. The fence is 5 feet high and is made from 2 strips of 2 inch mesh No. 19 poultry netting. By using 2 strips of 30 inch width, instead of one strip double that width, 2 strong lines of wire are brought in the middle and the liability of bagging is much lessened, while the cost is not increased.

To give free passage for teams near the door of the building, openings 12 feet wide are left in the yard fences. They are 15 feet away from the front of the building, so that the road may not be obstructed with snow which is liable to accumulate near the building. The frame fence sections, which fill in the openings during the summer, are quickly taken out and replaced on cleaning days, and the delivery of bedding and worn litter, back and forth, from wagon to buildings is very directly made.

When these yards were constructed it was the intention to arrange others corresponding to them in size and shape, in the rear of the building, but experience with the wide house, and observation of the yards as a source of green food has been such as to cause the abandonment of the plan of double yards. It was thought that 2 yards, to be used in alternation by the birds, frequently cultivated and reseeded, would furnish sufficient green food in summer, but 100 birds in yards of this size soon wear out and foul the young plants to such an extent that they eat very sparingly of the green stuff until the storms or showers wash the plants clean again.

Being satisfied that the birds were not getting green food enough in the yards last spring, young alfalfa as soon as it was tall enough so it could be mown with a scythe, was cut and then run through a feed-cutter. A peck measure was pressed full of this and fed to 100 hens in the A. M. and another peck of it was given to them in the P. M. They ate practically all of it, until the plants commenced to get woody. When clover was large enough to mow that was fed to them in the same way. They evidently relished the clover better than the alfalfa, but the alfalfa has the advantage of being ready to use before the clover has made growth enough to cut.

Feeding the clover was continued until the greenest spots were nearly all out of bloom. At that time young clover from a field

that was seeded on the frozen ground in March was tall enough to cut, and when that was too mature to use, the second crop, from the field of clover first used, was available. This method of supplying green food proved so satisfactory for confined hens that the practice will be continued. Of course, considerable labor is involved in bringing the clover from the fields and feeding it to the hens, but it makes certain an adequate supply of fresh, clean, appetizing green food every day, which it has never been possible to get continuously from the yards. The labor involved in cultivating and reseeding the yards, which must be done frequently in order to have them at all satisfactory, is saved, as is also the expense of maintaining fences about the extra yards.

Clover is the most satisfactory green food that the Station has used and the expense of growing it need not be great, as small areas will furnish enough for liberal feeding. The supplies of it should be constant, and that there may be no shortage between the first and second crops in the regular clover fields, small tracts of land can be seeded on the frozen ground early in the spring and the clover be large enough for use when needed to keep good the supply.

Dwarf Essex rape has also been satisfactorily used for green food for growing chickens in the open field. If the land is rich and the weather not too dry it springs up quickly after having been fed down, when the birds are removed for a few days, and it is soon ready for grazing again. Its use has been abandoned for laying hens as apparently it gives the yolks of some of the eggs a greenish color when they are boiled. No trouble of this kind was noted before beginning the feeding of rape, and none after its use was discontinued.

Experience with the wide, open front house is in favor of yards on the north rather than on the south side of the building. With the open front houses it is not necessary to get the hens out into the sunny south yards as soon as spring comes, as they are really out in the open air and sunshine, when on the floor, within the walls of the building, by means of the large open section in the front wall. On hot days in summer the front yards become very uncomfortable, from the sun shining on the front of the building, and the birds retreat into the house for shelter or go into the back yards and sprawl on the ground as close to the building as they can. With no front yard fences

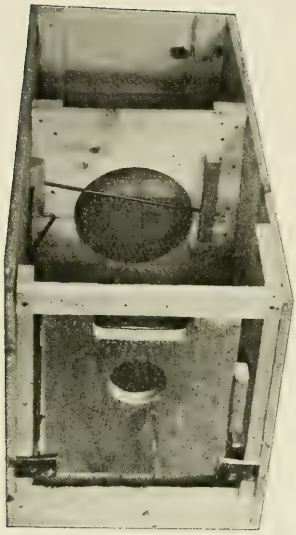

Figure 21. Trap nest from above. See page 171.

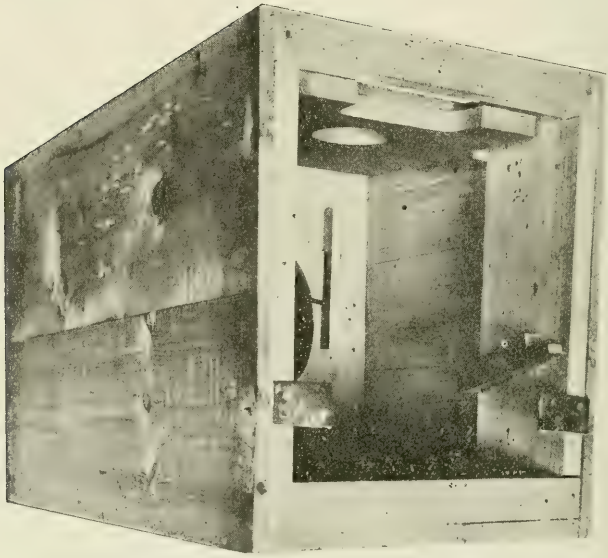

Figure 22. Trap nest, door open. See page 171.

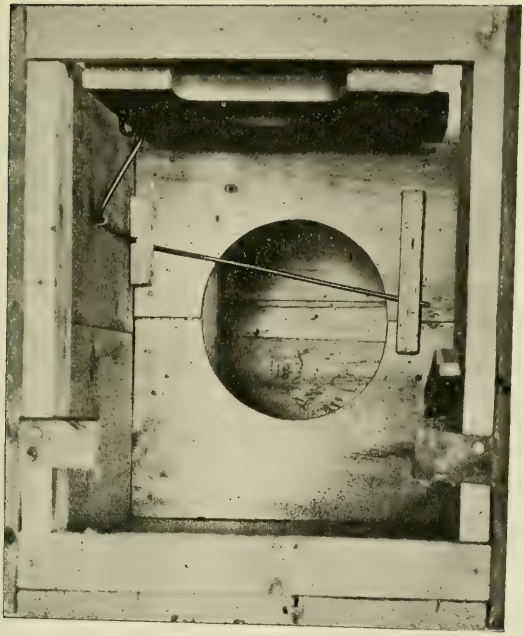

Figure 23. Trap nest, note trip wire. See page 171.

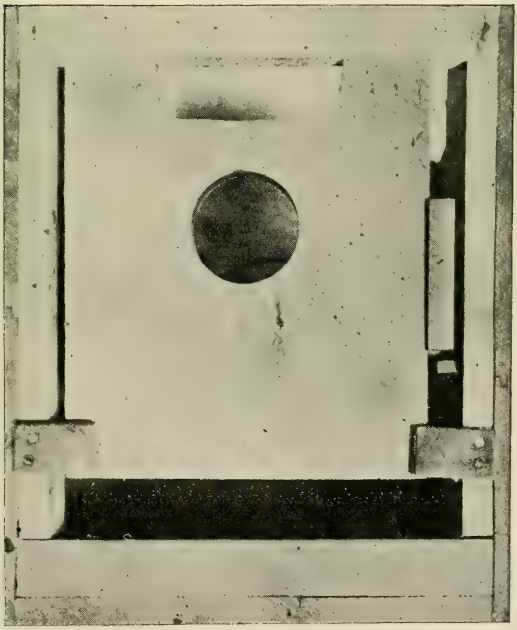

Figure 24. Trap nest, door closed. See page 171.

in the way the removal of the old litter, and the renewal of the bedding, would be much more quickly and easily done, as the teams could be brought close to the walk in front of the building.

THE MAINE STATION TRAP NEST.

This trap nest is original with us; it is a box-like structure without front end, or cover. It is 28 inches long, 13 inches wide and 16 inches deep, inside measurements. A division board with a circular opening 6 inches in diameter is placed across the box, 12 inches from the back end and 15 from the front end. The lower edge of the 6 inch opening in the division board comes down to within 4 inches of the floor of the box. The rear section of the box is the nest proper.

The double box with nest in its rear is necessary, as when a hen has laid and desires to leave the nest, she steps out into the front space and there remains, generally trying to escape, until she is released. With one section only she would be very likely to crush her egg by stepping upon it, and learn the pernicious habit of egg-eating.

The door is made of seven-eighths inch pine board. It does not fill the entire front, by 2 inches at the bottom and one inch at each side. A hole 2½ inches in diameter is bored in its center, to admit more light. For the same purpose a section is cut out of its upper end, leaving enough of the board at each side of the opening to extend up to the cross piece and hold the hinges, which are made of leather, tacked on the inside of the door and the top cross-piece.

The trip latch is made of a piece of stiff wire, about three-sixteenth of an inch in diameter and 23 inches long. This piece of wire is shaped so that a section of it, 12 inches long, rests horizontally across the circular opening in the division board, leaving about two-thirds of the 6 inch opening below it. It is held in place by 2 clamps, one on either side of the circular opening. The clamps have slots large enough to allow the wire to work up and down, about 3 inches, without friction. The next section of the wire is 8 inches long and is bent so that it is at right angles with the 12 inch section. It passes along the side of the box, back towards the entrance door. It is fastened strongly to the wall by staple and clamp, yet loosely enough so that the wire can roll easily, when its 12 inch section is pushed up by the passing

hen. The remaining section of the wire, which is 3 inches long, is bent towards the center of the box with an upward inclination, so that it supports the door when opened up. The end of the wire is turned over smoothly, forming a notch into which the door slips, and rests when it is opened. The notch prevents this section of the wire from sagging under the weight of the door and interfering with the free action of the latch. It is necessary that the wire from which the latch is made be of good stiff material, so it will not bend or spring much.

As the hen passes in under the open door, and then through the circular opening of the nest, she raises herself so that her keel may pass over the lower part of the division board, and her back presses against the horizontal wire, lifting it enough as she passes so that the notched end supporting the door, slides from under it, and the door swings down and passes a balanced catch which is screwed loosely to the side of the box. The catch locks the door and prevents the hen from escaping, and others from entering.

These nest boxes are placed in two rows, one above the other, and slide in and out like drawers and can be carried away for cleaning when necessary. Twenty nests in a pen accommodate 100 hens, by the attendant going through the pens once an hour, or a little oftener, during that part of the day when the hens are busiest. Earlier and later in the day his visits have not been so frequent. To remove a hen, the nest is pulled part way out, and as it has no cover she is readily lifted up, and the number on her leg band noted on the record sheet, that is tacked up close at hand. After having been taken off a few times they do not object to being handled, the most of them remaining quiet, apparently expecting to be picked up.

Before commencing the use of trap nests, it was thought that some hens might be irritated by the trapping operation and object to the noise incident to it, but not an individual has appeared to be annoyed by it, and Leghorns, Brahmas, Wyandottes and Plymouth Rocks have been used.

The amount of time required in caring for trap nests depends upon how heavily the hens are laying. In one house there are 400 nests used by 2000 birds. During the busy season when 1200 to 1500 eggs are laid per day, the work of liberating the hens and recording the laying, requires the full time of an active man, dur-

ing the busiest 4 or 5 hours of the day. During the remaining hours he has some time for other work.

The nest is certain in its action, easy of operation and simple in its construction. It is not patented. We do not sell it. Any one is free to make it.

FEEDING YOUNG CHICKENS.

The chicks are allowed to remain in the incubator without food until they are about 48 hours old. They are then strong, steady on their legs and hungry.

The temperature under the brooder hover is kept between 95 and 100 degrees during the first week; reducing it about 5 degrees during each of the next 2 weeks. The chicks must not be allowed to chill while young, day or night. After they are 3 or 4 days old, they are taught, little by little, the road down, and out on the floor, which is covered with a little sand and a little dry cut clover, or clover leaves and chaff.

The best method of feeding young chicks is at present a matter of some uncertainty and it is doubtful if ever there will be general agreement as to the one best method. One condition appears to be imperative and that is that the young things be not allowed to over-eat. During the past years we have practiced several different methods of feeding chicks quite extensively, and have observed the results carefully.

Method 1.

Infertile eggs are boiled for half an hour and then ground in an ordinary meat chopper, shells included, and mixed with about 6 times their bulk of rolled oats, by rubbing both together. This mixture is the feed for 2 or 3 days, until the little things have learned how to eat. It is fed with chick grit, on the brooder floor, on the short cut clover or chaff.

About the third day they are fed a mixture of hard, fine broken grains, as soon as they can see to eat it in the morning. The mixture consists of equal parts of cracked corn, cracked wheat, millet seed and pin-head oats. It is fed on the litter, care being taken to limit the quantity, so they shall be hungry a 9 o'clock A. M. Several of the prepared, dry, commercial chick foods may be substituted for the broken grains. They are satisfactory when made of good, clean, broken grains and seeds, but

they contain no secret properties that make them more desirable than the home mixed broken grains mentioned above. Their use is simply a matter of convenience. When only a few chicks are raised it is generally more convenient and probably not more expensive to buy the prepared food, but when many are raised it is less expensive to use the home mixed foods. Sharp grit, fine charcoal and clean water are always before them. At 9 o'clock the rolled oats and egg mixture is fed in tin plates with low rims. After they have had the food before them 5 minutes the dishes are removed and they have nothing to lunch on. At 12.30 o'clock the hard grain mixture is fed again, as in the morning, and at 4.30 or 5 o'clock, they are fed the rolled oats and egg mixture, all they will eat in half an hour.

When they are about 3 weeks old, the rolled oats and egg mixture is gradually displaced by a mixture made up of 2 parts by weight of good clean bran, 4 parts corn meal, 2 parts middlings or red dog flour, 1 part linseed meal and 2 parts screened beef scrap. This mixture is moistened just enough with water so that it is not sticky, but will crumble, when a handful is squeezed and then released. The birds are developed far enough by this time so that the tin plates are discarded for light troughs with low sides. Young chicks like the moist mash better than though it was not moistened, and will eat more of it in a short time. There is no danger from the free use of the properly made mash, twice a day, and being already ground the young birds can eat and digest more of it, than when the food is all coarse. This is a very important fact and should be taken advantage of, at the time when the young things are most susceptible to rapid growth. But the development must be moderate during the first few weeks. The digestive organs must be kept in normal condition by the partial use of hard foods, and the gizzard must not be deprived of its legitimate work and allowed to become weak by disuse.

By the time the chicks are 5 or 6 weeks old, the small broken grains are discontinued and the 2 litter feeds are wholly of screened cracked corn and whole wheat. Only good clean wheat that is not sour or musty should be used.

When young chicks are fed as described the results have always been satisfactory, if they have not been given too much of the scratch food, and the dishes of ground material have been

removed immediately after the meal was completed. The objections to this system of feeding are the extra labor involved in preparing the eggs, mixing the food with water and removing the troughs at the proper time.

There is no danger of underfeeding even though the morning and noon feeds of hard grains should be scanty for the birds have free access to supplies of food, in the troughs, twice a day, sufficiently long to get full meals.

Method 2.

This is like Method I, except that fine beef scrap is used instead of boiled eggs, and the mash is not moistened.

Early in the morning the chicks are given the hard food on the floor litter as described in Method I. At 9 o'clock they are fed a mixture consisting of 2 parts rolled oats, 2 parts wheat bran, 2 parts corn meal, 1 part sifted beef scrap and one-half part linseed meal. This is given in the plates or troughs and the dishes are removed after 10 minutes use.

At 12.30 the hard grains are fed again and at 4.30 or 5 the dry meal mixture is given to them for half an hour or left until their bed time. The meal being dry the chicks cannot eat it as readily as they can the egg and rolled oats, or the moistened mash, and for that reason it is left for them to feed upon longer than when moistened with the egg and water, but is never left before them more than 10 minutes at the 9 o'clock feeding time. The aim is to give them enough at each of the 4 meals so that their desire for food may be satisfied at the time, but to make sure that they have nothing left to lunch upon. It is desired to have their crops empty of food before feeding them again. When treated in this way they will have sharp appetites when the feeder appears, and come racing out from the brooder to meet him. If they have been over-fed at the previous meal, and have lunched along, when they saw fit, they do not care for the feeder's coming. If over-fed a few times the creatures become debilitated and worthless.

What has been said so far is with reference to chicks that are hatched out in early spring before the young things can get out of doors for work.

Method 3.

When warm weather comes and the later hatched chicks are able to get out on the ground they find much to amuse them, and they work hard and are able to eat and digest more food. Under these conditions the dry meal mixture described in Method II is kept constantly before them in troughs with good results. With 2 feeds a day of the broken grains in the litter they have hard food enough to insure health and they can safely peck away at the dry meal mixture—a mouthful or two at a time —when they seem to happen to think of it, and thrive. This method has been considerably used in feeding April and May hatched chicks. Many times the results from it have been good. At other times, when the weather was dark and raw out of doors and the little things were held inside, they would hang around the troughs and over eat. They would grow rapidly for a few days, then commence to cripple, eat little, and seek the warm hover never to recover.

Method 4.

This consists in feeding the cracked corn, cracked wheat, pin head oats and millet seed in the litter, 4 times a day and keeping a trough of fine beef scrap within their reach all of the time. Sometimes commercial chick foods have been used instead of the cracked corn, wheat, oats and millet. By this system the losses of birds have been small when the feeding has not been so liberal as to clog the appetite. Much care is necessary in adjusting the quantity of food to the needs of the birds.

Other methods of feeding young chicks have been tried and the results watched. Method I has been used for several years and no other has been found that gives better growth or less losses of birds. The only objection to it is the labor required in preparing the food and cleaning the dishes after each meal.

In the work at this Station, Method II is preferred and used. Many weighings of the birds in comparative pens, lead to the belief that the growths are as great under this dry mash system as from the moist mash used in Method I. The losses of chicks are small by either method. The labor in Method II is considerably less than is required in Method I. Where either Methods I or II are used the liability of injury to the chicks is much less than when Methods III or IV are followed.

There are no mysteries connected with the raising of the young chickens. Every chick that is well hatched out by the 21st day of incubation, has the right to live, and it will do so if it is kept dry, at reasonable temperatures, and is not allowed to over-eat.

The most careful work of the poultryman during the whole year is required in getting the chicks through the first 3 weeks of their lives successfully. If they are vigorous up to the fourth week there is little liability of injuring them thereafter by any system of feeding, if it is only generous enough, and they have their liberty.

FEEDING THE COCKERELS FOR MARKET.

When the chickens are about 9 or 10 weeks old, and the cockerels weigh a pound and a quarter to a pound and a half, the cockerels are put by themselves into vacated brooder houses, 100 to a house. Each house has a yard in front, about 12 feet square. They are fed on porridge, 3 times a day, in V-shaped troughs, with 4-inch sides. The porridge is made of 6 parts corn meal, 2 parts middlings, one-half part linseed meal and 2 parts beef scrap. Not having milk, it is mixed with tepid water. It is made thick enough so that it will drop and not run, from the end of a wooden spoon. They are given all they will eat in half an hour, when the troughs are removed and cleaned. When the yards get dirty, they are bedded down with sand, straw or hay. The birds will stand this feeding for 2 or 3 weeks with good appetites. When they commence taking less food they are dressed for market and usually weigh about 2¼ pounds dressed weight.

GROWING AND DEVELOPING THE PULLETS.

When the cockerels are taken out for finishing, the pullets of the same age, are moved to the grassy range, still occupying the same portable houses in which they were raised. At this time the method of feeding is changed, and dry food is kept by them constantly, in troughs with slatted sides and broad detachable roofs, so it may not be soiled or wasted. The troughs are from 6 to 10 feet long, with the sides 5 inches high. The lath slates are 2 inches apart and the troughs are 16 inches high from floor to roof. The roofs project about 2 inches at the sides and effectually keep out the rain except when high winds prevail.

The roof is easily removed by lifting one end and sliding it endwise on the opposite gable end, on which it rests. The trough can then be filled and the roof drawn back into place without lifting it. This arrangement is the best thus far found, for saving food from waste and keeping it in good condition. When dry mash is used in it there may be considerable waste by the finer parts being blown away. When used for that purpose it is necessary to put it in a sheltered place out of the high winds.

In separate compartments of the troughs, they are given cracked corn, whole wheat, oats, dry meal mixture, grit, dry cracked bone, oyster shell and charcoal. The dry meal mixture is of the same composition as that fed to the laying hens, described on page 167. The troughs are located about the field in sufficient numbers to fully accommodate all of the birds.

The results of this method of feeding are satisfactory. The labor of feeding is far less than that required by any other method. The birds do not hang around the troughs and overeat, but help themselves, a little at a time, and range off, hunting, or playing and come back again, when so inclined, to the food supply at the troughs. There is no rushing or crowding about the attendant, as is usual at feeding time, where large numbers are kept together.

For the last 8 years the first eggs have been lain when the pullets were from 4 months and 10 days, to 4 months and 20 days old. There is some danger of the pullets getting developed and commencing laying too early for best results, under this system of feeding. In order to prevent such conditions, the houses should not be located too close to each other, or to the feed troughs, and a large range should be given them so they may be induced to work, which they will do if given the opportunity, early after their removal to the fields. Should the birds show too great precocity, and that they are liable to commence laying in August, the supply of cracked corn and wheat in the feeding trough is reduced, or taken away altogether, which causes them to eat the oats and dry meal instead, and they continue to grow and develop without getting ripe too soon.

During the last days of October the pullets are moved into the laying house. This would be done earlier but the houses are in use by the laying hens to near the end of that month.

FEEDING THE HENS.

Early in the morning for each 100 hens, 4 quarts of screened cracked corn* are scattered on the litter, which is 6 or 8 inches deep on the floor. This is not mixed into the litter, for the straw is dry and light and enough of the grain is hidden so the birds commence scratching for it almost immediately. At 10 o'clock they are fed in the same way, 2 quarts of wheat and 2 quarts of oats. This is all of the regular feeding that is done.

Along one side of the room is the fed trough, with its slatted front. In it is kept a supply of dry meals mixed together. This dry meal mixture is composed of the following materials: 200 pounds good wheat bran, 100 pounds corn meal, 100 pounds middlings, 100 pounds gluten meal or brewers' grain, 100 pounds linseed meal, and 100 pounds beef scrap.

These materials are spread on the floor in layers one above another and shoveled together until thoroughly mixed, then kept in stock, for supplying the trough. The trough is never allowed to remain empty. The dry meal mixture is constantly within reach of all of the birds and they help themselves at will.

Oyster shell, dry cracked bone, grit and charcoal are kept in slatted troughs and are accessible at all times. A moderate supply of mangolds and plenty of clean water is furnished. About 5 pounds of clover hay cut into ½-inch lengths is fed dry, daily to each 100 birds, in winter. When the wheat, oats and cracked corn are given, the birds are always ready and anxious for them and they scratch in the litter for the very last kernel, before going to the trough where an abundance of food is in store.

It is very evident that they like the broken and whole grains better than the mixture of the fine, dry materials; yet they by no means dislike the latter, for they help themselves to it, a mouthful or two at a time, whenever they seem to need it, and never go to bed with empty crops, so far as noted. They apparently do not like it well enough to gorge themselves with it, and sit down, loaf, get over-fat and lay soft-shelled eggs, as is so commonly the case with Plymouth Rocks when they are given warm morning mashes in troughs.

Some of the advantages of this method of feeding are that

*Whole corn will be used hereafter at the Station. See comparison of whole corn and cracked corn on pages 180 and following.

the mash is put in the troughs at any convenient time, only guarding against an exhaustion of the supply, and the entire avoidance of the mobbing, that always occurs at trough feeding, when that is made a meal of the day, whether it be at morning or evening. There are no tailings to be gathered up or wasted, as is common, when a full meal of mash is given at night. The labor is very much less, enabling a person to care for more birds than when the regular evening meal is given.

For green food during winter and spring, mangolds are used. They are liked by the birds and when properly harvested and cared for remain crisp and sound until late spring. They are fed whole, by sticking them on to projecting nails, about a foot and a half above the floor. Care must be exercised in feeding them, as they are a laxative when used too freely. On the average about a peck per day to 100 hens, can be safely used. They would eat a much greater quantity if they could get it.

The average amounts of the materials eaten by each hen during the last year are about as follows:

Grain and the meal mixture	90.0 pounds.
Oyster shell	4.0 pounds.
Dry cracked bone	2.4 pounds.
Grit	2.0 pounds.
Charcoal	2.4 pounds.
Clover	10.0 pounds.

These materials cost about $1.45.

The hens averaged laying 144 eggs each.

COMPARISONS OF WHOLE CORN AND CRACKED CORN AS PARTS OF THE RATIONS FOR LAYING HENS.

The use of corn and corn meal as major parts of the food of hens kept for egg production has been very generally condemned by poultrymen and farmers, until it is now used only as a very minor part of the ration, for the fear that its use will cause over-fatness and interfere with egg making. When used more freely and made a prominent factor in the ration it has been thought best to have the kernels broken, so that in hunting and scratching for the small pieces the birds might get the exercise needed to keep themselves in health and vigor. It was reasoned that even a small quantity of whole corn could be readily seen and picked up from the straw litter, with little exertion, and that the vices of luxury and idleness would follow.

As told on page 179, in describing the Feeding of the Laying Hens in the Station Flocks; for each 100 hens, 4 quarts of screened cracked corn are scattered on the deep litter early in the morning and at 10 o'clock 2 quarts of wheat and 2 quarts of oats are mixed together and fed in the same way, the mixture of dry meals being in the slatted troughs within their reach all of the time.

At Go-well Farm, last October, 1000 April hatched pullets were put into 10 pens in the laying and breeding house and all of them received the same treatment for 6 months. The selections were made with great care so as to have the 100 birds in each pen comparable with those in every other pen. The 10 pens in which they were confined are 20x20 feet in size and exactly alike in construction and arrangement. In every pen the dry meal mixture, bone, shell, grit and charcoal, were constantly in the slatted troughs, and mangels and short cut clover were fed every day, to all alike. They had plenty of clean water, and the floors were well littered with straw, over 3 or 4 inches of fine sawdust.

As soon as the birds could see to eat in the mornings, they were fed. Those in the first 5 pens were given, in each pen, 2 quarts of wheat and 2 quarts of whole corn scattered evenly over the whole floor. At 10 o'clock they were fed again the same quantity and kind of food. Those in the second 5 pens received 2 quarts of wheat and a little more than 2 quarts of cracked corn in the morning and the same at 10 o'clock. As cracked corn is bulkier than whole corn, a measure was made, that holds a quantity that weighs the same as 2 quarts of corn while whole. The tables show the production of each of the 10 pens, each month, from November to April—one half the year.

Feed—Dry mash, wheat and whole corn.

EGG YIELDS IN FIVE ROOMS, IN EACH OF WHICH 100 PULLETS WERE PUT NOV. 1.

Month.	Room 1.	Room 2.	Room 3.	Room 4.	Room 5.
November	414	299	429	354	389
December	1283	1095	940	942	932
January	1404	1234	1024	1152	1149
February	1379	1315	1223	1369	1314
March	2014	1984	1959	2004	1945
April	1914	1926	1790	1862	1866
Total	8408	7853	7365	7683	7595
Approximate average number of eggs per bird	84	78	73	77	76
Birds died	3	6	4	3	3

Whole number of eggs laid by 500 birds 38904
Average number of eggs laid by each bird 77.8

Feed—Dry mash, wheat and cracked corn.

EGG YIELDS IN FIVE ROOMS, IN EACH OF WHICH 100 PULLETS WERE PUT NOV. 1.

Month.	Room 1.	Room 2.	Room 3.	Room 4.	Room 5.
November	389	210	324	331	157
December	1191	883	1038	995	847
January	1135	1179	1109	1145	1219
February	1260	1272	1285	1167	1316
March	1993	1921	1994	1973	1920
April	1906	1989	1997	1892	1921
Total	7874	7464	7747	7503	7381
Approximate average number of eggs per bird	79	75	77	75	74
Birds died	4	7	7	5	6

Whole number of eggs laid by 500 birds 37969
Average number of eggs laid by each bird 75.9

There were no interruptions or irregularities during the test. The weather was very severe during much of the winter, but the birds laid well in the open air houses and the losses were not heavier than usual with us.

There is nothing in the results that leads to the conclusion that it is necessary or advisable, to crack the corn fed to hens kept for laying eggs. The slight differences in the average yields of the birds in the two classes should not be interpreted as meaning that cracked corn is inferior to whole corn. Neither do the somewhat greater losses of birds on the cracked corn ration indicate that the cracked corn was injurious. There is nothing in the appearance of the birds in either of the ten flocks, to indicate lack of vigor or health, in any flock. An examination of the yields of the birds in the different rooms during the same, and succeeding months shows much regularity. The greatest variation in the average pen yields per bird was in Room 1 where it was 84 eggs, and in Room 3 where it was 73. The causes of this variation are not known.

In conducting feeding tests with any animals it is practically impossible to get individuals or groups that are exactly alike, or that will remain in exactly the same condition during consecutive weeks or months. The variations in animals are such, that reliable answers to delicate questions can probably only be secured by taking the average results from large numbers, that are apparently uniform in form, function and condition. In this test, 1000 individuals were employed, and the conduct of the work was such as to establish confidence in the results.

With corn costing from 55 to 65 cents per bushel of 56 pounds, the mill cost for cracking is usually from one to 2 cents per bushel. During much of the year cracked corn is liable to heat and sour if kept long, which necessitates buying in small quantities. This danger is less with whole corn, and it can usually be bought in large quantities to advantage. When cracked corn is not thoroughly screened the meal sifts out and is largely lost in the litter. Whole corn will take the place of cracked corn in feeding the mature birds of the Station flocks, except when experiments may require the use of other materials.

THE TOO FREE USE OF DRIED SUCCULENT FOOD.

The Station usually uses oat straw for bedding for laying hens. In April the supply of straw was short, and oat hay was substituted for it. The oat hay was made the previous summer, by cutting the oats when they were headed out, but before they commenced filling. It was nicely cured, and green in color. When first bedded with it the hens ate freely of the finer parts, and the morning following, the platforms under the roosts were flooded with their thin, liquid-like voidings. This continued, somewhat lessened, during the next 2 days, although the bedding was removed as soon as that was thought to be the cause of the trouble. They ate little food for 3 or 4 days and it was 8 or 9 days before they were consuming their usual amounts. The egg yields were about 60 per cent of the number of birds, just before the trouble began, but they were reduced to less than 10 per cent, and it was about 20 days before the birds regained their former productions.

In 2 pens the bedding was oat straw as usual, and there was no disturbance in those pens. It is not thought that the oat hay would have caused irregularities had it been fed sparingly. Long ago we learned that we must not feed mangels too freely, because of their laxative tendencies, but there was no thought that the dry hay, although made from young plants, was comparable with the crisp, juicy mangels.

ATTEMPT AT LICE EXTERMINATION.

There are no lice at all on the chickens, and they are not wanted on the fowls, but so far, it has been impracticable to keep clear entirely of them. The roost platforms are well cleaned every morning of the year, and the straw bedding is cleaned out and renewed every 2 weeks, except in summer when the birds are much in the yards, and then it remains 3 weeks before renewal. Kerosene and crude petroleum are used freely and frequently, on the roosts and adjacent woodwork, dust baths are provided, and the birds are occasionally dusted with a commercial lice killing powder, evidently composed chiefly of tobacco snuff. This powder is very destructive to lice life, but it is a good deal of a task to treat, individually, several thousand hens.

The University has 60 beautiful Horned Dorset sheep, and for 3 years there has not been a tick or nit found on them. They are perfectly clean and they have not been dipped for 3 years. Why can't lice be exterminated as completely on the hens as in the case of the ticks on the sheep? Last December the roosts and walls of the roosting closets in all of the rooms, but one, were sprayed with 2 different brands of liquid lice killers, which were warranted, by their makers, to destroy all of the lice on fowl, by the fumes penetrating among the feathers to the skins of the birds. The preparations were used according to directions. The roosts and woodwork near them were sprayed in the morning and left to dry, until the birds went to roost. But the sprayed paint was not fully dry at that time, although it was thinned by heating before applying it. The curtains of the roosting closets were shut down at bed time as usual and both ventilators, each of which are 3 feet long and 6 inches wide, were left wide open. Next morning it was very evident, from the appearance of the birds, that they had not enjoyed the night. They ate but little food during that, and the succeeding 3 or 4 days and did not have their usual appetites for 9 or 10 days. The 700 birds were laying over 300 eggs per day before the trouble, but they laid less than 100 per day during the following week, and did not lay as many as before, until 24 days had elapsed. Many of them moulted partially, or quite fully, and these did not lay much for 6 or 7 weeks. It was not thought that any birds died from the accident. Probably we were at fault in using the stuff in winter when it did not thoroughly dry out, as it might have done in a long, warm summer day. One pen at the end of the building was not sprayed, but the air in that room was loaded with the odor from the rest of the building, which easily found its way in, around the loosely fitting door. The birds in that room fell off in their egg yields for several days, but none of them moulted. Many of the birds in the sprayed rooms refused to go to roost in the closets again for several nights, until the odor had largely disappeared, while those in the unsprayed room went into their bedroom as usual. The reason for calling attention to this experience is, that others may guard against using such preparations too freely in cold weather.

The most unsatisfactory feature of this experience was, that the treatment did not kill the lice or materially lessen their numbers. It was only, when later, the birds were individually treated with the tobacco dust and insect powder, worked in among the feathers, that the lice were nearly exterminated.

The insides of the buildings are treated with these liquid preparations in warm weather, so that the woodwork may be obnoxious to the lice and prevent their lodging there. For this purpose they are satisfactory, but our experience with them shows plainly that any material, with odors sufficiently strong to penetrate the feathers and kill the lice on the bodies of live hens, will prove destructive to the hens themselves.

BULLETIN No. 145.

FOOD INSPECTION.

CHAS. D. WOODS, Director.

J. M. BARTLETT, Chemist in charge of inspection analysis.

The law regulating the sale and analysis of food enacted by the legislature of Maine in 1905 contemplated two things; the proper and truthful branding of all articles of food, and the exclusion from the market of deleterious food materials. The law did not seek to prevent the sale of any article of wholesome food but in case a food material was other than it appeared to be, it was required "to be plainly labeled, branded or tagged so as to show the exact character thereof."

The National pure food law entitled "An Act for preventing the manufacture, sale or transportation of adulterated or misbranded or poisonous or deleterious foods, drugs, medicines, and liquors, and for regulating traffic therein, and for other purposes," was approved June 30, 1906 and became effective January 1, 1907. The law, so far as it relates to foods has practically the same requirements as the Maine pure food law of 1905. The Maine legislature of 1907 believing it desirable not only to regulate the sale of food but the sale of drugs as well, enacted a law entitled "An Act to regulate the sale and analysis of food and drugs." This law very closely follows the National Food and Drug Law. The parts of the law concerning foods went into effect in the spring of 1907, immediately upon approval by the Governor. The part of the law relating to drugs goes into effect January 1, 1908. The full text of the law and the standards adopted will be sent on application to the Director of this Station.

The U. S. Secretary of Agriculture is the executive officer of the National law known as the Foods and Drugs Act June 30, 1906. The Director of the Maine Agricultural Experiment Station is the executive officer of the Maine Food and Drug Law. The food standards for the Maine law are the same as

those for the National law. While the National law only regulates interstate commerce and hence does not apply to materials produced within the State, the rules and regulations prescribed by the U. S. Secretary of Agriculture will be recognized in all respects in the execution of the Maine Food and Drug Law. There will therefore be only one set of standards and rules regulating the sale of foods and drugs in Maine. An article of food or drugs sold in conformity with the National law will be held to be in conformity with the Maine law.

Maple Goods.

In the spring of 1907 samples of maple goods on sale in Maine were collected in several of the larger cities and the results of the analyses together with related matter are here reported. It will be noted that not all the goods were pure and not all were sold in conformity with the law. No case of deliberate fraud on the part of Maine dealers was found and all dealers expressed themselves ready and anxious to conform to the requirements of the law. They either withdrew unlawfully branded goods from sale or made the necessary changes in the brands. It is confidently hoped that the spring of 1908 will find the Maine markets practically free from maple goods unlawfully offered for sale.

THE MANUFACTURE OF MAPLE GOODS.

Vermont is the largest maple sugar producing state in the Union and its Experiment Station has given considerable attention to subjects which have to do with the preparation of maple goods. The results are published chiefly in bulletins 26 and 103 and the reports of the Vermont Station for the years 1904 and 1905, aggregating about 260 pages. As these publications are not available for general distribution, and there are a number of sugar orchards in Maine, it may be helpful to give, greatly abridged, some of the conclusions relative to flow of sap made by the Vermont Station.

Maple trees well exposed to sunlight give more and richer sap than those farther back in the sugar bush where they are crowded and shaded.

The location of the branches upon the tree has very little to do with the distribution of the sugar in the trunk.

Without exception the largest yields of sap and sugar are derived from the tissues nearest the bark. The yields from the deeper tissues gradually decreases as the depth increases. This is also true of the percentage composition of the sap. Four-fifths of the sugar can be obtained from a boring 3 inches deep.

Taps on the south side of the tree give slightly more sap and sugar than those on the north side. With the yield of an entire season, there seems to be practically little differences in the yield from different sides of the tree.

The larger the hole, the more sap and sugar. It is unwise to so wound the tree that the hole will not heal over in two or three seasons. It is recommended that the hole be made with from a 3/8 to a 5/8 inch sharp bit and not more than 3 inches in depth.

The sap from the customary tap height of 4 feet is greater in quantity and better in quality than that from the ground level or at 14 feet above the ground.

Holes in the same vertical line of tissues effect each other, even at distances of several feet. Hence taps should be made around the tree rather than up and down the trunk.

STANDARDS FOR MAPLE SUGAR AND SIRUP.

The standards adopted and fixed for sugar and sugar products are given on page 239, Bulletin 135 of this Station and as amended in Miscellaneous Publication 259 (M. F. D. R. 10).

The standards or sugar and sugar products as fixed were adopted from those made by the U. S. Secretary of Agriculture. In fixing the standards for sirups they were made as concentrated as possible without crystallation of sucrose. The higher the percentages of reducing sugars, gums, ash, etc., the farther such concentration can be carried. With pure cane sugar, about 35 per cent water is required to prevent crystallization. With cane and sorghum sirups, the evaporation may be carried to 30 per cent water without danger of crystallization. With maple sirup the danger of crystallization comes between these and the moisture content was fixed at 32 per cent. Under the definitions and standards adopted by the U. S. Secretary of Agriculture, if an article were branded maple sugar sirup it would need to carry only 65 per cent of solids, while if branded maple sirup it would need to carry 68 per cent solids. While it is desirable

to have the standards as high as practicable, in order to avoid evasion and quibbling it was deemed wiser to change the Maine standards for sirup to a uniform water content of 35 per cent. Maine producers of maple and allied goods must bear in mind that the standards for interstate trade remain unchanged and as fixed by the U. S. Secretary of Agriculture. The corrected definitions and standards for maple and allied products are as follows:

Sugar is the product chemically known as sucrose (saccharose) chiefly obtained from sugar cane, sugar beets, surgum, maple, and palm.

Maple sugar is the solid product resulting from the evaporation of maple sap, and contains, in the water-free substance, not less than sixty-five one-hundredths (0.65) per cent of maple sugar ash.

Massecuite, melada, mush sugar, and *concrete* are products made by evaporating the purified juice of a sugar-producing plant, or a solution of sugar, to a solid or semisolid consistence, and in which the sugar chiefly exists in a crystalline state.

Sirup is the sound product made by purifying and evaporating the juice of a sugar-producing plant without removing any of the sugar.

Maple sirup is sirup made by the evaporation of maple sap or by the solution of maple concrete, and contains not more than thirty-five (35) per cent of water and not less than forty-five hundredths (0.45) per cent of maple sirup ash.

Sugar sirup is the product made by dissolving sugar to the consistence of a sirup and contains not more than thirty-five (35) per cent of water.

BRANDING MAPLE PRODUCTS.

Every statement, printed or otherwise, on food and drugs must be in strict accord with fact. The chief rulings bearing upon the correct branding of maple goods are as follows: Regulations 17 to 24 inclusive, Circular 21, Office of the Secretary, United States Department of Agriculture, and Food Inspection Decisions 46, 52, 68, 70, 72, and 75 of the United States Department of Agriculture.*

* These will be sent free on application to the Secretary of Agriculture, Washington, D. C., or to Director Chas. D. Woods, Orono, Maine.

Strictly pure maple sugar and strictly pure maple sirup carrying not less than 65 per cent solids may be lawfully sold unbranded. All other maple products must be labeled.

A mixture of maple and cane sugar or sirup may be branded "maple and cane sugar" or "maple and cane sirup" when the maple product makes up half or more of the whole. It may be branded "cane and maple sugar" or "cane and maple sirup" when the maple constitutes from 10 per cent to 50 per cent of the whole. If the maple constitutes less than 10 per cent of the whole it cannot be branded as a "mixture," "compound" or "blend" but must be labeled "cane sirup, maple flavor" or "cane sirup, flavored with maple," or some similar name.

In the case of all these compound maple goods the word "maple" must be no more prominent than the others words in the name. Misleading pictures or misleading descriptive matter are unlawful.

METHODS OF ANALYSIS USED.

Total Solids.—2 grams were put upon 2 to 3 grams shredded asbeston (previously ignited) in a round, flat bottomed dish three inches in diameter and dried in a steam oven at about the temperature of boiling water until nearly constant weight was obtained.

Sucrose.—The normal amount for the instrument was polarized before and after inversion and the percentage of sucrose calculated by Clerget's formula.

Lead Number.—In this determination the method described by Winton and Kreider, Gen. Am. Chem. Soc. 1906, 28, 1204, was employed and the percentage of maple given estimated therefrom.

Total Ash.—10 grams were burned in a platinum dish at a low red heat until the carbonaceous matter was destroyed.

DESCRIPTION OF SAMPLES.

Maple Sugar Not Found Adulterated.

7526. Purchased April 30, 1907 from George E. Lufkin, 92 Main St., Bangor. Selling price 30c. a pound. Sold for pure maple sugar.

7527. Purchased April 30, 1907 from A. L. Boyd, 5 Main St., Bangor, Me. Selling price 30c. a pound. This was said to be Maine made maple sugar.

7528. Purchased April 30, 1907 from A. L. Boyd, 5 Main St., Bangor. Selling price 25c. a pound. A "maple sugar candy made by B. M. & H. A. Titcomb, manufacturers of pure maple sugar and candy, Farmington, Me."

7561. Purchased May 13, 1907 from Charles K. D. Chase, 74 Exchange St., Portland. Selling price 25c. a pound. Sold for pure maple sugar.

7589. Purchased May 17, 1907 from Geo. C. Shaw, 467 Congress St., Portland. Selling price 30c. a pound. Sold for pure maple sugar.

7590. Purchased May 17, 1907 from George E. Sawyer, 465 Congress St., Portland, Maine. Selling price 24c. a pound. Sold as pure Vermont maple sugar.

7598. Purchased May 28, 1907 from Lewiston Candy Kitchen, 68 Lisbon St., Lewiston. Selling price 25c. a pound. Sold as pure maple sugar from Canada.

Branded as Compound Maple Sugars.

7529. Purchased April 30, 1907 from F. L. Frank & Co., 115 State St., Bangor. Selling price 20c. a pound. Sold as a compound maple sugar.

7531. Purchased April 30, 1907 from Matteo Infiorati, 46 Central St., Bangor. Selling price 20c. a pound. It was sold as a blended sugar and branded "50% maple sugar, 50% cane sugar." It will be noted from the analysis it contained less than 10% maple.

7585. Purchased May 17, 1907 from P. P. Bonfillio, 927 Congress St., Portland. Selling price 20c. a pound. This was sold to the inspector as maple sugar but it was taken from a package marked "compound maple sugar."

7588. Purchased May 17, 1907 from A. Stein, 551 Congress St., Portland. Selling price 15c. a pound. Sold as a compound maple sugar and so branded on the package.

Maple Sugar Adulterated With Other Sugar.

7530. Purchased April 30, 1907 from A. J. Zotos, 134 Main St., Bangor. Selling price 20c. a pound. Sold as pure maple sugar but carried only a small fraction of maple.

7560. Purchased May 13, 1907 from Charles K. D. Chase, 74 Exchange St., Portland. Selling price 20c. a pound. Sold

as a pure maple sugar. Analysis showed it to be about one-fourth maple.

7587. Purchased May 17, 1907 from The Vienna Bakery, 783 Congress St., Portland. Selling price 20c. a pound. This was sold as a pure maple sugar and was purchased by the Vienna Bakery from a Maine farmer who claimed that it was pure maple. The analysis showed it to be about one-half maple and one-half cane sugar.

7609. Purchased June 6, 1907, from J. T. Turner, 73 Water St., Augusta. Selling price 20c. a pound. It was sold as pure maple sugar but was about one-half maple.

Maple Sirup Not Found Adulterated.

7510. Purchased April 18, 1907 from O. T. Goodridge, Orono. Selling price 45c. a quart. Sold as pure maple sirup and made at Milo, Maine.

7517. Purchased April 29, 1907 from Staples & Griffin, 55-59 Pickering Square, Bangor. Selling price 30c. a quart. Sold as pure maple sirup made by J. F. Aiken, East Corinth, Me.

7518. Purchased April 29, 1907 from James H. Snow & Co., Bangor. Selling price 35c. a quart. The package was branded "absolutely pure put up hot at the Skinner Sugar Orchard, Corinth, Maine."

7542. Purchased May 8, 1907 from William H. Tibbetts, 501 Ohio St., Bangor. Selling price 35c. a bottle holding 25 ounces. This was sold as pure maple sirup bearing the following brand: "Puritan Brand Vermont Maple Sirup. The sirup contained in this package is absolutely pure, Huntington Maple Sirup and Sugar Co., Brattleboro, Vt., and Providence, R. I."

7562. Purchased May 15, 1907 from W. L. Wilson & Co., 112 Exchange St., Bangor. Selling price 20c. a pint. The package was labeled "Pure Vermont Maple Sirup made by Archie F. Holden, Bloomfield, Vt."

7565. Purchased May 13, 1907 from O. C. Elwell, 794 Congress St., Portland. Selling price 40c. a quart. The package was labeled "This can is warranted to contain pure maple sirup, made in 1907. From Maple Grove Farm, Bert A. Taylor, proprietor, Lunenburg, Vt."

7569. Purchased May 14, 1907 from William Milliken & Co., 584 Congress St., Portland, Me. Selling price 40c. per bottle

holding 26 ounces. Branded "Pure maple sirup, Vermont Sugar Orchards, bottled by S. S. Pierce Co., importers and grocers, Boston, Mass. Guaranteed under the Food and Drug Act, June 30, 1906, No. 3336."

7571. Purchased May 14, 1907 from John W. Deering & Son, 576 Congress St., Portland. Selling price 40c. a quart. Packed in one gallon cans branded "Warranted Pure Maple Sirup made by Luke Colby, Lunenburg, Vermont."

7572. Purchased May 14, 1907 from Libby & Chipman, 574 Congress St., Portland. Selling price 30c. a quart. Put up in one gallon cans branded "Pure maple sirup manufactured by the latest process and guaranteed strictly pure, season of 1907. Lewis E. King, Lunenburg, Vermont."

7575. Purchased May 15, 1907 from Charles H. Lombard, 47 and 49 Portland St., Portland. Selling price 18c. a pint. Put up in one gallon cans branded "The contents of this package are warranted to be fine maple product from Porter Smith, Lunenburg, Vermont."

7580. Sample given May 15, 1907 by W. W. Riggs and L. S. Wilbur, Boston & Maine Wharf, Commercial St., Portland. Selling price not stated. The package was branded, "Pure maple sirup put up by S. T. Noyes, Hilltop Farm, Colebrook, N. H."

Sirup Below Standards in Solids.

(The maple sirups included in this class were sold as pure maple sirups and did not carry any foreign sugars They were adulterated only in the sense that they fell below the standards in solids. Maple sirup to be up to the standard must not contain more than 35 per cent of water or in other words must have not less than 65 per cent of solids.)

7516. Purchased April 29, 1907 from Staples & Griffin, 55-59 Pickering Square, Bangor. Selling price 30c. a quart. Made by F. E. McCard, East Corinth, Maine. Goods were sold as pure maple sirup but were found to carry more water than the standards allow and carried only 62.7 per cent solids.

7522. Purchased April 30, 1907 from F. L. Frank & Co., 115 State St., Bangor. Selling price 30c. per bottle holding 16 ounces. Sold for pure maple sirup. Branded as follows: "Rival Brand Pure Maple Sap Sirup put up expressly for

Haskell, Adams & Co." This sirup carried 64.6 per cent solids, and was only .4 per cent below the standard.

7554. Sample sent May 11, 1907 by George C. Shaw Co., Congress St., Portland. No selling price was given. The sirup was contained in a bottle holding 25 ounces labeled "Mt. Washington Maple Sap Sirup, choicest quality, absolutely pure, C. M. Tice & Co., Boston, Mass." The sirup carried 63.7 per cent solids.

7563. Purchased May 13, 1907 from City Hall Market, Congress St., Portland. Selling price 35c. a quart. Package labeled "Pure Maple Sirup made by Austin Cobin, Newport, N. H. It carried 64.4 per cent solids, and was only .6 per cent below standard.

7564. Purchased May 13, 1907 from O. C. Elwell, 794 Congress St., Portland. Selling price 40c. a quart. It carried 64.8 per cent solids, and was ony .2 per cent below standard.

7566. Purchased May 13, 1907 from F. H. Verrill, 952 Congress St., Portland. Selling price 25c. per bottle holding 18 ounces, labeled "Pure Maple Sirup, Red Lily Brand, Martin L. Hall & Co., Boston, Mass." The sirup was considerably below the standard carrying only 60.7 per cent solids.

7578. Purchased May 15, 1907 from Sullivan & Osgood, 110-112 Portland St., Portland. Selling price 20c. a pint. In unlabeled gallon cans. The sirup was free from adulteration other than water. It was the lowest in solids of the samples examined carrying only 58.8 per cent solids.

7582. Purchased May 16, 1907 from W. H. Wright, 57-59 Chestnut St., Portland. Selling price 18c. a pint. Package branded "Pure Vermont Maple Sirup manufactured by J. Cassius Winn, Valley, Vermont. It is guaranteed strictly pure." The sirup carried only 61.9 per cent solids.

Sirup Branded Maple Compound. Solids above Maple Sirup Standard.

7513. Purchased April, 1907 from James Park, Orono. Selling price 25c. a quart can. It was branded "Maple and Cane Sugar Sirup."

7515. Purchased April 29, 1907 from Fred T. Hall & Co., 76 State St., Bangor. Selling price 35c. a bottle holding 32 ounces. It was branded "Champion Brand. 50% cane sirup, 50% maple

sirup from Waitsfield, Vermont. C. A. Reed, Medford, Mass." This sirup carried 66.9 per cent solids and was about one-eighth maple.

7519. Purchased April 30, 1907 from J. F. O'Connell, 171 Exchange St., Bangor. Selling price 25c. a bottle holding 26 ounces. Labeled "High Grade Pure Sirup, blended cane and maple sirups put up by Bay State Maple Sirup Co., Boston, Mass." This company is apparently controlled by C. M. Tice & Co., 549 Albany St., Boston, Mass. The goods carried no maple.

7520. Purchased April 30, 1907 from T. White, 1 Hammond St., Bangor. Selling price 25c. a bottle holding 24 ounces. Branded "Golden Tree Brand Fancy Quality Sirup made from pure maple and white sugar, New England Maple Sirup Co., Boston, Mass." This sample contained no maple.

7521. Purchased April 30, 1907 from T. White, 1 Hammond St., Bangor. Selling price 30c. a bottle holding 20 ounces. It was branded "Griddle Cake Falcon Brand Sirup. Guaranteed made from pure maple and refined granulated sugar put up by Falcon Packing Co., New York." This sirup carried 66.2 per cent solids and was about one-sixth maple.

7523. Purchased April 30, 1907 from F. L. Frank & Co., 115 State St., Bangor. Selling price 10c. a bottle holding 6 ounces. Branded "Golden Tree Brand Fancy Quality Sirup made from pure maple and white sugar, New England Maple Sirup Co., Boston, Mass." This sample was about one-fourth maple.

7525. Purchased April 30, 1907 from H. E. McDonald, 261 State St., Bangor. Selling price 25c. a bottle holding 32 ounces. It was branded "Shaker Brand Sirup; a mixture of pure maple sugar sirup and cane sugar sirup, bottled by E. D. Pettingill Sons Co., Portland, Maine." The goods contained 66.1 per cent solids and were about half maple.

7532. Purchased May 1, 1907 from A. J. McNaughton, Foxcroft. Selling price 10c. a bottle holding 6 ounces. It was branded "Barker's Brand Sirup; a mixture of maple sirup 50 per cent, and rock candy sirup 50 per cent put up by J. H. Barker & Co., 447 West 31st St., New York." The goods carried 67½ per cent solids and were about one-third maple.

7567. Purchased May 13, 1907 from F. H. Verrill, 952 Congress St., Portland. Selling price 15c. a bottle holding 11

ounces. This was labeled "Lamb's Celebrated Sirup, made from maple sugar and refined cane sugar, W. J. Lamb Co., 167 Main St., West Somerville, Mass." The sirup was about half maple.

7568. Purchased May 14, 1907 from M. B. Lougee, 198 Grant St., Portland. Selling price 25c. per bottle holding 24 ounces. It was branded "Vermont Maple Sirup scientifically blended, of maple and cane sugars. Put up by Vermont Maple Sugar Co., Stratton, Vermont." It carried 66.1 per cent solids and was about one-third maple.

7574. Purchased May 15, 1907 from A. R. Verrill, 27 Portland St., Portland. Selling price 10c. a bottle holding 6 ounces. It was branded "Mt. Mansfield Brand Fancy Quality Sirup compound of 50 per cent maple and 50 per cent cane sugar sirup. C. M. Tice & Co., Orleans County, Vermont, and Boston, Mass." The sirup carried 67.4 solids and was about one-third maple.

7576. Purchased May 15, 1907 from R. R. Reed, 57 Portland St., Portland. Selling price 10c. a bottle holding 8 ounces. It was branded "A mixture of pure maple sugar sirup and cane sugar sirup, Green Leaf Brand Choicest Food Froducts, J. B. Donnell Co., Portland." The sirup carried 67.4 per cent solids and was about half maple.

7577. Purchased May 15, 1907 from Sullivan & Osgood, 110-112 Portland St., Portland. Selling price 30c. a bottle holding 25 ounces. It was branded "Maple Sirup. This sirup contains maple sugar, cane sugar and grape sugar with 1-2000 part of salicylic acid, manufactured by the Twitchell-Champlin Co., Portland, Maine, and Boston, Mass." The sirup carries 65.2 per cent solids and was about one-third maple.

7583. Purchased May 16, 1907 from W. H. Wright, 57-59 Chestnut St., Portland. Selling price 10c. a bottle holding 8 ounces. It was branded "Fancy Sirup 50 per cent pure maple; 50 per cent cane sugar. Bottled by E. D. Pettingill Sons Co., Portland, Maine." The sirup carried 66.7 per cent solids and was about one-sixth maple.

7584. Purchased May 16, 1907 from A. D. Lovell, Cor. Wilmot & Oxford Sts., Portland. Selling price 10c. a bottle holding 7 ounces. It was branded "Green Leaf Sirup, a mixture of pure maple sugar sirup and cane sugar sirup. Put up for J. B. Donnell Co., Portland, Me." It carried 66.4 per cent solids and was about one-half maple.

7586. Purchased May 17, 1907 from P. P. Bonfillio, 927 Congress St., Portland. Selling price 20c. a bottle holding 12 ounces. It was branded "Gold Brand Sirup; a mixture made from maple sugar and refined cane sugar, W. J. Lamb Co., 157 Elm St., West Somerville, Mass." The sirup carried 65.8 per cent solids and was about one-half maple.

7593. Purchased May 23, 1907 from W. J. Clark, Ellsworth, Me. Selling price 25c. a bottle holding 25 ounces. It was branded "Glenwood Brand Orchard Sap Sirup. A mixture of pure maple sirup 40 per cent, refined sugar sirup 60 per cent. Put up expressly for The Charles Lawrence Co., Boston, Mass." The sirup carried 65.1 per cent solids and was about 40 per cent maple.

7597. Purchased May 28, 1907, from J. E. Pelletier, 285 Lisbon St., Lewiston. Selling price 25c. a bottle holding 25 ounces. It was branded "Maple Sirup. This sirup contains maple sugar, cane sugar and grape sugar with 1-2000 part of salicylic acid, manufactured by the Twitchell-Champlin Co., Boston, Mass." The sirup carried 65.6 per cent solids and was about one-third maple.

7613. Sent June, 1907 by G. F. Simmons, Hallowell. Selling price not given. Put up in a bottle holding 26 ounces. Branded "A mixture of pure maple sugar sirup and cane sugar sirup. Put up for C. A. Weston Co., Portland, Maine." The sirup carried 67.3 per cent solids and was about one-fourth maple.

Sirup Branded as Maple Compounds but Below the Maple Sirup Standards.

7537. Purchased May 6, 1907 from F. S. Jones & Co., 210 Hammond St., Bangor. Selling price 10c. a bottle holding 6 ounces. It was branded "Houghton Farm Brand Fancy Sirup. Made from Vermont maple and white sugar, New England Maple sirup Co., Vermont Houghton Farm, Fairfax, Vermont." It carried 61.3 per cent solids and was about one-fourth maple.

7541. Purchased May 8, 1907 from William H. Tibbetts, 501 Ohio St., Bangor. Selling price 35c. per bottle holding 24 ounces. It was branded "Purity Fancy Quality Vermont Maple Sap Sirup. Made from pure maple and white sugars, Thurston

& Kingsbury, Bangor, Maine." It contained 64.1 per cent solids and was about one-eighth maple.

7573. Purchased May 14, 1907 from Libby & Chipman, 574 Congress St., Portland. Selling price 25c. a bottle holding 24 ounces. It was branded "Champion Brand Maple Sirup. 50 per cent cane sirup, 50 per cent maple sirup from Waitsfield, Vermont. C. A. Reed, Medford, Mass." The sirup carried 62.9 per cent solids and was about one-third maple.

Sirup Adulterated With Other Sugars.

7524. Purchased April 30, 1907 from Gallager Brothers, 271 State St., Bangor. Selling price 25c. a quart in a five gallon can. Purported to be pure Vermont maple sugar. It had 69.8 per cent solids and was about one-sixth maple.

7581. Purchased May 16, 1907 from E. M. Leighton, 243 Oxford St., Portland. Selling price 10c. a bottle holding 8 ounces. It was branded "Merrimac Brand Pure Vermont Sirup packed only by Riverside Preserving Co., Lowell, Mass." The sirup carried 67.3 solids and was about one-half maple.

7600. Purchased May 29, 1907 from C. M. Penley, 62 Spring St., Auburn. Selling price 20c. a bottle holding 17 ounces. It was branded "This bottle is guaranteed to contain pure maple sirup put up by W. A. Little & Co., Andrew Square, Boston, Mass." The sirup carried 65.2 per cent solids and was about one-eighth maple.

RESULTS OF THE ANALYSES.

The tables which follow give the results of the chemical examination of the samples of maple goods collected by the inspector. On page 199 are given the results of the analyses of maple sugars not found adulterated and the compound sugars so branded. Tables on page 200 give the results of the examination of maple sugars adulterated with other sugars and all sirups not found adulterated with other sugar including those up to and those below the standards in solids. The table on page 201 gives the results of the analyses of the maple compound sirups both above and below the standard for solids and also the analyses of the samples adulterated with other sugars.

In the case of the maple sugars, the water varies from 4 to nearly 14 per cent or in other words the dry matter runs from

nearly 96 per cent to as low as 86 per cent. There is a corresponding range in sucrose, the sugar of maple,—ranging from nearly 91 per cent to less than 80 per cent. There is fully as great range in the amount of water and solids carried by the sirups. In the case of the sirups there is frequently little difference in the price asked for pure goods and for compounded or blended sirups. If one prefers to use a mixture of maple sirup and cane sirup, it would be much more economical to buy the pure goods and dilute them for one's self.

The last column gives the estimated amount of maple contained in the different classes of goods. This estimate is based upon the lead number which is an arbitrary but reliable measurement * for determining the quality of maple goods.

* Cf. Report Vermont Experiment Station 1905, pp. 315-339.

Table giving results of analysis of maple goods.

SUGAR NOT FOUND ADULTERATED.

Station No.	Brand.	Cost per pound.	Water.	Solids.	Sucrose.	Lead No.	Ash.	Estimated maple.
		Cts	Per ct.	Per ct.	Per ct.		Per ct.	Per ct.
7526	Lufkin	30	13.6	86.4	79.6	2.56	1.27	100
7527	Boyd	30	9.5	90.5	87.1	1.75	0.98	100
7528	Titcomb *	35	4.3	95.7	90.7	2.52	1.65	100
7561	Chase	25	7.3	92.7	86.8	2.67	1.42	100
7589	Shaw	30	4.1	95.9	84.2	2.52	1.18	100
7590	Vermont	24	5.2	94.8	85.0	2.24	0.81	100
7598	Canada	25	5.1	94.9	86.1	2.79	2.13	100

SUGAR BRANDED MAPLE COMPOUND.

7529	Frank	20	7.5	92.5	86.9	0.19	0.17	10
7531	Savage	20	8.2	91.8	88.6	0.15	0.08	8
7585	Bonfillio	20	5.2	94.8	85.9	0.37	0.10	17
7588	Stein	15	6.5	93.5	88.1	0.34	0.08	15

* Stick maple candy.

Table giving results of analysis of maple goods—Continued.

SUGAR ADULTERATED WITH OTHER SUGAR.

Station No.	Brand.	Cost per quart.	Water.	Solids.	Sucrose.	Lead No.	Ash.	Estimated maple.
		Cts.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
7530	Zutus	20	7.2	92.8	86.8	0.00	0.08	-
7560	Chase	20	6.7	93.3	87.8	0.60	0.24	25
7587	Farmer	20	6.7	93.3	86.4	1.19	0.53	50
7609	Turner	20	4.1	95.9	82.7	1.03	0.40	50

SIRUP NOT FOUND ADULTERATED.

7510	Milo	45	30.9	69.1	64.4	1.64	0.80	100
7517	Aiken	30	31.6	68.4	62.1	1.33	0.75	100
7518	Skinner	35	33.2	66.8	57.8	2.11	0.89	100
7542	Huntington	43	31.1	68.9	63.6	1.12	0.53	100
756	Holden	40	31.4	68.6	62.4	2.03	0.81	100
7565	Maple Grove Farm	40	32.8	67.2	63.3	2.00	0.76	100
7569	S. S. Pierce Co.	50	34.8	65.2	60.7	1.41	0.60	100
7571	Luke Colby	40	31.1	68.9	61.4	1.56	1.19	100
7572	Lewis E. King	30	33.7	66.3	63.3	1.65	0.84	100
7575	Porter Smith	36	27.5	72.5	63.2	1.86	0.60	100
7580	S. T. Noyes	-	33.7	66.3	61.8	1.73	0.83	100

SIRUP BELOW STANDARD IN SOLIDS.

7516	McCard	30	37.3	62.7	61.2	1.82	1.07	100
75	Haskell	60	35.4	64.6	56.7	1.06	0.65	100
7554	Mt. Washington	-	36.3	63.7	60.7	1.14	0.47	100
7563	Austin Corbin	35	35.6	64.4	59.8	2.30	0.93	100
7564	Bean	40	35.2	64.8	57.2	2.30	0.61	100
7566	Red Lily	45	39.3	60.7	49.7	1.84	0.58	100
7578	Smart	40	41.2	58.8	54.0	1.52	0.63	100
7582	J. C. Winn	36	38.1	61.9	50.0	1.89	0.74	100

Table giving results of analysis of maple goods—Concluded.

SYRUP BRANDED MAPLE COMPOUND.

SOLIDS ABOVE MAPLE SIRUP STANDARD.

Station No.	Brand.	Cost per quart.	Water.	Solids.	Sucrose.	Lead No.	Ash.	Estimated maple.
		Cts.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
7513	Park	25	30.2	69.8	64.4	0.48	.51	30
7515	Champion	35	33.1	66.9	62.3	0.19	0.22	12
7519	Bay State	32	33.2	66.8	63.1	0.00	0.15	-
7520	Golden Tree	32	31.8	68.2	64.3	0.00	0.11	-
7521	Griddle Cake	48	33.8	66.2	61.5	0.25	0.15	17
7523	Golden Tree	53	30.9	69.1	64.9	0.33	0.18	25
7525	Shaker Table	25	33.9	66.1	62.1	0.88	0 38	50
7532	Barker's	53	32.5	67.5	61.6	0.45	0.24	33
7567	Lambs	44	31.8	68.2	61.4	0.79	0.28	50
7568	Vermont	32	33.9	66.1	61.6	0.49	0.22	33
7574	Mt. Mansfield	53	32.6	67.4	64.4	0.96	0.16	33
7576	Green Leaf	40	32.6	67.4	64.4	0.56	0.24	50
7577	T. C. Co	38	34.8	65.2	41.6*	1.48	0.33	35
7583	Pettengill	40	33.3	66.7	61.6	0.28	0.29	17
7584	Green Leaf	46	33.6	66.4	63.3	0.83	0.39	50
7586	Gold	53	34.2	65.8	59.9	0.83	0.26	50
7593	Glenwood	32	34.9	65.1	59.7	0.97	0.33	40
7597	T. C. Co	32	34.4	65.6	38.7†	1.70	0.44	35
7613	C. A. Weston Co	-	32.7	67.3	65.8	0.54	0.11	25

* 25 per cent glucose. † 24.5 per cent glucose.

SIRUP BRANDED MAPLE COMPOUNDS.

BELOW MAPLE SIRUP STANDARD IN SOLIDS.

7537	Houghton Farm	53	38.7	61.3	58.2	0.26	0.11	17
7541	Purity	48	35.9	64.1	61.2	0.17	0.08	12
7573	Champion	32	37.1	62.9	59.6	1.02	0.14	33

SIRUP ADULTERATED WITH OTHER SUGAR.

7524	Gallager	25	30.2	69.8	64.9	0.23	0.14	17
7581	Merrimac	40	32.7	67.3	64.2	0.82	0.58	50
7600	Little & Co	38	34.8	65.2	52.8	0.68	0.06	13

FERTILIZER INSPECTION.

CHAS. D. WOODS, Director.

J. M. BARTLETT, Chemist in charge of Inspection Analyses.

The law regulating the sale of commercial fertilizers in this State calls for two bulletins each year. The first of these contains the analyses of the samples received from the manufacturer guaranteed to represent, within reasonable limits, the goods to be placed upon the market later. The second bulletin contains the analyses of the samples collected in the open market by a representative of the Station.

The analyses of the manufacturers' samples for this year were published in March. A number of samples were received so late that the analyses could not be included in the bulletin then issued. The results of these analyses are given in the tables on page 221.

In the tables (pages 206 to 220) the analyses of the samples of commercial fertilizers collected in the open market in the spring of 1907 by the Station representative are given. As far as possible two samples of each brand were taken, an effort being made to get the duplicate from a distinct lot of the same brand in a different part of the State. For the most part the samples were taken in the large warehouses where a large amount of the goods were stored as received from the factory. They were taken in almost every instance from a large number of packages and in the presence of a representative of the manufacturers.

So far as different lots were found by the inspector two analyses of the same brand are given in the tables. A few brands that were licensed were not actually shipped into the State and in two or three instances the inspector failed to find the brands in the hands of the dealers or agents.

During the years immediately following 1895 there was a tendency to the multiplication of brands. At present it is only

rarely that a company that has been doing business in the State for years offers a new brand. With the growth of the sale of fertilizers in the State, companies that formerly did no business in Maine are now sending their goods to the State. This of course results in an increase in the number of brands. While it is unfortunate that so many farmers buy fertilizers from a name rather than from the amount of plant food contained in the fertilizer, it is gratifying that brands are not being unnecessarily multiplied. There has been a constant increase from the 20 brands licensed in 1885 to 200 or more brands of complete manures and single ingredient chemicals licensed in 1907.

When the manufacturers first put their goods upon the market, recognizing the difficulty of accurate mixing, they placed a somewhat elastic guarantee upon them. For instance, potash might be guaranteed 4 to 5 per cent and for the most part the goods would carry 4.5 per cent of potash. As competition became closer and the process of manufacture became somewhat more trustworthy, the manufacturers worked closer and closer to the minimum guarantee so that at present it rarely happens that high grade fertilizers carry much above the minimum percentages of nitrogen and potash, the more costly constituents of a fertilizer. If this were the whole story there would be nothing to complain of, but up to the present year there has been an increasing tendency to fail to maintain the goods up to their minimum guarantee.

For the most part these are slight and generally in only one constituent. It also usually happens that the other constituents are in sufficient excess to preclude any idea of intention on the part of the manufacturer not to live up to the guarantee. Usually the trouble is due to incomplete mixing. For instance, in some formulas not more than 100 pounds of nitrate of soda are used per ton. Nitrate of soda is a crystalline material and it is difficult to so completely powder it and thoroughly incorporate it in the goods that the sample drawn in the inspector's tube shall have its just amount—neither too much nor yet too little. To try to meet this difficulty, the samples are taken from a large number of packages and the final sub-sample is taken with the greatest care. It is because of the difficulty of accurate sampling of fertilizers that the Station only undertakes the analysis of samples taken by its inspector, and employs an

experienced chemist who from his laboratory experience fully recognizes the importance and difficulties of correct sampling.

It is only fair to the manufacturers to say that probably no class of goods are more nearly sold on their merits than are commercial fertilizers. So far as the writer knows, there has not been a case in 10 years that could be called a wilful attempt on the part of a maker of fertilizers sold in Maine to defraud.

THE COMPARISON OF STATION ANALYSES FOR THREE YEARS.

It is important that the purchaser of fertilizers should know the analyses not merely for the current year but as a guide for future purchase to know how they have run for several years. The tables on pages 206 and following of this bulletin, show how the samples collected by the Station inspector in 1907 compare with the guarantees. The tables beginning on page 222 give the analyses, so far as total nitrogen, available phosphoric acid and potash are concerned, for the years 1905, 1906, and 1907. When the guarantees have been changed from that of previous years, the fact is indicated by a foot note.

In studying the table of comparisons of the analyses of Station samples for three years, it will be found that many goods run quite uniform year after year. This is particularly true as regards phosphoric acid, and this is readily understood when it is remembered that the superphosphate is the starting point and that the materials furnishing nitrogen and potash are usually added to this. The potash and nitrogen are the more expensive substances in fertilizers and the more difficult to mix and hence greater variation is found in these contituents.

Descriptive List of Station Samples, 1907.

Station number.	Manufacturer, place of business and brand.
	AMERICAN AGRICULTURAL CHEMICAL CO., NEW YORK, N. Y.
1092	A. A. C. Co.'s Aroostook Complete Manure
1232	A. A. C. Co.'s Aroostook Complete Manure
1090	A. A. C. Co.'s Aroostook High Grade
1054	Bradley's Alkaline Bone with Potash
1253	Bradley's Alkaline Bone with Potash
1056	Bradley's Complete Manure with 10% Potash
1168	Bradley's Complete Manure with 10% Potash
1049	Bradley's Complete Manure for Potatoes and Vegetables
1055	Bradley's Corn Phosphate
1167	Bradley's Corn Phosphate
1255	Bradley's Corn Phosphate
1045	Bradley's Eureka Fertilizer
1155	Bradley's Eureka Fertilizer
1256	Bradley's Eureka Fertilizer
1046	Bradley's XL Superphosphate of Lime
1154	Bradley's XL Superphosphate of Lime
1242	Bradley's XL Superphosphate of Lime
1047	Bradley's Niagara Phosphate
1130	Bradley's Niagara Phosphate
1051	Bradley's Potato Fertilizer
1169	Bradley's Potato Fertilizer
1246	Bradley's Potato Fertilizer
1048	Bradley's Potato Manure
1175	Bradley's Potato Manure
1050	Clark's Cove Bay State Fertilizer
1262	Clark's Cove Bay State Fertilizer
1039	Clark's Cove Bay State Fertilizer G. G
1165	Clark's Cove Bay State Fertilizer G. G
1029	Clark's Cove Defiance Complete Manure
1267	Clark's Cove Defiance Complete Manure
1020	Clark's Cove Great Planet Manure, A. A
1268	Clark's Cove Great Planet Manure, A. A
1074	Clark's Cove King Philip Alkaline Guano
1118	Clark's Cove King Philip Alkaline Guano
1261	Clark's Cove King Philip Alkaline Guano
1040	Clark's Cove Potato Fertilizer
1174	Clark's Cove Potato Fertilizer
1041	Clark's Cove Potato Manure
1172	Clark's Cove Potato Manure
1028	Cleveland Fertilizer for All Crops
1052	Cleveland High Grade Complete Manure
1069	Cleveland Potato Phosphate
1157	Cleveland Potato Phosphate
1035	Cleveland Superphosphate

Analysis of Station Samples, 1907

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	Soluble in water.	Insoluble in water.	Total.		Soluble.	Reverted.	Insoluble.	Available.		Total.		Found.	Guaranteed.
			Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.		
	%	%	%	%	%	%	%	%	%	%	%	%	%
1092	1.54	1.28	2.82	2.47	3.43	2.77	2.04	6.20	6.00	8.24	.....	9.71	10.00
1232	1.38	1.34	2.72	2.47	3.19	3.55	2.03	6.74	6.00	8.77	.....	10.09	10.00
1090	1.50	2.86	4.36	4.12	3.91	3.14	2.35	7.05	7.00	9.40	.....	6.63	7.00
1054	.....	.....	.....	.....	3.35	6.79	4.17	10.14	11.00	14.31	12.00	2.12	2.00
1253	.....	.....	.....	.....	4.02	6.02	3.89	10.04	11.00	13.93	12.00	2.06	2.00
1056	1.66	1.60	3.26	3.30	4.38	2.82	1.28	7.20	6.00	8.48	7.00	9.98	10.00
1168	2.14	1.20	3.34	3.30	2.41	3.18	3.24	5.59	6.00	8.83	7.00	9.55	10.00
1049	1.88	1.44	3.32	3.30	5.01	3.05	1.98	8.06	8.00	10.04	9.00	6.68	7.00
1055	0.78	1.40	2.18	2.06	6.30	1.72	2.52	8.02	8.00	10.54	10.00	1.61	1.50
1167	1.33	1.05	2.38	2.06	4.35	2.90	2.87	7.25	8.00	10.12	10.00	1.77	1.50
1255	1.16	0.70	1.86	2.06	4.29	3.50	2.41	7.79	8.00	10.20	10.00	1.52	1.50
1045	0.66	0.64	1.30	1.03	6.03	3.55	2.55	9.58	8.00	12.13	10.00	2.33	2.00
1155	0.64	0.54	1.18	1.03	6.66	3.15	2.59	9.81	8.00	12.40	10.00	2.45	2.00
1256	0.69	0.54	1.23	1.03	5.26	2.63	2.11	7.89	8.00	10.00	10.00	1.81	2.00
1046	1.42	1.36	2.78	2.50	2.31	7.24	2.04	9.55	9.00	11.59	11.00	2.55	2.00
1154	1.61	1.18	2.79	2.50	6.12	3.21	2.10	9.33	9.00	11.43	11.00	2.01	2.00
1242	1.42	1.16	2.58	2.50	5.71	2.55	2.40	8.26	9.00	10.86	11.00	2.23	2.00
1047	0.68	0.70	1.38	0.82	6.06	3.90	2.38	9.96	7.00	12.34	8.00	2.39	1.00
1130	0.66	0.54	1.20	0.82	4.27	3.59	2.58	7.86	7.00	10.44	8.00	2.13	1.00
1051	0.84	1.34	2.18	2.06	3.35	4.09	2.68	7.44	8.00	10.12	10.00	3.14	3.00
1169	0.74	1.58	2.32	2.06	4.42	3.52	2.58	7.94	8.00	10.52	10.00	3.31	3.00
1246	0.88	1.32	2.20	2.06	3.54	3.66	2.52	7.20	8.00	9.72	10.00	3.20	3.00
1048	1.08	1.54	2.62	2.50	5.26	2.16	1.89	7.42	6.00	9.31	8.00	6.73	5.00
1175	1.62	1.18	2.80	2.50	3.86	3.12	2.60	6.98	6.00	9.58	8.00	5.13	5.00
1050	1.36	1.40	2.76	2.50	6.30	2.57	2.29	8.87	9.00	11.16	11.00	2.46	2.00
1262	1.56	1.00	2.56	2.50	4.72	4.55	2.83	9.27	9.00	12.10	11.00	2.21	2.00
1039	0.71	1.36	2.07	2.06	5.56	2.11	2.58	7.67	8.00	10.25	10.00	1.58	1.50
1165	1.15	1.07	2.22	2.06	3.52	4.57	2.47	8.09	8.00	10.56	10.00	1.59	1.50
1029	0.68	0.70	1.38	0.82	3.63	3.73	2.68	7.36	7.00	10.04	8.00	2.00	1.00
1267	0.45	0.62	1.07	0.82	3.84	3.31	2.44	7.15	7.00	9.59	8.00	1.24	1.00
1020	1.86	1.60	3.46	3.30	5.93	2.76	1.94	8.69	8.00	10.63	9.00	7.04	7.00
1268	1.86	1.48	3.34	3.30	5.63	2.60	1.54	8.23	8.00	9.77	9.00	7.01	7.00
1074	0.64	0.78	1.42	1.03	3.92	3.50	2.49	7.42	8.00	9.91	10.00	2.16	2.00
1118	0.60	0.56	1.16	1.03	4.08	3.49	2.92	7.57	8.00	10.49	10.00	2.04	2.00
1261	0.50	0.56	1.06	1.03	4.96	2.37	2.46	7.33	8.00	9.79	10.00	1.77	2.00
1040	0.64	1.38	2.02	2.06	4.61	3.13	2.80	7.74	8.00	10.54	10.00	3.38	3.00
1174	0.73	1.62	2.35	2.06	4.93	2.68	2.54	7.61	8.00	10.15	10.00	3.33	3.00
1041	1.10	1.52	2.62	2.50	5.10	2.32	2.11	7.42	6.00	9.53	8.00	5.83	5.00
1172	1.45	1.22	2.67	2.50	4.06	2.95	2.69	7.01	6.00	9.70	8.00	5.06	5.00
1028	0.56	0.88	1.44	1.03	4.62	3.05	2.42	7.67	8.00	10.19	10.00	2.09	2.00
1052	1.62	1.78	3.40	3.30	4.86	3.02	2.35	7.88	8.00	10.23	9.00	6.75	7.00
1069	0.78	1.46	2.24	2.06	4.70	3.11	2.77	7.81	8.00	10.58	10.00	3.45	3.00
1157	1.40	0.86	2.26	2.06	4.75	2.78	2.69	7.53	8.00	10.22	10.00	3.48	3.00
1035	0.80	1.30	2.10	2.06	5.69	2.24	2.61	7.93	8.00	10.54	10.00	1.74	1.50

Descriptive List of Station Samples, 1907.

Station number.	Manufacturer, place of business and brand.
1136	Cleveland Superphosphate
1094	Crocker's Ammoniated Corn Phosphate
1095	Crocker's Aroostook Potato Special
1142	Crocker's Aroostook Potato Special
1098	Crocker's Grass and Oats Fertilizer
1243	Crocker's Grass and Oats Fertilizer
1144	Crocker's New Rival Ammoniated Superphosphate
1238	Crocker's New Rival Ammoniated Superphosphate
1105	Crocker's Potato, Hop and Tobacco Phosphate
1145	Crocker's Potato, Hop and Tobacco Phosphate
1093	Crocker's Special Potato Manure
1143	Crocker's Special Potato Manure
1032	Cumberland Potato Fertilizer
1125	Cumberland Potato Fertilizer
1163	Cumberland Seeding Down Manure
1027	Cumberland Superphosphate
1124	Cumberland Superphosphate
1288	Darling's Blood, Bone and Potash
1276	Fine Ground Bone
1084	Great Eastern General Fertilizer
1127	Great Eastern General Fertilizer
1102	Great Eastern Grass and Oats Fertilizer
1126	Great Eastern Grass and Oats Fertilizer
1100	Great Eastern High Grade Potato Manure
1166	Great Eastern High Grade Potato Manure
1236	Great Eastern High Grade Potato Manure
1081	Great Eastern Northern Corn Special
1085	Great Eastern Potato Manure
1082	High Grade Fertilizer with 10% Potash
1117	High Grade Fertilizer with 10% Potash
1252	High Grade Fertilizer with 10% Potash
1271	Lazaretto Corn Guano
1270	Lazaretto High Grade Potato Guano
1334	Lazaretto High Grade Potato Guano
1269	Lazaretto Propellor Potato Guano
1277	Nitrate of Soda
1329	Northern Maine Potato Special
1076	Pacific Dissolved Bone and Potash
1251	Pacific Dissolved Bone and Potash
1072	Pacific Grass and Grain Fertilizer
1121	Pacific Grass and Grain Fertilizer
1077	Pacific High Grade General Fertilizer
1030	Pacific Nobesque Guano
1131	Pacific Nobesque Guano
1070	Pacific Potato Special

Analysis of Station Samples, 1907

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	Soluble in water.	Insoluble in water.	Total.		Soluble.	Reverted.	Insoluble.	Available.		Total.		Found.	Guaranteed.
			Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.		
	%	%	%	%	%	%	%	%	%	%	%	%	%
1136	1.30	0.72	2.02	2.06	4.06	3.83	2.52	7.89	8.00	10.41	10.00	1.75	1.50
1094	1.74	1.56	2.30	2.06	6.38	1.74	2.72	8.12	8.00	10.84	.....	1.55	1.50
1095	1.06	1.08	2.14	2.06	6.03	1.43	1.90	7.87	8.00	9.77	.....	6.58	6.00
1142	1.24	1.02	2.26	2.06	5.15	2.96	2.11	8.11	8.00	10.23	.....	7.61	6.00
1098	.....	.....	.....	.....	5.29	4.92	3.34	10.21	11.00	13.55	.....	2.00	2.00
1243	.....	.....	.....	.....	3.68	6.34	4.55	10.02	11.00	14.57	.....	2.12	2.00
1144	0.74	0.72	1.46	1.03	4.89	2.92	2.01	7.81	8.00	9.82	.....	2.86	2.00
1238	0.54	0.54	1.08	1.03	5.52	2.59	1.96	8.11	8.00	10.07	.....	2.02	2.00
1105	1.10	1.32	2.42	2.06	6.46	1.78	2.31	8.24	8.00	10.55	.....	3.34	3.00
1145	1.33	0.82	2.15	2.06	3.86	4.07	2.49	7.93	8.00	10.42	.....	3.45	3.00
1093	1.76	1.58	3.34	3.29	3.71	2.37	2.89	6.08	6.00	8.97	.....	9.52	10.00
1143	1.73	1.60	3.33	3.29	4.37	2.85	2.26	7.22	6.00	9.48	.....	10.01	10.00
1032	1.00	1.28	2.28	2.06	4.37	3.67	2.24	8.04	8.00	10.28	10.00	3.20	3.00
1125	1.55	0.81	2.36	2.06	4.89	3.02	2.61	7.91	8.00	10.52	10.00	3.33	3.00
1163	0.62	0.60	1.22	1.03	5.16	2.72	2.19	7.88	8.00	10.07	10.00	1.88	2.00
1027	0.76	1.36	2.12	2.08	5.93	2.47	2.31	8.40	8.00	10.71	10.00	1.74	1.50
1124	0.84	0.88	1.72	2.06	4.05	2.85	2.54	6.90	8.00	9.44	10.00	1.86	1.50
1288	2.12	2.08	4.20	4.10	4.37	2.85	1.71	7.22	7.00	8.93	8.00	8.76	7.00
1276	.....	.....	2.52	2.47	.....	.....	.....	.....	.....	22.92	22.80	.....	.....
1084	0.66	0.56	1.22	0.82	2.55	4.68	2.83	7.23	8.00	10.06	.....	4.30	4.00
1127	0.37	0.54	0.91	0.82	3.57	4.71	2.21	8.28	8.00	10.49	.....	4.12	4.00
1102	.....	.....	.....	.....	3.84	6.06	4.13	9.90	11.00	14.03	.....	2.00	2.00
1126	.....	.....	.....	.....	4.81	6.15	2.78	10.96	11.00	13.74	.....	2.76	2.00
1100	1.80	1.66	3.46	3.29	4.14	1.55	2.41	5.69	6.00	8.10	.....	9.79	10.00
1166	2.17	1.22	3.39	3.29	2.77	3.21	2.72	5.98	6.00	8.70	.....	9.65	10.00
1236	2.61	0.85	3.46	3.29	2.98	2.15	3.49	5.13	6.00	8.62	.....	9.45	10.00
1081	0.80	1.36	2.16	2.06	5.90	2.10	2.39	8.00	8.00	10.39	.....	1.92	1.50
1085	0.82	1.22	2.04	2.06	6.77	1.57	2.31	8.34	8.00	10.65	.....	3.24	3.00
1082	1.48	1.20	2.68	2.40	4.38	1.95	3.63	6.33	6.00	9.96	7.00	9.61	10.00
1117	1.96	1.35	3.31	2.40	2.23	3.22	3.09	5.45	6.00	8.53	7.00	9.08	10.00
1252	1.38	1.11	2.49	2.40	3.47	2.53	2.31	6.00	6.00	8.31	7.00	9.88	10.00
1271	1.10	0.78	1.88	1.64	6.17	2.07	2.18	8.24	8.00	10.42	.....	2.26	2.00
1270	2.11	1.19	3.30	3.29	2.79	3.56	2.35	6.35	6.00	8.70	.....	9.96	10.00
1334	2.03	1.51	3.54	3.29	4.93	1.82	0.92	6.75	6.00	7.87	.....	9.73	10.00
1269	0.93	1.37	2.30	2.06	4.10	3.20	2.42	7.30	8.00	9.72	.....	6.40	6.00
1277	14.92	.....	14.92	15.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
1329	1.98	1.84	3.82	3.70	3.91	3.14	1.59	7.05	7.00	8.64	8.00	9.12	10.00
1076	.....	.....	.....	.....	3.83	6.50	3.76	10.33	10.00	14.09	11.00	2.18	2.00
1251	.....	.....	.....	.....	6.85	3.87	1.82	10.72	10.00	12.54	11.00	2.06	2.00
1072	0.72	0.78	1.50	0.82	4.14	3.46	3.00	7.60	7.00	10.60	8.00	2.11	1.00
1121	0.66	0.58	1.24	0.82	4.22	1.68	2.96	5.90	7.00	8.86	8.00	1.88	1.00
1077	1.46	2.04	3.50	3.30	4.67	3.64	2.40	8.31	8.00	10.71	9.00	6.78	7.00
1030	0.56	0.90	1.46	1.03	4.32	2.83	2.73	7.15	8.00	9.88	10.00	2.38	2.00
1131	0.55	0.60	1.15	1.03	4.13	3.52	2.49	7.65	8.00	10.14	10.00	1.88	2.00
1070	0.98	1.22	2.20	2.06	4.30	3.20	2.78	7.50	8.00	10.28	10.00	3.27	3.00

Descriptive List of Station Samples, 1907.

Station number.	Manufacturer, place of business and brand.
1245	Pacific Potato Special
1103	Packer's Union Animal Corn Fertilizer
1153	Packer's Union Animal Corn Fertilizer
1229	Packer's Union Animal Corn Fertilizer
1260	Packer's Union Economical Vegetable Guano
1091	Packer's Union Gardener's Complete Manure
1089	Packer's Union Potato Manure
1150	Packer's Union Potato Manure
1231	Packer's Union Potato Manure
1096	Packer's Union Universal Fertilizer
1106	Packer's Union Universal Fertilizer
1263	Packer's Union Universal Fertilizer
1083	Packer's Union Wheat, Oats and Clover Fertilizer
1152	Packer's Union Wheat, Oats and Clover Fertilizer
1208	Quinnipiac Climax Phosphate for All Crops
1119	Quinnipiac Corn Manure
1212	Quinnipiac Corn Manure
1215	Quinnipiac Market Garden Manure
1122	Quinnipiac Mohawk Fertilizer
1132	Quinnipiac Potato Manure
1210	Quinnipiac Potato Manure
1170	Quinnipiac Potato Phosphate
1211	Quinnipiac Potato Phosphate
1133	Read's Farmers' Friend Superphosphate
1026	Read's High Grade Farmers' Friend Superphosphate
1302	Read's High Grade Farmers' Friend Superphosphate
1034	Read's Potato Manure
1213	Read's Potato Manure
1303	Read's Potato Manure
1068	Read's Practical Potato Special Fertilizer
1149	Read's Practical Potato Special Fertilizer
1259	Read's Practical Potato Special Fertilizer
1129	Read's Standard Superphosphate
1254	Read's Standard Superphosphate
1038	Read's Sure Catch Fertilizer
1148	Read's Sure Catch Fertilizer
1043	Read's Vegetable and Vine Fertilizer
1073	Soluble Pacific Guano
1164	Soluble Pacific Guano
1037	Standard A. Brand
1135	Standard A. Brand
1036	Standard Bone and Potash
1151	Standard Bone and Potash
1071	Standard Complete Manure
1237	Standard Complete Manure

Analysis of Station Samples, 1907

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	Soluble in water.	Insoluble in water.	Total. Found.	Total. Guaranteed.	Soluble.	Reverted.	Insoluble.	Available. Found.	Available. Guaranteed.	Total. Found.	Total. Guaranteed.	Found.	Guaranteed.
	%	%	%	%	%	%	%	%	%	%	%	%	%
1245	1.69	0.52	2.21	2.06	4.08	3.64	2.86	7.72	8.00	10.58	10.00	3.28	3.00
1103	1.37	1.40	2.77	2.47	6.01	2.68	2.79	8.69	9.00	11.48	.....	2.76	2.00
1153	1.30	1.20	2.50	2.47	6.07	2.38	2.82	8.45	9.00	11.27	.....	2.06	2.00
1229	1.54	0.99	2.53	2.47	5.39	3.57	3.20	8.96	9.00	12.16	.....	2.28	2.00
1260	0.53	0.99	1.52	1.25	4.03	4.06	2.37	8.09	6.00	10.46	.....	3.90	3.00
1091	1.42	1.22	2.64	2.47	3.91	2.30	2.35	6.21	6.00	8.56	.....	9.53	10.00
1089	1.20	1.26	2.46	2.06	5.42	1.85	3.28	7.27	8.00	10.55	.....	5.54	6.00
1150	1.14	1.14	2.28	2.06	5.07	2.79	2.29	8.04	8.00	10.33	.....	6.82	6.00
1231	1.20	0.94	2.14	2.06	4.65	3.10	3.12	7.75	8.00	10.87	.....	7.04	6.00
1096	0.62	0.62	1.24	0.82	2.39	5.93	2.60	8.32	8.00	10.92	.....	3.80	4.00
1106	0.51	0.54	1.05	0.82	2.53	5.05	3.16	7.58	8.00	10.74	.....	4.52	4.00
1263	0.52	0.50	1.02	0.82	3.87	4.38	2.27	8.25	8.00	10.52	.....	4.00	4.00
1083	.....	.....	.....	.....	5.18	6.03	2.77	11.21	11.00	13.98	.....	2.21	2.00
1152	.....	.....	.....	.....	5.40	5.22	2.98	10.62	11.00	13.60	.....	2.00	2.00
1208	0.66	0.50	1.16	1.03	5.36	2.69	2.04	8.05	8.00	10.09	10.00	1.82	2.00
1119	1.17	1.07	2.24	2.06	4.70	2.94	2.72	7.64	8.00	10.36	10.00	1.96	1.50
1212	1.22	0.96	2.18	2.06	3.52	4.54	3.11	8.06	8.00	11.17	10.00	1.77	1.50
1215	1.82	1.40	3.22	3.30	5.50	2.50	1.77	8.00	8.00	9.77	9.00	6.62	7.00
1122	0.62	0.60	1.22	0.82	4.13	2.97	3.10	7.10	7.00	10.20	8.00	1.57	1.00
1132	1.50	1.28	2.78	2.50	3.55	3.10	2.64	6.65	6.00	9.29	8.00	6.40	5.00
1210	1.40	1.24	2.64	2.50	3.87	3.42	2.15	7.29	6.00	9.44	8.00	5.98	5.00
1170	0.72	1.56	2.28	2.06	4.85	2.93	2.45	7.78	8.00	10.23	10.00	3.24	3.00
1211	1.31	0.98	2.29	2.06	3.87	3.68	3.03	7.55	8.00	10.58	10.00	3.10	3.00
1133	1.46	0.82	2.28	2.06	4.56	3.24	2.72	7.80	8.00	10.52	10.00	3.40	3.00
1026	1.70	1.66	3.36	3.30	2.81	4.01	2.55	6.82	6.00	9.37	7.00	10.06	10.00
1302	1.84	1.32	3.16	3.30	4.14	1.81	1.54	5.95	6.00	7.49	7.00	10.02	10.00
1034	1.34	1.36	2.70	2.40	3.43	2.88	2.09	6.31	6.00	8.40	7.00	9.42	10.00
1213	1.25	1.20	2.45	2.40	3.27	2.63	2.07	5.90	6.00	7.97	7.00	10.00	10.00
1303	1.46	0.95	2.41	2.40	5.67	1.85	2.12	7.52	6.00	9.64	7.00	9.59	10.00
1068	0.44	0.84	1.28	0.82	3.12	3.57	2.87	6.69	4.00	9.56	5.00	7.39	8.00
1149	0.42	0.57	0.99	0.82	3.97	3.60	2.12	7.67	4.00	9.69	5.00	7.67	8.00
1259	0.27	0.77	1.04	0.82	2.89	3.84	2.63	6.73	4.00	9.36	5.00	8.52	8.00
1129	0.51	0.51	1.02	0.82	4.05	4.46	1.87	8.51	8.00	10.38	10.00	3.95	4.00
1254	0.36	0.48	0.84	0.82	3.06	4.46	3.00	7.52	8.00	10.52	10.00	3.80	4.00
1038	.....	.....	.....	.....	3.87	6.28	3.53	10.15	10.00	13.69	11.00	2.21	2.00
1148	.....	.....	.....	.....	5.13	5.61	2.97	10.74	10.00	13.71	11.00	2.17	2.00
1043	0.84	1.34	2.18	2.06	2.89	5.82	2.26	8.71	8.00	10.97	10.00	5.51	6.00
1073	0.96	1.16	2.12	2.06	5.69	2.64	2.51	8.33	8.00	10.84	10.00	1.62	1.50
1164	0.89	0.77	1.66	2.06	3.94	3.98	2.65	7.92	8.00	10.57	10.00	1.58	1.50
1037	0.62	0.66	1.28	0.82	3.83	3.16	3.00	6.99	7.00	9.99	8.00	1.99	1.00
1135	0.58	0.52	1.10	0.82	5.02	2.76	2.18	7.78	7.00	9.96	8.00	2.03	1.00
1036	.....	.....	.....	.....	3.68	6.46	3.95	10.14	10.00	14.09	11.00	2.08	2.00
1151	.....	.....	.....	.....	5.61	5.05	2.98	10.66	10.00	13.64	11.00	2.02	2.00
1071	1.40	2.08	3.48	3.30	4.73	3.32	2.50	8.05	8.00	10.55	9.00	7.22	7.00
1237	1.76	1.40	3.16	3.30	4.99	3.01	1.53	8.00	8.00	9.53	9.00	6 85	7.00

Descriptive List of Station Samples, 1907.

Station number.	Manufacturer, place of business and brand.
1075	Standard Fertilizer
1146	Standard Fertilizer
1134	Standard Guano for All Crops
1031	Standard Guano for All Crops
1250	Standard Guano for All Crops
1053	Standard Special for Potatoes
1147	Standard Special for Potatoes
1241	Standard Special for Potatoes
1160	Williams & Clark's Americus Ammoniated Bone Superphosphate
1161	Williams & Clark's Americus Corn Phosphate
1159	Williams & Clark's Americus High Grade Special
1162	Williams & Clark's Americus Potato Manure
1158	Williams & Clark's Royal Bone Phosphate for All Crops
	ARMOUR FERTILIZER WORKS, BALTIMORE, MD.
1335	All Soluble
1293	Armour's Blood, Bone and Potash
1294	Armour's Complete Potato Fertilizer
1323	Armour's Complete Potato Fertilizer
1337	Armour's Grain Grower
1321	Armour's High Grade Potato
1328	Fruit and Root Crop Special
1336	Wheat, Corn and Oat Special
	BOWKER FERTILIZER COMPANY, BOSTON, MASS.
1067	Bowker's Bone, Blood and Potash
1181	Bowker's Bone, Blood and Potash
1286	Bowker's Complete Manure for Potatoes and Vegetables
1062	Bowker's Corn Phosphate
1042	Bowker's Early Potato Manure
1066	Bowker's Farm and Garden Phosphate
1180	Bowker's Farm and Garden Phosphate
1186	Bowker's Fresh Ground Bone
1025	Bowker's Hill and Drill Phosphate
1183	Bowker's Hill and Drill Phosphate
1063	Bowker's Market Garden Fertilizer
1176	Bowker's Market Garden Fertilizer
1059	Bowker's Potash Bone
1178	Bowker's Potash Bone
1327	Bowker's Potash or Staple Phosphate
1044	Bowker's Potato and Vegetable Fertilizer
1114	Bowker's Potato and Vegetable Fertilizer
1064	Bowker's Potato and Vegetable Phosphate
1033	Bowker's 6% Potato Fertilizer
1065	Bowker's Square Brand Bone and Potash
1177	Bowker's Square Brand Bone and Potash
1310	Bowker's Superphosphate with Potash for Grass and Grain
1061	Bowker's Sure Crop Bone Phosphate
1179	Bowker's Sure Crop Bone Phosphate

Analysis of Station Samples, 1907

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	Soluble in water.	Insoluble in water.	Total.		Soluble.	Reverted.	Insoluble.	Available.		Total.			
			Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	%	%	%	%	%	%	%	%	%	%	%	%	%
1075	0.68	1.38	2.06	2.06	5.74	2.83	2.36	8.57	8.00	10.93	10.00	1.57	1.50
1146	1.37	0.81	2.18	2.06	4.16	3.77	2.54	7.93	8.00	10.47	10.00	1.80	1.50
1134	0.54	0.68	1.22	1.03	5.18	2.64	2.24	7.82	8.00	10.06	10.00	2.11	2.00
1031	0.44	0.84	1.28	1.03	3.76	3.51	2.58	7.27	8.00	9.85	10.00	2.04	2.00
1250	0.56	0.48	1.04	1.03	5.64	2.32	2.05	7.96	8.00	10.01	10.00	2.08	2.00
1053	0.74	1.60	2.34	2.06	4.86	2.70	2.69	7.56	8.00	10.25	10.00	3.47	3.00
1147	1.50	0.78	2.28	2.06	4.10	3.68	2.36	7.78	8.00	10.14	10.00	3.17	3.00
1241	1.10	0.99	2.09	2.06	3.68	4.59	2.54	8.27	8.00	10.81	10.00	3.01	3.00
1160	1.32	1.20	2.52	2.50	6.12	2.77	2.22	8.89	9.00	11.11	11.00	2.10	2.00
1161	1.39	0.77	2.16	2.06	3.98	3.78	2.52	7.76	8.00	10.28	10.00	1.56	1.50
1159	1.88	1.50	3.38	3.30	6.03	1.82	1.98	7.85	8.00	9.83	9.00	6.91	7.00
1162	1.40	0.84	2.24	2.06	4.72	3.19	2.63	7.91	8.00	10.54	10.00	3.05	3.00
1158	0.58	0.56	1.14	1.03	5.21	2.56	2.13	7.77	8.00	9.90	10.00	1.91	2.00
1335	2.57	1.04	3.61	2.88	7.08	1.29	0.51	8.37	8.00	8.88	10.00	3.65	4.00
1293	2.39	1.88	4.27	4.11	6.61	1.86	0.77	8.47	8.00	9.24	10.00	7.99	7.00
1294	1.74	1.58	3.32	3.28	4.30	2.08	1.13	6.38	6.00	7.51	8.00	10.89	10.00
1323	1.50	1.70	3.20	3.28	4.19	2.15	1.20	6.34	6.00	7.54	8.00	10.49	10.00
1337	0.90	0.84	1.74	1.65	6.22	1.93	0.68	8.15	8.00	8.83	10.00	3.83	2.00
1321	0.46	1.12	1.58	1.65	6.82	2.04	1.25	8.86	8.00	10.11	10.00	10.89	10.00
1328	0.72	1.24	1.96	1.65	7.12	1.88	1.33	9.00	8.00	10.33	10.00	4.31	5.00
1336	.....	0.65	0.65	0.82	6.42	2.60	1.40	9.02	7.00	10.42	9.00	1.07	1.00
1067	2.14	2.44	4.58	4.11	4.89	1.93	2.04	6.87	7.00	8.91	9.00	7.55	7.00
1181	1.74	2.86	4.60	4.11	5.02	1.79	1.49	6.81	7.00	8.30	9.00	7.13	7.00
1286	2.15	1.30	3.45	3.29	3.55	3.06	1.89	6.61	6.00	8.50	7.00	10.32	10.00
1062	0.60	1.32	1.92	1.65	5.96	2.60	2.55	8.56	8.00	11.11	9.00	2.05	2.00
1042	1.52	1.80	3.32	3.29	5.02	3.24	2.42	8.26	8.00	10.68	9.00	6.47	7.00
1066	1.26	0.88	2.14	1.65	4.10	2.97	2.96	7.07	8.00	10.03	9.00	2.36	2.00
1180	1.22	0.76	1.98	1.65	4.59	2.86	2.35	7.45	8.00	9.80	9.00	2.13	2.00
1186	.....	.....	2.58	2.47	.....	.....	.....	.....	.....	23.40	22.80	.....	.....
1025	1.34	1.24	2.58	2.47	6.76	2.05	2.01	8.81	9.00	10.82	10.00	2.34	2.00
1183	1.49	1.28	2.77	2.47	5.61	2.97	2.50	8.58	9.00	11.08	10.00	2.29	2.00
1063	1.28	1.30	2.58	2.47	3.75	2.69	2.14	6.44	6.00	8.58	7.00	9.82	10.00
1176	1.52	1.02	2.54	2.47	4.02	2.65	1.70	6.67	6.00	8.37	7.00	9.01	10.00
1059	0.72	0.78	1.50	0.82	4.38	2.83	2.83	7.21	6.00	10.04	8.00	2.03	2.00
1178	0.81	0.48	1.29	0.82	5.58	2.33	1.86	7.91	6.00	9.79	8.00	2.02	2.00
1327	0.44	0.64	1.08	0.82	3.44	3.93	2.80	7.37	8.00	10.17	9.00	3.03	3.00
1044	1.26	1.30	2.56	2.47	6.53	2.26	1.76	8.79	8.00	10.55	10.00	4.81	4.00
1114	1.16	1.34	2.50	2.47	6.53	1.68	2.15	8.21	8.00	10.36	10.00	4.34	4.00
1064	0.76	1.28	2.04	1.65	5.74	2.60	2.42	8.34	8.00	10.76	9.00	2.00	2.00
1033	0.38	0.80	1.18	0.82	2.90	3.51	2.68	6.41	6.00	9.09	7.00	6.66	6.00
1065	0.92	0.80	1.72	1.65	1.20	4.80	4.51	6.03	6.00	10.54	7.00	1.83	2.00
1177	1.06	0.60	1.66	1.65	3.21	3.15	3.34	6.36	6.00	9.70	7.00	1.93	2.00
1310	.....	.....	.....	.....	6.85	4.46	1.73	11.31	10.00	13.04	11.00	2.02	2.00
1061	0.60	0.86	1.46	0.82	3.83	2.98	2.77	6.81	8.00	9.58	9.00	2.13	2.00
1179	0.52	0.46	0.98	0.82	5.53	2.80	1.86	8.33	8.00	10.19	9.00	1.77	2.00

Descriptive List of Station Samples, 1907.

Station number.	Manufacturer, place of business and brand.
1287	Monticello Grange Chemicals
1324	Special Potato Manure for the Grange
1057	Stockbridge's Corn
1060	Stockbridge's Seeding Down
1024	Stockbridge's Special Complete Potato and Vegetable Manure
1182	Stockbridge's Special Manure for Cabbage
1285	Stockbridge's Special Manure A for Potatoes
1058	Stockbridge's Top Dressing
	COE-MORTIMER COMPANY, NEW YORK, N. Y.
1101	E. Frank Coe's Celebrated Special Potato Fertilizer
1190	E. Frank Coe's Celebrated Special Potato Fertilizer
1272	E. Frank Coe's Celebrated Special Potato Fertilizer
1079	E. Frank Coe's Columbian Corn Fertilizer
1191	E. Frank Coe's Columbian Corn Fertilizer
1280	E. Frank Coe's Columbian Corn Fertilizer
1080	E. Frank Coe's Columbian Potato Fertilizer
1189	E. Frank Coe's Columbian Potato Fertilizer
1278	E. Frank Coe's Columbian Potato Fertilizer
1116	E. Frank Coe's Double Strength Potato Manure
1196	E. Frank Coe's Double Strength Potato Manure
1283	E. Frank Coe's Double Strength Potato Manure
1104	E. Frank Coe's Excelsior Potato Fertilizer
1273	E. Frank Coe's Excelsior Potato Fertilizer
1194	E. Frank Coe's Excelsior Potato Fertilizer
1108	E. Frank Coe's Famous Prize Brand Grain and Grass Fertilizer
1282	E. Frank Coe's Famous Prize Brand Grain and Grass Fertilizer
1087	E. Frank Coe's High Grade Ammoniated Superphosphate
1192	E. Frank Coe's High Grade Ammoniated Bone Superphosphate
1281	E. Frank Coe's High Grade Ammoniated Bone Superphosphate
1086	E. Frank Coe's High Grade Potato Fertilizer
1279	E. Frank Coe's High Grade Potato Fertilizer
1097	E. Frank Coe's New Englander Corn and Potato Fertilizer
1195	E. Frank Coe's New Englander Corn and Potato Fertilizer
1107	E. Frank Coe's Red Brand Excelsior Guano
1193	E. Frank Coe's Red Brand Excelsior Guano
1275	E. Frank Coe's Red Brand Excelsior Guano
1099	E. Frank Coe's Special Grass and Grain Fertilizer
1187	E. Frank Coe's Special Grass and Grain Fertilizer
	HUBBARD FERTILIZER COMPANY, BALTIMORE, MD.
1315	Hubbard's Bone, Blood and Potash
1326	Hubbard's Bone, Blood and Potash
1316	Hubbard's Farmers' IXL
1311	Hubbard's Farmers' IXL Superphosphate
1312	Hubbard's Royal Ensign
1314	Hubbard's Soluble Bone and Potash
1313	Hubbard's Trucker's 5%

Analysis of Station Samples, 1907

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	Soluble in water.	Insoluble in water.	Total.		Soluble.	Reverted.	Insoluble.	Available.		Total.		Found.	Guaranteed.
			Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.		
	%	%	%	%	%	%	%	%	%	%	%	%	%
1287	1.70	0.98	2.68	2.50	5.50	2.55	1.58	8.05	8.00	9.63	12.00	4.40	4.00
1324	1.08	0.64	1.72	1.65	6.79	2.33	0.89	9.12	9.00	10.01	12.00	12.15	12.00
1057	1.76	1.62	3.48	3.29	7.17	2.82	0.61	9.99	10.00	10.60	11.00	7.28	7.00
1060	1.40	1.30	2.70	2.47	3.87	2.71	1.95	6.58	6.00	8.53	9.00	9.62	10.00
1024	1.56	1.78	3.34	3.29	4.30	5.24	1.86	9.54	6.00	11.40	7.00	9.73	10.00
1182	3.92	1.72	5.64	4.93	2.25	3.08	2.45	5.33	4.00	7.78	6.00	6.03	6.00
1285	1.99	2.04	4.03	4.11	5.04	2.24	1.36	7.28	7.00	8.64	8.00	10.38	10.00
1058	3.54	1.50	5.04	4.93	1.99	3.62	2.44	5.61	4.00	8.05	6.00	6.37	6.00
1101	0.76	0.82	1.58	1.65	6.14	1.84	1.72	7.98	8.00	9.70	10.00	3.71	4.00
1190	1.07	0.76	1.83	1.65	5.85	3.01	1.10	8.86	8.00	9.96	10.00	3.92	4.00
1272	0.86	0.80	1.66	1.65	5.16	2.31	2.36	7.47	8.00	9.83	10.00	3.53	4.00
1079	0.46	0.84	1.30	1.23	4.32	5.44	2.75	9.76	8.50	12.51	10.50	2.31	2.50
1191	0.98	0.52	1.50	1.23	6.50	2.96	1.71	9.46	8.50	11.17	10.50	2.37	2.50
1280	0.70	0.58	1.28	1.23	4.30	5.09	3 26	8.70	8.50	11.96	10.50	2.24	2.50
1080	0.60	0.72	1.32	1.23	4.85	4.19	2.80	9.04	8.50	11.84	10.50	2.31	2.50
1189	0.88	0.49	1.37	1.23	5.79	3.66	1.33	9.45	8 50	10.78	10.50	2.38	2.50
1278	0.85	0.51	1.36	1.23	6.38	2.18	2.31	8.56	8.50	10.87	10.50	2.34	2.50
1116	2.45	1.17	3.62	3.70	4.30	2.63	2.28	6.93	7.00	9.21	8.50	8.06	10.00
1196	2.88	0.64	3.52	3.70	6.01	2.02	0.88	7.03	7.00	8.91	8.50	8.97	10.00
1283	2.82	0.84	3.66	3 70	5.88	2.01	1.28	7.89	7.00	9.17	8.50	8.74	10.00
1104	1.66	0.78	2.44	2.47	5.58	1.67	1.36	7.25	7.00	8.61	9.00	7.24	8.00
1273	1.65	0.80	2.45	2.47	3.38	4.45	1.48	7.83	7.00	9.31	9.00	6.81	8.00
1194	2.16	0.36	2.52	2.47	4.56	2.59	1.76	7.15	7.00	9.91	9.00	6.77	8.00
1108	.....	.....	.....	.....	4.94	5.06	4.35	10.00	10.50	14.35	12.00	1.51	2.00
1282	.....	.....	.....	.....	4.96	4.97	4.62	9.93	10.50	14.55	12.00	1.81	2.00
1087	0.95	0.75	1.70	1.85	5.74	2.95	2.42	8.69	9.00	11.11	11.00	2.47	2.25
1192	1.18	0.68	1.86	1.85	6.09	3.69	1.86	9.78	9.00	11.64	11.00	2.02	2.25
1281	0.90	0.76	1.66	1.85	5.82	3.30	2.42	9.12	9.00	11.54	11.00	2.17	2.25
1086	1.46	0.92	2.38	2.40	4.38	3.32	2.58	7.70	8.00	10.28	10.00	5.39	6.00
1279	1.42	1.06	2.48	2.40	4.89	3.02	2.31	7.91	8.00	10.22	10.00	4.95	6.00
1097	0.69	0.43	1.12	0.80	5.98	3.75	2.03	9.73	7.50	11.76	9.00	2.86	3.00
1195	0.63	0.56	1.19	0.80	4.42	3.93	1.53	8.35	7.50	9.88	9.00	2.85	3.00
1107	2.22	0.70	2.92	3.30	6.93	2.07	1.79	9.00	9.00	10.79	10.00	5.08	6.00
1193	2.36	0.76	3.12	3 30	6.76	1.57	2.11	8.33	9.00	10.44	10.00	5.10	6.00
1275	2.08	0.98	3.06	3.30	6.09	2.95	1.80	9.04	9.00	10.84	10.00	5.41	6.00
1099	0.44	0.60	1.04	0.80	5.13	5.50	3 00	10.63	8.50	13.63	10.00	1.62	1.50
1187	0.66	0.48	1.14	0.80	5.26	3.27	1.96	8.53	8.50	10.49	10.00	2.12	1.50
1315	2.82	0.56	3.38	3.29	5.23	2.20	0.89	7 43	8.00	8.32	9.00	7.91	7.00
1326	2.23	0.84	3.07	3.29	5.90	2.14	0.85	8.04	8.00	8.89	9.00	7.01	7.00
1316	0.97	0.75	1.72	1.65	7.49	1.51	2.03	9.60	8.00	11.03	9.00	2.49	2.00
1311	0.96	1.06	2.02	1 65	2.82	5.01	1.76	7.83	8.00	9.59	9.00	2.50	2.00
1312	1.59	0.71	2.30	2.47	6.25	2.34	0.73	8.59	8.00	9 32	9.00	4.57	4.00
1314	.....	.....	.....	.....	2.26	7.22	1.96	9.48	10.00	11.44	.....	1.84	2.00
1313	2.73	0.88	3.61	4.10	5.56	2.27	0.91	7.83	6.00	8.74	.....	4.97	5.00

Descriptive List of Station Samples, 1907.

Station number.	Manufacturer, place of business and brand.
	JOHN WATSON COMPANY, HOULTON, MAINE.
1291	Watson's Improved High Grade Potato Manure
1292	Watson's Improved High Grade Potato Manure
	LISTER'S AGRICULTURAL CHEMICAL WORKS, NEWARK, N. J.
1023	High Grade Special for Spring Crops
1078	High Grade Special for Spring Crops
1111	Lister's Animal Bone and Potash
1123	Lister's Animal Bone and Potash
1110	Lister's Oneida Special Fertilizer
1139	Lister's Oneida Special Fertilizer
1021	Lister's Potato Manure
1109	Lister's Potato Manure
1156	Lister's Pure Raw Bone Meal
1113	Lister's Special Corn Fertilizer
1137	Lister's Special Corn Fertilizer
1115	Lister's Special Potato Fertilizer
1140	Lister's Special Potato Fertilizer
1112	Lister's Success Fertilizer
1138	Lister's Success Fertilizer
1022	Lister's 10% Potato Grower
1088	Lister's 10% Potato Grower
	NATIONAL FERTILIZER COMPANY, BRIDGEPORT, CONN.
1297	Chittenden's Complete Root Fertilizer
1296	Chittenden's Excelsior Potato Fertilizer
1298	Chittenden's Market Garden Fertilizer
1322	Chittenden's Market Garden Fertilizer
	NEW ENGLAND FERTILIZER COMPANY, BOSTON, MASS.
1016	New England Complete Manure
1217	New England Complete Manure
1017	New England Corn and Grain Fertilizer
1222	New England Corn and Grain Fertilizer
1012	New England Corn Phosphate
1230	New England Corn Phosphate
1018	New England High Grade Potato Fertilizer
1225	New England High Grade Potato Fertilizer
1014	New England High Grade Special
1219	New England High Grade Special with 10% Potash
1305	New England Market Garden Manure
1015	New England Potato Fertilizer
1224	New England Potato Fertilizer
1009	New England Potato Grower
1019	New England Superphosphate
1223	New England Superphosphate
	PARMENTER & POLSEY FERTILIZER CO., PEABODY, MASS.
1299	A. A. Brand Fertilizer
1010	Aroostook Special

Analysis of Station Samples, 1907

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	Soluble in water.	Insoluble in water.	Total.		Soluble.	Reverted.	Insoluble.	Available.		Total.		Found.	Guaranteed.
			Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.		
	%	%	%	%	%	%	%	%	%	%	%	%	%
1291	2.09	1.09	3.18	3.00	4.16	1.78	1.39	5.94	6.00	7.33	7.00	5.03	5.00
1292	1.95	1.08	3.03	3.00	4.51	1.64	1.25	6.15	6.00	7.40	7.00	5.00	5.00
1023	0.78	0.94	1.72	1.65	4.78	3.98	2.68	8.76	8.00	11.44	10.00	9.93	10.00
1078	0.85	0.89	1.74	1.65	4.70	3.31	3.51	8.01	8.00	11.52	10.00	9.54	10.00
1111	.....	.....	.....	.....	2.71	7.27	4.30	9.98	11.00	14.28	13.00	2.02	2.00
1123	.....	.....	.....	.....	3.30	6.81	4.12	10.11	11.00	14.23	13.00	2.17	2.00
1110	0.60	0.54	1.14	0.83	3.95	3.46	1.99	7.41	7.00	9.40	8.00	1.00	1.00
1139	0.85	0.50	1.35	0.83	5.69	2.77	1.98	8.46	7.00	10.44	8.00	2.01	1.00
1021	2.02	1.32	3.34	3.20	4.91	2.76	2.64	7.67	8.00	10.31	9.00	7.30	7.00
1109	2.04	1.38	3.42	3.20	6.09	1.81	2.38	7.90	8.00	10.28	9.00	7.03	7.00
1156	.....	.....	2.58	2.68	.....	.....	.....	.....	.....	26.87	23.00	.....	.....
1113	0.85	1.13	1.98	1.65	2.65	4.35	4.88	7.00	8.00	11.88	9.00	3.04	3.00
1137	0.87	1.26	2.13	1.65	4.10	3.14	2.64	7.42	8.00	10.06	9.00	3.18	3.00
1115	0.78	1.10	1.88	1.65	2.33	3.77	4.90	6.10	8.00	11.00	9.00	2.58	3.00
1140	1.05	1.30	2.35	1.65	3.19	4.23	2.45	7.42	8.00	9.87	9.00	3.74	3.00
1112	0.64	0.86	1.50	1.30	5.77	3.44	2.82	9.21	9.00	12.03	11.00	2.06	2.00
1138	0.68	0.60	1.28	1.24	4.93	4.39	3.24	9.32	9.00	12.56	11.00	2.18	2.00
1022	1.83	1.40	3.23	3.29	1.75	3.73	3.24	5.48	6.00	8.72	7.00	10.59	10.00
1088	2.06	1.38	3.44	3.29	2.79	2.94	2.08	5.73	6.00	7.81	7.00	9.66	10.00
1297	1.62	1.76	3.38	3.30	4.94	2.85	1.91	7.79	8.00	9.70	10.00	7.77	6.00
1296	2.08	1.28	3.36	3.30	4.54	2.12	2.15	6.66	6.00	8.81	8.00	10.29	10.00
1298	1.47	1.02	2.49	2.40	2.65	3.40	2.49	6.05	6.00	8.54	8.00	5.61	5.00
1322	1.15	1.34	2.49	2.40	2.65	4.65	0.91	7.30	6.00	8.21	8.00	6.13	5.00
1016	1.92	1.38	3.30	3.28	4.56	2.74	1.16	7.30	6.00	8.46	7.00	9.77	10.00
1217	1.81	1.28	3.09	3.28	4.65	1.38	1.19	6.03	6.00	7.22	7.00	9.43	10.00
1017	0.82	0.42	1.24	1.23	5.01	2.11	2.36	7.12	7.00	9.48	8.00	2.00	2.00
1222	0.70	0.47	1.17	1.23	4.18	2.70	2.49	6.88	7.00	9.37	8.00	1.89	2.00
1012	0.94	0.78	1.72	1.64	5.66	1.85	1.39	7.65	8.00	9.04	9.00	3.09	3.00
1230	0.98	0.74	1.72	1.64	6.44	2.10	2.12	8.54	8.00	10.66	9.00	2.94	3.00
1018	1.09	1.18	2.27	2.46	4.72	3.31	3.30	8.03	8.00	11.33	9.00	6.24	6.00
1225	0.94	1.24	2.18	2.46	4.37	3.60	3.23	7.97	8.00	11.20	9.00	5.67	6.00
1014	1.86	2.02	3.88	3.69	3.55	2.82	3.02	6.37	7.00	9.39	8.00	10.05	10.00
1219	1.95	1.98	3.93	3.69	3.36	3.43	2.41	6.79	7.00	9.20	8.00	9.76	10.00
1305	1.78	2.26	4.04	4.10	3.00	3.21	4.09	6.21	7.00	10.30	8.00	5.93	7.00
1015	0.84	0.86	1.70	1.64	3.78	2.99	2.17	6.77	7.00	8.94	8.00	4.03	4.00
1224	0.70	0.78	1.48	1.64	3.89	3.09	1.50	6.98	7.00	8.48	8.00	4.08	4.00
1009	1.36	1.00	2.36	2.46	3.52	2.19	1.59	5.71	6.00	7.30	7.00	9.89	10.00
1019	1.24	1.18	2.42	2.46	6.53	4.35	1.30	10.88	8.00	12.18	10.00	4.27	4.00
1223	1.06	1.22	2.28	2.46	6.09	3.01	3.51	9.10	8.00	12.61	10.00	4.18	4.00
1299	2.27	1.66	3.93	4.10	5.28	1.86	1.53	7.14	7.00	8.67	8.00	8.43	8.00
1010	1.96	1.68	3.64	3.69	3.57	3.15	2.60	6.72	7.00	9.32	8.00	10.07	10.00

Descriptive List of Station Samples, 1907.

Station number.	Manufacturer, place of business and brand.
1308	Maine Potato Fertilizer
1013	Plymouth Rock Brand Fertilizer
1300	Plymouth Rock Brand Fertilizer
1011	Special Potato Fertilizer
	PORTLAND RENDERING COMPANY, PORTLAND, MAINE.
1184	Bone Dust Tankage
1309	Bone Dust Tankage
	R. T. PRENTISS COMPANY, HOULTON, MAINE.
1290	Prentiss Aroostook Complete
1306	Prentiss Aroostook Complete
1307	Prentiss Aroostook Standard
1289	Prentiss Aroostook Standard
	PROVINCIAL CHEMICAL FERTILIZER CO., ST. JOHN, N. B.
1304	10% Complete Potato
	P. H. REED, FORT FAIRFIELD, MAINE.
1317	Reed's Potato Grower
	RUSSIA CEMENT COMPANY, GLOUCESTER, MASS.
1325	Essex Complete Manure for Aroostook County Crops
1295	Essex Market Garden and Potato Manure
1301	Essex XXX Fish and Potash
	SAGADAHOC FERTILIZER COMPANY, BOWDOINHAM, MAINE.
1201	Acid Phosphate
1197	Aroostook Potato Manure
1198	Dirigo Grass and Grain
1200	Muriate of Potash
1199	Nitrate of Soda
1204	Sagadahoc High Grade Superphosphate
1205	Sagadahoc Special Potato Fertilizer
1206	XX Chemical Fertilizer Brand Clark's Mixture
1207	Yankee Fertilizer
1203	3-6 and 10 Fertilizer
1339	3-6 and 10 Fertilizer
1202	4-6-10 Fertilizer
1340	4-6-10 Fertilizer
	SWIFT'S LOWELL FERTILIZER COMPANY, BOSTON, MASS.
1007	Swift's Lowell Animal Brand
1227	Swift's Lowell Animal Brand
1008	Swift's Lowell Bone Fertilizer
1216	Swift's Lowell Bone Fertilizer for Corn and Grain
1002	Swift's Lowell Cereal Brand
1228	Swift's Lowell Cereal Brand
1003	Swift's Lowell Dissolved Bone and Potash
1218	Swift's Lowell Dissolved Bone and Potash
1214	Swift's Lowell Empress Brand
1006	Swift's Lowell Potato Grower
1226	Swift's Lowell Potato Grower
1001	Swift's Lowell Potato Manure
1004	Swift's Lowell Potato Phosphate
1220	Swift's Lowell Potato Phosphate

Analysis of Station Samples, 1907

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	Soluble in water.	Insoluble in water.	Total. Found.	Total. Guaranteed.	Soluble.	Reverted.	Insoluble.	Available Found.	Available Guaranteed.	Total. Found.	Total. Guaranteed.	Found.	Guaranteed.
	%	%	%	%	%	%	%	%	%	%	%	%	%
1308	1.79	1.12	2.91	3.29	4.49	1.76	0.89	6.25	6.00	7.14	7.00	9.58	10.00
1013	1.18	1.42	2.60	2.47	5.10	2.71	3.51	7.81	8.00	11.32	9.00	3.72	4.00
1300	1.23	1.27	2.50	2.47	4.02	3.80	4.17	7.82	8.00	11.99	9.00	4.18	4.00
1011	1.70	1.26	2.96	3.29	4.18	3.71	1.56	7.89	8.00	9.45	9.00	7.18	7.00
1184	.....	.....	6.62	5.00	.....	.....	.....	.....	.....	14.90	16.00	.....	.....
1309	.....	.....	5.53	5.00	.....	.....	.....	.....	.....	15.88	16.00	.....	.....
1290	2.22	0.14	2.36	3.29	1.63	2.85	1.93	4.48	6.00	6.41	8.00	8.18	10.00
1306	1.80	0.62	2.42	3.29	1.67	3.85	1.73	5.52	6.00	7.25	8.00	9.48	10.00
1307	0.70	0.61	1.31	1.62	4.57	2.42	1.84	6.99	8.00	8.83	10.00	8.66	10.00
1289	0.82	0.80	1.62	1.62	3.19	4.54	1.02	7.73	8.00	8.75	10.00	10.09	10.00
1304	1.87	1.53	3.40	3.29	6.22	1.19	0.77	7.41	8.00	8.18	8.87	9.51	10.00
1317	1.61	1.46	3.07	3.29	5.91	2.01	1.11	7.92	7.00	9.03	8.00	8.13	8.00
1325	2.14	1.30	3.44	3.30	5.80	2.25	3.03	8.05	7.00	11.08	9.50	9.17	9.50
1295	0.70	1.38	2.08	2.00	2.65	4.44	5.79	7.09	8.00	12.88	10.00	5.47	5.00
1301	0.78	1.66	2.44	2.10	1.24	5.73	6.53	6.97	9.00	13.50	12.00	2.64	2.25
1201	.....	.....	.....	.....	11.06	5.89	0.28	16.95	16.00	17.23	17.00	.....	.....
1197	0.64	0.86	1.50	1.05	2.52	3.56	1.17	6.08	6.00	7.25	7.00	4.01	4.00
1198	0.36	0.84	1.20	0.85	3.43	3.43	2.38	6.86	6.00	9.24	9.00	3.33	3.00
1200	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	49.20	50.00
1199	14.32	.....	14.32	15.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
1204	0.52	0.92	1.44	1.85	3.28	3.90	1.48	7.18	7.00	8.66	8.00	3.25	3.00
1205	1.38	0.66	2.04	2.00	3.25	3.48	0.89	6.73	7.00	7.62	8.00	7.77	8.00
1206	6.32	0.86	7.18	7.00	0.00	4.42	3.73	4.42	3.00	8.15	7.00	8.52	8.00
1207	0.51	0.21	0.72	0.40	4.02	3.43	0.82	7.45	7.00	8.27	8.00	2.41	2.00
1203	1.52	0.58	2.10	2.35	3.52	2.63	0.80	6.15	5.00	6.95	7.00	8.90	10.00
1339	1.00	1.38	2.38	2.35	4.21	3.63	1.99	7.84	5.00	9.83	7.00	9.34	10.00
1202	2.40	0.70	3.10	3.25	2.63	3.78	1.07	6.41	5.00	7.48	7.00	10.27	10.00
1340	1.16	1.98	3.14	3.25	4.14	2.46	1.98	6.60	5.00	8.58	7.00	9.77	10.00
1007	1.10	1.36	2.46	2.46	6.38	4.62	1.78	11.00	8.00	12.78	10.00	3.63	4.00
1227	1.15	1.22	2.37	2.46	6.38	2.15	3.68	8.53	8.00	12.21	10.00	4.21	4.00
1008	0.98	0.72	1.70	1.64	5.63	2.07	1.35	7.70	8.00	9.05	9.00	2.86	3.00
1216	0.87	0.78	1.65	1.64	5.90	1.67	1.66	7.57	8.00	9.23	9.00	2.80	3.00
1002	0.38	0.38	0.76	0.82	4.35	2.44	1.59	6.79	7.00	8.38	8.00	1.06	1.00
1228	0.50	0.50	1.00	0.82	4.85	2.05	1.58	6.90	7.00	8.48	8.00	1.53	1.00
1003	0.58	0.54	1.12	1.64	6.14	1.79	1.38	7.93	9.00	9.31	10.00	5.61	2.00
1218	0.98	0.76	1.74	1.64	5.98	2.15	2.01	8.13	9.00	10.14	10.00	2.66	2.00
1214	0.70	0.62	1.32	1.23	5.66	2.15	1.36	7.81	7.00	9.17	8.00	2.03	2.00
1006	2.04	1.36	3.40	3.28	4.32	1.59	0.85	5.91	6.00	6.76	7.00	9.87	10.00
1226	1.88	1.10	2.98	3.28	4.57	1.53	0.98	6.10	6.00	7.08	7.00	10.74	10.00
1001	0.82	0.86	1.68	1.64	3.97	2.73	1.81	6.70	7.00	8.51	8.00	4.13	4.00
1004	1.14	1.12	2.26	2.42	4.75	2.82	3.91	7.57	8.00	11.48	9.00	5.93	6.00
1220	1.03	1.15	2.18	2.42	4.69	3.57	3.45	8.26	8.00	11.71	9.00	6.21	6.00

Descriptive List of Station Samples, 1907.

Station number.	Manufacturer, place of business and brand.
1005	Swift's Lowell Superior Fertilizer with 10% Potash
1221	Swift's Lowell Superior Fertilizer with 10% Potash
	TUSCARORA FERTILIZER COMPANY, BALTIMORE, MD.
1318	Tuscarora Aroostook Special
1319	Tuscarora Complete Potato
1320	Tuscarora Trucker's Special
	WHITMAN & PRATT RENDERING COMPANY, LOWELL, MASS.
1330	Potash Special
1331	Potato Manure
1332	Vegetable Grower
1333	Whitman & Pratt's Corn Success

Analysis of Station Samples, 1907

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	Soluble in water.	Insoluble in water.	Total.		Soluble.	Reverted.	Insoluble.	Available.		Total.			
			Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	%	%	%	%	%	%	%	%	%	%	%	%	%
1005	1.84	2.24	4.08	3.69	3.14	2.81	3.12	5.95	7.00	9.07	8.00	9.75	10.00
1221	1.76	2.24	4.00	3.69	3.17	3.46	2.55	6.63	7.00	9.18	8.00	9.60	10.00
1318	1.24	1.28	2.52	2.47	5.01	2.01	1.44	7.02	7.00	8.46	8.00	8.79	8.00
1319	1.73	1.52	3.25	3.29	4.94	1.42	1.47	6.36	6.00	7.83	7.00	9.25	10.00
1320	2.19	1.66	3.85	4.12	7.25	1.17	0.89	8.42	8.00	9.31	9.00	6.93	7.00
1330	1.03	1.82	2.85	2.88	3.08	2.49	4.14	5.57	6.00	10.71	8.00	9.25	10.00
1331	0.44	1.54	1.98	2.45	4.43	3.16	4.97	7.59	7.00	12.56	9.00	4.18	5.00
1332	1.16	1.36	2.52	3.29	4.85	3.01	3.66	7.86	8.00	11.52	10.00	7.26	7.00
1333	0.41	1.41	1.82	1.64	5.99	2.39	3.67	8.29	8.00	11.96	10.00	3.10	3.00

Descriptive List of Manufacturer's Samples Licensed After March 1, 1907.

Station number.	Manufacturer, place of business and brand.
	BOWKER FERTILIZER COMPANY, BOSTON, MASS.
1838	Stockbridge Special Manure for Cabbage
	HUBBARD FERTILIZER COMPANY, BALTIMORE, MD.
1938	Hubbard's Soluble Bone and Potash
1937	Hubbard's Trucker 5%
	NATIONAL FERTILIZER COMPANY, BRIDGEPORT, CONN.
1928	Chittenden's Aroostook Special Fertilizer
	WHITMAN & PRATT RENDERING COMPANY, LOWELL, MASS.
1939	Potash Special
1942	Potato Manure
1940	Vegetable Grower
1941	Whitman & Pratt's Corn Success

Analyses of Manufacturers' Samples Licensed After March 1, 1907.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
			Total.					Available.		Total.			
	Soluble in water.	Insoluble in water.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	%	%	%	%	%	%	%	%	%	%	%	%	%
1838	3.18	1.88	5.06	4.93	3.01	2.69	2.26	5.70	4.00	7.96	6.00	6.11	6.00
1938	.....	.....	.....	.....	10.34	1.58	0.13	11.92	10.00	12.05	.....	2.30	2.00
1937	3.60	1.00	4.60	4.10	6.55	0.87	0.26	7.42	6.00	7.68	.....	6.47	5.00
1928	2.46	1.72	4.18	4.11	5.77	2.60	1.39	8.37	7.00	9.76	8.00	7.89	7.00
1939	1.47	1.26	2.73	2.88	3.32	3.02	2.89	6.34	6.00	9.23	8.00	10.85	10.00
1942	1.34	1.01	2.35	2.45	2.44	4.81	1.28	7.25	7.00	8.53	9.00	5.41	5.00
1940	1.57	1.15	2.72	3.29	3.52	3.33	3.56	6.85	8.00	10.41	10.00	8.90	7.00
1941	0.90	0.87	1.77	1.64	4.61	3.26	2.54	7.87	8.00	10.41	10.00	3.30	3.00

Summary of results of analyses of Station samples for the years *1905, 1906 and 1907.*

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
A. A. C. Co. Aroostook Complete Manure.....	1906	2.56	7.17	10.21
	1907	2.77	6.47	9.90
A. A. C. Co. Aroostook High Grade.....	1906	4.35	8.15	6.31
	1907	4.36	7.05	6.63
Bradley's Alkaline Bone with Potash.....	1905	.....	10.69	1.95
	1906	.....	11.19	2.10
	1907	.....	10.09	2.09
Bradley's Comp. Manure for potatoes and vegetables	1905	3.05	7.79	6.92
	1906	3.27	8.69	6.79
	1907	3.32	8.06	6.68
Bradley's Complete Manure with 10% Potash..	1905	3.32	5.56	9.66
	1906	3.36	7.03	9.79
	1907	3.30	6.39	9.76
Bradley's Corn Phosphate.....	1905	2.11	8.05	1.87
	1906	2.18	8.51	2.06
	1907	2.14	7.69	1.63
Bradley's Eureka Fertilizer.....	1905	1.10	8.42	2.36
	1906	1.19	8.55	2.14
	1907	1.23	9.09	2.19
Bradley's Niagara Phosphate.....	1905	1.10	6.50	1.27
	1906	1.19	9.14	1.97
	1907	1.29	8.91	2.26
Bradley's Potato Fertilizer.....	1905	1.96	7.74	3.41
	1906	2.10	9.46	3.04
	1907	2.25	7.52	3.22
Bradley's Potato Manure.....	1905	2.56	6.84	5.26
	1906	2.60	6.76	5.01
	1907	2.71	7.20	5.93
Bradley's X. L. Superphosphate of Lime.....	1905	2.33	8.69	2.22
	1906	2.55	9.26	2.40
	1907	2.72	9.04	2.26
Clark's Cove Bay State Fertilizer.....	1905	2.32	9.39	2.33
	1906	2.58	8.95	2.57
	1907	2.66	9.07	2.34
Clark's Cove Bay State Fertilizer G. G.....	1905	1.94	8.19	1.92
	1906	2.09	7.94	1.95
	1907	2.14	7.88	1.59
Clark's Cove Bay State Fertilizer for Seeding Down	1905	1.06	8.14	1.80
	1906	1.13	8.42	2.04
Clark's Cove Defiance Complete Manure.....	1905	1.06	6.29	1.43
	1906	1.39	8.04	2.29
	1907	1.22	7.25	1.62
Clark's Cove Great Planet Manure A. A.....	1905	3.24	7.05	6.64
	1906	3.39	8.01	7.60
	1907	3.40	8.46	7.02
Clark's Cove King Philip Alkaline Guano.....	1905	1.09	7.89	1.78
	1906	1.10	8.48	2.09
	1907	1.21	7.44	1.99

Summary of results of analyses of Station samples for the years 1905, 1906 and 1907.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Clark's Cove Potato Fertilizer	1905	2.03	8.13	2.99
	1906	2.05	8.26	3.36
	1907	2.18	7.67	3.35
Clark's Cove Potato Manure	1905	2.58	6.27	5.62
	1906	2.61	7.07	5.48
	1907	2.64	7.21	5.44
Cleveland Fertilizer for all Crops	1905	1.00	9.76	2.18
	1906	1.38	8.21	2.43
	1907	1.44	7.67	2.09
Cleveland High Grade Complete Manure	1905	3.07	6.34	6.62
	1906	2.95	8.16	7.91
	1907	3.40	7.88	6.75
Cleveland Potato Phosphate	1905	2.01	8.75	3.02
	1906	2.14	8.08	3.13
	1907	2.25	7.67	3.47
Cleveland Seeding Down Fertilizer	1906	1.11	8.31	2.10
Cleveland Superphosphate	1905	1.71	8.13	1.68
	1906	2.14	7.57	1.84
	1907	2.06	7.91	1.75
Complete Manure with 10% Potash	1905	3.26	5.70	10.79
	1906	3.17	6.42	9.85
Crocker's Ammoniated Corn Phosphate	1905	1.85	7.40	1.75
	1906	2.19	8.03	1.87
	1907	2.30	8.12	1.55
Crocker's Aroostook Potato Special	1905	2.01	7.45	5.95
	1906	2.00	8.69	5.90
	1907	2.20	7.99	7.09
Crocker's Grass and Oats Fertilizer	1905	.....	9.89	2.10
	1906	.....	10.58	2.14
	1907	.....	10.10	2.06
Crocker's High Grade	1906	3.23	8.15	6.58
Crocker's New Rival Ammoniated Superphosphate	1905	1.13	7.97	1.98
	1906	1.31	8.28	2.30
	1907	1.27	7.96	2.44
Crocker's Potato, Hop and Tobacco	1905	2.04	8.07	2.97
	1906	2.04	7.99	3.10
	1907	2.28	8.08	3.39
Crocker's Special Potato Manure	1905	3.32	7.03	8.44
	1906	3.33	6.73	10.91
	1907	3.34	6.65	9.76
Cumberland Guano for all Crops	1905	1.40	7.90	2.05
	1906	1.04	8.79	2.29

Summary of results of analyses of Station samples for the years *1905, 1906 and 1907.*

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Cumberland Potato Fertilizer	1905	2.05	8.01	3.11
	1906	2.21	8.51	3.34
	1907	2.32	7.97	3.26
Cumberland Seeding Down Manure	1905	1.16	8.05	2.16
	1906	1.14	9.09	2.24
	1907	1.22	7.88	1.88
Cumberland Superphosphate	1905	1.91	7.31	1.54
	1906	2.12	7.87	2.43
	1907	1.92	7.65	1.80
Darling's Blood, Bone and Potash	1905	3.77	5.95	6.70
	1906	4.32	6.69	[illegible].09
	1907	4.20	7.22	8.76
Fine Ground Bone	1907	2.52	.....	22.92
Grass and Lawn Top Dressing	1905	4.80	4.86	3.32
	1906	4.93	5.84	2.62
Great Eastern General Fertilizer	1905	0.81	6.26	3.93
	1906	0.99	7.55	3.87
	1907	1.06	7.75	4.21
Great Eastern Grass and Oats Fertilizer	1905	.....	10.06	2.19
	1906	.....	10.61	2.06
	1907	.....	10.43	2.38
Great Eastern High Grade Potato Manure	1905	3.21	6.43	9.72
	1906	3.48	7.38	10.13
	1907	3.44	5.60	9.63
Great Eastern Northern Corn Special	1905	2.05	7.67	1.81
	1906	2.39	8.80	2.06
	1907	2.16	8.00	1.92
Great Eastern Potato Manure	1905	2.10	7.60	3.18
	1906	2.10	8.30	3.32
	1907	2.04	8.34	3.24
Great Eastern Potato Special	1906	3.35	8.45	7.32
High Grade Fertilizer with 10% Potash	1905	2.48	5.63	9.68
	1906	2.61	6.48	10.26
	1907	2.83	5.93	9.52
Lazaretto Aroostook Potato Guano	1905	0.84	7.03	4.11
	1906	0.98	8.30	4.06
Lazaretto Corn Guano	1905	2.28	7.48	2.37
	1906	2.16	7.42	2.37
	1907	1.88	8.24	2.26
Lazaretto High Grade Potato Manure	1905	3.02	5.00	10.13
	1906	3.38	6.10	10.58
	1907	3.42	6.65	9.84

Summary of results of analyses of Station samples for the years 1905, 1906 and 1907.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Lazaretto Propeller Potato Guano	1905	1.73	8.32	5.81
	1906	2.05	8.16	5.62
	1907	2.30	7.30	6.40
Nitrate of Soda	1907	14.92	.....	.....
Northern Maine Potato Special	1907	3.82	7.05	9.12
Otis' Potato Fertilizer	1905	2.07	7.20	3.05
	1906	2.03	8.46	3.11
Otis' Seeding Down Fertilizer	1905	1.10	7.46	2.14
	1906	1.17	8.54	2.22
Otis' Superphosphate	1905	2.06	7.42	1.78
	1906	2.23	9.19	1.96
Pacific Dissolved Bone and Potash	1905	.....	8.93	2.00
	1906	.....	10.29	2.08
	1907	.....	10.52	2.12
Pacific Grass and Grain Fertilizer	1905	0.82	7.94	1.22
	1906	1.16	8.96	1.51
	1907	1.37	6.75	1.99
Pacific High Grade General Fertilizer	1905	3.09	7.23	7.33
	1906	3.17	8.34	7.07
	1907	3.50	8.31	6.78
Pacific Nobsque Guano	1905	1.10	7.49	1.96
	1906	1.12	8.50	2.29
	1907	1.30	7.40	2.13
Pacific Potato Special	1905	1.95	7.72	3.19
	1906	2.07	7.55	3.42
	1907	2.21	7.61	3.28
Packer's Union Animal Corn Fertilizer	1905	2.36	8.94	2.35
	1906	2.50	9.26	2.38
	1907	2.60	8.70	2.37
Packer's Union Economical Vegetable Guano	1905	1.26	6.09	3.80
	1906	1.37	6.66	4.49
	1907	1.52	8.09	3.90
Packer's Union Gardeners' Complete Manure	1905	2.25	5.48	8.65
	1906	2.47	6.67	10.26
	1907	2.64	6.21	9.53
Packer's Union High Grade	1906	3.25	8.48	7.27
Packer's Union Potato Manure	1905	1.92	8.21	5.44
	1906	2.21	9.12	6.40
	1907	2.29	7.68	6.47
Packer's Union Universal Fertilizer	1905	0.69	6.68	4.07
	1906	1.24	8.25	4.18
	1907	1.10	8.05	4.11

Summary of results of analyses of Station samples for the years 1905, 1906 and 1907.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Packer's Union Wheat, Oats and Clover Fertilizer	1906	.....	11.16	2.45
	1907	.....	10.91	2.10
Quinnipiac Climax Phosphate for all Crops	1905	1.13	7.16	1.94
	1906	1.18	8.60	2.05
	1907	1.16	8.05	1.82
Quinnipiac Corn Manure	1905	1.86	8.05	1.71
	1906	2.13	8.63	2.23
	1907	2.21	7.85	1.85
Quinnipiac Market Garden Manure	1905	3.17	9.18	6.48
	1906	3.33	8.16	7.28
	1907	3.22	8.00	6.62
Quinnipiac Mohawk Fertilizer	1905	0.88	6.80	1.29
	1906	1.22	8.39	2.29
	1907	1.22	7.10	1.57
Quinnipiac Potato Manure	1905	2.56	6.13	5.25
	1906	2.59	7.54	5.05
	1907	2.71	6.97	6.19
Quinnipiac Potato Phosphate	1905	2.09	7.58	2.80
	1906	2.08	8.84	3.35
	1907	2.29	7.66	3.17
Read's Farmers' Friend Superphosphate	1905	2.10	8.05	3.03
	1906	2.03	8.42	3.76
	1907	2.28	7.80	3.40
Read's High Grade Farmers' Friend	1905	3.32	5.08	11.68
	1906	3.31	6.55	7.38
	1907	3.26	6.38	10.04
Read's Potato Manure	1905	2.42	5.38	9.48
	1906	2.59	6.10	9.76
	1907	2.53	6.58	9.67
Read's Practical Potato Special	1905	1.52	4.21	8.01
	1906	1.05	5.87	6.65
	1907	1.10	7.03	7.86
Read's Standard Superphosphate	1905	1.06	7.14	4.03
	1906	1.00	7.92	3.95
	1907	0.93	8.01	3.87
Read's Sure Catch Fertilizer	1905	.....	10.46	2.08
	1906	.....	9.69	2.06
	1907	.....	10.44	2.19
Read's Vegetable and Vine Fertilizer	1905	1.86	7.37	6.06
	1906	2.12	8.34	5.16
	1907	2.18	8.71	5.51
Soluble Pacific Guano	1905	2.26	8.17	1.51
	1906	2.10	8.25	1.99
	1907	1.89	8.12	1.60
Standard A. Brand	1905	1.40	6.34	2.20
	1906	1.19	8.03	1.67
	1907	1.19	7.38	2.01

Summary of results of analyses of Station samples for the years 1905, 1906 and 1907.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Standard Bone and Potash	1905	.....	8.83	2.07
	1906	.....	10.79	2.03
	1907	.....	10.40	2.05
Standard Complete Manure	1905	3.20	7.90	6.45
	1906	3.38	8.19	7.38
	1907	3.32	8.03	7.03
Standard Fertilizer	1905	1.87	8.07	1.73
	1906	2.24	7.97	1.86
	1907	2.12	8.25	1.68
Standard Guano for all Crops	1905	1.11	7.94	1.90
	1906	1.22	8.18	2.14
	1907	1.18	7.68	2.08
Standard Special for Potatoes	1905	1.99	7.84	2.94
	1906	2.14	8.22	3.07
	1907	2.24	7.87	3.22
Williams & Clark's Americus Ammoniated Bone Superphosphate	1905	2.37	8.86	1.97
	1906	2.43	9.29	2.25
	1907	2.52	8.89	2.10
Williams & Clark's Americus Corn Phosphate	1905	1.89	8.67	1.60
	1906	2.18	8.14	1.97
	1907	2.16	7.76	1.56
Williams & Clark's Americus High Grade Special	1905	3.06	6.80	6.87
	1906	3.30	8.55	7.15
	1907	3.38	7.85	6.91
Williams & Clark's Americus Potato Manure	1905	1.99	7.71	2.93
	1906	2.05	8.11	3.24
	1907	2.24	7.91	3.05
Williams & Clark's Royal Bone Phosphate for all Crops	1905	1.16	7.88	2.34
	1906	1.16	7.93	2.18
	1907	1.14	7.77	1.91
Armour's All Soluble	1906	2.71	9.44	4.02
	1907	3.61	8.37	3.65
Armour's Bone, Blood and Potash	1906	3.90	7.94	8.39
	1907	4.27	8.47	7.90
Armour's Complete Potato Fertilizer	1907	3.26	6.36	10.69
Armour's Fruit and Root Crop Special	1906	1.86	8.34	5.77
	1907	1.96	9.00	4.31
Armour's Grain Grower	1906	1.67	8.46	2.05
	1907	1.74	8.15	3.83
Armour's High Grade Potato Fertilizer	1906	1.61	8.42	9.86
	1907	1.58	8.86	10.89
Armour's Wheat, Corn and Oats Special Fertilizer	1906	0.92	8.10	1.03
	1907	0.65	9.02	1.07
Bowker's Bone, Blood and Potash	1905	3.88	6.10	6.37
	1906	4.02	7.60	7.01
	1907	4.59	6.84	7.34

Summary of results of analyses of Station samples for the years 1905, 1906 and 1907.

Name of Fertilizer.	Y	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Bowker's Bone and Potash Square Brand.....	1905	1.78	7.26	2.01
	1906	2.04	7.85	2.29
	1907	1.69	6.19	1.88
Bowker's Complete Manure for Potatoes and Vegetables	1907	3.45	6.61	10.32
Bowker's Corn Phosphate.....	1905	1.86	7.66	2.37
	1906	2.01	7.78	2.45
	1907	1.92	8.56	2.05
Bowker's Early Potato Manure.....	1905	3.01	7.85	6.65
	1906	3.36	7.66	7.56
	1907	3.32	8.26	6.47
Bowker's Farm and Garden Phosphate.....	1905	1.85	7.61	2.26
	1906	1.88	8.04	2.27
	1907	2.06	7.27	2.24
Bowker's Fresh Ground Bone.....	1907	2.58	.....	.....
Bowker's Hill and Drill Phosphate.....	1905	2.43	8.86	2.23
	1906	2.44	9.28	2.33
	1907	2.67	8.69	2.31
Bowker's Market Garden Fertilizer.....	1905	2.27	5.71	9.32
	1906	2.77	6.61	9.90
	1907	2.56	6.55	9.41
Bowker's Potash Bone.....	1905	1.02	8.17	1.72
	1906	1.16	8.81	2.11
	1907	1.39	7.56	2.03
Bowker's Potash or Staple Phosphate.....	1905	1.04	8.21	2.88
	1906	1.19	8.28	3.34
	1907	1.08	7.37	3.03
Bowker's Potato and Vegetable Fertilizer.....	1905	2.17	8.14	4.60
	1906	2.58	8.76	4.35
	1907	2.53	8.50	4.57
Bowker's Potato and Vegetable Phosphate.....	1905	1.89	7.96	2.14
	1906	1.71	8.77	2.16
	1907	2.04	8.34	2.00
Bowker's Six Per Cent Potato Fertilizer.....	1905	0.82	6.27	5.67
	1906	1.29	7.62	6.34
	1907	1.18	6.41	6.66
Bowker's Superphosphate of Potash for Grass and Grain	1905	.....	10.35	1.80
	1906	.....	10.40	1.89
	1907	.....	11.31	2.02
Bowker's Sure Crop Phosphate.....	1905	1.17	7.80	1.86
	1906	1.34	8.57	2.15
	1907	1.22	7.57	1.95
Bowker's Ten Per Cent Manure.....	1905	0.82	5.53	10.75
	1906	1.03	6.95	7.80

Summary of results of analyses of Station samples for the years 1905, 1906 and 1907.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Monticello Grange Chemicals	1905	2.34	8.16	4.32
	1906	2.52	8.22	4.01
	1907	2.68	8.05	4.40
Special Potato Manure for the Grange	1905	1.44	9.08	11.02
	1906	1.79	9.06	12.06
	1907	1.72	9.12	12.15
Stockbridge's Special Manure for Cabbage	1907	5.64	5.33	6.03
Stockbridge's Special Manure A for Potatoes	1907	4.03	7.28	10.38
Stockbridge's Special Manure for Corn (Class D 107)	1905	2.96	10.54	6.36
	1906	3.55	9.02	†6.12
	1907	3.48	9.99	7.28
Stockbridge's Special Manure for the Grass (Class F 56)	1906	4.91	6.02	6.20
	1907	5.04	5.61	6.37
Stockbridge's Special Manure for Potatoes (Class D 610)	1905	3.20	5.03	10.10
	1906	3.11	6.15	9.74
	1907	3.34	9.54	9.73
Stockbridge's Special Manure for Seeding Down (Class C 610)	1905	3.10	7.76	10.11
	1906	2.45	7.01	10.40
	1907	2.70	6.58	9.62
E. Frank Coe's Celebrated Special Potato Fertilizer	1905	2.04	7.32	4.11
	1906	1.72	8.22	3.92
	1907	1.69	8.10	3.72
E. Frank Coe's Columbian Corn Fertilizer	1905	1.64	7.30	2.93
	1906	1.57	8.16	2.78
	1907	1.36	9.31	2.32
E. Frank Coe's Columbian Potato Fertilizer	1905	1.80	8.62	2.70
	1906	1.42	8.68	2.73
	1907	1.35	9.02	2.34
E. Frank Coe's Double Strength Potato Manure	1907	3.60	7.28	8.59
E Frank Coe's Excelsior Potato Fertilizer	1905	2.68	6.84	8.53
	1906	2.59	7.30	8.38
	1907	2.47	7.41	6.94
E. Frank Coe's Grass and Grain Special Fertilizer	1905	1.08	8.99	1.80
	1906	1.09	9.01	1.66
	1907	1.09	9.58	1.87
E. Frank Coe's High Grade Ammoniated Bone Superphosphate	1905	2.42	8.52	2.59
	1906	2.18	9.11	2.77
	1907	1.74	9.20	2.22
E. Frank Coe's High Grade Potato Fertilizer	1905	2.70	*8.05	6.07
	1906	2.61	8.34	5.65
	1907	2.43	7.80	5.17
E. Frank Coe's New Englander Corn Fertilizer	1905	1.48	8.07	3.1[illegible]
	1906	1.49	8.27	4.02

† Guarantee changed in 1906.

Summary of results of analyses of Station samples for the years 1905, 1906 and 1907.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
E. Frank Coe's New Englander Corn and Potato Fertilizer	1907	1.15	9.04	2.86
E. Frank Coe's New Englander Potato Fertilizer	1905	1.52	6.96	3.24
	1906	1.30	7.39	3.27
E. Frank Coe's Prize Brand Grain and Grass	1905	.....	8.11	2.01
	1906	.....	11.05	1.87
	1907	.....	9.96	1.66
E. Frank Coe's Red Brand Excelsior Guano	1905	3.13	8.40	5.94
	1906	3.24	8.80	6.45
	1907	3.03	8.79	5.20
E. Frank Coe's Standard Grade Ammoniated Bone Superphosphate	1905	1.82	8.39	2.22
	1906	1.49	9.26	2.37
Dexter Special Potato Manure	1906	3.47	7.35	9.87
Hubbard's Bone, Blood and Potash	1905	2.91	7.97	7.51
	1906	3.41	7.89	7.34
	1907	3.22	7.73	7.41
Hubbard's Farmers' I. X. L. Superphosphate	1905	1.76	7.52	2.26
	1906	2.17	8.07	2.18
	1907	1.87	8.41	2.50
Hubbard's Royal Ensign	1905	2.10	7.72	4.81
	1906	2.41	7.04	4.02
	1907	2.30	8.59	4.57
Hubbard's Soluble Bone and Potash	1907	.....	9.48	1.84
Hubbard's Trucker's 5%	1907	3.61	7.83	4.97
Watson's Improved High Grade Potato Manure	1905	2.84	5.83	5.11
	1906	3.17	7.24	5.24
	1907	3.10	6.04	5.02
Lister's Animal Bone and Potash	1905	.....	10.42	1.96
	1906	.....	10.50	2.06
	1907	.....	10.04	2.09
Lister's High Grade Special for Spring Crops	1905	1.59	7.88	9.45
	1906	1.81	8.20	8.81
	1907	1.73	8.38	9.73
Lister's Oneida Special	1905	0.98	5.84	2.44
	1906	1.33	7.99	1.73
	1907	1.24	7.93	1.50
Lister's Potato Manure	1905	3.11	7.21	8.11
	1906	3.21	8.38	6.47
	1907	3.38	7.78	7.16
Lister's Pure Raw Bone Meal	1907	2.58	.....	.....
Lister's Special Corn Fertilizer	1905	1.64	7.50	3.03
	1906	1.99	7.91	3.20
	1907	2.05	7.21	3.11

Summary of results of analyses of Station samples for the years 1905, 1906 and 1907.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Lister's Special Potato Fertilizer	1905	1.57	7.65	2.94
	1906	1.90	7.85	2.95
	1907	2.11	6.76	3.16
Lister's Success Fertilizer	1905	1.28	8.63	1.94
	1906	1.39	9.42	2.47
	1907	1.39	9.26	2.12
Lister's 10% Potato Grower	1906	3.18	6.62	10.38
	1907	3.33	5.60	10.12
Chittenden's Complete Root Fertilizer	1905	3.14	7.86	6.79
	1906	3.14	8.12	7.67
	1907	3.38	7.79	7.77
Chittenden's Eureka Potato Fertilizer	1906	3.19	6.77	10.37
Chittenden's Excelsior Potato Fertilizer	1906	3.48	5.25	10.44
	1907	3.36	6.66	10.29
Chittenden's Market Garden Fertilizer	1905	2.48	6.72	5.50
	1906	2.30	6.62	5.11
	1907	2.49	6.67	5.87
New England Complete Manure	1905	3.04	8.11	9.40
	1906	3.31	7.16	8.30
	1907	3.19	6.66	9.60
New England Corn and Grain Fertilizer	1905	1.34	7.32	2.34
	1906	1.29	7.21	2.17
	1907	1.20	7.00	1.94
New England Corn Phosphate	1905	1.50	8.37	3.00
	1906	1.75	8.35	3.10
	1907	1.72	8.09	3.01
New England High Grade Potato Fertilizer	1905	2.38	7.60	6.12
	1906	†2.41	8.41	6.44
	1907	2.22	8.00	5.95
New England High Grade Special with 10% Potash	1905	3.72	7.31	10.63
	1906	3.38	8.19	9.78
	1907	3.90	6.58	9.90
New England Market Garden Manure	1906	4.16	9.16	5.39
	1907	4.04	6.21	5.93
New England Potato Fertilizer	1905	1.57	7.18	4.27
	1906	1.92	8.06	4.23
	1907	1.59	6.87	4.05
New England Potato Grower	1906	2.28	7.18	9.74
	1907	2.36	5.71	9.89
New England Superphosphate	1905	2.06	8.59	4.15
	1906	2.42	9.87	3.93
	1907	2.35	9.99	4.22
Excelsior Potato Fertilizer	1905	3.13	6.87	11.62
	1906	3.41	6.37	9.73

† Guarantee changed in 1906.

Summary of results of analyses of Station samples for the years 1905, 1906 and 1907.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash
		Per ct.	Per ct.	Per ct.
P. & P. A. A. Brand	1905	4.14	7.26	7.82
	1906	3.98	8.23	8.24
	1907	3.93	7.14	8.43
P. & P. Aroostook Special	1905	3.44	6.82	10.13
	1906	†3.53	8.27	9.67
	1907	3.64	6.72	10.07
P. & P. Grain Grower	1906	1.01	7.48	2.30
Maine Potato Fertilizer	1907	2.91	6.25	9.58
P. & P. Potato Fertilizer	1906	1.66	6.83	4.90
Plymouth Rock Brand Fertilizer	1905	2.34	8.05	4.32
	1906	2.37	8.69	4.08
	1907	2.55	7.82	3.95
P. & P. Special Potato Fertilizer	1905	3.00	8.06	7.37
	1906	3.07	9.03	7.34
	1907	2.96	7.89	7.18
Star Brand Superphosphate	1905	1.66	6.63	3.32
	1906	1.52	7.53	2.62
Bone Dust Tankage	1907	6.07	.....	.....
Prentiss Aroostook Complete Fertilizer	1906	3.20	6.78	9.97
	1907	2.39	5.00	8.83
Prentiss Aroostook Special	1906	2.67	8.79	8.44
Prentiss Aroostook Standard	1906	2.19	9.12	5.11
	‡1907	1.46	7.36	9.37
Tuscarora Fruit and Potato Fertilizer	1906	1.59	8.46	9.32
Tuscarora Aroostook Special	1907	2.52	7.02	8.79
Tuscarora Complete Potato	1907	3.25	6.36	9.25
Tuscarora Trucker's Special	1907	3.85	8.42	6.93
Provincial Ten Per Cent Aroostook Complete Potato	1905	2.73	8.63	10.35
	1906	3.10	7.27	9.62
	1907	3.40	7.41	9.51
Provincial Special Potato Phosphate	1905	2.08	8.04	5.10
	1906	†2.39	7.28	6.25
Read's Potato Grower	1906	3.35	5.83	6.77
	1907	3.07	7.92	8.13
Essex A. 1 Superphosphate	1905	1.06	5.06	2.34
	1906	1.16	6.06	2.19
Essex Complete Manure for Aroostook County Crops	1906	3.37	9.34	9.58
	1907	3.44	8.05	9.17

‡ Guarantee changed in 1907.

Summary of results of analyses of Station samples for the years 1905, 1906 and 1907.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid	Potash.
		Per ct.	Per ct.	Per ct.
Essex Market Garden and Potato Manure.....	1905	2.00	7.11	5.56
	1906	1.89	7.42	5.95
	1907	2.08	7.09	5.47
Essex XXX Fish and Potash.....	1905	2.10	6.94	2.28
	1906	2.28	6.81	2.57
	1907	2.44	6.97	2.64
Acid Phosphate	1907	.....	16.95	.....
Sagadahoc Aroostook Potato Manure.....	1905	1.08	5.24	5.56
	1906	1.29	6.96	3.39
	1907	1.50	6.08	4.01
Dirigo Grass and Grain Fertilizer.....	1905	0.57	7.09	2.41
	1906	0.87	6.96	5.18
	1907	1.20	6.86	3.33
Muriate of Potash.....	1907	.....	.....	49.20
Nitrate of Soda.....	1907	14.32	.....	.....
Sagadahoc High Grade Superphosphate.....	1905	1.68	8.51	4.71
	1906	1.62	8.94	3.52
	1907	1.44	7.18	3.25
Sagadahoc Special Potato Fertilizer.....	1905	2.06	6.68	8.22
	1906	1.83	8.91	7.52
	1907	2.04	6.73	7.77
Sagadahoc XX Chemical Fertilizer.....	1905	7.44	4.54	8.26
	1906	†8.02	7.79	8.07
	1907	7.18	4.42	8.52
Yankee Fertilizer	1905	0.60	8.25	2.01
	1906	0.74	9.37	2.38
	1907	0.72	7.45	2.41
3-6-10 Fertilizer	1906	2.11	8.38	9.34
	1907	2.24	6.99	9.12
4-6-10 Fertilizer	1907	3.12	6.50	10.02
Sanborn's Special Potato Fertilizer.....	1906	3.19	9.19	10.51
Scientific Potato and Vegetable Fertilizer.....	1905	3.30	7.10	6.45
	1906	3.87	7.22	7.43
Swift's Lowell Animal Brand.....	1905	2.18	9.37	4.03
	1906	2.37	10.66	4.22
	1907	2.41	9.76	3.92
Swift's Lowell Bone Fertilizer.....	1905	1.67	8.80	2.97
	1906	1.78	9.24	3.22
	1907	1.67	7.63	2.83
Swift's Lowell Cereal Fertilizer.....	1905	0.82	6.44	0.95
	1906	0.86	7.21	1.19
	1907	0.88	6.84	1.29

† Guarantee changed in 1906.

Summary of results of analyses of Station samples for the years 1905, 1906 and 1907.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Swift's Lowell Dissolved Bone and Potash....	1905	1.59	8.10	2.24
	1906	1.61	10.42	2.10
	1907	1.43	8.03	4.23
Swift's Lowell Empress Brand.....	1905	1.24	7.37	2.16
	1906	1.32	7.50	2.15
	1907	1.32	7.81	2.03
Swift's Lowell Potato Grower.....	1906	3.11	7.29	10.55
	1907	3.19	6.00	10.30
Swift's Lowell Potato Manure.....	1905	1.64	7.31	3.90
	1906	1.72	8.61	4.65
	1907	1.68	6.70	4.13
Swift's Lowell Potato Phosphate.....	1905	2.30	7.55	6.00
	1906	2.40	8.19	6.13
	1907	2.22	7.91	6.06
Swift's Lowell Superior Fertilizer with 10% Potash	1905	3.69	7.14	11.99
	1906	3.30	8.85	10.04
	1907	4.04	6.29	9.67
Whitman and Pratt's Vegetable Grower.....	1906	3.53	9.21	6.56
	1907	2.52	7.86	7.26
Whitman and Pratt's Potash Special.....	1906	2.38	9.23	10.49
	1907	2.85	5.57	9.25
Whitman and Pratt's Potato Manure.....	1907	1.98	7.59	4.18
Whitman and Pratt's Corn Success.....	1907	1.82	8.29	3.10

BULLETIN No. 147.

THE POTATO PLANT LOUSE.

Nectarophora solanifolii Ashmead.

EDITH M. PATCH.

On account of their extremely small size, aphids or plant lice are to a great extent unnoticed, but when conditions are favorable to their increase there are many species of these minute creatures that are capable of bringing devastation to the vegetation which they frequent and staple crops often suffer severe attacks. The hop plant louse, the several aphids of the apple, the spring grain aphis, the corn aphids, the melon aphis, are, for instance, pests of tremendous importance; and the destructive green pea louse alone is estimated to have caused a loss of $7,000,000 during the two seasons of 1899 and 1900 just along the Atlantic Coast States. During the past 4 years many species of aphids representing 14 genera and living upon about 90 species of plants and trees have been collected for the Maine Agricultural Experiment Station and some few of these have been given special study. Of these the potato plant louse, attacking as it does one of our chief crops in Maine, and presenting in its life history certain points which may be of significance in connection with closely related species, has seemed of sufficient importance to record somewhat fully.

ECONOMIC SIGNIFICANCE.

During the summers of 1904, 1905 and 1906, enormous numbers of the plant louse, *N. solanifolii,* appeared over wide areas in Aroostook County, the potato vines being attacked to an injurious extent in the vicinity of Houlton and elsewhere. The colonies cluster thick on stem, leaf and blossom stalk, blighting

the stems and drying the terminal leaves. See Fig. 25. The time of severest attack apparently varies somewhat, but the infestation for the past 3 years in Maine has not been excessive before early August and is entirely over with before the middle of September. Under conditions favorable to Aphid growth, an attack of less than 2 weeks' duration suffices to kill the potato stalk for a distance from 4 to 6 inches from the tip, and the growth of the tubers on plants thus weakened must necessarily be affected. Aside from the direct weakening of the plant due to the loss of sap and the withering of the tissue, the danger to the health of a plant thus attacked by plant lice is considerable. Although exceedingly minute, the beak of the plant louse makes a wound which becomes in a short time surrounded by a discolored area, readily detected by the unaided eye. As these wounds extend for some little distance into the plant, a favorable location for the entrance of bacterial or fungus disease is thus secured even where the infestation of plant lice is not excessive enough to wither the tips of the stalk. Moreover it is perfectly possible for insects to carry fungus spores from diseased to healthy plants. Where the plant lice are abundant the leaves are covered with honey dew which is soon attacked by a dark fungus, and which together with the molted skins adhering to the sticky substance, gives the leaves an unhealthy appearance and must interfere with their natural function.

The same species has at times been extremely abundant upon the potato in Canada and the following quotation from Doctor Fletcher's report for 1904 is of interest in this connection both because of the seriousness of the infestation and the fact that the time of appearance at Mahone Bay where the observations were made was earlier than it has been in Maine.

"Potato Aphis (*Nectarophora solanifolii,* Ashm.).—Potatoes are not often troubled with plant lice in Canada; but at long intervals outbreaks have been observed on this crop, and such a one occurred last summer at Mahone Bay, which was closely watched by Doctor Hamilton.

'Mahone Bay, June 28.—I send you some aphides from potatoes which are abundant enough to have appreciably blighted my potato plants.'

'July 10.—The aphis on my potatoes has overrun the whole patch, with the result that the potatoes have stopped growing and look very unhealthy. The blossoms have withered up and fallen, the lower leaves have turned yellow, and many others have turned black, just as if smitten with the blight, and are falling. They occur in immense numbers. Their

favorite position is upon the peduncles of the flowers, which they cover completely. They are also found in large clusters on the stems and upon the under surface of the leaves. In many colonies there are a few flesh-colored individuals.'

'July 16.—The plant lice on the potatoes are fast diminishing in numbers; but they have left the crop in a sorry condition.'

'August 1.—I send you today a last specimen from my potato plot. They have evidently been killed by a fungus. I first noticed its effects about a week ago on one corner, and it has since spread over the whole piece. Very few aphides are left alive. Since I last wrote, I noticed larvæ of lady bird beetles and of *Syrphus* flies; but neither of these or anything else had much effect in reducing the numbers of the plant lice until this disease appeared. A month ago my potatoes could not have looked more promising. Today I tried them, and out of 6 average hills I got 17 tubers, of which 2 only were large enough to be marketed.' —C. A. HAMILTON."

In view of so extended and injurious an infestation of one of the chief crops of Maine for 3 consecutive years, it seemed desirable to ascertain whether there might not be some practical method of treatment or prevention. The standard remedy for plant lice—kerosene emulsion or whale oil soap spray—did not seem advisable for several reasons. By the time the plant lice have colonized the vines to an extent great enough to be particularly noticeable, the damage is already half done and the winged generations which develop at the time the potato tops grow sickly, leave the plants they are on for fresh vegetation. The proposition of spraying 40 acres of potato vines with kerosene emulsion late in August for instance when the wing pads which bespeak the migrating generation are already in evidence would not appeal to the large potato grower. To apply such a spray before the infestation became excessive, while it would kill many of the scattered plant lice, might on the other hand be a sheer waste of energy, for the amount of injury which plant lice are going to inflict is a matter not fairly open to prophecy, so many elements of uncertainty enter in. The weather, for instance, plays an important part in the welfare of plant lice, heavy rains washing the tender forms from the plants, and cold days retarding the rate of increase. A long stretch of damp weather is favorable to fungus parasitism which may sweep out the plant lice from a large area. Then, too, in certain seasons, predaceous and parasitic insects appear in numbers sufficient to render any artificial remedial measures

superfluous. The efficiency of emulsion sprays for plant lice has too long been known to make plausible any attempt for any other direct treatment in this case. But to be successful an emulsion spray since it kills by contact would need to be forced under the infested leaves as well as along the tip of the stem and between the buds and flowers where the plant lice are particularly crowded. Just what the results of such a treatment upon the potato might be is a problem which concerns the plant pathologist, and while the fate of the insects subjected to such a treatment would be satisfactory to the potato grower, whether the fate of the vine would be equally so is a matter which would require careful tests to decide.

The standard remedy for plant lice, in short, seemed not available for the situation in question.

The alternative was the study of the life history of this species with a view of ascertaining the alternate host plant and if practicable eradicating it or controlling its growth within the vicinity of potato fields.

A Generalized Life Cycle for Nectarophora.

In order to outline the need of such a study with a given species of plant louse whose life history is not known, the life cycle of plant lice in general is here briefly sketched. Although the life cycle varies greatly within the range of Aphididæ, the family of plant lice, the following are the points drawn from related forms which seemed of significance with the life cycle of *N. solanifolii* in view.

In the north such a plant louse may be expected to winter in the egg stage. From the egg emerges in the spring a wingless form which is commonly spoken of as the stem mother. The stem mother does not deposit eggs but produces living young, and is the first of a long series of forms designated on this account as viviparous females. The young plant lice begin at once to feed upon the sap of the plant and in 8 or 10 days produce offspring. The first few spring generations may be wingless or at any time winged individuals or an entire winged generation may appear and fly away to fresh plants and there start new colonies where a succession of generations are produced as before. Such a winged generation is called the

migrant generation and with many species the migrants desert the host plant upon which they have been feeding and seek a plant of an entirely different species. Thus the plant louse destructive to hops passes part of its life cycle upon plum trees. This alternation of hosts is a point in the life history of Aphididæ of great economic significance, for it sometimes happens that a species can be controlled on one plant and thus its attack upon the alternate host be prevented.

After spending a few weeks or a few months upon the second host plant, winged individuals called fall migrants appear and return to the same kind of plant, the winter host, upon which the stem mother and the spring generations had lived, and there continue the series of generations. Up to this time no males have appeared and all of the forms, whether winged or wingless, have been females giving birth to living young as was the case with the "stem mother." But after the fall migration they are likely to develop the true sexes, males and egg-laying females. These oviparous females deposit a few comparatively large eggs, in which stage the insect winters and from which the stem mothers hatch in the spring.

It is some such outline as the foregoing to which a species whose life history is unknown must be referred as a working basis. Any variation of the general life cycle of the plant lice, however, is never a fair cause for surprise. One is quite likely to find, for instance, that a certain species does not pass the winter in the egg stage but as a subterranean form at the roots of some plant.

The difficulties as to life history studies presented by the alternation of host plants common among the Aphididæ are augmented by the fact that certain differences in structure, great enough to count as specific if occurring in other families of insects, are common in different generations of a single species of plant louse. It not infrequently happens, therefore, that the same species may, when found upon different host plants, be recorded as two or more distinct species and their identity not suspected for years. Also, 2 actually distinct species may resemble each other so closely in certain forms that they are easily mistaken for one species. Moreover the specific characters of the genus Nectarophora have not been systematically determined.

Any work, therefore, either systematic or ecological, undertaken with this genus should be pursued with the idea that it shall in some way lessen instead of augment the confusion which already exists with this group of plant lice. The observations recorded for *N. solanifolii* in the present bulletin are meagre but they all unquestionably refer to the single species under consideration. It seems advisable to tabulate such facts as have been ascertained now rather than to wait for the accumulated observations of a longer period for 2 reasons. The economic point involved—that is, whether *N. solanifolii* might practically be combated upon its winter host—seems to be answered by the evidence now at hand. Then, too, over those parts of the State which were under observation this season, *N. solanifolii* upon the potato was apparently so nearly exterminated by fungus parasitism that it is probable that some time will elapse before this species again appears in the State to an extent great enough to make further work with it practical.

Nectarophora Solanifolii from Field Observations.

The points which were evident for this species in Maine from field observations upon the potato for the 3 seasons 1904-1906 were that about the middle of July a very few scattered individuals may be seen upon the potato; that before the last of August the infestation may become excessive, the tips of the stalks, flower stems and terminal leaves being packed with plant lice; that by the middle of September the fall migration is over; and that the migration takes place before the true sexes appear, neither the oviparous female nor the male occurring upon the potato in the field. The points in the life history which were not known and concerning which it was desirable to obtain data were upon what plant the spring generations lived; whether this Nectarophora would accept more than one host beside the potato (that is, whether it was a "general" or a "specific" feeder); whether the true sexes appeared in the fall, and if so where the eggs were deposited.

A few dates may be quoted here for instance.

August 11, 1904, Houlton.—A correspondent who had been much worried by a bad infestation sent in a box of *N. solanifolii* mostly winged or within one molt of being winged with the comment: "I do not find

nearly so many on my vines as I did a week ago. The blossoms are about all gone from my potatoes and the small stalk on which the blossoms grew is a dirty brown color and seems to be withering up."

August 17, 1905, Houlton.—The writer found *N. solanifolii* excessively abundant over about 20 acres. The stalk tips were crowded with viviparous forms both winged and wingless, and in many cases the flower stalks were dead.

August 25, 1906, Houlton.—Potato stem tips and leaves literally packed with *N. solanifolii*. Much injury to the potato tops evident.

July 18-19, 1906, Houlton.—A 2 days' careful search in 4 large potato fields (one of which is the field for which the foregoing record of August 17, 1905, is made) resulted in the finding of but one specimen of *N. solanifolii*. That single specimen was a wingless form and there were 3 lady-beetles after it.

July 18, 1907, Houlton.—A large field that had been heavily infested the previous August was examined. A very few scattered individuals were found on the blossom stalks of potato. A most thorough search for some distance over many rows revealed not more than an average of a single specimen to 3 rods. These were wingless viviparous forms sometimes apparently still too young to start a colony and sometimes mature and accompanied by a very few progeny. No winged form was seen on this date.

July 24, 1907, Kennebunkport.—*N. solanifolii* present upon potato but very scattering and chiefly wingless. A single winged specimen taken.

July 25, 1907, Farmington.—*N. solanifolii* present upon potatoes but very much scattered.

July 31, 1907, Houlton.—(Same field as foregoing record for July 18, 1907). *N. solanifolii* nowhere numerous, yet present all over the field. A single wingless, viviparous form with progeny on every third and fourth hill and winged viviparous forms with progeny found here and there, but less common than the wingless forms. A few individuals whose wing pads indicated they were but one molt from maturity taken on this date would indicate that these winged forms present did not come as migrants but had developed as progeny of the wingless forms noticed earlier in the month.

September, 1906, Houlton.—Early in the month the fall migrants acquired wings and deserted the potato. On September 14 only 4 or 5 belated specimens were found in a day's search in several fields where the infestation had been excessive in August. No males or oviparous females were seen upon the potato in the field during the 3 years though frequent searches were made. Although the infested fields were visited once or twice weekly for nearly the entire season, further quotations from the field notes for 1907 are omitted here because on account of continuous and heavy rains the species were held much in check and also because later practically the whole infestation was killed out by a fungus parasite, the natural increase of the species being prevented by either cause enough to make the field notes for the present year exceptional rather than the rule.

Insectary Observations.

During the summer of 1906 this species was bred in the insectary upon potato, but as various other species were under observation in the same house and as two species of the genus Aphis colonized the potato there to an extent which interfered with the work with *N. solanifolii,* little reliable data was obtained. For the season 1907 particular precautions were taken. During the entire summer no plants were grown in the insectary except such as were started there from seed—that is, no risks were taken as to the introduction of any other species of plant louse upon plants. A single exception was made when the house was stocked with shepherd's purse, but for this purpose very young plants were used and these carefully examined. It should be stated that during the entire time of the observations upon these plant lice the insectary was not heated in any way, so that the temperature conditions were not so widely different from those out of doors, that this element need come in for consideration. It was, however, possible for the insectary colonies to breed unchecked by rains, predaceous or parasitic insects, though a fungus parasite was introduced in August which seriously interfered with the uncaged material.

The few specimens obtainable (see field notes for Houlton, July 18, 1907) were placed upon potato plants in cloth cages in the insectary July 19; July 22 they were increasing rapidly, many had molted and all seemed healthy. Some such interesting data were obtained from the material started at this time that quotations from notes made upon them are here included. These specimens and their descendants, caged in cloth cages from July 19 to September 20, were protected during the entire time from the fungus which was introduced in August with uncaged material and which spread through the insectary.

August 3, 1907. Insectary.—The progeny of the wingless viviparous lot taken at Houlton July 18 are winged viviparous forms. The stalks this lot have been colonizing since July 18 are speckled with beak wounds. The plants have a general unhealthy appearance and the leaves are sticky with honey dew and somewhat attacked by honey dew fungus.

These winged individuals left the sickly potato stalks upon which they had fed during the earlier stages of their lives and rested upon the cloth sides of the cage which confined the potato. These winged forms were removed from the cloth and placed in lots of 20 each under cages upon fresh potato previously uninfested. They settled at once, remaining upon the fresh stalks.

August 5. None of the transferred specimens have left the new plants. They are feeding and producing young actively and not a single individual is to be seen upon the cloth of these new cages, all signs of the restlessness evinced in the old cage having left them. It seems reasonable to suppose that their desertion of the plants upon which they had been reared was caused by the unhealthy condition of these plants due to the two weeks presence of the plant lice. Provided with fresh plants they were content. It is probably due to this migrating instinct that makes possible the even infestation of a whole potato field,—the first winged forms developing upon stalks over crowded and consequently sickly, seeking uninfested tips for their own feeding places and for their progeny.

August 13. The progeny of the foregoing winged viviparous forms are partly wingless viviparous forms and partly, as indicated by wing pads, to be winged viviparous forms. The colonies do not seem particularly vigorous. The plant tips are badly speckled with beak wounds and the leaves a little discolored with honey dew fungus.

September 20.—The material recorded August 3 and August 13 was in the case of 2 cages left unmolested until today when both the true sexes are found to be present. The males are winged. The females are wingless. Further description of these forms is reserved for another place.

September 21.—About 8 males and some 20 oviparous females were removed from the potato and placed upon a young shepherd's purse plant in a cloth cage. Females were added from time to time and a very few males. From September 21 to October 11 from one to 3 pairs of these were noticed in copulation each day. On October 11 examination of the sheperd's purse showed Nectarophora eggs variously placed on the upper and under sides of the leaves and along the stem. One was deposited on a cheese cloth thread in the cage.

It should be emphasized here that although the true sexes developed upon the potato in the insectary and thereby showed that another plant was not a necessity for these forms, the situation was practically forced. A single caged potato plant had been stocked August 3 with 20 winged viviparous forms reared on potato from the wingless viviparous forms collected July 18 and left to them and to their progeny until September 20, there being no choice for the prisoners except the potato or death, for a period of 2 months. This period extended considerably past the season of migration for *N. solanifolii* in the field which had been observed to have occurred for 3 years early in September or late in August. The fact that the imprisoned insects then developed the true sexes upon potato is no indication that such would be the case in the open field. Indeed the fact that the true sexes did not appear until long after the season of out-of-door migration would rather indicate

that normally the winter host plant would be sought previous to the appearance of the males and oviparous females.

The objection that such forced conditions might have no bearing upon the normal development in the field might be a legitimate one except for the observations taken as a check upon material during this same time that had the liberty of the whole insectary and a choice of host plants. These observations are as follows:

August 16 about 80 perfectly healthy potato plants in the insectary were stocked with *N. solanifolii* collected at Orono and were left uncaged. By August 30 they were fairly represented by the photograph (Fig. 26) taken at that time. Later the stalks in most cases died to the ground and new shoots started up from the base. By planting potatoes in the insectary often the plant lice were kept supplied with fresh plants which were colonized by the individuals which deserted the plants they had rendered sickly.

August 31, 1907, Houlton, Maine.—In a buckwheat field adjacent to a potato field several colonies of *Nectarophora* sp. were to be found upon buckwheat tips. They were in all respects discernable by a hand lens the same as *N. solanifolii.* Both green and pink color forms were present but they were so seriously fungus attacked that by the time even the healthiest of the specimens could be brought to Orono, microscopic examination for comparison with *N. solanifolii* was unsatisfactory and breeding for winged forms was impossible.

August 31, 1907, Houlton, Maine.—From shepherd's purse *Capsella Bursa-pastoris* Moench. several colonies of *Nectarophora* sp. were taken. They were not to be distinguished from *N. solanifolii* by hand lens examination and both green and pink color forms were taken. They were badly attacked by fungus and by the time they reached Orono they were in no condition for further observations.

The suggestions given by these two collections was acted upon conversely, however, by sowing buckwheat among the potato plants in the insectary and transplanting about 200 young and clean plants of shepherd's purse into trays. Peas were also sown at the same time. By the time the buckwheat and peas were well up about 100 fresh potato plants were available, and the *N. solanifolii,* deserting the older potato stalks, colonized thoroughly the fresh potato vines, pea vines, and the shepherd's purse apparently with no preference. Both winged and wingless forms were found for the rest of the season rearing contented progeny upon potato, and shepherd's purse, and also upon the young pea vines until they killed them. Except for stray individuals which, of course, would be found upon everything in the crowded insectary, the buckwheat remained apparently untouched. Whether *N. solanifolii* would have accepted the blossom tips of the older buckwheat or not was not demonstrated as the buckwheat, although it lived, did not make much growth.

From the last of July, 1907, to October 11 (possibly later) both winged and wingless viviparous forms were present in the insectary. With the Orono material of August 16, individuals attacked by a fungus were inadvertably introduced, and the fungus spread among all the uncaged material keeping it so reduced in numbers there seemed danger of the insectary observations meeting the same fate as those of the field. However, every opportunity by way of freshly planted material was given them and the insectary was kept as dry as possible and enough of the plant lice escaped the fungus to keep the situation interesting.

September 23. After finding the true sexes upon the caged material, careful canvass was made of the uncaged plants in the insectary and numerous oviparous females (mostly still young) were found both upon the potato and shepherd's purse, although more numerously upon shepherd's purse. No males were found at this time and later but two were seen in copulation on the uncaged material,—one pair being upon shepherd's purse and one upon potato. The prevalence of the fungus undoubtedly prevented the development of a greater number of the true sexes.

October 11. Insectary search showed the *Nectarophora* eggs near some of the oviparous forms both upon potato and shepherd's purse. Many of the eggs were the glistening brownish black of well hardened eggs but some were pelucid green showing that they had very recently been deposited. They were upon the plants indiscriminately on leaves and stalks.

The appearance of the oviparous females and the deposition of eggs with the uncaged material at practically the same time as that of the forms that had been prisoners for 2 months would indicate that these dates are about normal. In the insectary the migration from overcrowded potato stalks to fresh plants seemed to take place irregularly and not at any stated times, the condition of the infested plant apparently influencing these movements. The fact that they seemed to seek the fresh potato plants almost as readily as the peas or the shepherd's purse might seem to indicate that if a similar succession of new potatoes were supplied them in the field they might not seek another host even there. As it is a wholesale migration has taken place each of the 3 seasons these plant lice have been under observation.

It seemed reasonable to expect that such an enormous number of healthy plant lice as had migrated from the Houlton potato vines late in the summer of 1906 might with careful search be located on the alternate host. After several long and tedious attempts during September, 1906, the writer, somewhat chagrined, postponed the search until the following spring in

hopes of finding them before the spring migration. During June and July, 1907, (until *N. solanifolii* appeared upon the potato) the search was continued until it seemed as though every species of vegetation within aphid flight of potato fields had been examined, but no *N. solanifolii* were chanced upon.

Two conditions noted July 18, 1907, were of considerable consolation in this connection. The first specimens observed on the potato at the date were very few—one to about 3 rods—a circumstance that might seem to indicate that the species was not numerous enough upon anything to make a wholesale migration necessary. A more puzzling fact was that the first forms seen were wingless and solitary except for their own progeny, and many of them had not yet begun to produce. There was in this no basis for suspecting that any migration in the usual sense, that is of a horde of winged forms, had taken place, but rather that restless individuals had crept over on to the potatoes from neighboring vegetation. No conclusive statement, of course, would be justifiable upon observations sc limited, and these suggestions relative to the manner of migration are merely tentative. Insectary observations showed this species to be active and restless at times both in the winged and young apterous forms.

The Practicability of Combating N. Solanifolii Upon Its Winter Host.

Since for several consecutive seasons of excessive infestation of the potato, *N. solanifolii* has while upon its winter (and consequently late fall and early spring) host lived in such restricted numbers that it was, to say the least, nowhere conspicuous, it is evident that any measure directed against this species while upon its winter host is for Maine quite futile. The readiness with which the insectary material accepted pea vines and shepherd's purse lays this species open to the suspicion of not being confined to 2 hosts for Maine. Further tests as to the wider range of food plants would be of much interest and there is a possibility that a complete food list would contain some helpful suggestions. Insectary tests as to a wide range of food plants are contemplated as a part of the further study of this species. As an example of the possible significance of fuller host plant data may be cited the following

observation. After the insectary material was found to accept pea vines for colonization, the fact that it is the custom in Aroostook County to plant peas with oats as a part of the crop rotation including the potato was remembered. These pea vines are, of course, sheltered by the oats and as they are cut merely for fodder a summer infestation of aphids would, unless especial search was made, pass undetected.

In the vicinity of Houlton, September 11-September 16, 1907, search on the peas growing with oats was made and both winged and wingless forms of *Nectarophora* sp. apparently like *N. solanifolii* were found. Like the *Nectarophora* upon potato, shepherd's purse, and buckwheat, the species upon peas was too badly attacked by fungus to render much work with it possible.

In view of the fact, however, that the species upon the potato will feed and multiply readily upon pea vines (see insectary notes) it might be advisable, if the trouble continues to be seriously prevalent, to omit the peas from the rotation scheme. For potatoes upon numerous 20 to 60-acre fields one year and peas over the same area the next would seem to offer an unbroken opportunity for the growth of the summer generations of this destructive plant louse. This suggestion does not touch the question of the winter host, because it would be upon these vines as upon the potato that the summer generations would occur, and even if eggs were deposited upon the pea, as it is harvested with the oat crop it could not serve as a dangerous winter host.

Summary as to Remedial Measures.

1. The standard remedies for plant lice, emulsion sprays, do not seem practicable for the large potato crop of Maine.

2. No other direct remedy seems to be more available.

3. It is apparently futile to attempt to combat this species in Maine through the medium of the winter host.

4. Clean culture may legitimately be classed among the available preventive measures with this pest as with most crop pests. Since it has been ascertained that *N. solanifolii* passes the winter in the egg stage and that the eggs are attached to the leaves of its host, shepherd's purse and possibly various other

weeds, the practice of fall plowing commends itself in this connection and also the burning over of grassy and weedy spaces in the vicinity of potato fields. As it seems not impossible, although it has not been observed, that belated specimens might under certain conditions remain upon potato vines slightly infested and the oviparous females develop there, the custom common through Aroostook County of burning the old potato stalks to get them out of the way is commendable as a precaution.

5. If *N. solanifolii* continues to be a serious pest upon the potato it may be advisable to drop the peas from the rotation.

6. While under favorable conditions *N. solanifolii* is a serious pest upon the potato, there seems to be nothing better to advise by way of direct remedy than to leave it to its natural enemies, which sometimes, as the fungus of this present season, serve practically to exterminate it over wide areas.

7. The countless beak wounds inflicted upon the stalk and leaves must render the potato more susceptible to fungus and bacterial disease. Its presence, therefore, should emphasize the need of careful Bordeaux sprays.

Natural Enemies.

1. Weather conditions stand high among the controlling influences of aphid growth, heavy or continuous rains serving as a check.

2. Predaceous insects. Among these found feeding upon *N. solanifolii* in Maine may be mentioned 2 lady beetles, *Adalia bipunctata* and *Hippodamia 13-punctata,* and larvæ of syrphus flies.

3. Parasitic insects. Braconid parasites of the subfamily Aphidiinæ have been bred from *N. solanifolii* taken in this State.

4. Fungus parasites. Frequent mention has already been made in this bulletin of the work of fungus upon *N. solanifolii* at Houlton and also at Orono whence it was introduced into the insectary. Dead specimens from both localities were submitted to Doctor Roland Thaxter, who kindly identified the Orono species as *E. planchoniana* Cornu, and that from Houlton as the more common *E. aphidis.*

Fig. 25. N. solanifolii on potato stalk. Leaves covered with honey dew, honey dew fungus, and cast skins.

Fig. 26. Potato plant showing the result of 14 days infestation of plant lice on perfectly healthy stalks.

DESCRIPTION OF NECTAROPHORA SOLANIFOLII ASHMEAD.

It will be evident to anyone interested in Aphididæ that *solanifolii* is quite possibly open to the synonomic honors so common to the genus *Nectarophora.* As the question cannot be satisfactorily settled for this species without straightening out *N. pisi* (!) and perhaps all the other nondescript green and pink *Nectarophora,* the writer modestly though regretfully refrains from offering any elucidating suggestions, at present. Utmost care has been taken and will be taken in the future work proposed for this species, to be positive that the data recorded for *N. solanifolii* refers to one species only so that at least it may be certain that the observations add nothing to synonymic confusion.

A considerable mass of mounted material of this species collected during 1904-1905 was kindly determined through the courtesy of the U. S. Bureau of Entomology by Mr. Pergande as *Macrosiphum (Nectarophora) solanifolii* Ashmead. Doctor Fletcher acknowledges the same authority for the name of the species abundant upon potato in Canada mentioned in his report for 1904.

The original description made for specimens found on *Solanum jasminoides* for this species appeared in the Canadian Entomologist, Vol. 14, 1882, pages 92-93, and may be quoted for the apterous viviparous form:

"*Siphonophora solanifolii* n. sp.

"Wingless female.—Length .12 inch. Elongate ovate and of a pale yellowish green color; beak short, not reaching middle coxæ, pale, tip black; antennæ 7-jointed, slightly reaching beyond abdomen, situated on large tubercles, pale greenish, joints infuscated, 6th joint shortest, dark, 7th longest, brown; eyes red; honey tubes very long, reaching considerably beyond abdomen, slightly thickened at base, infuscated at tip; style short, conical, greenish, coxæ shining and yellowish, feet black."

Mistake as to the identity of the so-called male is evident from the original description of this form and is therefore omitted. "Antennæ hardly reaching to middle of abdomen" and "honey tubes rather short" could not, in light of further acquaintance with this form, be expected to apply to a male of the genus under consideration.

In general *N. solanifolii* is a large, active species, usually green but very often pink, and sometimes yellowish, especially the young of the pink individuals.

Decidedly pink individuals occur both with the winged and apterous viviparous females. At Houlton, August 17, 1905, a pink-winged viviparous female was taken with 12 young, 7 of which were decidedly green and 5 decidedly pink. About 20 pink viviparous specimens collected at Maple Grove, August 18, 1906, were placed upon potato in the insectary. Some were winged and some were apterous. On August 29 the young of these were all found to be pink, though many were toning into pale yellow.

The insectary specimens of oviparous females were largely pink, though many were yellow, and a few distinctly green.

NECTAROPHORA SOLANIFOLII. *Winged viviparous female.*—Head yellowish green. Antennæ, proximal segments pale green, distal segments dark; length of segments: III, .88 to .96 mm.; IV, .76 to .9 mm.; V, .64 to .72 mm.; VI, .16 to .2 mm.; VII, .96 to 1.12 mm.; total length I to VII, 3.6 to 4.05 mm. Prothorax and thorax light yellowish green. Wings hyaline, veins dark brown, very slender, stigma pale brown. Total wing expansion 8.1 mm. Legs with proximal part of femora and tibiæ pale, tarsi and distal part of femora and tibiæ dark. Tarsi .16 to .2 mm. Abdomen light green unmarked dorsally or ventrally. Cornicles, with proximal portion green, and distal portion dark brown, inbricated, cylindrical, length .95 mm. or about 5 times length of tarsus. Style light green, ensiform, length .48 mm. or about one-half length of cornicles.

Total length of body to distal tip of style and exclusive of antennæ, 2.9 to 3.37 mm.

Winged viviparous female, pink individual.—Head light yellowish. Antennæ with I and II light yellowish, rest dark. Prothorax and thorax light yellowish pink. Abdomen pale pink. Cornicles light yellow with tips dusky. Style pink.

Apterous viviparous female.—Color as with the winged viviparous form. Antennæ, length of segments: III, .8 to .96 mm., IV, .72 to .88 mm., V, .56 to .72 mm., VI, .16 to .2 mm., VII, .96 to 1.2 mm.; total length of segments I to VII average about 4.05 mm. Cornicles .96 to 1.04 mm. in length. Style .56 mm.

Total length of body to distal tip of style and exclusive of antennæ, 4.05 mm.

Apterous oviparous female.—Head pale, nearly white. Antennæ with proximal joints pale, distal half dark. Length of segments: III, .68 to .88 mm.; IV, .56 to .68 mm.; V, .52 to .64 mm.; VI, .16 mm.; VII, .96 to 1.04 mm.; total antennæ length I to VII average about 3.6 mm. Prothorax and thorax pale like head. Legs with femora and tibiæ, proximal portion pale, distal portion dusky. Tarsi dark, .16 mm. long. Hind tibiæ conspicuously darker and much swollen and thickly set with senoria. Abdomen light salmon pink. Cornicles pale at base, distal half dark; length .6 to .8 mm. Style salmon pink, ensiform, length .32 to .4 mm. Total body length to tip of style, antennæ excluded, 2.13 to 2.15 mm. The size of the hind tibiæ of this form makes it readily distinguished from the apterous viviparous form and young, even to the unaided eye.

The pink variety has been described because these predominate. The color scheme of the green and yellow forms can be determined merely by substituting these colors for the salmon pink of the individual described, the dark coloration being the same for all 3.

Winged male.—Head and antennæ dark brown. Length of antennal segments: III, .72 to .8 mm.; IV, .48 to .64 mm.; V, .48 to .6 mm.; VI, .16 mm.; VII, 1.04 to 1.28 mm.; total antennal length I to VII, 2.93 to 3.60 mm. Prothorax and thorax dark brown. Wings deflexed, hyaline, veins dark and very slender, stigma pale brown. Legs brown, darker at tips. Abdomen brown. Cornicles pale brown, dark distally, cylindrical, .48 to .56 mm. long. Total body length exclusive of antennæ and cornicles, 1.12 to 1.57 mm. The thorax is large and strong to support the wing muscles, the abdomen much shrunken and is rendered conspicuous only by the comparatively (for the size of the body) long cornicles. The male is described from specimens observed in copulation, in order that no mistake as to the identity of the species might occur.

Explanation of Plates.

It will be seen from the accompanying camera lucida drawings that *N. solanifolii* is a fairly typical *Nectarophora* as regards antennæ. Although the number of sensoria varies somewhat within the limits of each of the four forms, the segments figured are representative. The antennæ of the apterous viviparous and oviparous females most closely resemble each other, segment III sometimes having 4 sensoria for each form, though the number is more commonly as figured. The number of sensoria is not constant for the winged viviparous form, there frequently being a few more than occurred in the specimen drawn, but they are in all cases arranged in a somewhat irregular row. As is usual for Aphididæ the antennæ of the males are conspicuous for the great number of sensoria present, giving a very uneven outline. Segment V characteristically bears sensoria not found in the other sex. Although the antennæ of the male are not actually so long as those of the females, they are, relative to the total length of the body, much longer, being in this sex more than twice the length of the body.

Fig. 27, winged viviparous form, Antennal Segment III.
Fig. 28, apterous " " " " III.
Fig. 29, apterous oviparous " " " III.
Figs. 30 and 31, winged male, Antennal Segments III, IV, V.
Fig. 32, viviparous form, Basal ⅔ of hind tibia.
Fig. 33, oviparous " " ⅔ " " "

Fig. 27.

Fig. 28.

Fig. 29.

Fig. 30.

Fig. 31.

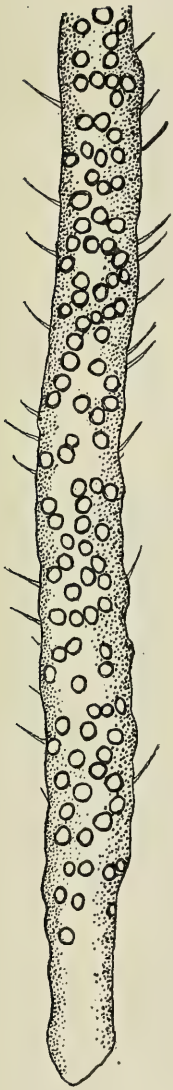

Fig. 33.

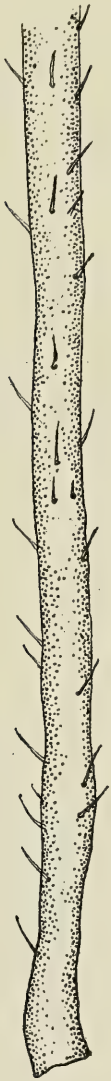

Fig. 32.

Fig. 34. The Carolina locust, killed by fungus, *Entomophthora grylli*. The specimen figured was collected at Orono, September 5, 1907. See page 270.

INSECT NOTES FOR 1907

EDITH M. PATCH.

The annual bulletin published under the title of Insect Notes is a record of such insects of Maine as come particularly to the notice of the Station during the season. It is not designed primarily as a remedial measure bulletin, as advice of this character is sent largely to suit the individual needs either by personal correspondence or wherever possible by popular economic circulars which are kept constantly in print for this purpose. For notice of the species recorded in Insect Notes we are in a great measure indebted to people all over the State who send specimens for identification which are frequently of much interest. Although the Station would be glad to keep in touch with the insect life in every part of the State, its entomological work is often concentrated for an entire season in a few places and thus for information concerning local outbreaks we are dependent many times upon data volunteered by correspondents. To those people who have thus aided the Station for the current year, the present bulletin is in itself an acknowledgment.

Where definite lines of work are in progress, notes upon insects outside these definite lines must be more or less incidental and the most significant of these are brought together annually in a bulletin of miscellaneous Insect Notes.

THE GIPSY AND BROWN-TAIL MOTHS.

The two insects most to be dreaded in the State, the brown-tail and the gipsy moths, are discussed so fully in so much easily available and widely distributed literature* that they are merely mentioned here by way of constantly keeping the danger from them in mind. The success with which they have been so far combated in places in which they have been most numerous in this State should in no wise serve as an excuse for less vigilance, but rather as a stimulus to the continuation of the most rigid measures. Any temporary negligence with either

* Maine Agr. Exp. Sta. Circulars and Bulletins; Maine Dept. of Agriculture, Augusta, Circulars and Bulletins; U. S. Bureau of Entomology, Washington, D. C., Circulars and Bulletins.

of these insects will inevitably bring disaster with the necessity of combating them over ever increasing areas at enormous expense.

Forests Attacked by One of "The Prominents."

Heterocampa guttivitta Walk.

For a distance of more than 40 miles across Southern Oxford, Cumberland and Androscoggin Counties, a caterpillar invasion swept clear of foliage much of the forest growth over large areas. The complaints were numerous about the middle of August. A correspondent from Wayne wrote: "These caterpillars are on all the maples in this section and stripping the foliage." From West Bridgton another said: "They are ruining the hard wood growth in the forests of Fryeburg, Sweden, and of a part of Bridgton." A resident of Bridgton reported them as "very plentiful here and devastating certain sections of the forests. They seem to prefer the beech trees, though they also are found on maple and apple trees." Specimens accompanying all these and various other reports all proved to be the same species, *Heterocampa guttivitta.*

August 15 and 16, South Leeds and Upper Gloucester were visited by the writer. At Upper Gloucester a beech forest was stripped as bare of foliage as winter trees. The insects for the most part were full grown and buried for pupation. By lifting back the top of the leafy soil from 1 to 3 inches the freshly formed pupæ and newly buried larvæ were found to be thick. The cocoon was very slight and was torn in disturbing the soil.

Numbers of Carabid beetles were searching about the bases of trees, most conspicuous among which, probably, because of its size, was the Fiery Hunter, *Colosoma calidum.* The predaceous bug, *Podisus modestus* (shown in Fig. 44) was particularly active. This species in both larval and adult stages was found in considerable numbers on the trunks of the trees sucking the blood of wilted looking caterpillars which they had stabbed. At the bases of many of the trees were little heaps of dead and half sucked caterpillars, while the group of *Podisus modestus* just above and still at work on other victims showed the cause of their condition. At South Leeds these caterpillars had entirely stripped a beautiful hard maple grove and were at work rid-

dling adjacent beeches. The larvæ here were not quite full fed and the sound of their jaws together with that of falling bits of leaves and castings was like the sound of a rain storm. They were also at work on oak and apple at South Leeds but not to such an extent as on the maple and beech.

The larva resembles closely *H. manteo* and *H. bilineata* and the species was not definitely determined from this form. By keeping the pupæ moist and warm in the laboratory, however, adults began to emerge Dec. 3, 1907, and these were kindly determined by Doctor H. G. Dyar as *H. guttivitta* Walk.

The specimens taken in Maine this season presented the greatest variety of dorsal color patterns in white, green, and brownish purple. All the color variations faded in the full fed larvæ, however, and before pupating the body of the caterpillar was dull green with almost all trace of other color obliterated except the dark side lines of the head. Three specimens are shown in Figs. 39, 40, 41.

The weather in the southern part of the State, unlike the rest of Maine was very dry this season and seemed to be particularly favorable for caterpillar growth. Numerous other species were at work during August and the "green striped maple caterpillar," *Dryocampa rubicunda,* defoliated maples in certain localities. See Fig. 38.

Forest Tent Caterpillar.

The Forest Tent Caterpillar, *Clisiocampa disstria,* has been in the increase in the State for 2 seasons, especially in the vicinity of Blaine and Mapleton, and though it is not yet very generally troublesome, it seems to be getting ready for one of its periodical outbreaks. A circular of information is in preparation for this species in order that the danger may be appreciated in localities where this caterpillar is gaining ground. The devastations of the forest tent caterpillar of 1889 and 1890 * are plainly remembered by people living along the Penobscot and in the vicinity of Seboeis, who still refer to "the caterpillar year."

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* Me. Agr. Exp. Sta. Report 1889, p. 188; 1890, p. 138.

Orchard Tent Caterpillar.

The large percentage of dead eggs of the common orchard tent caterpillar, *C. americana,* was noticed this season by even casual observers. This species was exceedingly numerous during 1906 and in certain Orono orchards as many as 5 to 20 egg clusters to a tree were found in the spring.

Following is the hatching record of 24 egg masses collected in April before any eggs had hatched:

Egg mass No.	Eggs Hatching.	Egg mass No.	Fggs Hatching.	Egg mass No.	Eggs Hatching.
1	0	9	0	17	41
2	0	10	0	18	138
3	0	11	92	19	4
4	0	12	93	20	96
5	0	13	0	21	108
6	0	14	64	22	0
7	0	15	123	23	5
8	0	16	26	24	134

This gives a total of 927 caterpillars to 24 egg masses, a number which would ordinarily be equaled by 4 or 5 egg masses.

The peculiar weather of the past winter may perhaps be held accountable for a share in this condition, not so much because of the excessive cold but because of the sudden changes occurring. On Jan. 16 the temperature swung from a maximum of 21 degrees above zero to a minimum of 40 degrees below zero the following night, making a range of 61 degrees in less than 24 hours. Jan. 21 the temperature ranged from 47 degrees above zero to 13 degrees below. It seems probable that a winter unusually long and severe with sudden fluctuations in temperature would be perilous for insect eggs exposed upon the twigs of trees as are those of the tent caterpillar.

Cherry-Tree Tortrix, *Archips (Cacœcia) cerasivorana.*

The "ugly nests" filled with little yellowish, black-headed caterpillars have been very numerous for several seasons, on wild cherry for the most part, though sometimes on apple and raspberry. One colony just hatching from the eggs was collected at Portland June 20 on chokecherry. These were reared in the insectary on apple leaves. The moths which developed from this colony had mostly emerged by August 6. A colony

just hatched on wild cherry at Orono June 12 was likewise bred on apple leaves and the moths emerged August 5-12. As is often the case with an insect which has for several seasons been particularly numerous, the cherry-tree tortrix has been this season attacked by various insect parasites.

Of the hymenopterous parasites, *Pimpla conquisitor* was taken at the ugly nest of this tortrix at Portland, July 23. *Exochus albifrons Cr.* were reared from ugly nests received from Otisfield, Maine. *Labronchus** sp. were reared from ugly nests from Otisfield, Waldoboro and Orono. *Macrocentrus** sp. were reared from nests from Waldoboro and Orono. A dipterous parasite, *Dichætoneura leucoptera* Johnson, emerged in great numbers from ugly nests from various localities.

One of the solitary wasps, *Odynerus* sp., was observed on the nest of this tortrix at Kennebunkport July 24. It had captured a full grown larva and with its jaws grasping the caterpillar just back of the head, was preparing to take flight. The larva was limp and helpless.

Archips fervidana Clem., the oak ugly nest, was reported this year as last from Mt. Desert Island. September 8 a correspondent from Southwest Harbor stated that from one to several of these nests were in every oak and that the caterpillars were denuding the oak groves rapidly. Some of the same species of hymenopterous parasites which were present with *A. cerasivorana* emerged from Mt. Desert nests of *fervidana*. *Dichætoneura leucoptera* Johnson and one other dipterous parasite were also bred from *fervidana*.

Orchard Insects in Maine.

There is probably no reason so far as insects are concerned why apple raising should not be as profitably carried on in Maine as in other parts of the country. The conditions are, however, in many places far more promising at present for the production of insects than apples. Almost unbroken lines of neglected and therefore dangerous apple trees stretch for miles along the roadsides, scattering ungathered windfalls as

* For the determination of these two hymenopters as well as about 20 other insects appearing in this bulletin, which were not named in the Station collection we are indebted to specialists in the United States Bureau of Entomology, through the courtesy of Doctor Howard.

food for apple maggots, curculio grubs, and larvæ of codling moths. There is rarely a farmyard in which a few apple trees have not been planted and then in many cases left undisturbed as food for whatever insects chance that way. Wild cherries and hawthorn as well as native apples are permitted to grow within insect flight of cultivated apples and form entirely satisfactory breeding places from the standpoint of orchard pests. Paramount inducements are thus offered for every apple pest that can endure the climate. In the face of this cordial standing invitation to apple insects, there is many an orchard owner in the State who is grumbling because the invitation is annually accepted, and who has about decided that there is not much use trying to get perfect apples enough for his own family use.

There is a panacea for most of this trouble to be found in *clean culture,* by which is understood in part the clearing out of worthless trees, both cultivated and native, that serve as breeding places for orchard pests; the proper pruning and spraying of all apple trees not cut down; the tilling of orchard soil to disturb insects hibernating or transforming there; and the persistent destruction of windfalls.

The difficulties in the way of securing clean culture are not so serious for the man who depends upon his orchard for his income, for he would, of course, expect to supply himself with the necessary help and equipment. But the people who are engaged in other occupations and have only a small orchard, or a few favorite trees, cannot always conveniently give their trees the necessary attention. There is probably no neighborhood nor any grange in the State, however, which could not find one capable man who could be induced to care for the trees in a certain locality. The utterly hopeless conditions which small orchards present all through the southern part of the State would seem to offer a perfectly practical proposition for cooperation. Any grange or neighborhood could easily afford the spraying equipment.

The great economy of time and energy made possible by some such arrangement is apparent, for it would necessitate but one person making an effort to become acquainted with the dangerous insects, their vulnerable points and remedial measures instead of 20 or 30 to do so.

The number of insects which occur upon any one species of tree is likely to be excessive. The number of determined spe-

cies of oak insects, for instance, recorded by Packard * is over 400 for the United States, and he estimates that "it is not improbable that ultimately the number of species of oak insects for the United States will be between 600 and 800 or even 1000," when they are all determined. Yet oaks still grow! And even if there should prove to be 1000 species of insects which occur upon the apple, apples could probably still be grown and with care still be grown for profit as well as pleasure. But as a matter of fact the insects which are doing real damage to apple orchards in Maine at present are very well known so far as their life histories and remedial measures are concerned and there is not one among them that is not practically combatable if fought consistently over a considerable area. This could be done by each man taking care of his own trees, or much simpler by some system of cooperation by which one man could direct the care of trees on a given locality. It does not come within the intention of this bulletin to recommend the manner of such cooperation. It might be accomplished in various ways—through the grange, by a neighborhood club, or if the sentiment of the town supported such a movement, local measures could be secured against any neglected apple tree as a public nuisance and a danger to the orchards in the vicinity.

In view of the fact that the apple crop is one of the chief interests of the State, the Maine Agricultural Experiment Station has constantly had the orchard in mind with reference to insects of economic importance. The majority of inquiries which are received accompany insects found upon apple trees. In order that fuller information may be sent in reply to such inquiries than could be possible through a personal letter, illustrated circulars upon about 30 orchard insects most common in the State are kept in print for use in correspondence, and are sent as replies to persons submitting these insects for identification.

With this economic literature available for distribution to anyone in the State at any time, it hardly seems necessary to repeat annually extended bulletin notes upon such standard orchard pests as the red humped caterpillar, the yellow-necked caterpillar, the tiger caterpillars *(Halisidota caryæ* and *H. macu-*

* Forest Insects, page 48.

lata), the fall web worm, the tussock caterpillar, the tent caterpillar, the bud moth, the codling moth, the apple maggot, and others, unless some such unusual condition arises as a peculiar parasite invasion or an unwonted increase which should, of course, be noted.

While the available circulars include only a small number of the multitude of apple insects, yet if the orchards are so treated as to combat the serious pests, the multitude of lesser evils need not be feared, for they will for the most part succumb incidentally to the treatment given to the really dangerous insects and thus many species may be killed with one treatment. Moreover the remedial measures against the standard pests overlap. For instance, the destruction of windfalls by pasturing an orchard with hogs is a measure directed at once against 3 of the worst apple insects in the State—the apple maggot, the curculio and the codling moth. Or removing colonies while young and still gregarious includes the red humped caterpillar, the yellow-necked caterpillar, the tiger caterpillar and others, all of which occur upon the trees during the same time. In a similar way, because arsenical sprays are recommended for a multitude of orchard pests, it does not mean that the sprays need be applied a multitude of times each season.

Much study has been put upon these orchard pests by economic entomologists all over the country, but that avails the orchards nothing unless the orchardists make practical use of the resulting suggestions. Experiment Stations have repeatedly demonstrated the value of spraying for the codling moth, yet it is optional with the owner of the trees whether he shall profit by those demonstrations or not. It has been known for 18 years that a consistent and persistent destruction of infested fruit would practically exterminate the apple maggot, and the apple maggot is working in many parts of Maine as much havoc now as it did 20 years ago.

It is due orchardists of the State that the insect pests upon so important a crop should be studied for the purpose of finding what can be done by way of combating them. It is no less due orchardists of the State that careless owners of neglected trees should somehow be induced to contribute to the health of orchards in general by either caring for their own trees or cutting them down.

If the well known and constantly recommended remedial measures against orchard insects of Maine were to be applied in good earnest, the standard apple insect pests of Maine would diminish in a wholesale and satisfactory degree. And this is a matter that rests with the owners of trees. Merely by way of comment it might be stated that in certain localities where it has been known for 15 years or more that the apple maggot (or "railroad worm") must be fought by the destruction of infested fruit, it is not unusual to hear some such remark as "Now, there's that high top sweeting. I haven't had an apple to eat from that tree for five years. The railroad worm gets them all." And while season after season the infested fruit is permitted to lie and rot undisturbed upon untilled sod beneath the tree, the railroad worm is actually blamed for continuing to breed in conditions rendered ideal for that very purpose. The full humor of the situation is forthcoming when the owner of the high top sweeting complains of his neighbor for rearing curculios in his apples "to infest all the apples in the vicinity," though just what difference it makes whether the railroad worm or the curculio gets the fruit is not apparent. However, merely by way of interesting information the neighbor's attention is called to Fig. 35, which presents a curculioed apple. If raisers of such deformed fruit would pasture their orchards with hogs they would destroy the curculios which are a menace to the neighborhood and incidentally some of the descendants of the railroad worms which have migrated from the high top sweeting across the way.

Grasshoppers.

The summer of 1907 has been conspicuously a grasshopper season. Many species were more abundant than usual, but the red-legged locust, *Melanoplus femur-rubrum,* was, so far as observed, guilty of most of the serious trouble. They were present over a large part of the State all summer in troublesome numbers, but most of the complaints were made in August after the grass was harvested, when they were to be started up in clouds. Potato fields, large orchards, raspberry and blueberry bushes, as well as a great variety of other vegetation suffered. The "Carolina locust," *Dissosteira carolina,* was very common, but this species together with many other of the grass-

hoppers fell vicitims to the fungus *Entomophthora grylli,** during late August and September.

Figure 34 shows one of these grasshoppers in the position characteristic of victims of the grasshopper fungus. In low meadows the work of this same fungus was particularly to be observed with certain of the *Tryxalinæ,* as many as 4 or 5 dead grasshoppers being found clinging to a single grass stem. One of the invariable symptoms of this disease is evinced in a tendency to climb and to cling, and the dead grasshoppers remain clinging to the tops of grass heads or weeds until beaten off by storms. The sick grasshoppers when disturbed do not jump but instead climb a little higher and clasp their legs a little tighter about the plant they are on.

Except in the southern part of the State, the season was very wet, a condition which favored fungus parasitism among much of the insect life, hairy caterpillars and plant lice as well as grasshoppers being especially susceptible.

Beetles.

Buprestids.—Chief among the Buprestids of the season is *Brachys ærosa* Melsh. June 15, 1907, everywhere in the vicinity of Portland the adults of this species were common, feeding greedily upon the leaves of various trees. Collections were made from *Alnus incana,* oak, hazelnut, wild rose, elm, hawthorn, birch, cherry, *Amelanchier,* hazelnut and willow, the leaves of all of which they were skeletonizing, though they were most abundant upon the first four mentioned. As many as 12 to 20 of these bettles were common upon a single leaf of alder or oak. Their bright metallic colors made them conspicuous in the sun. At the slightest jar they relaxed their hold and slipped to the ground. They were not taken in large numbers in other parts of the State, though a few were found at Orono and elsewhere during June. This species in the larval stage is a leaf miner.

The strawberry weevil, *Anthonomus signatus,* is apparently widely distributed throughout the State, although strawberry growers have not complained of their presence to any great extent on cultivated plants. One large strawberry crop a few miles out from Farmington was practically destroyed by this

* Kindly determined by Doctor Roland Thaxter.

weevil this season, however. The weevils were collected in considerable numbers also near Houlton, June 28, 1907, about the blossom buds of wild red raspberry. Some of the weevils were inside the buds depositing eggs and others were observed to be nibbling at the bud stem, causing the buds to wither, as is their custom.

The Rose Chafer, *Macrodactylus subspinosus,* continued to be as troublesome this year as last. From Clinton it was reported as destroying hens. Another correspondent sent speciments of this beetle with the statement that out of a flock of about 2000 chickens on free range nearly 400 had killed themselves in 5 days by stuffing themselves with these chafers. The birds averaged from 12 to 13 weeks, and in some cases part of the chafers with which their crops were packed were still alive after the death of the greedy chicken.

The Striped Cucumber Bettles, Diabrotica vittata, were so numerous this season at Orono that cucumber and squash vines suffered severe attacks. Lime, bug death, sulphur, red lead, or ashes heaped thick upon the plants kept the bettles from the upper surface of the leaves, but as they congregated cheerfully underneath and ate through the leaves to the application on the upper side, these remedies did not avail much. Turpentine or kerosene and land plaster when applied about the plants in sufficient amount to keep away the bettles, killed the plants. This may have been partly due to the fact that a heavy rain followed the treatment and beat the young plants down against the application. One man practically rid his field by going over his vines when they were very small and gathering and killing the beetles by hand. The beetles were so thick that thousands were readily killed in this way. After gathering the beetles for 3 consecutive mornings, the infestation was reduced to such an encouraging extent that the process was repeated 3 or 4 mornings more, when no further treatment was necessary. This was, of course, a tedious method, but it disposed of the beetles inside of a week, while a field a few miles distant where nearly all the remedies which have ever been recommended against this pest were tried on different plats, the beetles remained in extremely troublesome numbers for between 3 and 4 weeks, during which time the adults had deposited so many eggs that some of the vines wilted later in the season

from the larval attacks in the stalks. In these treated plats the fall generation appeared in October as numerously as in June and the Hubbard squashes were pitted thickly with holes in which the beetles feasted until the squashes, which were undersized anyway, were unpresentable for market purposes.

Macrops vitticollis.—Besides the flea beetles, *Dibolia borealis* Chevr., which riddled the plaintain leaves, *Plantago major,* all over the State, plaintain crowns were found to be excavated by numerous small beetle larvæ. Some of these were collected July 23 at Portland in order to secure the adult beetles. On August 26, 2 beetles developed which proved to be *Macrops vitticollis* Kirby.

Sawflies.

The birch sawfly, *Nematus erichsonii,* is again at work in Maine upon the larch or tamarack, or as it is more popularly known here, the "juniper." By August 8 the work was mostly in the vicinity of Houlton, but clusters of larvæ still remained here and there and it was gratifying to note that a fair percentage of these had attached to them the small white eggs of a Tachina parasite. The larvæ of *Crœsus latitarsus,* a sawfly common in the State, were received from Bar Harbor September 17, where they were attacking birch. The fir tree sawfly, *Lophyrus abietis* Harris, was present at Seeket, where it completely stripped some fir trees and spruce. Cocoons were received from this locality August 29 and September 10, and on the latter date cocoons of the same species were received from MacMahan, Sagadahoc County. The adults emerged from the middle to the last of September. This species also attacks the pitch pine, and seems to have a deplorable start in the localities mentioned.

An Ant Attack on Plant Lice.

June 12, a birch growth was visited where great numbers of a large and sprightly aphid, *Callipterus betulæcolens,* were to be found both in late pupal and freshly winged condition. This species is very active, running lightly and dropping from the branch at the slightest jar, and were thus seen everywhere on the ground as well as on the trunks of evergreens and other trees where they do not feed.

Ants were observed to be traveling to their nests with these aphids in their jaws, both in the late pupal and the winged

stage. As numerous ants were doing this and from many nests, the incident was of particular interest. As the aphids appeared to be squeezed and helpless, all the ants which could be caught in about 20 minutes were made to drop their aphids for examination. The aphid in each case was either dead or roughly injured and there seemed to be but one explanation—that the ants were appropriating these juicy insects for food. In view of the peaceful and often interbeneficial relations of ants and aphids in general this occurrence seems worth noting.

Aroostook Potato Insects.

The nearly continuous rains of the season made field observations unprofitable in this part of the State. A considerable mass of miscellanous data for various potato-feeding insects has accumulated, but the notes for the most part should be supplemented by observations over a longer period of years, before being recorded. A single species of plant louse, *Nectarophora solanifolii,* was followed closely throughout the season and the results given in a separate bulletin. A spring search for the tarnished plant-bug, *Lygus pratensis,* present in enormous numbers last fall,* was made May 6-8, with the surprising outcome that in a particularly favorable hibernating place only one tarnished plant-bug was uncovered in several hours' careful hunting. Meanwhile 200 or 300 ground-beetles and rove-beetles were observed skirmishing the same haunts, and the following laboratory feeding experiments confirmed the suspicion that the tarnished plant-bugs seeking this shelter the previous fall, crept literally into the jaws of their natural enemies.

Predaceous Beetles and Hibernating Insects.—Feeding notes for ground-beetles and rove-beetles. A potato field near Houlton, the vines of which were in the fall of 1906 overrun with tarnished plant-bugs, 2 species of flea beetles *(E. cucumeris* and *S. hudsonias)* as well as other plant feeding insects, is bordered by tempting shelter for hibernating insects. At the left of this field separating it from the next is a lane with a line of logs laid in lieu of a fence. Grass and weeds grow the whole distance and more or less rubbish (piles of old potato vines, etc.)

* Me. Agr. Exp. Sta. Bul. 134, p. 214-215.

have been tossed up along the ridge. At the right of the field is an uncultivated piece of land, part swamp and part wooded knolls, along the slopes of which the fallen leaves are caught in drifts. Search was made in the spring, May 6-8, before their hibernating pests were on the wing in this locality, and though tarnished plant-bugs were found in considerable numbers under the leaves at the right of the field where predaceous beetles were not present to any great extent, at the left, equally favorable hibernating ground to all appearances, these insects were found in the proportion of 1 to several hundred ground-beetles and rove-beetles. The inference was acted upon by collecting the beetles for laboratory observations as to their diet. The ground-beetles were the common Carabid species, *Pterostrichus lucublandus* Say.

Test with a lot of 22 ground-beetles.

May 11. They were given one *Cosmopepla carnifex* which they did not eat until May 18.

May 13. They were given 2 negro bugs *(Corimelæna pulicaria)*. These they devoured May 15.

May 14. They were given 6 sowbugs. May 18 only one live sowbug was left and a beetle was carrying off bits of a sowbug.

They showed no eagerness in regard to any of the foregoing insects. May 18, however, they became much excited upon being given an inch-long moth pupa. They tried patiently to bite it, but the pupal skin was particularly hard and it slipped about so that it had to be finally cut for them. In less than a minute 20 of the 22 beetles were either feeding upon the pupa or fighting violently for a chance. They hauled one another off by the legs and were very much excited and vicious, the taste of this food seeming to make them tigerish. They had been stupid for a week previous. While they were still excited over the one-inch pupa they were offered a cecropia pupa taken uninjured from the cocoon. This they attacked at the abdominal creases and succeeded in biting through. After gorging at this feast the beetle abdomens protruded beyond the wing covers for more than one-sixteenth of an inch, giving them a peculiar appearance.

Test with Lot of 8 ground-beetles.

May 13. They were given 8 negro bugs *(Corimelæna pulicaria)* and one *Cosmopepla carnifex.* May 18, 3 negro bugs and the *C. carnifex* had been eaten. A crushed live negro bug offered them was devoured at once. They showed hesitation in attacking live ones. Their jaws seemed to find little purchase when they tried. Four beetles were observed to bite at the same negro bug, but their jaws slipped off every time without harm to the bug.

May 18. A sowbug which had been with them for 5 days was still alive and unharmed.

May 18. They were given an unbroken cecropia pupa, which they soon punctured at the abdominal rings and gorged as much as their bodies would hold.

Test with lot 23 ground-beetles.

May 10. They ate on this date 3 cut worms (a little less than 1 inch long), 2 tarnished plant-bugs and 1 wounded sowbug.

May 11-12. They devoured 5 unwounded sowbugs and 1 *Cosmopepla carnifex.*

May 13. They disposed of the half of a beetle *Serica vespertina* that was cut for them.

May 15. They were offered small eggs but remained indifferent to those that were broken for them as well as the whole ones.

These ground-beetles seem a little shy about attacking their prey, but when the first pair of jaws have pierced the chitinous skin the other beetles gather about and there is soon nothing left of the soft parts of the victim. If a morsel is small enough a beetle grabs it and runs, often with several beetles after him. At the body of an insect too large to be dragged much they pile up one above another devouring the prey, or if others crowd them away they bite viciously at one another for a place. They nip at one another between the thorax and abdomen or pinch each others' legs. One beetle had one of his legs bitten off between the femur and tibia by another who was trying to drag him away from a cutworm.

Test with the rove-beetles or Staphylinids.

These beetles ate tarnished plant-bugs, negro bugs *(C. pulicaria), Cosmopepla carnifex* and cutworms. Three Staphy-

linids ate a fourth of the same species which was enclosed in the same vial with them. They had no other food at the time. Two individuals were observed pulling at 1 small cutworm like 2 chickens over an earthworm, each bracing its legs and tugging while they curved up the tips of their abdomens high in the air with a threatening jerk. A small cutworm was given to a pair of hungry rove-beetles. The female dragged the partly devoured caterpillar beneath her and bit the male so viciously when he attempted to share it that he died about an hour later.

All the insects fed to the Staphylinids as well as the Carabids were alive and uninjured except when otherwise stated.

The fate of countless hordes of hibernating insects must be settled by such predaceous beetles during the fall and spring, and thus such lively and difficult insects to combat as the tarnished plant-bug find a natural check in the voracious appetites of these beetles everywhere to be seen skirmishing over the ground and under rubbish. The common ground-beetles would seem effective particularly with such soft-bodied insects as the tarnished plant-bug which proved attractive morsels during the feeding observations. This pest is particularly active only in the warmth and sunny weather, and seeks shelter during weather which the ground-beetles accept for hunting days. Its dormant days particularly during the fall and spring are a vulnerable season in the life history of the tarnished plant-bug at a time when the ground-beetles are still active. Such natural aids as these are, it is to be regretted, often entirely unappreciated, yet they accomplish more in a case like the tarnished plant-bug which is often not practically combatable by artificial means than man could possibly hope to do.

Cosmopepla carnifex.—July 19 about 20 of these little black and red bugs which are numerous upon potato, mullein, mint, thistle, buttercups and many other plants near Houlton were caged upon a potato plant in the insectary. August 13, one bug and several young ones were still feeding upon the plant, the stalks and leaf stems of which showed numerous black beak wounds.

Euchistus tristigma.—From June 13 to July 4, 10 of these large bugs were caged on a potato plant in the insectary. During this time several egg clusters were deposited upon the leaves

of the plant and upon the cage. The young, hatching, took at once to the potato and fed there and the old bugs spent much time with their beaks deep in the stalks drinking sap. The beak punctures caused little swollen lumps to appear about the black wound on the stalk and along the midvein of the leaves. See Figs. 36 and 37.

Podisus modestus.—A second and larger insectary colony of the foregoing bugs, *E. tristigma,* was observed to be rapidly diminishing in numbers. Examination showed that a specimen of the predaceous bug *P. modestus* had been inadvertently caged with them. This bug was placed in a glass with 8 young *E. tristigma* and was observed to stab and suck them dry. *P. modestus* is an old and well-known enemy to dangerous insects. It was observed this summer feeding upon larvæ of the potato beetle, currant worms, tent caterpillars, cabbage worms and other caterpillar pests. See Fig. 44.

Milo, July 5, the writer found a female of this species depositing eggs on balsam fir. Two neat rows of eggs were started on the underside of a needle when the bug was found, 6 eggs having been deposited, the first at the tip of the needle. The bug was suspended dorsum down with all 6 legs clasped about a single needle, the abdomen tip pointed toward the tip of the needle. The next 5 eggs were laid regularly and alternately left and right and one egg was deposited after every 2 minutes' wait, at 2.09, 2.11, 2.13, 2.15, 2.17 P. M. exactly. The bug then left the needle and the 11 eggs.

Grasshoppers were at Foxcroft and other localities thick enough to injure potato vines, particularly along the edges of the fields, the common red-legged locust, *Melanoplus femur-rubrum,* doing most of the damage.

Blister Beetles.—From Columbia Falls, August 11 a box of beetles came with the complaint that they were "very destructive on the potatoes, many times as bad as potato bugs." These were the gray blister beetles, *Macrobasis unicolor,* Kirby, which are now and then numerous enough to be very troublesome locally. A black blister beetle, *Epicauta pennsylvanica,* also fond of potatoes, is on the increase in the southern part of the State. As the larvæ of blister beetles feed largely upon grasshopper eggs, their appearance in large numbers is almost certain to follow a grasshopper increase, and in reckoning their depre-

dations on potato and certain garden vegetables their benefits as a destroyer of grasshoppers must be taken into account. An oil beetle, *Meloe angusticollis,* closely related to the blister beetles, was found here and there eating potato leaves, but these are not numerous enough to do any damage.

Trichocera regelationis Linné.—Maggots breeding in potatoes. May 17, in response to complaints of maggoty potatoes, a visit to Patten was made in order to examine the infested potatoes. Great numbers of slender maggots were found in a lot of potatoes that froze last fall and were soft and rotting in May. Some of these potatoes were placed in the insectary and the adults which emerged about June 1 proved to be the species recorded. A second generation developed in the insectary, 16 adults appearing about October 26. Whether this species would develop in healthy potatoes was not ascertained.

Gall Insects.

No attempt has been made to list the insect galls of Maine. The following few species taken in this State are in the Station collection, together with the insects emerging from them. Such of these as had not previously been determined were submitted to Mr. William Beutenmuller, American Museum of Natural History, who kindly determined them:

Aphid galls.—Pemphigus rhois, Fitch, on sumach; Pemphigus populimonilis, on Populus balsamifera; Hormaphis hamamelidis, Fitch, on Hamamelis virginiana; Hamamelistes spinosus, Shiner, on Hamamelis virginiana; Colopha ulmicola, Fitch, on elm; Chermes abietis, Linn, on spruce.

Mite galls.—Acarus serotinæ, on wild cherry; Acarid, on Amelanchier; Phytoptus (Eriophyes) quadripes, Shimer, on Norway maple.

Dipterous galls.—Cecidomyia niveipila, O. S., on oak; Cecidomyia sp., on hazel nut; Cecidomyia sp., on Cratægus; Cecidomyia batatas, O. S., on willow; Cecidomyia strobiloides, O. S., on willow; Cecidomyia rigidæ, O. S., on willow; Cecidomyia solidaginis, Loew., on golden rod.

Hymenopterous galls.—Andricus palustris, O. S.; Andricus punctatus, Bass., on oak; Andricus (Callirhytis) scitula, Bass., on oak twigs; Andricus sp., on red oak; Andricus ventricosus,

Bass., on oak; Diastrophus turgidus, Bass., on red raspberry; Diastrophus cuscutæformis, O. S., on blackberry; Biorhiza forticornis, Walsh., on Quercus alba; Eurostra solidaginis, Fitch., on golden rod; Holcaspis globulus, Fitch., on oak; Rhodites globulus, Beuten., on rose; Rhodites bicolor, Harr., on rose; Rhodites rosæ, Linn, on rose; Rhodites radicum, Bass., on sweet briar; Solenozopheria vaccinii, Ashm., on Vaccinium canadense; Andricus lanata, Gill., on red oak.

Table Recording Some of the Insect Collections of 1907.

A considerable number of insects interesting either in themselves or deriving a significance due to the circumstances in which they are found, come to the attention of the Station each season. A few of these which it seems desirable to record without extended notice are listed in the table on the 3 succeeding pages.

Table recording some of the insect collections of the season of 1907.

Scientific name.	Common name.	Date.	Locality.	Remarks.
Coleoptera.				
Adimonia cavicollis Lec	Cherry leaf beetle	July 5	Milo	Riddling leaves of wild cherry. Depositing eggs.
Adoxus vitis Fabr		July 30	Sherman	Feeding on leaves of Salix sp.
Agrilus ruficollis Fab	Red-necked blackberry borer	July 11	Farmington	Adults feeding on blackberry leaves.
Amphicoma lupina Lec		July 29	Auburn	Reported very numerous in Timothy meadow.
Anthobium pothos Mannh		July 6	Orono	Numerous in blossoms of Vibirnum cassinoides L.
Brachyacantha ursina Fab		July 18	Orono	Great numbers on cherry tree in orchard.
Brachyacantha ursina Fab		July 5	Milo	Common on brake fern. Mating.
Callidium antennatum Newm	Black horned Callidium	May 27	Athens	Adults numerous in attic of new house.
Callidium antennatum var	Black horned Callidium	June 25	Orono	Resting on cedar trunks.
Clytanthus ruricola Oliv		July 8	Orono	Adult beetle feeding on rose buds.
Crepidodera helxines Linn	Small willow flea beetle	June 15	Portland	Eating willow, wild cherry and apple leaves.
Criocephalus agrestis Kirby		July 14	Orono	Adult beetle taken.
Cryptocephalus notatus Fab		June 28	Houlton	Adults feeding on hazelnut and willow. Mating.
Cryptorhynchus lapathi Linn	Willow borer	June 7	Orono	Single beetle on willow twig.
Dibolia borealis Chevr		June 18	Throughout the State	Leaves of plantain, Plantago major, everywhere riddled by this flea beetle.
Dichelonycha elongata Fabr		June 26	Orono	Feeding on leaves of alder, birch and plum.
Dichelonycha testacea Kirby		June 26	Orono	Feeding on leaves of alder, birch, and plum.
Disonycha 5-vittata Say		July 11	Orono	Common on willow. Mating and depositing eggs.
Gymnetron teter Fabr		July 18	Sherman	Numerous among buds of mullein, Verbascum thapsus L.
Haltica carinata Germ		June 26	Orono	Beetles numerous feeding on elm. Eggs yellow, in rows along midrib and other veins.
Haltica ignita Seliger	Lesser grape vine flea-beetle	June 18	Portland	Common. Eating foliage of wild rose.
Hoplia trifasciata Say		July 5	Milo	Beetles numerous in flower clusters of Viburnum cassinoides L. Mating.
Hylesinus aculeatus Say	Ash timber beetle	Sept. 6	S. Waterford	"In quantities on windows."
Isomira quadristriata Coup		July 5	Milo	Numerous in flower clusters of Vibernum cassinoides L.
Lina lapponica Linn		June 28	Houlton	Adult taken on Populus.
Malachius æneus Linn		June 28	Houlton	Flying about buttercups and other meadow flowers
Monohammus marmorator Kirby	Marbled pine borer	Aug. 12	Bar Harbor	Single specimen taken.
Pissodes dubius Rand			Orono	Common.
Phyllobrotica limbata Fabr		July 11	Farmington	Beetles riddling deadly night-shade. Numerous.

Polygraphus rufipennis Kirby	Destruc ive spruce bark beetle	June	28	Houlton	Near bridge over Meduxnekeag R. which was filled with logs.
Rhabdopterus picipes Oliv		July	11	Farmington	Numerous on blackberry eating leaves. (They ate both potato and apple in confinement).
Rhagium lineatum Oliv	Ribbed pine borer	June	12	Orono	Adults common.
Rhopalopus sanguinicollis Horn		June	25	Orono	Adults common.
Rhynchites cyanellus Lec		July	30	Sherman	On Salix sp. Mating.
Saperda calcarata Say	Poplar borer	Aug.	10	Orono	Single specimen taken.
Saperda mœsta Lec	Poplar borer	June	15	Veazie	23 adult beetles taken just before emerging from galls on twigs of single tree, Populus balsamifera
Sciaphilus asperatus Bonsd		July	25	Farmington	Adult feeding on elder berry leaves, also taken in strawberry bed.
Serica sericea Ill	Silken Serica	June	15	Orono	Numerous on alder and birch.
Trichius affinis Gory		July	15	Orono	Adults eating rose blossoms.
Trirhabda canadensis Kirby		July	24	Kennebunkport	Numerous, eating leaves of goldenrod.
Lepidoptera.					
Ceratomia amyntor Geyer	Horn shouldered sphinx	Aug.		Various locaiities	Larvæ often reported from elm. Usually the green variety but sometimes the brown.
Eufitchia ribearia Fitch	Currant span worm	July	16	Houlton	Larvæ on wild currant. Moths emerged July 31. Part of larvæ parasited.
Euproctis chrysorrhæa Linn	Brown tail moth	July	24	Kennebunkport	Moths numerous. Depositing eggs.
Euproctis chrysorrhæa Linn	Brown tail moth	Aug.	14	N. Haven	2 live female moths received with the eggs masses just deposited. Late specimens.
Euproctis chrysorrhæa Linn	Brown tail moth	Sept.	4	W. Pownal	An egg mass received, not yet hatched. Very late.
Hybernia tiliaria Harris	Lime tree winter moth	June	28	Houlton	Larvæ on apple and wild cherry.
Hyperchiria io Fabr	Io moth			Various localities	Larvæ numerous on trees and in gardens. Several cases of painful poisoning reported.
Oxyptilus tenuidactylus Fitch	The raspberry plume	July	11	Farmington	Moths common resting on wild blackberry. Mating
Paonias excæcatus S. & A	Blind eyed sphinx	Sept.	10	Orono	Larva covered with cocoons of Braconid parasites. On willow.
Paonias myops S. & A		July	18	Houlton	A pair of moths.
Phoxopteris nubeculana Clem	Apple leaf sewer	Sept.	11	Clifton	Larvæ numerous in orchard.
Sesia tipuliformis Linn	Currant borer	June	29	Orono	Moths collected from currant bushes. Mating.
Sphinx chersis Hbn	Pen marked sphinx			Various localities	Moths and larvæ very common.
Sphinx drupiferarum S. & A				Various localities	Moths and larvæ very common. Many parasited by tachinids.
Sphinx gordius Cram	Apple sphinx	July	2	Exeter	Larva.
Tolype velleda Stoll	Velleda lappet			Various localities	Larvæ numerous during August on apple. Moths depositing eggs, Sept. 17-23.

Table recording some of the insect collections of the season of 1907—Concluded.

Scientific name.	Common name.	Date.	Locality.	Remarks.
Diptera.				
Anopheles quadrimaculatus Say	.....	Sept. 9	Orono	Taken in house.
Phorbia brassicæ Bouché	Cabbage maggot	Apr. 30	Winthrop	Pupæ near roots of diseased lettuce in hot beds. Adults emerged May 13.
Phorbia ceparum Meigen	Onion maggot	June 29	Orono	In Onions. Adult flies emerged July 22.
Rhagoletis pomonella Walsh	Apple maggot	July 16	Orono	Flies common about apple trees.
Rhagoletis pomonella Walsh	Apple maggot	July 11-25	Farmington	Flies common about apple trees.
Rhagoletis tabellaria Fitch	.....	July 11-15	Orono	Flies numerous upon Cornus stolanifera Michx. Later, maggots of (probably) this species plentiful in the berries.
Hymenoptera.				
Limneria guignardi	.....	Sept. 14	.....	Parasites bred from red humped caterpillar, Oedemasis concinna.
Urocerus abdominalis Harris	Yellow banded Urocerus	Aug. 8	Houlton	Single specimen male.

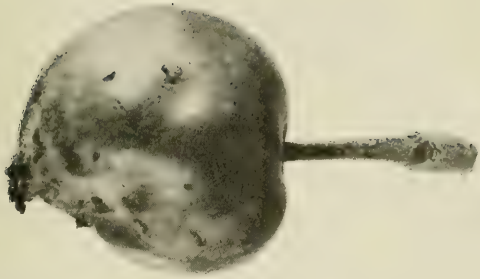

Fig. 35. Apple deformed by Plum curculio. The apple figured was taken from an orchard near Portland about the middle of July, 1907. See page 269.

Fig. 37.

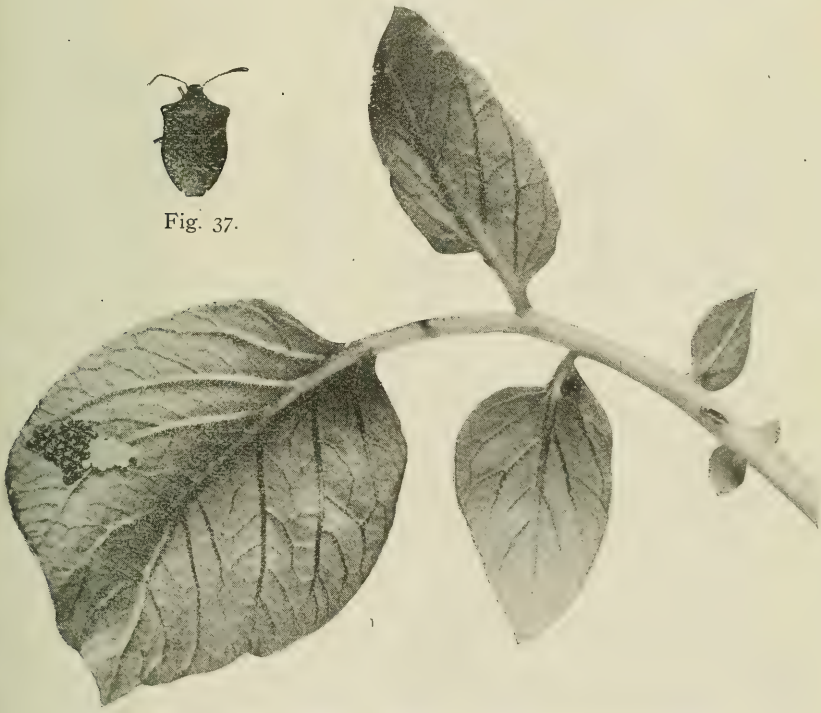

Fig. 36. Eggs and recently hatched young of plant feeding bug. *Euchistus tristigma,* on potato leaf. Notice wound on stem which is caused by the full grown bug of same species shown in Fig. 37. Insectary material, Orono, 1907. See page 277.

Fig. 38. Green striped maple caterpillar, *Dryocampa rubicunda.* Taken near Greene, Me., August 14, 1907. See page 263.

Fig. 39.

Fig. 40.

Fig. 41.

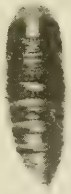

Fig. 42.

Fig. 43.

Figs. 39, 40, 41, three color varieties of "The Prominent" caterpillar which ravaged hardwood growths in Maine this season. Specimens collected at South Leeds August 15, 1907.

Figs. 42, 43. Pupæ of "The Prominent" taken at Upper Gloucester, August 17, 1907. See page 263.

Fig. 44. Predaceous bug, *Podisus modestus* (slightly enlarged), which feeds upon destructive caterpillars and other insects. See pages 262 and 277.

POTATO DISEASES IN 1907.

W. J. Morse.

In comparison with the conditions prevailing for several years, particularly with those of 1906, the season of 1907 presents a decided contrast with regard to the development of the various Maine potato diseases. All through the eastern part of the State, low temperatures prevailed during the entire growing season. Planting and hoeing were delayed from 2 to 3 weeks and spraying largely interfered with. The wet weather at digging time and immediately preceding, greatly increased the amount of loss from rot on unsprayed or improperly sprayed fields.

Early Blight.—*Alternaria solani,* which was very prevalent and destructive during the dryer season of 1906, was seen only on a few fields, late in the season—little or no damage resulting from this cause.

Late Blight.—*Phytophthora infestans.* For several seasons preceding 1907 this fungus has been responsible for very little damage in Aroostook County. This has been due partly to the almost universal practice of spraying and partly to the prevailing weather conditions. A careful search over several hundred acres the last of August, 1906, failed to show a single leaf of well defined late blight. In 1907 it was first seen by the writer August 8 at Ft. Fairfield, where the disease was well distributed and had already destroyed the entire foliage on one field. Very soon all but the most thoroughly sprayed fields were severely attacked. Several days of bright, dry weather beginning the third week in August decidedly checked the epidemic in most localities. Wet weather about September 1 started the blight again with renewed vigor, this time lasting until frost came. Continued wet weather through September resulted in a large amount of rot following blight except on the most thoroughly sprayed fields.

A somewhat peculiar form of the dry rot caused by this fungus on potatoes from the stored crop of 1906 is elsewhere described.

The complaints from scab were much less numerous than in 1906, and so far as could be ascertained from observation and correspondence the percentage of loss from this cause was actually much less. This is in direct contradiction of the statement frequently made that scab is more prevalent in wet seasons than in dry.

Internal Brown Spot of the Tuber. This is a non-parasitic disease, common in some parts of Europe although but little known in America. Specimens of this disease have, as yet, been received from only one locality in Maine.

Black Leg is another disease or possibly a type of disease which is recorded for the first time from Maine. Since 1903 somewhat similar diseased conditions of potatoes have been reported from Ohio, Colorado, Florida, Vermont and Canada, under various names such as "potato rosette," "collar rot," "little potato disease," "black leg," etc. The reader is referred to the more detailed description for the characters, appearance and distribution of this disease.

A discussion of the following topics with reference to potato diseases and their treatment, based largely upon the studies of the past season, will be found in the succeeding pages.

Dust Sprays vs. Wet Bordeaux for Potato Blight.

The use of dry or dust sprays is by no means a new idea, but their extended use for potato blights is a matter of quite recent development in Maine. A few dust machines, used in 1906, almost without exception as far as the writer can ascertain, upon fields where no unsprayed or wet bordeaux checks were saved, and in a season very free from late blight, led many to believe that dusting is an ample protection against potato blights. As a result certain limited sections used dry sprays almost entirely during 1907.

If equal protection can be secured, dusting has many advantages over wet bordeaux, even though the first cost of the necessary materials for the former are much more than for the latter. The advantages lie chiefly in the ease, rapidity and cheapness of application. Very frequently it may be necessary to cart the water for wet bordeaux half a mile or more. This hauling of 1000 or 2000 gallons of water every time a 20-acre field is sprayed is no small item of expense. Furthermore the hauling of a 100-gallon spray tank requires two horses and the services of a second man are necessary for a large part of his time to prepare the spray while the other man is applying it. The dust machines are light, even when loaded to their full capacity. One man with a light, fast-walking horse, can cover as much ground with a dust machine in 1 day as can be done in 2 or 3 days with a pair of workhorses attached to a heavy sprayer. On account of the present scarcity and high price of labor these points in favor of dusting have appealed quite strongly to potato growers.

For several years the Station has been carrying on experiments to test the relative merits of dust and wet sprays. Only part of this data has been published.*

In all trials previous to 1907 the weather conditions were such that little or no late blight occurred and as a consequence no well marked results were secured. The trials of the past season were conducted upon the farm of and in cooperation with the Commissioner of Agriculture, Hon. A. W. Gilman, of Foxcroft. All of the ingredients of each kind of spray were

* Woods, C. D. and Bartlett, J. M., Me. Agr. Exp. Sta. Bul. 112, p. 6 (1905) and Bul. 126, p. 34 (1906).

carefully measured and weighed at each application and the yield of the resulting crop determined by weight.

The experimental field was well drained, sloping slightly to the east, the rows running north and south. The soil was well adapted to potato growing and uniform throughout. The land had been in sod for several years. In September, 1906, a light coat of stable manure was applied with a manure spreader. The field was plowed in May and thoroughly harrowed before planting, which was begun on June 8. On account of a storm, that portion including Plots 8 to 13 was delayed in planting a few days, but the work was all completed within a week from the beginning. One thousand pounds per acre of a commercial fertilizer carrying 3 per cent nitrogen, 6 per cent phosphoric acid, and 10 per cent potash was applied at the time of planting. The plants were very strong and vigorous, and after the first few weeks of growth absolutely no difference could be detected in the appearance of the different plots till the foliage began to show the effects of blight.

For experimental spraying 13 plots about 39 rods long and containing approximately one-third acre each were laid off on this field beginning on the east side. These plots were all sprayed 6 times, on the following dates, July 17 and 27, August 2, 9, 16 and 27.

Plots 1, 3, 5, 9, 11 and 13 were sprayed with standard wet bordeaux. For the first 3 applications single nozzles were used to each row, applying not over 45 gallons per acre. The last 3 times 2 nozzles per row were used, applying 70-75 gallons per acre.

Plot 2 was dusted with 6 pounds of sal bordeaux per acre, and Plot 4 with 10 pounds of sal bordeaux per acre.

Plot 6 was an unsprayed check. It was sprayed with paris green only for Colorado beetles.

Plot 7 was sprayed with sodium benzoate bordeaux,* applied at same rate and the same amount as standard wet bordeaux.

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* This spray was tried at the request of a firm which manufactures sodium benzoate and according to the formula which they furnished as follows: Copper sulphate 1 pound, lime 1 pound, sodium benzoate ½ pound, water 50 gallons. "Dissolve the different ingredients separately in about the whole quantity of water required, then combine and add sufficient water to make up to 50 gallons." The manufacturers state

Plot 8 was dusted with 6 pounds Leggett's Blight Dust No. 2 per acre.

Plot 10 was dusted with 6 pounds Bowker's Dry Boxal per acre.

Plot 12 was sprayed with 10 pounds Bowker's Boxal Paste per acre.

To apply the dust sprays a horse power cart of the type known as the "Beetle" was used. To secure uniform applications and to avoid changing the regulator on the machine for each plot, more or less prepared or ground lime was thoroughly mixed with the dust used on each plot and applied with it, i. e., the dust application was made up to equal volume on each plot with lime. The lime simply acted as a dilutant and in no way interfered with the action of the dust spray. The Boxal paste was mixed thoroughly in the keg at each application and then the required quantity weighed out. With a small quantity of water this was stirred in a pail till all lumps had disappeared and then thoroughly mixed and agitated with the necessary amount of water in the spray tank.

The Boxal preparations claim to serve as insecticides as well as fungicides, therefore no paris green was used with these and none was necessary. On the other plots from one to one and one-half pounds per acre of paris green was used at each application as long as necessary, mixing it with the dust or wet bordeaux as the case might be.

The field was visited nearly every week during the season, and at no time did over 10 days pass without observations as to the condition of the foliage. Early blight *(Alternaria solani)* was practically absent except for a small amount late in the season, and practically all of the damage to the foliage resulted from attacks of the late blight *(Phytophthora infestans)*. The record for the condition of the foliage after blight was first observed is as follows:

further: * * * "The sulphate and benzoate exchange places forming 2 other materials viz. sodium sulphate and copper benzoate. Now it is the copper benzoate that combines all the virtue of the spray, it being infinitely less soluble than the original chemicals while combining the germicidal and fungicidal value. Copper benzoate is very slow to wash off with the rain and practically the only successive sprayings necessary are those required to protect new growth."

August 9. Considerable blight on Plot 6, just beyond the center of the rows. Some less on Plots 7 and 8 in about the same locality. Remainder of the plots healthy. This had all developed since the last observation on August 2.

August 16. Plots sprayed with wet bordeaux free from blight, except a little on Plot 5, adjoining the bad outbreak on the unsprayed check, Plot 6. Plot 2 showed some late blight near the south end, Plot 4 an occasional blighted leaf, Plot 6 blight generally distributed over entire plot except on north end. Several rods in center badly damaged. Plots 7 and 8 diseased almost as much as 6. Plot 10 some blight on south end. Plot 12, a few blighted leaves.

August 27. Following the last record several days of bright clear weather held the progress of the disease largely in check. The wet bordeaux plots were clean except as noted on August 16 and here there was no increase. All other plots showed some increase of blighted leaves. Following this came another period of rainy weather so that two weeks later the disease had developed to such an extent that the plots could be distinguished as alternate green and brown strips as far as the field could be seen.

September 11. Plot 1, free from late blight, a little early blight. Plot 2, 50 per cent of leaves dead. Plot 3, free from blight except for an occasional leaf. Plot 4, a little healthier than Plot 2. Plot 5, the slight outbreak noted in one portion of this plot appears to have been entirely checked at the fifth spraying on August 16. Plot 6, foliage all dead. Plot 7, 50 per cent of leaves killed. Plot 8, 75 per cent of foliage killed. Plot 9 shows an occasional blighted leaf. Plot 10, 75 per cent of leaves killed. Plot 11, about like Plot 9. Plot 12, 10 to 15 per cent of leaves killed by blight. Plot 13, very little blight, better than Plots 9 and 11.

September 25. Wet sprayed plots showed 80 per cent to 90 per cent of foliage still green on this date. On all others the plants were practically dead except on Plots 7 and 12, where the stalks were alive but the foliage dead.

October 5. Plants on Plots 7 and 12 entirely dead, while those sprayed with standard bordeaux were fully as healthy as at last record. The living plants were all killed by frost during the following week.

The crop was harvested during the week beginning October 14. A summary of the yields and losses resulting from the use of dust sprays, etc., as compared with the use of standard wet bordeaux, are given in the following table. However, it should be mentioned that this table, a record taken at digging time, by no means represents the entire loss on the dusted plots. The crop from these plots contained more undersized, immature tubers and was in general of an inferior quality. Moreover, Mr. Gilman informed the writer a month after the potatoes had been placed in storage that those from the dust plots were showing more or less decay while there was practically none in those harvested from the plots sprayed with wet bordeaux. The relative net yields are shown graphically on page 294.

Table showing total and net yields of potatoes per acre from the use of different fungicides.

Plot number.	Treatment.	Net yield per acre (bushels).	Rot per acre (bushels).	Total yield per acre (bushels).	Per cent of decay.	Net loss in bushels per acre.*	Net loss per acre at 50 cents a bushel.
1	Wet Bordeaux	288	18	306	5.9		
2	Sal Bordeaux, 6 lbs	173	68	241	28.2	107	$53 50
3	Wet Bordeaux	312	18	330	5.5		
4	Sal Bordeaux, 10 lbs	214	57	271	21.0	66	33 00
5	Wet Bordeaux	293	28	321	8.7		
6	Check unsprayed	112	95	207	45.9	168	84 00
7	Sodium Benzoate Bordeaux	189	59	248	23.8	91	45 50
8	Leggett's Blight Dust No. 2	130	62	192	32.3	150	75 00
9	Wet Bordeaux	257	18	275	6.5		
10	Bowkers Dry Boxal	132	74	206	36.0	148	74 00
11	Wet Bordeaux	245	13	258	5.0		
12	Bowkers Boxal Paste	191	48	239	20.1	89	44 50
13	Wet Bordeaux	284	25	309	8.1		

* As compared with average net yield (280 bushels) of wet sprayed plots 1, 3, 5, 9, 11 and 13.

DUST vs WET BORDEAUX

NET YIELDS PER ACRE.

280 bu. Average of Wet Sprayed Plots.

214 bu. Sal Bordeaux, 10 lbs.

191 bu. Bowker's Boxal Paste

189 bu. Sodium Benzoate Bordeaux.

173 bu Sal Bordeaux, 6 lbs

132 bu. Bowker's Dry Boxal.

130 bu. Leggett's Blight Dust No. 2.

112 bu. Unsprayed Check.

DISCUSSION OF RESULTS.

So far as the results of the foregoing experiments show, none of the substitutes for wet bordeaux in any way approached it in efficiency as a preventive for late blight. While none of the dust sprays in any way produced the results claimed for them by the manufacturers and others, they all showed more or less fungicidal value. This was least with Leggett's Blight Dust No. 2 and Bowker's Dry Boxal, which only showed a gain of 18 or 20 bushels per acre resulting from 6 applications of 6 pounds each, when compared with the unsprayed check. The same amount of Dust Sprayer Manufacturing Co's. Sal Bordeaux increased the yield 60 bushels per acre, while 10 pounds of the same material to an application gave an increase of 102 bushels per acre. The fact should not be overlooked that wet bordeaux under the same conditions gave an increase of 168 bushels per acre. The value of the wet bordeaux as compared with the dust sprays is more apparent from the last column of the table. Estimating the value of potatoes at 50 cents per bushel, which was about the price being paid when the crop was dug, it will be seen that the loss from dusting as compared with the average yield of the wet sprayed plots varied from $33.00 per acre from using 10 pounds to an application of Sal Bordeaux to $75.00 per acre where 6 pounds of Leggett's Blight Dust No. 2 was used per application. Sodium Benzoate Bordeaux and Bowker's Boxal Paste, the former containing only one pound of copper sulphate and one-half pound of sodium benzoate to 50 gallons of spray, gave better results than each of the dust sprays except the 10-pound application of Sal Bordeaux. However, there does not appear to be any particular merit in them as substitutes for standard bordeaux. Boxal paste costs in 100-pound lots about 3 times as much as the materials to prepare an equal amount of home-made bordeaux, and the writer found it nearly as much work to get the paste in proper condition for spraying as it was to make the same quantity of bordeaux. Unfortunately no check plot treated with a bordeaux mixture containing one pound of copper sulphate to 50 gallons of water was provided, so it is impossible to say whether the partial protection on Plot 7 was due entirely to the small amount of copper sulphate which it contained or in

part to the addition of the sodium benzoate. It seems reasonable to assume that the latter was of some value, for as is shown elsewhere sodium benzoate apparently reduced the amount of scab where seed tubers were treated with a solution of it, and its value as a preservative in preventing the growth of the ordinary saprophytic fungi is well known.

The foregoing account and discussion is based wholly on the Station experiments at Foxcroft, where every endeavor was made to give the dust sprays a fair and impartial trial. Before leaving the subject it should be mentioned that a large number of dust machines were used the past season around Maple Grove and Ft. Fairfield. While there was considerable difference of opinion, a number of growers there expressed themselves as well satisfied with the results obtained from dusting. The writer on August 22 spent nearly the entire day driving from one field to another in this locality and was convinced that at this time the dust was of considerable value in keeping the blight in check. However, there was very little opportunity for accurate comparisons. With one or two possible exceptions there were no fields or parts of fields lying side by side where both had otherwise been treated alike and one sprayed with dust and the other with wet bordeaux the same number of times on approximately the same dates. No unsprayed checks were left in any case. Many cases were found also both with the dusting and wet spraying where it seemed evident that the applications were not begun till after the blight had become well established on the plants.

Attempts were made in the spring to arrange for cooperative dusting experiments in this locality but without much success. Most of the owners of the dust machines were so thoroughly convinced of the value of the method from the experience of the previous year that they did not wish to bother with the wet bordeaux sufficiently to spray a part of their fields in this way and keep the necessary records. One gentleman did attempt this but unfortunately waited too long before beginning spraying, and neglected to keep a record of the dates when he did spray. On August 22 both parts of this field showed more or less blight, but one was about as bad as the other. A later visit, September 19, the day following a severe frost, indicated that the wet sprayed tops remained green somewhat longer than

those which were dusted. As near as could be judged 30 per cent to 50 per cent of the foliage on the wet sprayed portion was alive and practically none on the dusted portion when the freeze came.

Relative Efficiency of Light and Heavy Spraying: Frequency of Spraying.

While the losses from early blight are not so marked as from late blight, and often pass unnoticed, careful observations show that, especially in dry years, this fungus does much damage even on what are generally considered well-sprayed fields. The examination of a large number of fields in Aroostook County in the late summer of 1906 indicated that early blight was not controlled to any great extent by the methods of spraying commonly practiced there. Since in the experience of the writer a moderate number of thorough, heavy sprayings gave ample protection against this fungus,* it seemed best to test the matter on a large scale in two different parts of the State. The places selected were Houlton, Aroostook County, near the eastern border, and Foxcroft, Piscataquis County, near the center of the State. The former on the John Watson farm and the latter on Commissioner Gilman's farm, being a continuation on the south of the field described under the dusting experiment.

On account of the nature of the season very little early blight developed, but the results secured furnish some interesting data with reference to how often and how thoroughly we should spray for late blight.

Plots were selected on each field as nearly as possible to an acre in size. Plot 1 to be double sprayed 6 times (twice on the same date going in opposite directions on the row). Plot 2 to be double sprayed 3 times and Plot 3 to be single sprayed 6 times. In practice this going over the ground twice for the double spraying would be avoided by doubling the number of nozzles to the row, so arranged that half pointed slightly to the front and half to the rear, taking care that the cones of the spray are so adjusted and directed as to cover the entire width of the foliage on the row. Thus the labor for the 6 double applications would be no more than for 6 single. If the extra

* Vt. Sta. Rep. 18, p. 275 (1905).

time required to prepare the mixture is disregarded, the 3 double sprayings would only take half the time of the 6 single applications.

At Foxcroft Plots 1 and 3 were sprayed July 18 and 27, August 2, 9, 16 and 27. Plot 2 on July 18, August 2 and 16. At Houlton Plots 1 and 3 were sprayed July 15 and 22, August 3, 10, 15 and 22. Plot 2 on July 15, August 3 and 15.* At Foxcroft single nozzles applying about 45 gallons to a single and 90 gallons to a double application were used for the first 3 sprayings, while for the last 3 sprayings double nozzles were used, giving 70-75 gallons for single and 140-150 gallons for double applications. At Houlton double nozzles applying about 80 gallons for a single application and 160 gallons for a double application were used for all 6 sprayings.

On account of the construction of the sprayers it was impossible to adjust the nozzles to a sufficient height so that the entire outer margins of the rows were protected after the tops fully covered the ground. This difficulty was partly overcome at Foxcroft and it doubtless explains, in part, the lower percentage of rot obtained there. At Foxcroft no blight was seen until August 27 when a little early blight was seen on Plot 2, the others being entirely healthy. All of the plots were quite well protected through the season. From September 11 until shortly after October 5 when the plants were killed by frost, Plot 2 showed a small amount of late blight and some early blight, though not enough of the latter to do any damage. Occasional leaves affected with late blight could also be found on Plot 3, but none on Plot 1. On Plot 1 the early blight was almost entirely confined to marginal leaves where they were imperfectly protected by the spray. There was about the same

* On account of severe rains and the exceeding prevalence and destructiveness of the late blight during the first week in August it was thought best to make an extra single application to Plot 2 which was originally planned to be double sprayed as near July 15, August 1 and 15 as possible. Accordingly Plot 2 at Foxcroft was gone over with a single application on August 9. On account of not understanding the directions the man in charge at Houlton made this application on August 8 not to Plot 2, but to Plot 3 which was to receive 6 single applications and came in for its regular spraying on August 10. This probably explains why as later noted there is considerable disagreemant with regard to the relative results from these plots in the two localities.

amount of early blight on Plot 3 as on Plot 2, but in both cases it was much more destructive on the outer, unprotected leaves. In fact on all the plots at Foxcroft after the middle of September a distinct black line could be observed midway between the rows. This was made by the browning of the unprotected leaves as a result of the combined injuries of early blight, flea beetles and grasshoppers. The repellent qualities of bordeaux upon the insects mentioned was very marked.

At Houlton late blight could be found after August 20 on all the plots where the leaves were imperfectly protected at the margins, Plot 1 looking a little the healthiest, with not much choice between the other two. These plants were killed by frost on September 8. There was practically no early blight on the Houlton field. The crop at both places was harvested during the week beginning October 14. The yields and amount of rot are given below in tabular form.

YIELDS OF POTATOES FROM SINGLE AND DOUBLE SPRAYING IN BUSHELS PER ACRE.

	Total yield per acre.	Net yield per acre.	Rot per acre.	Per cent of rot.
Foxcroft.				
Plot 1, Double Sprayed 6 times,	345	343	2	0.6
Plot 2, Double Sprayed 3 times,*	303	298	5	1.7
Plot 3, Single Sprayed 6 times,	300	280	20	6.6
Houlton.				
Plot 1, Double Sprayed 6 times,	462	420	42	9.1
Plot 2, Double Sprayed 3 times,	362	277	85	23.5
Plot 3, Single Sprayed 6 times,*	392	343	49	12.5

* See note on p. 298.

DISCUSSION OF RESULTS.

The profits from 6 heavy applications in a season like that of 1907 are very apparent. These plots gave an increase of 45 bushels per acre at Foxcroft and 77 bushels per acre at Houlton over the yields of the better of the other 2 plots, while at the prevailing prices of copper sulphate and lime the cost of the extra materials used would not be over $3.00 per acre.

The results from the 6 single *vs.* the 3 double applications are somewhat contradictory. At Houlton the former gave 66 more bushels per acre while at Foxcroft the latter was the better by 18 bushels per acre. This may be partly accounted for because, as has already been stated, the modified Houlton experiment was really 7 single sprayings compared with 3 double, while at Foxcroft there were 6 single sprayings compared with 3 double sprayings with a single one added to make up for excessive washing by rain. That a moderate number of thorough sprayings applied at the right time are quite effective against late blight is well shown by the Foxcroft experiment in comparing the results obtained from Plots 2 and 3. However, it should not be overlooked that additional thorough applications produced still better results, as is seen in the largely increased yields from Plot 1 at both places.

The per cent of rot in both fields is instructive in that it corresponds quite closely with the ability of the machines used to cover the entire foliage of a row. When compared with the loss of 45.6 per cent from rot on the unsprayed check of the adjoining dust experiment the amount of loss from rot in the part of the experiment at Foxcroft is quite satisfactory. The loss from rot of from 9.5 per cent to 23.5 per cent at Houlton is entirely too high and might have been materially lessened if the adjustments on the machine had admitted the raising of the nozzles to sufficient height to cover the entire row with the spray cone. However, it should be said that the work of spraying this field was as carefully and thoroughly done as could be under the circumstances. This is very evident when we consider that on Plot 1, a measured acre, produced 420 bushels of sound potatoes and only about 5 bushels of these were sorted out as below merchantable size. Moreover, out of a large number of fields examined only one other was seen in Aroostook County which was so well sprayed as this one.

Can Our Spraying Methods Be Improved?

After going over hundreds of acres of potatoes this past summer and talking with the growers as to the methods used in spraying, the writer would answer this question with a decided affirmative. A most encouraging fact is that many of the growers themselves agree with this conclusion and state their determination to return to the more thorough practice formerly in vogue. It is probably not excessive to state that in most districts at least 30 per cent of the crop in 1907 was lost from rot, to say nothing of the reduction in yield from the early killing of the tops. In many cases 50 per cent or 60 per cent and even 75 per cent of the crop went to the starch factory. The station experiments and the results obtained by growers who followed similar methods indicate that a large proportion of this loss could have been prevented by proper spraying.

Spraying must always be looked upon as a form of insurance, and for potato blights is a preventive and not a cure, hence it must be begun before the blight appears. Various causes are responsible for the losses during 1907. The almost entire absence of late blight for a few seasons led some to question the value of spraying and many of these individuals announced their intention of not spraying at all this season. These, and many others from one cause and another, waited till their plants were well infested and then began to spray—a proceeding about as effective as turning a hose on the outside walls of a house to stop a fire in the interior partitions. Here, frequently, enough bordeaux was used during the season but not at the proper time. Others were provided with sprayers having single nozzles so placed as to be only a few inches above the full grown tops. They drove over the fields with these carts leaving a deep blue line about 6 inches wide on the center of the foliage of each row and went their way apparently satisfied, for *had they not applied 50 gallons per acre?* Here again, it is possible that enough bordeaux was used, but it was not properly distributed to protect the entire foliage. In cases where the entire foliage was not covered with bordeaux the unprotected leaves blighted and the spores from their surfaces were washed down into the soil and thus infected the tubers with rot.

In making bordeaux mixture, too frequently guess work is substituted for weights and measures. There is also a tendency to vary the proportions of the ingredients to a marked degree. As low as 3 pounds of copper sulphate to 100 gallons of spray and as high as 24 pounds to the 100 gallons were found to be used, although these were exceptional cases.

In view of these facts it seems well to supplement the directions for spraying which have been sent out by the Station during the last dozen years, giving special emphasis to the lessons which the experience of the last season has furnished.

All power machines so far as observed met the requirements with regard to the construction of pumps and nozzles, namely, providing a constant high pressure and a fine, mist-like spray. Nevertheless every type of sprayer so far seen in Maine potato fields is inefficient as it comes from the manufacturers. Most of them are only provided with a single nozzle to a row and, when the foliage is full grown, can be raised but a few inches above the top of the row. This arrangement is sufficient for the first and possibly the second spraying but should never be used thereafter. Every spraying should mean the deposition of a thin film of bordeaux on the surface of each leaf. Two nozzles per row are necessary to accomplish this and 3 would be better. These should be so arranged that they will evenly cover the entire foliage of a full grown row. Where double nozzles are used they should be farther apart than is commonly the case, and if possible admit of some adjustment as to direction. It should be possible to raise the line of nozzles, as the plants grow, to such an extent that each time the bordeaux is applied the outer margins of the spray cones extend just beyond the margins of the foliage of the row, thus giving uniform protection to all leaves. It is with respect to the extent of this adjustment that most machines are deficient. If a machine does not meet these requirements it should be remodeled till it does. *Each leaf should be covered at each spraying regardless of whether it takes 50, 100 or 150 gallons of bordeaux per acre.*

For late blight, spraying should ordinarily be begun from 10th to the 20th of July. If the weather is dry and sunny one can wait until the latter date or even later, but if very moist, cloudy weather prevails the former date is none too early. In average seasons 4 and sometimes 3 thorough sprayings will be

sufficient. In a season like the past, 5 or even 6 are necessary. More frequent and thorough spraying is necessary for early blight, and it must as a rule be begun quite early in the season.

Therefore, unless one has made a careful study of the different blights, and the relation of their development to weather conditions, the following rule is probably the only safe one to follow: *Begin when the tops are 6 or 8 inches high and spray every 10 days (every week if the weather is very cloudy and rainy) until the last of August or the first of September.* In any event spraying must be begun some days before the average observer will detect blight on the leaves. Do not stop for rainy weather, this is just the time when spraying is most needed. Each application should be made as often as it is necessary regardless of the weather. If the mixture is properly prepared and it once dries on the leaves, which usually takes place in an hour's time, it will withstand much more washing than is commonly supposed.*

In the sense of the term used, properly prepared bordeaux consists of 50 gallons of water, 5 pounds of copper sulphate, and 5 pounds of fresh stone lime (some are using ground or hydrated lime with apparent success). The copper sulphate should be dissolved and the lime slaked in different vessels. Each solution should then be diluted with half of the water and then the *cold, dilute sulphate and milk of lime solutions quickly united and thoroughly mixed.* Never pour the concentrated solutions together as an inferior mixture is sure to result. If it is desired to increase the amount of copper sulphate used per acre, do not make a stronger mixture but increase the number of nozzles per row or go twice over the piece in opposite directions on the rows, provided in the latter case that the nozzles are so arranged as to cover the entire width of the row at each application.

Most large growers use stock solutions of lime and copper sulphate. The most convenient plan for this is to slake 100

* The writer has specimens of leaves taken at Foxcroft, October 5, 1907, which are well coated with bordeaux mixture, yet they were collected 38 days after the last spray was applied. At Orono during this period rain fell on 21 different days making a total of 6.66 inches. 2.18 inches of this fell in 24 hours. The two places are not over 40 miles apart by air line and it is believed that the rainfall did not vary materially.

pounds of lime in a 50-gallon cask and then fill up with water. (This milk of lime solution should be strained before using.) Fill another cask of equal capacity with water and suspend in this near the top a sack containing 100 pounds of copper sulphate, which will usually dissolve in 24 hours. If thoroughly stirred just before using, each gallon of this stock solution will contain 2 pounds of copper sulphate or lime as the case may be. The most convenient method of preparation is to have an elevated platform above the top of the spray cart. Where running water is not available this platform can be built over a small stream or well and a pump connected to the water supply, so placed that it will deliver over the top of a barrel placed on the platform. Two other casks in addition to those for the stock solutions are now necessary, each with a piece of hose 3 or 4 feet long connected to the bottom. When not in use the outer end of the hose is elevated above and fastened to the top of the cask. When ready to prepare a tank full of mixture, the stock solutions are well stirred and 2½ gallons of concentrated copper sulphate solution is *measured* into one cask and 2½ gallons of lime solution into the other and each filled half full for a 50-gallon tank. For a 100-gallon tank 5 gallons each of the stock solutions are used and the casks filled full of water. These casks for the dilute solutions should be at the edge of the platform. Now back the spray cart underneath and quickly lower the hose attached to each barrel and insert it in the opening of the tank on the spray cart. The cart is thus quickly loaded and the dilute, cold solutions quickly and thoroughly mixed.

By following these directions in preparing and applying bordeaux mixture the losses from late blight and the rot associated with it can be entirely prevented in any ordinary season, while in a season like the one just passed the loss can be reduced to a minimum if the work is thoroughly and carefully done.

Treating Seed Potatoes with Formaldehyde Gas to Prevent Scab.

In Bulletin No. 141 of this Station attention was called to a rapid increase of potato scab in Maine during recent years. In discussing preventive measures especial stress was laid upon the importance of using seed tubers as free from scab spots as

possible, and as a farther precaution it was stated that the seed should be treated with a disinfectant to destroy any germs of the scab fungus which might be present. For small lots soaking in formalin or corrosive sublimate solutions is the usual method, but for the large grower or seed dealer formaldehyde gas, generated by the use of potassium permanganate, was recommended. This is a much more convenient and rapid method of treating the seed, but up to the present season it had not been tried on a commercial scale.

Through the courtesy of Mr. John Watson of Houlton a 20-acre field in that town was placed at the disposal of the Station to test the matter on a large scale. About one-half of this land had never been planted to potatoes before, while the remainder had been in cultivation for many years. A house formerly stood on this part of the field and presumably some of the land near the house was devoted to garden purposes. One portion of the old land also had been used in an alfalfa experiment in 1904. Of the part planted to alfalfa one-third was limed, one-third treated with a heavy application of wood ashes, while commercial fertilizer alone was used on the remainder. Hence, it was not expected that scab could be cut down materially on the old ground, but it was hoped that its introduction into the new soil could largely be prevented.

For a disinfecting chamber a room was partitioned off in the basement of the barn. This chamber was 15 feet 3 inches by 11 feet 8 inches and 7 feet 7 inches high and was large enough to treat 75 barrels of seed at one time. There was already a plank floor and the side of the barn formed the back wall of the chamber. The floor was first covered with builders' paper and then with rough boards. To build the walls the studding was set and first covered with paper and then unplaned boards nailed over this on the inside. The top was first boarded over and then this and the back wall were covered with paper held down by strips of lath nailed over the joints. Care was taken to cover with paper all joints at the corners and at the junction of the side walls and floor. The door was carefully fitted and shut into a joint covered with paper. When the door was closed 3 wooden cleats or bars were placed across it passing under other slightly slanting cleats nailed to the studding, thus drawing the door tight against the casing.

Thirty slat-work crates or drawers each containing about 2½ barrels were made to hold the potatoes while being treated. These were 4 feet 4 inches by 3 feet 7 inches, and 9 inches deep. The sides were made of solid inch board while the ends and bottom was constructed of slats of the same material 1½ inches wide and placed an inch apart. The interior angles were reinforced by a triangular strip made by splitting a piece of 2x2 from corner to corner. These crates were arranged in vertical tiers of 5 each on opposite sides of the room. To support them while in use 2x4 scantlings were placed upright between the tiers, one near each corner, and securely fastened to the floor and ceiling. Pieces of 2x2 were then spiked crosswise on these uprights in such a way as to support the crates one above the other and to allow their being pulled out when empty like drawers in a cabinet. When in place there was a space of 4 inches between the top of the one crate and the bottom of the next above, and a 10-inch open space in the rear of all, thus providing for free circulation of the gas on all sides. In the center of the room between the 2 rows of tiers was an aisle somewhat wider than the length of the boxes. This was provided to facilitate the filling of the crates and to leave an open central space in which to generate the gas. As will be shown later there should be no potatoes directly above the generator, in order that the gas may mix with the air somewhat before it comes in contact with the surface of the tubers. If this is not done there is danger of injuring the germinating qualities of those tubers directly above the generator and in contact with the strong, hot gas as it is given off. Figure 45 shows the appearance of these crates when in position.

For a generator a small galvanized washtub about 15 inches in diameter at the bottom was placed in the center of the room about a foot from the floor, midway between the 2 lines of crates filled with potatoes. When ready to use 31½ ounces of potassium permanganate was spread evenly over the bottom of the tub, then 4 pints and 1 ounce of 40 per cent formaldehyde poured over this.

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* Approximately 23 ounces of potassium permanganate and 3 pints of formalin to the 1000 cubic feet. See Bulletin No. 141, p. 89.

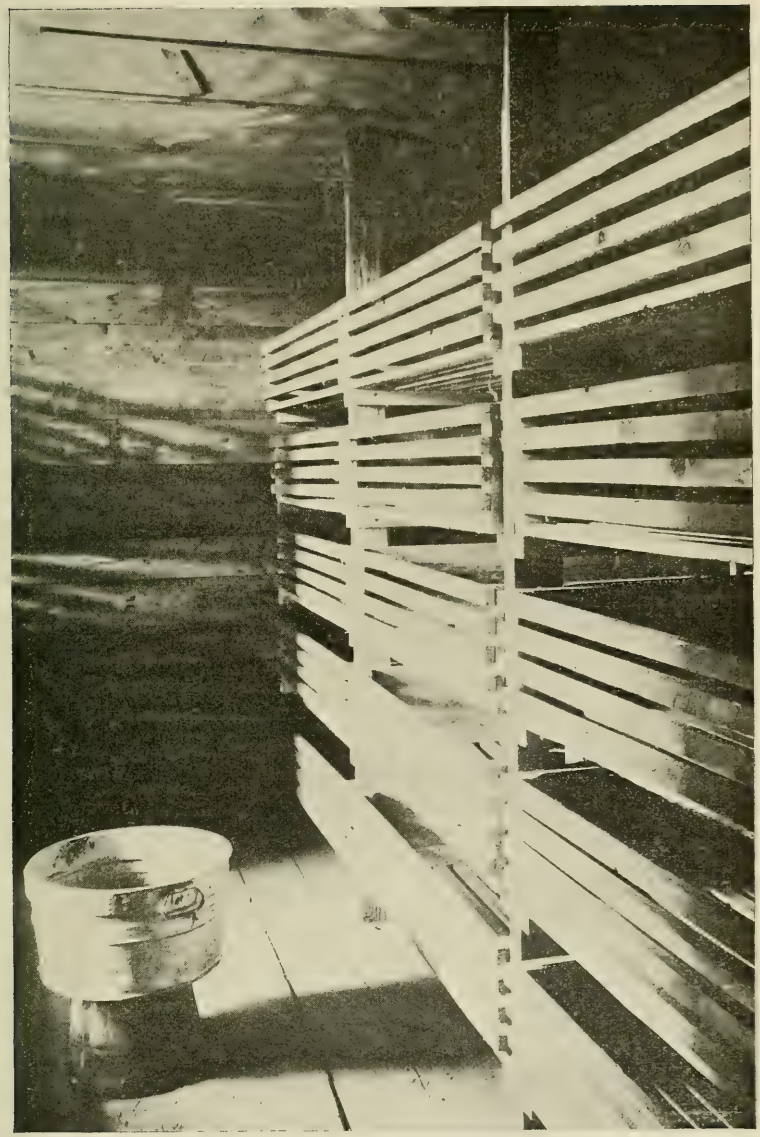

Fig. 45. Interior of disinfecting chamber, showing slat-work bins and position of tub used for a gas generator.

The tub was given one rapid tilt to entirely wet the potassium permanganate with the formalin and then the door was quickly and tightly closed from without. The almost entire absence of the odor of escaping gas while the treatment was in progress indicated that the room was practically air tight. The door remained closed for 24 hours and when opened the gas was still so strong that it was impossible to work in the room for from 20 to 30 minutes. In fact 3 weeks after the disinfection was finished a distinct odor of formaldehyde could be detected in the room.

The seed for the entire 20 acres was treated in this way, care being taken to place the treated seed in barrels which had never been used for potatoes before. This to avoid contamination in taking to the field after treatment.

To secure more accurate data than could be obtained from the general results from the large field, 2 barrels of potatoes were obtained which were said to be sorted from the same lot. The tubers of one barrel, which are referred to as "scabby" seed, were so scabby that they were absolutely unfit for market. Figure 46 is a fair example of these. Those of the other barrel, represented by Figure 47, are referred to as "smooth" seed in the following account. They were quite free from scab, although frequently, as in the illustration, 1 or 2 scab spots could be found on a tuber. Each barrel of seed was divided into 4 different lots according to treatment; care being taken not to mix the smooth and scabby seed of each treatment.

The treatment of the different lots was as follows: No. 1. Soaked 2 hours in a solution containing one-half pint of formalin in 15 gallons of water. No. 2. Treated with formaldehyde gas as described above. No. 3. Soaked 2 hours in a solution containing 20 ounces of sodium benzoate in 15 gallons of water. No. 4. Untreated. Since soaking in formalin solution is one of the 2 standard remedies for scab, Nos. 1 and 4 were inserted as checks for comparison. The writer is not aware that sodium benzoate used in No. 3 has been tried for this purpose before, but the well-known qualities of this chemical as an antiseptic suggested its possible value as a method of treatment for potato scab.

The crop was planted May 23, each treatment and each kind of seed in each treatment being kept separate. The treated

seed was perhaps slightly slower to germinate, due to killing back of the tender sprouts which had started, but soon after the young plants appeared above the surface no difference could be detected in the treated and untreated. The crop was harvested October 8 and the potatoes grown from the several kinds of treated seed were then carefully sorted. Any tubers which had one or more scab spots were placed with the scabby crop. The results obtained are as follows:

Yields of smooth and scabby potatoes from seed differently treated.

	Lbs. smooth.	Lbs. scabby.	Total lbs. per plot.	per cent scabby.
Formalin solution:				
Seed scabby,	776	5	781	0.6
" smooth,	820.5	6.5	827	0.8
Formalin gas:				
Seed scabby,	822.5	9.5	832	1.1
" smooth,	834	3.7	837.7	0.4
Sodium benzoate:				
Seed scabby,	849.5	10.6	860.1	1.2
" smooth,	855.5	15	870.5	1.7
Untreated:				
Seed scabby,	792	55.1	847.1	6.5
" smooth,	819	36.7	855.7	4.3

DISCUSSION OF RESULTS.

The trials of the present year confirm what has already been shown on a smaller scale * that exposure to formaldehyde gas is fully as effective a treatment for potato scab as soaking in formalin solution. Moreover this treatment is much more economical in time and labor when large quantities of seed are to be treated. For example the seed for 25 acres of potatoes could be treated in the room described by using only 4 pounds of potassium permanganate and a little over a gallon of formalin with less than 3 days' delay for the entire amount of seed.

* Vt. Sta. Rept. 18, p. 287.

Fig. 46. Samples of "scabby" seed. The tuber at the left shows also sclerotia of Rhizoctonia.

Fig. 47. Samples of "smooth" seed. Note the occasional scab spots.

In commenting upon the fact that none of the treatments entirely eliminated scab from the crop it should be remembered that even the smooth seed had some scab spots, and no treatment has yet been devised which will penetrate the tissues of the potatoes in these spots, kill all the scab germs, and not endanger the germinating qualities of the seed. However, if by treating very scabby seed, the amount of scab in the resulting crop is reduced to 1 per cent or less, it seems reasonable to assume that by using only smooth seed and treating it to kill any germs which may be on the surface the infection of clean ground may be avoided, and probably the danger of increasing the disease on ground already infected will be lessened.

The fact that so little scab developed from the untreated seed detracts somewhat from the value of the results, although a glance at the table shows that in every case the treatment materially reduced the per cent of scab in the resulting crop. However, only 6.5 per cent of scab in a crop from very scabby seed is unusual. For 4 consecutive years the writer found the per cent of scab in a crop from very scabby seed like that in question varied from 19.8 per cent to 63 per cent.* Moreover smooth seed invariably produced less scab than scabby seed and treated seed less than untreated seed. It is of interest in this connection to call attention to the fact already stated that scab in general was very much less prevalent than in the preceding season, although that of 1906 was much the dryer of the two.

It is also of interest to note that sodium benzoate materially reduced the amount of scab in the resulting crop. However, with the present prices quoted for this chemical its use cannot be recommended as a substitute for formalin or corrosive sublimate, the materials commonly used in treating the seed by soaking.

The results from gas disinfection were perfectly satisfactory on the portion of the field where comparatively clean, treated seed was used on clean land. A crop free from scab resulted and it is believed the introduction of scab germs into this soil

* Vt. Sta. Repts. 15, p. 229 (1902); 16, p. 167 (1903); 17, p. 400 (1904); and 18, p. 289 (1905).

was entirely prevented.* On the portion of the field which had been under cultivation for many years, the amount of scab varied in different parts as might be expected. While no attempt was made to secure exact data on that part of the field planted to alfalfa in 1904, there was a marked difference where the fertilizer, lime, and ashes plots were located. Where commercial fetrilizer was used very little scab resulted, somewhat more was observed on the lime plots, while the potato crop was badly scabbed where a heavy dressing of wood ashes were applied when the alfalfa was planted 3 years ago.

WILL FORMALDEHYDE GAS INJURE THE SEED.

In treating a disease like potato scab the following rule must be taken into consideration. "The poison employed must be sufficiently strong or concentrated to kill the parasite, but not sufficiently powerful to injure the host." Five years of experience in treating potatoes with formaldehyde gas generated in various ways indicate that, if properly handled, the gas from 3 pints of 40 per cent formaldehyde may be safely used to the 1000 cubic feet of space. In fact over 3 quarts to the 1000 cubic feet have been used repeatedly without injuring the germinating qualities of the tubers in the least.

However, the experience of one correspondent indicates that the directions for gas disinfection as given in Bulletin No. 141 are deficient in that special attention was not called to the fact that no potatoes should be placed directly over the generator. The action of the potassium permanganate upon a part of the formaldehyde generates considerable heat and makes the liquid boil vigorously. It is this heat which vaporizes the liquid and in a very short time sets free a large per cent of the available gas in the solution. Hence, potatoes directly above the generator are exposed not only to considerable heat but to a gas many times stronger and more active than they would be after the gas became diffused and diluted with the air of the room. The gentleman referred to placed his generator directly underneath and only a few inches below a large slat work bin in

* Mr. Joel Remington of Monticello who treated his seed this season with formaldehyde gas feels sure that by this means he prevented the introduction of scab into his new ground.

which he had placed his potatoes to be treated. As a result, several barrels of tubers were severely injured, the eyes of those nearest the generator being entirely killed.

To test the matter in our own disinfecting chamber a few tubers were placed in a basket and suspended 6 inches above and directly over the generator just before it was charged and were thus exposed during the period of disinfection. All the eyes in these tubers were killed. After a few days the injury was very apparent. The tissues around the eyes were browned and depressed, forming well-marked pits. Cutting into the tubers showed that the injury extended down into the flesh one-fourth of an inch or more. See Figure 49 p. 326.

Samples of tubers exposed during the same period were removed from bins in various parts of the room and taken to the laboratory for examination. None of the eyes were affected and germination was normal.

With the exception of the first 2 or 3 acres planted, the stand on the 20 acres where the seed was treated with gas was exceedingly even and showed very few missing hills. The somewhat uneven stand on the part of the field mentioned was, in the writer's opinion, due to the poorer grade of seed used and to the cold, wet weather which prevailed when the planting was begun, rather than to any effect of seed treatment. The fact that a measured acre of this portion of the field produced a total yield of 168 barrels (462 bushels) indicates that whatever was the cause of the slight uneven germination, the resulting yield was unusually satisfactory on this area. Careful records on acre plots in various parts of the 20-acre field, covering over a third of its area, showed yields varying from 125 to 168 barrels, one other acre in addition to the one already mentioned reaching the latter figure.

ADDITIONAL DIRECTIONS FOR FORMALDEHYDE GAS DISINFECTION.

Recent experience suggests the following modifications and additions to the directions for formaldehyde gas disinfection as given in Bulletin No. 141.

The generator should be placed in an open space in the center of the disinfecting chamber, the bins or crates so arranged that the gas can circulate on all sides of them and

mix with the air of the room. To avoid injury from the strong gas as it is liberated *no potatoes should be placed directly above the generator.*

There is less danger of retarding germination if the disinfection is performed before the sprouts begin to appear.

The gas is more effective if the temperature of the room is 60 degrees to 65 degrees F. at the beginning of the disinfection period than will be the case with a lower temperature.

The gas also appears to be more effective in a moist atmosphere than in a dry one, therefore it is recommended that part of a pailful of boiling water be sprinkled over the floor of the room just before the generator is started. Do not wet the surfaces of the potatoes, for experiments have shown that the gas is more effective on dry potatoes than those which are moistened just before being treated.*

Can Potato Soil be Limed with Safety?

With potato growers clover is usually an important factor in the rotation. Unfortunately clover, like potato scab, thrives best under alkaline soil conditions. To bring about the required alkalinity the practice of liming is resorted to with increasing frequency. The Station has recently secured some remarkably good stands of clover by liming Aroostook potato soils. The question naturally arises, can the amount of lime be so gauged as to produce the required stand of clover and not materially increase the amount of scab when potatoes are again planted on the land? Fortunately one of these trials which was located on the Watson farm at Houlton was made up of a series of alternate acre plots treated with 1000 pounds, 500 pounds and no lime per acre. The lime was applied when stocked with clover in oats in 1905. With a 3-year rotation potatoes would be the crop for 1907, so permission was secured to plow a strip directly across the middle of these plots and at right angles with them. Five long rows of potatoes were planted on this strip. It was intended to use treated seed, but through a misunderstanding on the part of the man in charge of the planting, clean, untreated seed was used instead. The treatment of the

* Vt. Sta. Rpt. 17, p. 401 (1904).

plots with regard to liming was as follows, given in the order that the potato rows intersected the lime plots from north to south: No. 1, 1000 pounds of lime; No. 2, no lime; No. 3, 500 pounds of lime; No. 4, no lime; No. 5, 1000 pounds of lime; No. 6, no lime; No. 7, 500 pounds of lime. At digging time the crop on the rows for about 12 feet either side of a junction of 2 plots was discarded and the per cent of scab in the remaining portion of the rows carefully determined. The results obtained on similar plots were very uniform indeed. The following gives the average per cent of scab on potatoes from each set of plots receiving the different applications of lime:

Treatment,	1000 lbs. lime.	500 lbs. lime.	No lime.
Per cent of scab on potato crop,	49	27	11

DISCUSSION OF RESULTS.

It would seem from this experiment that the application of 1000 pounds of lime per acre is likely to lead to a dangerous increase in scab unless a longer period than 3 years is allowed before potatoes are again used in the rotation, for there was more than 4 times as much scab on these plots as on those which received no lime. Five hundred pounds of lime per acre increased the amount of scab nearly 3 fold. The only conclusion that can be drawn from this single experiment is that sufficient lime to produce marked increase in the clover and grass yields is likely to also produce a marked increase in scab on potatoes used in a 3-year rotation on infected soil. However, it is possible that the amount of scab might be largely decreased by the following procedure: First, the use of clean, treated seed. Second, the season before the potato crop is to be planted the clover crop could be cut early in July. The second crop of clover would be allowed to grow well into September and then plowed under before being killed with frost. This would not only supply considerable fertilizing material for the following potato crop but the production of more or less acid resulting from the decay of the relatively large quantity of organic matter would tend to neutralize the lime and make conditions less favorable to scab.

Internal Brown Spot of the Tuber.

A peculiar spotting of the interior of potato tubers has been observed for some time by Mr. Charles Fish of Brunswick. Samples were sent to the Station and examination showed that the appearance of the diseased potatoes agreed in every respect with the published description of the "internal brown spot" which is quite common in some parts of Europe. So far as the writer can learn the occurrence of the disease in America has been recorded in the publications of but 2 of the Stations.* In Scotland and England this disease is more commonly known as "sprain."

The surface of the tuber looks perfectly healthy and normal. On cutting open the affected ones the flesh is found to be dotted with rusty-brown spots as is illustrated in Fig. 48, which represents a series of consecutive slices through the same tuber. These spots vary in size from minute dots to one-eighth of an inch or even one-fourth of an inch in diameter. The diseased areas are of various shapes but more often approach the spherical in general outline. The affected portions are not confined to any particular portion of the tuber, and where they are few enough to be isolated from one another the spots are entirely imbedded in what appeared to be healthy tissue.

A larger supply of the affected tubers was secured to determine whether or not the disease was of parasitic origin. Careful examination with the microscope failed to show the presence of either fungi or bacteria. Neither could any such organisms be isolated from the spots—the diseased areas appeared to be sterile when cut out with a flamed knife and transferred with proper precautions to tubes or plates of nutrient media.

The variety examined was Burpee's Extra Early, grown on rather dry, sandy loam. A special brand of commercial fertilizer for potatoes was used but no stable dressing was applied. Mr. Fish states that he finds considerable difference in the resistance of various varieties to this disease. Green Mountain is not very susceptible, while Early Prolific was badly affected one season. The amount of spotting present varies also with the season.

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* Minn. Exp. Sta. Bul. 39, pp. 212-213 (1894); Bul. 45, p. 310 (1895). N. Y. (Geneva) Bul. 101, pp. 78-83 (1896).

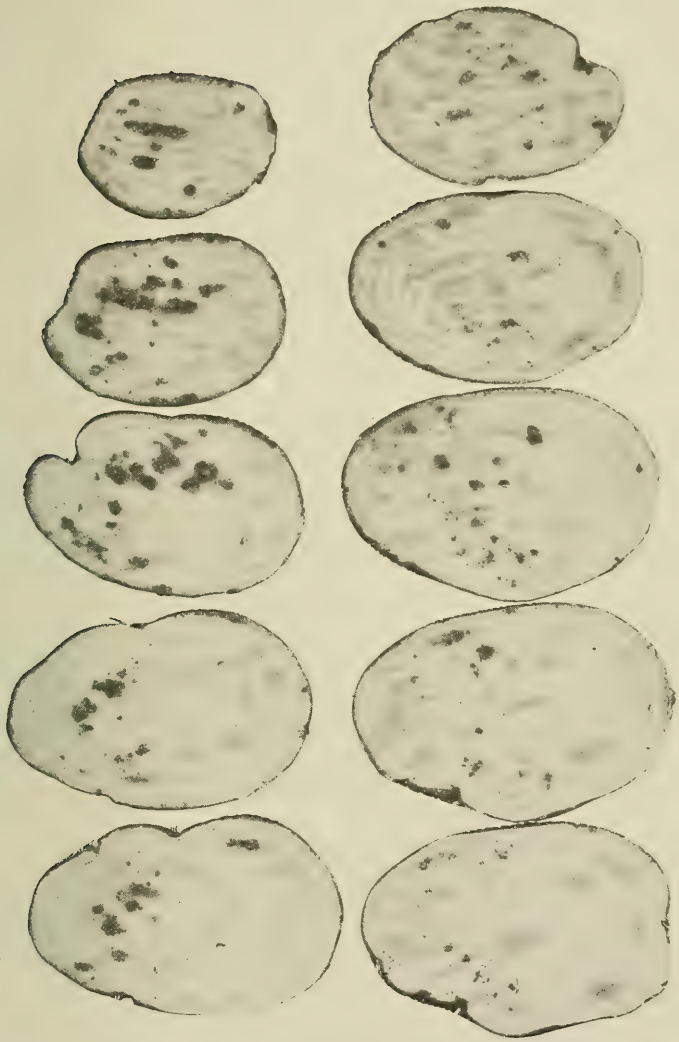

Fig. 48. Internal Brown Spot showing a series of slices through the same tuber.

Dr. Jones,* who has made a careful study of this disease as it occurs in Europe, makes the following statement with regard to the causes and treatment:

"It is not propagated in seed or soil and is non-parasitic. It is considered to be the direct result of malnutrition associated with unfavorable soil conditions, resulting either from too dry conditions or from the lack of potash and lime. It is frequent in light, dry soils, during dry seasons, and is never seen on heavy, strong, moist soils. The remedy, in the judgment of the specialists cited, lies wholly in attention to cultural conditions and the choice of varieties.

"Some varieties are more liable than others to internal brown spot and should not be used on soil that favors the disease; e. g. Mr. Scarlett stated that the British Queen variety is especially predisposed to 'sprain.' The primary remedy, however, lies in the selection and treatment of the soil—i. e., avoiding dry soil—and in so cultivating as to conserve moisture, while using lime and potash liberally."

From our present knowledge it would seem then that this is not a disease to be feared on soils which are particularly adapted to potato culture and that there is no danger of its spreading like a parasitic disease. It is, therefore, one of the so-called physiological diseases and due to purely local soil conditions. There is some lack of balance in the nutrition of the plant when grown on certain soils which is indicated by the spotting of the tubers. What this is and how to remedy the condition we do not know except as indicated above.

At our request Mr. Fish planted some of the diseased tubers last spring. Writing on October 29 he states that the plants from these tubers grew as vigorously as any others in the field and produced a good crop of sound potatoes. No brown spots could be found in any of them.

Surface Spotting of Tubers by *Phytophthora infestans.*

In the early spring of 1907 several growers and shippers called the writer's attention to what they felt sure to be a new potato disease, characterized by a spotting of the surface or

* Jones, L. R., Bureau of Plant Industry, Bul. 87, p. 13 (1905).

skin of the tuber. It was seen only on the Irish Cobbler variety and was wholly confined to the early dug portion of the crop.

The spots, which were black, varied from the size of a small pea to one-half an inch or more in diameter, and showed up in marked contrast to the clean, white surface of the potato. Little or no shrinking of the tissues below the blackened area was apparent. On cutting into a spot it was seen to extend only through the skin and practically none down into the tissues below. The appearance as a whole suggested the late blight fungus, *Phytophthora infestans,* (also the cause of the common dry rot), as a possible explanation of the cause. However, it differed from the appearance of the ordinary dry rot enough so that none of the shippers would agree that it was the same thing. Furthermore, a careful search late in the preceding August over some of the fields on which affected potatoes were grown failed to produce a single characteristic specimen of late blight on the foliage. Samples of the diseased tubers were taken to the laboratory and placed in a moist chamber. Before doing so, the whole tubers were carefully washed and dried, and then cut across through one or more diseased areas, using a flamed knife. After 2 or 3 days the cut pieces were examined and in every case the characteristic spore clusters of *Phytophthora infestans* could be found along the cut margin of the diseased areas. No other fungus was found associated with the spotting.

The potatoes on which the spotting occurred were dug early in September. The tubers were not mature and were easily skinned and bruised by the digger and in handling. Without doubt the fungus was at that time present on the leaves in a very slight degree. The spores falling on the bruised tubers germinated, but on account of adverse temperature and moisture conditions the mycelium passed at once into a resting state, instead of penetrating farther into the tissues and producing the usual characteristic dry rot of the tuber.

Potatoes showing these spots as well as those showing the ordinary dry rot should be rejected for seed. The use of unsound tubers for seed is one of the sources, and possibly the only source from which late blight is conveyed to the foliage of the growing crop.

Black Leg of Potatoes.

Late in July the Station Entomologist noticed that many of the potato stems on one field at Sherman were blackened and decayed at the base. Examination of the specimens which she collected showed that they were affected with what is known in England as "black leg." This is a disease, or more likely in the present case, one of a class of similar potato stem diseases which has begun to attract considerable attention in America within the past few years. It has not been previously reported from Maine, and so far as the writer can learn was first credited to New England by Jones in 1906.* It is interesting to note that he makes the following statement with regard to the seed used on the field where the outbreak occurred: "The field was planted with Green Mountain potatoes, the seed being from Houlton, Maine."

The field in Sherman where the diseased stems were first found was visited with Miss Patch on July 30. This was on rather low land which had recently been cleared, having never been under cultivation before. The field where the seed was grown was some miles away and planted to another crop, therefore no attempt was made to discover if the disease occurred on the original field. However, as will be seen later, there is some reason to think that the disease is carried with the seed. Affected plants were scattered all over the field, but probably less than one per cent of them were involved. When the field was examined, and in fact the same is true of all the fields seen later, the disease had apparently passed its greatest period of activity and was now on the decline. Affected plants could usually be detected some distance away. Their leaves were, as a rule, of a lighter green or yellowish color, especially in the later stages of the disease. The diseased plants were almost invariably more compact than the healthy ones, due to the upward trend of the lateral branches and petioles. The leaves also tend to curve upward, the younger ones folded upward along the midrib. Occasionally small green tubers could be found on diseased plants growing in the axils of the leaves above ground. Careful observation showed that any one of

* Jones, L. R., Vt. Sta. Rept. 19, p. 257 (1906).

these external symptoms mentioned might result from any other cause which injured the stem near or just below the surface of the ground and thus interfered with the free transference of nutrient substances.

Examination of the diseased plants showed that in every instance the stem was more or less blackened or browned usually at or just below the surface of the soil and downward. At Sherman, however, a few specimens showed the blackening following up the main stalk and branches for several inches. Frequently the diseased portions of the stem were very soft, resembling the decay caused by soft rot bacteria, while other cases, possibly in the later stages, showed more of a dry rot. In every case where the seed tuber could be found it was soft and mushy as though attacked by a soft rot. The seed tubers of healthy potatoes were, as a rule, sound and remarkably well preserved.

Another field at Sherman, about a mile from the first, contained from 5 per cent to 15 per cent diseased plants, the higher percentage being on the more poorly drained portions of the field. A few fields were found at Houlton where diseased plants were quite frequent, but here as in some other places a careful search over any large field would occasionally produce isolated plants which were affected. Late in the season outbreaks were discovered at Dover and at Orono. At the former place was secured the only evidence of possible spreading of the disease in the field. Here the portion involved was situated in a somewhat depressed area in an otherwise well-drained field. The owner, a professional man, had had the matter under observation for some days before the field was seen by the writer. He was well satisfied that the diseased area was gradually enlarging. In fact when the field was visited the plants on the margin of the somewhat circular, diseased area showed earlier stages of the disease than those in the center. In all other cases examined there did not appear to be any evidence of spreading from plant to plant or from hill to hill. If 2 diseased stalks were close together it was invariably found that they arose from the same seed piece.

The case at Orono would indicate that the disease is transmitted with the seed. Here all the seed on a 4-acre field was obtained from away, and from 3 or 4 different sources. Two

of these lots of seed, consisting of a single barrel each, were planted on one side of the field under exactly the same conditions. The plants from one of these barrels of seed were found to be quite generally attacked by "black leg" late in August, while not a single diseased stem could be found on the remainder of the field. A barrel of seed from this portion of the field was saved for future planting.

For a similar diseased condition Selby * has given the name "potato rosette," while Rolfs has used the terms "little potato disease," "collar-rot," etc.† Jones apparently prefers the name "black leg" which is commonly used in England. The evidence seems to be pretty conclusive that the disease as it occurred in Ohio and Colorado is due to the fungus *Corticium vagum var. Solani,* Burt., or as it is more commonly known, the potato *Rhizoctonia,* while the similar trouble known as *Schwarzbeinigkeit* in Germany has been ascribed to certain bacteria. Harrison has more recently described a new bacterial rot of the stem and tuber due to *Bacillus solanisaprus.* This organism was most carefully studied by him and its ability to produce the disease fully demonstrated.‡ The article in question was not available to the writer till after the observations herein recorded were made, but the evidence strongly suggests that the Maine potato stem trouble is identical with Harrison's bacterial disease which he states is widely distributed over various Canadian Provinces.

Microscopic examination of a large number of diseased stems both before and after being placed in a moist chamber almost invariably failed to show *Rhizoctonia* hyphæ. One case was noted where spores resembling those of the *Corticium* stage were observed, although they were somewhat larger than those described by Rolfs. Very frequently indeed spores were found which in shape and size agreed perfectly with the description of macroconidia of *Fusarium oxysporium,* as published by Smith and Swingle.§ Preparations from stem where the diseased

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* Selby, A. D., Ohio Exp. Sta. Bulletins No. 139 and 145 (1903).

† Rolfs, F. M., Colo. Exp. Sta. Buls. 70 (1902); 91 (1904).

‡ Harrison, F. C., A Bacterial Rot of the Potato, caused by *Bacillus solanisaprus.* Centralblatt f. Bakt. u. Parasitenkunde, Bd. XVII, II Abt. 1906.

§ Smith, Erwin, F. and Swingle, Deane B., Bureau of Plant Industry, Bulletin 55, p. 30 (1904).

portions had not become dry invariably showed myriads of motile bacteria. As farther evidence that *Rhizoctonia* is probably not primarily the cause of the disease as it occurs in Maine it should be noted that the occurrence and distribution of the fungus is far out of proportion to the amount of "black-leg." *Rhizoctonia* sclerotia are of almost universal occurrence on the tubers everywhere in the State. Examination of the old potato tops which had lain out all winter, in widely separated localities, showed that the old, dried stems were invariably studded with these same black sclerotia. Figure 50 is a fair representation of the appearance of these stems from one field. However, repeated searching during the summer over an 8-acre field planted with seed from the same source failed to reveal but one stem affected with "black-leg."

Attempts to produce the disease in the field by inoculation with pieces of diseased tissues and from cultures were without success and greenhouse facilities with which to follow up the matter with younger plants with control conditions were not available. Therefore, little was accomplished other than described above in determining the cause of the disease as it occurs in Maine.

The writer is fully aware that the foregoing adds little to what is already known with regard to this class of potato stem diseases, other than enlarging the range of distribution. However, this somewhat extended account is given with the hope it will cause Maine growers to be on the lookout for potato stem diseases and to report them at once to the Station with samples for examination. In this way they will materially assist in the studies which are now planned for the coming season.

In conclusion it should be stated that so far as the present knowledge of the disease as it occurs in this State goes there need be no cause for serious alarm. The severe outbreaks observed were largely on low, poorly drained soil, not well adapted to potato culture. It is not believed that "black leg" will ever become in Maine so serious a pest to handle as scab. There is considerable reason to believe that it may be transferred from one field to another with the seed, therefore seed from infected fields should not be used. The suggestions with reference to the use of clean, smooth seed, disinfected with formalin or formaldehyde, apply equally well here as in the case of scab.

Fig. 49. Tuber injured by improper use of formaldehyde gas. See p.

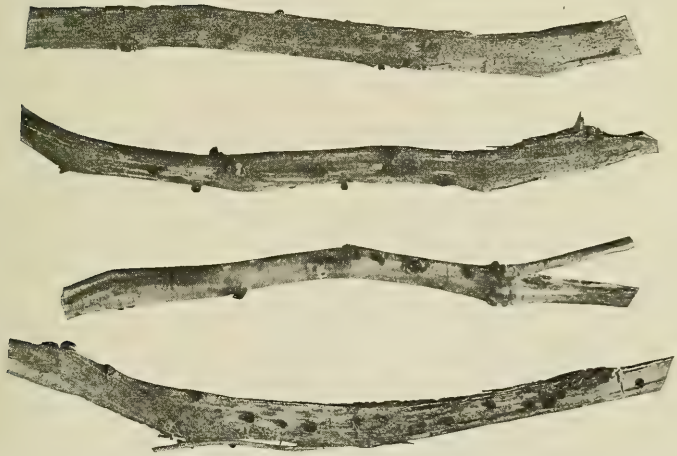

Fig. 50. Dry potato stems studded with Rhizoctonia sclerotia. Collected in May.

As a general precautionary measure against all potato diseases the collection and burning of all weeds, litter and tops as soon as the crop is harvested cannot be too strongly recommended.

Red Lead as an Insecticide.

Last spring a correspondent at Gray wrote the Station that Mr. J. E. Leighton of that place was successfully using red lead as a substitute for Paris green to destroy the larvæ of Colorado beetles on potatoes. Investigation showed that Mr. Leighton had been using this material for 3 years, applying dry about 10 pounds per acre, diluted with wood ashes. He stated that the red lead was very adhesive and remained on during the entire season. That, whereas he was obliged to go over his field repeatedly with Paris green, it was unnecessary where red lead was used, except to protect new growth. Mr. Leighton stated that in his experience, not only did the red lead keep the foliage clean from the Colorado beetles but the leaves on the plants where it was used remained green for 2 or 3 weeks longer than was the case where Paris green alone was used.

To test the matter one-half of a small field of potatoes was sprayed on July 9 and again on July 20 with bordeaux mixture containing 10 pounds of red lead to 50 gallons of mixture. The other half was sprayed with bordeaux mixture containing 1 pound of Paris green to 50 gallons. The spraying was quite thoroughly done so about 75 or 80 gallons of mixture per acre was applied, thus using about 15 pounds of red lead and 1½ pounds of Paris green per acre. The red lead proved to be very hard to use with bordeaux mixture. On account of its relatively high specific gravity it all settled to the bottom of the spray tank, forming a thick, pasty mass by the time the field was reached. In order to spray it on at all it was necessary to remove the hose from the nozzles and pump the mixture back through the hose into the tank for several minutes, till it became thoroughly mixed. Then the mixture had to be kept constantly agitated and applied at once.

Both the Paris green and the red lead cleared the foliage of insects, but while the former killed them, as was evidenced by the dead on the ground, the latter simply acted as a repellent. No dead insects could be found under the plants sprayed with

red lead, but the largely increased numbers on nearby, unsprayed plants showed that they had migrated to these. The length of time that a spraying with red lead would protect the foliage did not appear to exceed that of Paris green. The only conclusion that could be drawn from the field trials was that while red lead used in sufficient quantities will keep the larvæ away from potato foliage there is nothing to recommend it as a substitute for Paris green as an insecticide.

In order to determine just what the action of red lead is upon the young larvæ the Station Entomologist tested the matter in the insect house. The results of her experiments and her conclusions are as follows:

"Twelve insectary tests were made to determine the value of dry red lead as an insecticide, about 50 potato beetle larvæ being involved in each test. It was found that leaves heavily coated with red lead were to a very considerable extent avoided by even the large larvæ and this substance has some value as a repellent. Some of the very young larvæ that trailed through the red lead which adhered to them died, and this powder served to a slight degree, therefore, as a contact insecticide. Without going into the details of any of the tests it is perhaps sufficient to state that of the 2 lots of larvæ caged July 27 at 4 P. M. upon potato plants, one of which was treated with red lead and one with Paris green in exactly similar ways, an examination July 28 at 9 A. M. showed 50 live and apparently healthy larvæ in the red lead cage and 43 dead and 7 alive (part of which subsequently died) in the Paris green cage."

METEOROLOGICAL OBSERVATIONS.

Lat. 44° 54′ 2″ N. Lon. 68° 40′ 11″ W. Elevation 150 feet.

The instruments used at this Station are the same as those used in preceding years, and include: Wet and dry bulb thermometers; maximum and minimum thermometers; rain-gauge; self-recording anemometer, vane, and barometer. The observations at Orono now form an almost unbroken record of thirty-nine years.

January was 3 degrees and February 5 degrees below the average, while March, April and May fell from 1 to 3 degrees below the average. On the other hand, December was over 7 degrees above the average for that month. Other minor compensations brought the mean temperature of the year within 0.29 degrees of the average. The precipitation was very unevenly distributed, with a total 1.32 inches below the average.

METEOROLOGICAL SUMMARY FOR 1907.

Observations Made at the Maine Experiment Station.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Mean.	Total.
Highest barometer	30.55	30.51	30.38	30.28	30.20	30.07	30.03	30.13	30.28	30.43	30.43	30.20	30.28	
Lowest barometer	29.17	29.37	29.27	28.98	29.52	29.30	29.28	28.36	29.39	29.27	29.18	29.13	29.18	
Mean barometer	30.05	29.87	29.89	29.69	29.82	29.80	29.71	29.78	29.88	29.85	29.91	29.81	29.84	
Highest temperature	47°.0	43°.0	60° 0	65°.0	75°.0	90°.0	91°.0	88°.0	81°.0	67°.0	57°.0	55°.0		
Lowest temperature	-40°.0	-28°.0	-25° 0	9°.0	27°.0	31°.0	47°.0	40° 0	37°.0	42° 0	10°.0	-2°.0		
Mean temperature	13°.1	13°.8	27°.2	39°.0	49°.0	61°.9	66°.9	65°.2	59° 3	44°.4	35°.6	27° 8	41° 93	
Mean temperature for 39 years	16°.0	18°.9	27°.9	40°.7	52°.4	61° 8	67°.0	65°.0	57°.4	44° 9	34°.2	20° 5	42° 22	
Total precipitation in inches	4.41	3.01	2.25	3.53	1.77	5.77	3.44	1.41	6.12	2.72	4.22	3.84	.....	42.49
Mean precipitation for 39 years	4.26	3.81	4.29	2.90	3.49	3.58	3.28	3.44	3.43	3.82	3.74	3.77	.....	43.81
No. of days with precip. of .01 in. or more	10	13	7	6	6	9	12	10	16	8	7	7	.....	111
Snow fall in inches	31.5	27.0	15.5	18.0	.....	.....	.....	.....	.....	.....	1.0	7.7	.....	100.7
Average snow fall for 39 years	22.9	21.3	15.9	5.6	0.3	.....	.....	.....	.....	0.8	8.1	17.0	.....	91.9
Number of clear days	12	15	14	11	6	10	10	11	7	10	9	8	.....	123
Number of fair days	8	7	4	4	12	5	10	11	11	4	8	7	.....	91
Number of cloudy days	11	6	13	15	13	15	11	9	12	17	13	16	.....	151
Total movement of wind in miles	4773	5038	5060	6817	6332	4210	4470	4085	4397	5764	4539	5512		

Monthly and Annual Precipitation (as rain) for the Year 1907.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Bar Harbor	3.00	3.45	2.00	5.30	2.90	4.48	3.05	2.37	5.90	4.90	5.30	5.75	48.40
Cornish	3.04	2.45	3.03	3.19	2.05	4.25	2.85	2.06	7.51	4.06	6.04	3.27	43.80
Debsconeag	2.85	1.75	2.80	3.80	1.30	7.57	5.85	2.30	6.10	4.50	.....	3.44	.....
Eastport	5.05	4.59	3.17	4.54	1.84	1.57	4.32	2.43	4.41	4.71	2.85	4.94	44.42
Fairfield	3.19	2.65	1.43	3.49	2.62	2.95	5.36	1.32	5.23	2.34	3.66	2.68	36.92
Farmington	2.34	1.96	2.88	4.05	2.57	2.88	4.59	2.09	5.97	6.15	4.50	3.30	43.28
Gardiner	3.12	2.50	2.09	3.70	2.48	3.10	2.77	1.51	7.38	4.15	4.97	3.75	41.52
Greenville	0.98	1.30	2.56	3.78	2.54	6.90	5.81	2.68	5.64	.....	5.16	3.12	.....
Houlton	1.90	1.50	1.70	1.75	1.00	4.20	.....	3.22	5.00	3.10	2.10	2.00	.....
Lewiston	2.45	2.29	3.05	3.71	2.11	4.79	2.63	2.56	7.03	3.56	4.25	3.58	42.01
Madison	2.38	2.45	1.84	6.32	2.83	3.89	7.34	2.54	7.49	6.31	6.28	4.35	54.02
Mayfield	1.33	1.72	1.86	4.04	2.40	4.64	4.75	3.18	5.67	6.11	5.35	5.42	46.47
Millinocket	3.24	1.95	2.16	3.60	2.50	7.33	4.70	4.04	5.31	4.14	3.75	3.32	46.04
North Bridgton	1.90	1.89	3.68	3.80	2.21	4.28	2.95	2.10	6.49	4.49	4.74	3.67	42.20
Oquossoc	2.03	1.38	2.86	3.61	1.90	.....	.....	.....	.....	.....	.....	.....	.....
Orono	4.41	3.01	2.25	3.53	1.77	5.77	3.44	1.41	6.12	2.72	4.22	3.84	42.49
Patten	1.00	2.40	1.40	1.50	2.05	10.04	4.21	5.00	6.04	5.70	5.30	4.00	48.64
Portland	2.46	2.95	2.58	2.75	1.99	3.55	3.63	2.07	7.71	2.53	4.40	4.12	40.74
Rumford Falls	1.67	1.52	2.90	3.88	1.84	3.03	3.53	1.22	6.34	5.17	5.14	2.68	38.92
Van Buren	2.80	1.80	3.20	2.30	0.90	6.20	5.90	4.40	3.70	2.87	3.00	4.70	.....
Winslow	2.60	1.56	1.72	3.40	2.58	2.90	5.26	0.83	6.00	3.24	4.49	3.15	37.73

With the exception of readings from the Orono station, the above table is complied from the monthly bulletins of the U. S. Weather Bureau.

REPORT OF THE TREASURER.

Maine Agricultural Experiment Station in account with the United States appropriation, 1906-7, Hatch Fund:

Dr.

To receipts from the Treasurer of the United States as per appropriation for the fiscal year ending June 30, 1907, as per act of Congress approved March 2, 1887		$15,000 00

Cr.

By salaries:		
(a) Director and administration officers	$3,975 97	
(b) Scientific staff	1,664 88	
(c) Assistants to scientific staff	1,823 01	
(d) Special and temporary services	125 57	
Total		$7,589 43
Labor:		
(b) Daily employees	$637 89	
(d) Teams	147 95	
Total		785 84
Publications		332 83
Postage and stationery		433 44
Freight and express		283 66
Heat, light, water, and power		175 95
Chemical snpplies		251 79
Seeds, plants and sundry supplies:		
(a) Agricultural	$13 75	
(d) Entomological	218 29	
(e) Miscellaneous	50 36	
(f) Photography	28 51	
Total		310 91

Fertilizers	85
Feeding stuffs	1,296 83
Library	965 71
Tools, implements and machinery	73 06
Furniture and fixtures	850 45
Scientific apparatus	310 67
Live stock	173 40
Contingent expenses	15 00
Traveling expenses	400 18
Buildings and repairs	750 00
Total	$15,000 00

Maine Agricultural Experiment Station in account with the United States appropriation, 1906-7, Adams Fund:

Dr.

To receipts from the Treasurer of the United States as per appropriation for the fiscal year ending June 30, 1907, as per act of Congress approved March 16, 1906		$7,000 00

Cr.

By salaries:		
(b) Scientific staff	$5,545 47	
(d) Special and temporary services	109 05	
Labor Total		$5,654 52
(d) Teams		1 50
Freight and express		2 10
Heat, light, water, and power		28 82
Chemical supplies		3 17
Seeds, plants and sundry supplies:		
(b) Pomological	$72 43	
(e) Miscellaneous	12 06	
(g) Vegetable Pathological	177 25	
Total		261 74
Fertilizers		51 34
Feeding stuffs		4 60
Library		320 41
Tools, implements and machinery		70
Scientific apparatus		471 36
Traveling expenses		199 74
Total		$7,000 00

I, the undersigned, duly appointed Auditor of the Corporation, do hereby certify that I have examined the books of the Maine Agricultural Experiment Station for the fiscal year ending June 30, 1907, that I 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 $22,000.00, and the corresponding disbursements, $22,000.00; for all of which proper vouchers are on file and have been examined by me and found correct.

And I further certify that the expenditures have been solely for the purposes set forth in the acts of Congress approved March 2, 1887, and March 16, 1906.

GEORGE E. FELLOWS, *Auditor.*

Maine Agricultural Experiment Station in account with "General Account" for the year ending June 30, 1907.

Dr.

To balance from 1904-1905	$3,685 84	
Sales of produce, inspection fees, etc	11,277 68	$14,963 52

Cr.

By salaries	$5,176 52	
Labor	719 85	
Publications	3 25	
Postage and stationery	128 36	
Freight and express	80 56	
Heat, light, water and power	363 84	
Chemical supplies	199 16	
Seeds, plants and sundry supplies	393 89	
Fertilizers	88 93	
Feeding stuffs	1,245 87	
Library	611 98	
Tools, implements and machinery	42 63	
Furniture and fixtures	123 65	
Scientific apparatus	208 50	
Live stock	142 16	
Traveling expenses	912 38	
Buildings	938 03	
Balance to 1906-1907 account	3,583 96	14,963 52

ISAIAH K. STETSON, *Treasurer.*

The Bulletins of this Station will be sent free to any address in Maine. All requests should be sent to

Agricultural Experiment Station,
Orono, Maine.

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