TWENTY-FOURTH ANNUAL REPORT

OF THE

Maine Agricultural Experiment Station

ORONO, MAINE.

1908

WATERVILLE
SENTINEL PUBLISHING COMPANY
1909

MAINE
AGRICULTURAL EXPERIMENT STATION
ORONO, MAINE.

ORGANIZATION JANUARY TO JUNE, 1908.

THE STATION COUNCIL.

PRESIDENT GEORGE E. FELLOWS	*President*
DIRECTOR CHARLES D. WOODS	*Secretary*
JOHN A. ROBERTS, Norway	*Committee of Board of Trustees*
CHARLES L. JONES, Corinna	*Committee of Board of Trustees*
SAMUEL W. GOULD, Skowhegan	*Committee of Board of Trustees*
AUGUSTUS W. GILMAN, Foxcroft	*Commissioner of Agriculture*
EUGENE H. LIBBY, Auburn	*State Grange*
CHARLES S. POPE, Manchester	*State Pomological Society*
RUTILLUS ALLEN, Winthrop	*State Dairymen's Association*
JAMES M. BARTLETT	*Members of the Station Staff*
LUCIUS H. MERRILL	*Members of the Station Staff*
FREMONT L. RUSSELL	*Members of the Station Staff*
EDITH M. PATCH	*Members of the Station Staff*
WARNER J. MORSE	*Members of the Station Staff*
RAYMOND PEARL	*Members of the Station Staff*

THE STATION STAFF.

CHARLES D. WOODS	*Director*
JAMES M. BARTLETT	*Chemists*
LUCIUS H. MERRILL	*Chemists*
HERMAN H. HANSON	*Chemists*
ARTHUR C. WHITTIER	*Chemists*
JOANNA C. COLCORD	*Chemists*
FREMONT L. RUSSELL	*Veterinarian*
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*
LOTTIE E. McPHETERS	*Computer*
HENRY A. MILLETT	*Meteorological Observer and Janitor*
WALTER ANDERSON	*Poultryman*
FRANK D. STERRY	*Laboratory Assistant*

MAINE
AGRICULTURAL EXPERIMENT STATION
ORONO, MAINE.

ORGANIZATION JULY TO DECEMBER, 1908.

THE STATION COUNCIL.

PRESIDENT GEORGE E. FELLOWS	*President*
DIRECTOR CHARLES D. WOODS	*Secretary*
JOHN A. ROBERTS, Norway	*Committee of Board of Trustees*
CHARLES L. JONES, Corinna	*Committee of Board of Trustees*
SAMUEL W. GOULD, Skowhegan	*Committee of Board of Trustees*
AUGUSTUS W. GILMAN, Foxcroft	*Commissioner of Agriculture*
EUGENE H. LIBBY, Auburn	*State Grange*
CHARLES S. POPE, Manchester	*State Pomological Society*
RUTILLUS ALDEN, Winthrop	*State Dairymen's Association*
JAMES M. BARTLETT	*Members of the Station Staff*
FREMONT L. RUSSELL	*Members of the Station Staff*
EDITH M. PATCH	*Members of the Station Staff*
WARNER J. MORSE	*Members of the Station Staff*
RAYMOND PEARL	*Members of the Station Staff*
HERMAN H. HANSON	*Members of the Station Staff*
FRANK M. SURFACE	*Members of the Station Staff*
CHARLES E. LEWIS	*Members of the Station Staff*

THE STATION STAFF.

CHARLES D. WOODS		*Director*
BIOLOGY	RAYMOND PEARL	*Biologist*
	FRANK M. SURFACE	*Associate*
	FREMONT L. RUSSELL	*Assistant*
	MAYNIE R. CURTIS	*Assistant*
	WALTER ANDERSON	*Poultryman*
	LOTTIE E. McPHETERS	*Computer*
CHEMISTRY	JAMES M. BARTLETT	*Chemist*
	HERMAN H. HANSON	*Associate*
	JOANNA C. COLCORD	*Assistant*
	JOSEPH F. MERRILL	*Assistant*
	REX C. GELLERSON	*Inspector*
ENTOMOLOGY	EDITH M. PATCH	*Entomologist*
	ALICE W. AVERILL	*Laboratory Assistant*
PLANT PATHOLOGY	WARNER J. MORSE	*Pathologist*
	CHARLES E. LEWIS	*Associate*
	FRANK D. STERRY	*Laboratory Assistant*
ROYDON 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*

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.

CONTENTS.

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 1908.

Publications.

The Experiment Station publishes during the year several bulletins which make up the annual report for the year. All bulletins issued 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 feeding stuff, fertilizer and seed inspection are sent to the general mailing list. Publications having to do with food and drug inspection are sent to a special list including all dealers in Maine and other citizens who request them. The annual report is sent to directors and to libraries.

BULLETINS PUBLISHED IN 1908.

No. 151.	Food and Drug Inspection	48 pages
No. 152.	Seed Inspection	36 pages
No. 153.	Fertilizer Inspection	24 pages
No. 154.	Paris Green. Bordeaux Mixture	16 pages
No. 155.	Orchard Notes, 1907	32 pages
No. 156.	Feeding Stuff Inspection	48 pages
No. 157.	Poultry Work at the Maine Station	16 pages
No. 158.	Food of Man Studies	20 pages
No. 159.	Appliances and Methods for Pedigree Poultry Breeding	36 pages
No. 160.	Fertilizer Inspection	36 pages
No. 161.	Saddled Prominent	40 pages
No. 162.	Insect Notes for 1908	36 pages
No. 163.	Meteorology, Finances, Index	10 pages

MISCELLANEOUS PUBLICATIONS PUBLISHED IN 1908.

The following miscellaneous publications were issued in 1908. The newspaper bulletins were sent to the press of the State and to exchanges. The Official Inspections were food and drug publications and were sent to all dealers in Maine, and other citizens who requested them.

Food and Drug Inspection No. 13 (M. F. D. R. 12, 13 and 14) ..... 4 pages
Food and Drug Inspection 14. (M. F. D. R. 15 and 16) 4 pages
Official Inspections No. 1..... 8 pages
Official Inspections No. 2..... 8 pages
Official Inspections No. 3..... 8 pages
Official Inspections No. 4..... 8 pages
Official Inspections No. 5..... 8 pages
Official Inspections No. 6..... 8 pages
Forest Tent Caterpillar..... 6 pages
Prentiss Aroostook Complete Fertilizer..... 8 pages
How to Fight Potato Enemies.....14 pages
Newspaper Bulletin,—Wild Mustard..... 1 page
Newspaper Bulletin,—Damage by the Prominent Caterpillar ..... 1 page
Newspaper bulletin,—Two Potato Diseases New to Maine ..... 1 page
The New Maine Station Trap Nest..... 8 pages
Organization and Work of the Department of Biology 8 pages
Notice to Dealers in Agricultural Seeds in Maine..... 2 pages
List of bulletins published in 1907..... 1 page
Newspaper Notice of Bulletin 149..... 1 page
Newspaper Notice of Bulletin 151..... 1 page
Newspaper Notice of Bulletin 152..... 1 page
Newspaper Notice of Bulletin 153..... 1 page
Newspaper Notice of Bulletin 154..... 1 page
Newspaper Notice of Bulletin 155..... 1 page
Newspaper Notice of Bulletin 156..... 1 page
Newspaper Notice of Bulletin 157..... 1 page
Newspaper Notice of Bulletin 158..... 1 page
Newspaper Notice of Bulletin 159..... 1 page

TECHNICAL PUBLICATIONS.

The bulletins of the Station contain the results of the work of investigation. It frequently happens, however, that much of the work of investigation is of so technical a nature as not to warrant its distribution to the general mailing list of the Experiment Station. The work of this kind is sometimes published in the bulletins of the Station and sent out to a special mailing list or sometimes published in technical journals or other places. There is given below a complete list of the biological and entomological publications for 1908. Some of these have been printed in Station bulletins and others elsewhere as indicated.

A limited number of the complete sets of the biological publications and of the entomological publications for 1908 are available for exchange with laboratories and institutions working in similar lines. Correspondence relative to the affecting of such exchanges should be addressed to Director Charles D. Woods, Maine Agricultural Experiment Station, Orono, Maine, U. S. A.

Biology Publications 1908.

1. Certain Points Concerning the Probable Error of the Standard Deviation, by R. Pearl. Biometrika, Vol. 6, pp. 112-117, 1908.
2. A Biometrical Study of Egg Production. Part I. Variation in Annual Egg Production. By R. Pearl and F. M. Surface. Bulletin 110 Bureau of Animal Industry, U. S. Dept. Agr. (In press.)
3. Fecundity of Swine, by F. M. Surface. Biometrika Vol. VI.
4. The Frequency Constants of the Variable $z=f(x^1, x^2)$ by R. Pearl. Biometrika, Vol. VI.
5. Resection and End-to-End Anastomosis of the Oviduct in the Hen without Loss of Function, by R. Pearl and F. M. Surface. American Journal of Physiology, Vol. 22, pp. 357-361. 1908.
6. Appliances and Methods for Pedigree Poultry Breeding, by R. Pearl and F. M. Surface. Maine Agricultural Experiment Station Bulletin No. 159, pp. 239-274. 1908.

7. Studies on the Physiology of Reproduction in the Domestic Fowl. L. Regulation in the Morphogenetic Activity of the Oviduct, by R. Pearl. Journal of Experimental Zoölogy. Vol. 6.
8. Data on Variation in the Comb of the Domestic Fowl. Biometrika, Vol. VI.
9. On the use of Atropin Sulphate in Anaesthetizing Birds for Surgical Experiments. Jour. Amer. Med. Asso., Vol. LII, pp. 382-383.

Entomology Publications 1908.

No. 29. Crocigrapha normani, Grote, Entomological News July 1908.
No. 30. Pemphigus Tessellata. Alternate host. Migrants and True Sexes. Entomological News 1908.
No. 31. The Saddled Prominent. Bulletin 161.
No. 32. Insect Notes for 1908. Bulletin 162.

Inspection Publications.

Prior to July, 1908, the results of all the inspection work conducted by the Experiment Station were printed in the bulletins of the Station. A new series of publications under the title of "Official Inspections" was begun with July, 1908, and before the close of the year six of these publications were issued; practically all having to do with the work of the food and drug inspection.

The bulletins for 1908 contain, as in the past, the full report of the feeding stuffs, fertilizer and agricultural seed inspections. Beginning with 1909 none of the work of inspection will be published in the regular bulletins of the Station, but will appear in the Official Inspections.

As in the past, the work of inspection which has to do with agricultural seeds, fertilizer and feeding stuffs will be sent to the general list. Official Inspections containing the results of work under the Food and Drug Law will be sent to a special list including all dealers in Maine and other citizens who request them. Official Inspections will not be sent to the official mailing list of the office of Experiment Stations or to non-residents of the State except on special request. The six Official Inspections for 1908 are bound in as an appendix to the annual report of the Station.

Inspection Publications 1908.

Feeding Stuffs Inspection.

Bulletin 156 .....48 pages

Fertilizer Inspection.

Prentiss Aroostook Complete Fertilizer (Circular).... 8 pages
Bulletin 153 .....24 pages
Bulletin 160 .....36 pages

Food and Drug Inspection.

Bulletin 151 .....36 pages
Official Inspections 1 to 6.....48 pages
Food and Drug Regulations 12 to 16 (Circulars).... 8 pages

Seed Inspection.

Bulletin 152 .....36 pages

CHANGES IN STATION STAFF.

June 30, 1908, Prof. L. H. Merrill resigned from the Experiment Station staff to devote his whole time to teaching in the University. Mr. Merrill had been on the Experiment Station staff since 1885 and had the longest continuous service, with one exception, of any member of the staff.

Mr. Arthur C. Whittier, assistant chemist, resigned June 30, 1908 to accept a similar position in the Ohio Experiment Station.

June 1 the Department of Veterinary Science which was under the charge of Prof. F. L. Russell for a number of years, was discontinued. The major portion of Dr. Russell's time during the past few years has been given to the work of instruction in the University. He is continuing his connection with the Station since July 1 doing special work in the Department of Biology.

Dr. Chas. E. Lewis, was appointed Associate Pathologist and entered upon his duties July 1.

Joseph F. Merrill who did special work in the Experiment Station during the fall of 1907 and winter of 1908 was regularly appointed assistant chemist July 1, 1908.

Miss Maynie R. Curtis was appointed assistant in biology and began her work August 1, 1908.

Miss Alice W. Averill was appointed laboratory assistant in entomology and began her work in August, 1908.

BUILDINGS.

A small greenhouse 15 x 30, for the use of the Pathologists and Entomologist was erected on the south of the Experiment Station building. It is divided into three rooms with arrangements for automatically controlling the temperature. A small potting shed is connected.

The frame poultry house, known as No. 1, was abandoned and torn down in the summer of 1908. At the east end of poultry house No. 2, a house was erected for a poultry hospital and special physiological investigations with poultry.

BULLETIN No. 151

FOOD AND DRUG INSPECTION.

CHAS. D. WOODS, Director.

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

The present bulletin, intended primarily for dealers, contains reports upon the food inspection as it has been conducted during the last six months of 1907 and the results of analyses of samples collected, together with a discussion of these results. This discussion is made as simple and as free from technical language as possible. The attempt is made to clearly point out some of the more common violations of the law which are made unwittingly, and to call attention to some violations that have been passed over during this, the first year of the present law, that cannot be allowed to continue.

SELLING GOODS THAT HAVE BEEN REMOVED FROM THE PACKAGE.

Some cases have come to our attention of unwitting violations of the law on the part of dealers by removing the contents of a package into some other receptacle before selling. This is perfectly proper in the case of goods that are exactly what they appear to be, but goods that require branding cannot be lawfully removed from original package before being sold unless they are still corerctly labeled. For example—adulterated maple sugar may be sent out in boxes that are properly labeled; it is unlawful for the dealer to remove it from the package in which it was received and expose it for sale unless it shall be plainly marked adulterated maple sugar or maple sugar and cane sugar or whatever is necessary to accord with the fact. Pork sausage as put up by many of the manufacturers contains some cereal and is properly labeled "Pork sausage, cereal added." The removal of such sausage from the original package and expo-

sure for sale without proper labeling is unlawful. An imitation cream of tartar sold in bulk, may be properly labeled in its original package but it is unlawful to remove it from that package and expose it for sale unless it shall be properly labeled.

Substitution.

One of the most difficult things to meet in the enforcement of the law is in connection with goods sold from opened packages. When these goods come from the wholesaler to the retailer they may be properly labeled so as to show their exact nature, but when they are given by the retailer to the consumer, it does not follow that the consumer knows what he receives. For instance a retailer may buy a barrel of distilled vinegar, artificially colored and below the standard strength of acid. The barrel may be branded correctly "Distilled vinegar, colored, 3½ per cent acetic acid," but in taking orders from house to house, the grocer's clerk may find a customer who asks for a gallon of vinegar. Under the law the customer has the right to expect that cider vinegar of legal strength will be given him. The order may, however, be filled from this imitation vinegar. One sends to the market for pork sausage; the order may be filled from a package labeled "Pork Sausage, cereal added." Cream of tartar may be ordered and the grocer may deliver an imitation cream of tartar although he may take it from a correctly labeled opened package.

The lesson from this is obvious. Unless the customer knows that his grocer is thoroughly reliable and will deliver him exactly what he orders, there is only one thing to do and that is to follow up the purchases to make sure they are taken from properly labeled packages. No possible food inspection can protect the customer that does not use his eyes for his own protection. The great mass of bulk goods at present being sold in Maine are properly labeled. The dealer violates the law who substitutes an inferior article even though it be from a properly labeled package. The inspector will do all in his power to look after these cases but it is necessary that the consumer be on the watch for his own protection.

The Guaranty.

Section 9 of the Maine Food and Drug Law reads as follows: "No dealer shall be prosecuted under the provisions of this act when he can establish a guaranty signed by the wholesaler, jobber, manufacturer, or other party residing in the United States, from whom he purchased such articles, to the effect that the same is not adulterated or misbranded within the meaning of this act, designating it. Said guaranty, to afford protection, shall contain the name and address of the party or parties making the sale of such articles to such dealer, and in such case said party or parties shall be amendable to the prosecutions, fines and other penalties which would attach, in due course, to the dealer under the provisions of this act."

By Maine Food and Drug Regulation 6, Regulation 9 of the U. S. Secretary of Agriculture which has to do with the form of guaranty, was adopted for Maine. In M. F. D. R. 11, "A Written Guaranty the Dealers Safeguard," the folowing statement is made. While the law cited applies only to the sale of food and drugs, discretion is given to the Director regarding prosecutions under other laws. No prosecutions will be made against any handler of feeding stuffs, fertilizers, or agricultural seeds within the State provided he obtain at the time of purchase a *written guaranty* that the goods are in conformity with the law regulating their sale. Failure to obtain such a guaranty on the part of the dealer will be presumptive evidence that he is not sufficiently interested in the purity of the goods which he handles, and unless there are especially extenuating circumstances, the Director will feel it his duty to begin prosecution for violations of either of the laws regulating the sale of food and drugs, feeding stuffs, fertilizers, or agricultural seeds.

There seems to be some misunderstanding relative to the guaranty on the part of the dealers and the attempt is here made to state this matter clearly.

Any form of guaranty covering the facts may be used. Forms are suggested below. The guaranty must be signed in ink. The signature of a corporation should be made in the following form. First the legal corporate title of the company; second the autograph of a duly authorized officer of the company; third the title or designation of his office. For example —The Smith-Jones Company, *Chas. R. Doe,* Member of firm.

The following three classes of guarantees cover the cases about which questions have arisen.

(1) *A guaranty filed with the United States Secretary of Agriculture* by the manufacturer or dealer and given a serial number, which number shall appear on each and every package of goods sold under such guaranty together with the words "Guaranteed under the Food and Drug Act, June 30, 1906" protects the dealer. The following is the form suggested by the U. S. Secretary of Agriculture.

"I (we) the undersigned do hereby guarantee that the articles of food or drugs manufactured, packed, distributed, or sold by me (us) (specify the same as fully as possible) are not adulterated or misbranded within the meaning of the food and drugs act, June 30, 1906.

(Signed in ink.)

. . . . . .

(Name and place of business of wholesale, dealer, manufacturer, jobber, or other party.)"

(2) If a *guaranty* is *not filed* and the serial number not printed as above stated, the guaranty should identify and may be attached to the bill of sale, invoice, bill of lading or other schedule giving the names and quantities of the articles sold.

"I (we) the undersigned do hereby guarantee that the following articles, packed, distributed or sold by me (us) (specify the same as fully as possible) are in conformity with the requirements of the Maine Food and Drug Law," to be signed, etc. as under (1).

In the case of commercial feeding stuffs, commercial fertilizers or agricultural seeds, the same form may be used but specify the class of goods and the law to which they apply. These last may be designated as the Maine law regulating the sale of concentrated commercial feeding stuffs, the Maine law regulating the sale of commercial fertilizers, the Maine law regulating the sale of agricultural seeds.

(3) A *general guaranty* may be given by a manufacturer or dealer for a period of time and the following form may be used.

"I (we) the undersigned do hereby guarantee that the articles (specify whether foods, drugs, feeding stuffs, fertilizers or seeds) packed, distributed or sold by me (us) (state name of consignee) during the year 19—shall be in conformity with the requirements of the (here insert proper law, as Maine food and drug law, March 26, 1907; the Maine law regulating the

sale of commercial feeding stuffs; the Maine law regulating the sale of commercial fertilizers; the Maine law regulating the sale of agricultural seeds.)"

To be signed, etc., as under (1).

The Work of the Inspector.

From July 1, 1907, to the end of the year, most of the time of the inspector was used in connection with food and drug inspection. During this time he visited the dealers at least once in about 175 of the cities and larger towns of the State. There are in the neighborhood of 5,000 dealers in the State handling foods and drugs. Approximately two-thirds of these places have been visited by the inspector. There is, of course, a large amount of misunderstanding on the part of dealers regarding the law and doubtless there are many goods on the shelves of retailers that are being unlawfully sold. There is, however, a gratifying disposition on the part of the great majority of the trade to conform strictly to the requirements of the Maine Food and Drug Law so far as they are understood. The inspector has reported approximately 450 violations. These, however, were for the most part technical and the matter has been cleared up and adjusted by correspondence and either the goods were withdrawn from sale or were properly branded.

The inspector has during the past six months taken about 600 samples of foods of which about two-thirds have been analyzed. Most of the analyses so far as they are completed, are reported in the present bulletin. Following up the reports of the inspector has taken a large amount of office time and involved the writing of more than 1,500 letters. There have been no prosecutions as yet and only in a few instances has it been necessary to appoint private hearings as a preliminary step to the prosecution, as outlined in section 7 of the law.

Dyes, Chemicals and Preservatives in Food.

By the law and by the different food inspection decisions of the U. S. Secretary of Agriculture which have been adopted for Maine, no drug or chemical may be used in foods. Common salt, sugar, wood smoke, potable distilled liquors, vinegar and condiments may be used. Pending further investigation, the use of saltpeter is allowed and in certain cases (See F. I. D. 76) sulphur dioxide may be used. In the pack of 1907 it was

lawful to use sodium bezoate in quantites not exceeding one-tenth of one per cent in such food and food products as it has been generally used in the past. The label must distinctly state that it has been so preserved. The list of the coal tar dyes which can be lawfully used are also given in F. I. D. 76.

In order to learn to what extent this law was being complied with, samples of sausages, salt fish, opened oysters and clams were purchased in the fall of 1907. It was found in a few instances that boric acid was being used in salt fish. Correspondence led to the agreement of the packers that they would stop this practice. In a few cases opened oysters were found to carry boric acid. This matter was taken up by correspondence and affidavits were obtained from the dealers and packers that the practice would be stopped. The sausages were for the most part found to be free from preservatives, but many of them carried starch showing that a cereal had been used in their manufacture. In some instances these were properly branded and in other cases they were not. Correspondence led to the obtaining of affidavits which promised that in the future the goods would be true to name and lawfully branded.

The tables on pages 7 to 14 give the results of the analyses of the samples of salt fish, clams, oysters, scallops and sausages examined.

Analyses of Salt Fish.

*Table showing the kinds of fish, the names * of the wholesale and retail dealers, the exact copy of the brand, the price asked per pound and the kind of preservative, if any.*

Station number.	Wholesale dealer, Retail dealer and brand.	Price per lb.	Preservative found.
	BONELESS COD IN PACKAGES.	cents	
7659	Alfred Jones Sons, Bangor, Me. Chas. Jones, Bangor, Me. "Strictly boneless pure codfish, Alfred Jones Sons, Bangor."	12	Boric acid
7662	O. A. Fickett, Bangor. S. H. Robinson & CO., Bangor. "Strictly boneless pure codfish, Alfred Jones Sons, Bangor."	13	Boric acid
7644	W. L. Daggett & Co., Portland, Me. J. W. Deering & Son, Portland, Me. "Portland brand selected codfish, strictly boneless, packed by Lord Bros. Co., Portland."	12	None
7647	Lord Bros. Co., Portland, Me. W. L. Wilson & Co., Portland, Me. "Portland Brand selected codfish, strictly boneless, packed by Lord Bros. Co., Portland."	12	None
7651	Lord Bros., Portland, Me. F. H. Verrill, Portland, Me. "Boneless Georgia's codfish, Lord Bros., Portland."	13	Benzoic soda
7656	T. M. Nicholson & Co., Bucksport, Me. H. E. Wentworth, Bangor, Me. "Lilly white codfish, T. M. Nicholson & Co., Bucksport, Me."	12	None
7661	T. M. Nicholson & Co., Bucksport, Me. T. F. Gallager, Bangor, Me. "Choice selected Boneless cod bits, T. M. Nicholson & Co., Bucksport, Me."	10	None
7860	Geo. Perkins & Son, Portland, Me. T. F. McCann & Co., Mechanic Falls, Me. "Perkins Georgia cod cake, Geo. Perkins & Son, Gloucester, Mass."	13	Benzoic acid
7636	D. W. True Co., Portland, Me. J. H. Littlefield, Ogunquit, Me. "Beardsleys Shredded Codfish, J. W. Beardsleys Sons, New York."	12	None
7643	Vinalhaven Fish Co., Vinalhaven, Me. John W. Deering & Co., Portland, Me. "Tidal wave brand selected stock boneless fish, cured and packed by Vinalhaven Fish Co., Vinalhaven, Me."	5	None

*The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

Analyses of Salt Fish—Continued.

*Table showing the kinds of fish, the names * of the wholesale and retail dealers, the exact copy of the brand, the price asked per pound and the kind of preservative, if any.*

Station number.	Wholesale dealer and Retail dealer.	Price per lb.	Preservative found.
		cents	
7641	J. T. Davis, Portsmouth, N. H. Bickford & Dorr, Kittery Point, Me. "Silver seal boneless codfish, packed for fancy trade"	15	None
7639	H. W. Spurr, Boston, Mass. Thos. Clarkson & Son, Kittery Point, Me. "Spurr's 1 lb. fish bricks, Howard W. Spurr Coffee Co., Boston, Mass."	15	Trace boric acid.
7664	H. W. Beardsleys Sons, Gloucester, Mass. T. J. Daley & Co., Bangor, Me. "Beardsley's Jewel Shredded Codfish, packed and guaranteed, J. W. Beardsleys Sons."	15	Boric acid
7638	Geo. Perkins & Son, Gloucester, Mass. A. E. Cuzner, York Village, Me. "Perkins Sweet Brier Picked Codfish, packed only by Geo. Perkins & Sons, Gloucester, Mass."	10	Boric acid
7642	Pinkham & Foster, Gloucester, Mass. Kittery Grocery Co., Kittery, Me. "Absolutely pure hand line brand Georgie's codfish, entirely boneless, Pinkham & Foster, Gloucester, Mass."	13	Benzoic acid
7663	Pinkham & Foster, Gloucester, Mass. T. J. Daley & Co., Bangor, Me. "Absolutely pure hand lined brand, Reg. U. S. Pat. Off. Georgie's codfish, entirely boneless, packed by Pinkham & Foster, Gloucester, Mass."	10	None
7653	Shute & Merchant, Gloucester, Mass. Fred T. Hall Co., Bangor, Me. "S. & M. Ocean Pearl Brand, Reg. U. S. Pat. Off., absolutely pure and free from all preservatives except salt, put up and guaranteed by Shute & Merchant, Gloucester, Mass."	15	None
7657	Shute & Merchant, Gloucester, Mass. H. E. Wentworth, Bangor, Me. "S. & M. Gold wedge brand fibered codfish, Reg. U. S. Pat. Off., absolutely pure and free from all preservatives except salt."	18	None
7637	Chas. F. Wonson & Co., Gloucester, Mass. T. J. Donohue, York Beach, Me. Condensed Codfish cured, prepared, flaked and packed, Chas. F. Wonson & Co."	10	Boric acid
7648	J. W. Beardsleys Sons CO., New York. W. L. Wilson Co., Portland, Me. "Beardsleys Shredd Codfish, J. W. Beardsleys Sons, New York."	10	None

*The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

Analyses of Salt Fish—Continued.

*Table showing the kinds of fish, the names * of the wholesale and retail dealers, the exact copy of the brand, the price asked per pound and the kind of preservative, if any.*

Station number.	Wholesale dealer, Retail dealer and brand.	Price per lb.	Preservative found.
	DRY SALTED COD., WHOLE FISH.	cents	
7819	Alfred Jones Sons, Bangor, Me. Fred Scott, Benton Station, Me. "Jones Celebrated Boat Fish."	10	None
7825	Alfred Jones Sons, Bangor, Me. M. G. Moore, North Anson, Me. Billed as "shore cod."	6	None
7896	Alfred Jones Sons, Bangor, Me. W. W. Farrar, Auburn, Me. "Jones Celebrated Boat Fish."	10	None
7864	John Cassidy Co., Bangor, Me. Beaulier Brothers, Oldtown, Me.	7	None
7665	T. J. Daley Co., Bangor, Me.	10	None
7861	Pinkham & Foster, Bangor, Me. G. H. Hunt, Oldtown, Me.	8	None
7824	T. R. Savage & Co., Bangor, Me. Foss & Tuscan, Solon, Me.	8	None
7899	T. N. Nicholson & Co., Bucksport, Me. N. W. Whitman, Bangor, Me.	7	None
7821	Lord Bros. Co., Portland, Me. David King, Fairfield, Me.	8	None
7839	Lord Bros. Co., Portland, Me. C. H. Callahan, Auburn, Me.	8	None
7950	M. C. Mortensen, Portland, Me. C. W. Lombard, Portland, Me.	14	None
7831	Geo. Perkins & Sons, Portland, Me. McNally & Bremner, Oakland, Me.	8	Boric acid
7883	Twitchell-Champlin Co., Portland, Me. Geo. S. Billings, Portland, Me.	9	None
7885	Twitchell-Champlin Co., Portland, Me. H. L. Starbird, Portland, Me.	8	Boric acid
7888	John Bird Co., Rockland, Me. J. H. McQuillan, N. Vassalboro, Me.	9	None
7840	B. S. Snow & Co., Boston, Mass. A. P. Conant & Co., Lewiston, Me.	8	Boric acid
7850	Gorton-Pew Fisheries Co., Gloucester, Mass. C. L. Macomber, Jay, Me.	10	None
7851	Gorton-Pew Fisheries Co., Gloucester, Mass. Gauthier Bros., Rumford Falls, Me.	8	None

* The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

Analyses of Salt Fish—Concluded.

*Table showing the kinds of fish, the names * of the wholesale and retail dealers, the exact copy of the brand, the price asked per pound and the kind of preservative, if any.*

Station number.	Wholesale dealer and Retail dealer.	Price per lb.	Presertative found.
7862	Gorton-Pew Fisheries Co., Gloucester, Mass. C. O. Stevens, Oldtown, Me.	cents 8	None
	DRY SALTED HAKE, WHOLE FISH.		
7893	N. W. Eaton, Small Point, Me. V. P. Emery, Bath, Me.	7	None
	DRY SALTED POLLOCK—WHOLE FISH.		
7895	Alfred Jones Sons, Bangor, Me. V. G. Harding, Lisbon Falls, Me.	6	None
7849	Lord Bros. Co., Portland, Me. E. A. O'Dell, Farmington, Me.	6	Boric acid
7871	Lord Bros. Co., Portland, Me. G. A. Smith, W. Paris, Me.	6	None
7859	Geo. Perkins & Son, Portland, Me. F. T. Dwinal, Mechanic Falls, Me.	6	None
7882	Geo. W. Perkins & Son, Portland, Me. J. C. Wright, Portland, Me.	7	None
7884	Twitchell-Champlin Co., Portland, Me. H. L. Starbird, Portland, Me.	6	None
7894	Steadman & Hawkes, Portland, Me. Jack & Wakely, Lisbon Falls, Me.	6	None
7841	B. S. Snow & Co., Boston, Mass. A. P. Conant & Co., Lewiston, Me.	7	None
7881	B. S. Snow & Co., Boston, Mass. Ideal Market, Sanford, Me.	7	None
	SMOKED ALEWIVES AND HERRING.		
7872	Lord Bros. Co., Portland, Me. G. A. Smith, W. Paris, Me. "Fancy Imported Imperial Gronartz Bloaters."	30 per doz.	None
7855	Lord Bros. Co., Portland, Me. B. Spaulding & Sons, Buckfield, Me.	10	None

* The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

ANALYSES OF OPENED CLAMS, OYSTERS AND SCALLOPS.

Table showing the names of wholesale and retail dealers, the price asked per quart, and the kind of preservative, if any.*

Station number.	Wholesale dealer and Retail dealer.	Price per qt.	Preservatives found.
	OPENED CLAMS.	cents	
7959	H. B. Snow, Pine Point, Me. J. Murphy, Auburn, Me.	25	None
7486	Chas. S. Jones, Bangor, Me.	25	None
7912	W. H. Smith, Calais, Me. Chas. S. Jones, Bangor, Me.	30	None
7958	Leavitt Bros., Pine Point, Me. Walker Bros., Lewiston, Me.	25	None
7934	Meserve Bros., Scarboro, Me. Cobb & Trefethen, Portland, Me.	20	None
7929	Adamson, Falmouth Foreside, Me. C. W. Lombard, Portland, Me.	20	None
7936	Nelson & Gregory, Portland, Me. J. R. McDonald, Portland, Me.	20	None
7938	Stephen Ricker, Great Chebeague Island, Me. L. A. Taylor, Portland Me.	25	None
7963	John Loveitte & Co., Portland, Me. Witcomb & Cannon, Waterville, Me.	25	None
	OPENED OYSTERS.		
7955	H. O. Atwood & Co., Boston, Mass. Olfene & Holmes, Auburn, Me.	45	Boric acid
7954	D. Atwood & Co., Boston, Mass. J. Murphy, Auburn, Me.	45	Boric acid (trace)
7491	Chas. S. Jones, Bangor, Me.	40	None
7910	Rocky Point Oyster CO., Providence, R. I. Chas. S. Jones & Co., Bangor, Me.	7	Boric acid (trace)
7487	Porters Market, Bangor, Me. C. C. Porter, Bangor, Me.	40	None
7921	Norfolk Oyster CO., Boston, Mass. C. C. Porter Fish Co., Bangor, Me.	50	None
7488	H. E. Wentworth, Bangor, Me.	40	None
7919	R. R. Higgins Co., Boston, Mass. H. E. Wentworth, Bangor, Me.	50	Boric acid
7957	H. C. White & Co., Norfolk, Va. Walker Bros. Co., Lewiston, Me.	36	Boric acid

*The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

ANALYSES OF OPENED CLAMS, OYSTERS AND SCALLOPS.

Table showing the names of wholesale and retail dealers, the price asked per quart, and the kind of preservative, if any.*

Station number.	Wholesale dealer and Retail dealer.	Price per qt.	Preservatives found.
7935	Narragansett Bay Oyster Co., Providence, R. I.	cents	
	Cobb & Trefethen, Portland, Me.	45	Boric acid
7937	F. W. Smith, Warren, R. I. Wm. Hill, Portland, Me.	40	None
7927	C. J. Crosby, Norfolk, Va. C. W. Lombard, Portland, Me.	45	Boric acid (trace)
7928	H. W. Schmeelk Oyster Co., Brooklyn, N. Y. C. W. Lombard, Portland, Me.	45	Boric acid
7097	John W. Dodge, W. Barrington, R. I. Frank D. Robinson, Waterville, Me.	50	Boric acid
7962	Wheeler & Barnes, Boston, Mass. W. P. Stewart Co., Waterville, Me.	40	Boric acid
	OPENED SCALLOPS.		
7918	John E. Kane, Sorrento, Me. Alfred Jones Sons, Bangor, Me.	50	None
7911	P. K. Reed, Owls Head, Me. Chas. S. Jones, Bangor, Me.	50	None
7920	Thorndike & Hicks, Rockland, Me. C. C. Porter Fish Co., Bangor, Me.	40	None
7956	Simmonds & White, Rockland, Me. Atwoods Market, Lewiston, Me.	40	Boric acid
7930	Wm. Hill, Portland, Me. C. W. Lombard, Portland, Me.	50	None

* The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

ANALYSES OF SAUSAGES.

Table showing the kind of sausage, the names of the wholesale and retail dealers, the price asked per pound, the amount of starch and the kind of preservative, if any.*

Station number.	Wholesale dealer. Retail dealers and brand.	Price per lb.	Starch.	Preservative.
	BEEF SAUSAGE.	cts.	%	
7913	M. C. Baker, Bangor, Me.	10		None
7923	O. A. Fickett, Bangor, Me.	10	5.17	None
	BLOOD SAUSAGE.			
7945	North Packing Co., Boston, Mass. Mercier's Meat Market, Portland, Me.	12	———	None
	"BOLOGNA" SAUSAGE.			
7660	C. H. Rice, Bangor, Me. G. W. & C. S. Leighton, Bangor, Me.	12	———	None
7666	John P. Squire & Co., Bangor, Me. E. H. Stiles, Bangor, Me.	10	———	None
7652	John P. Squire & Co., Bangor, Me. Chas. York & Co., Bangor, Me.	10	———	None
7649	Schonland Brothers, Portland, Me. Libby & Dudley, Portland, Me.	10	2.22	None
7645	Jo. Thompson, Portland, Me. J. W. Deering & Son, Portland, Me.	12	(above 1%)	slight trace boric acid
	"FRANKFORT" SAUSAGE.			
7654	O. A. Fickett, Bangor, Me.	10	———	None
7490	Staples & Griffin, Bangor, Me.	12	present	None
7646	Schonland Bros., Portland, Me. Libby & Chipman, Portland, Me.	12	6.37	slight trace boric acid
7650	Schonland Bros., Portland, Me. Libby & Dudley, Portland, Me.	10	5.06	None
7658	Schonland Bros., Portland, Me. Staples Cash Market, Bangor, Me.	12	3.73	None
7944	Schonland Bros., Portland, Me. Mercier's Meat Market, Portland, Me.	11	5.78	None
	"GERMAN" SAUSAGE.			
7942	J. P. Squire & Co., Portland, Me. Libby & Chipman, Portland, Me. J. P. Squire & Co., Boston, Mass. Squire's German Frankfort Style Sausage, U. S. Inspected and passed under Act of Congress of June 30, 1906 establishmet No. 27D."	15	trace	None

*The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

ANALYSES OF SAUSAGES—Concluded.

*Table showing the kind of sausage, the names * of the wholesale and retail dealers, the price asked per pound, the amount of starch and the kind of preservative, if any.*

Station number.	Wholesale dealer. Retail dealer and brand.	Price per lb	Starch.	Preservative.
	LIVER SAUSAGE.	cts		
7946	J. P. Squire & Co., Portland, Me. Mercier Meat Market, Portland, Me	12	———	None
	PORK SAUSAGE.	12	trace	None
7914	M. C. Baker, Bangor, Me.			
7915	J. P. Squire & Co., Bangor, Me. M. C. Baker, Bangor, Me. Squire's Alrington Brand Sausage, U. S. Inspected and passed under the Act of Congress, June 30, 30, 1906, establishment No. 27.0."	18	———	None
7922	O. A. Fickett, Bangor, Me.	15	2.46	None
7916	G. W. & C. S. Leighton, Bangor, Me.	12	———	None
7917	Staples Cash Market, Bangor, Me.	15	8.44	None
7489	Staples & Griffin, Bangor, Me.	10	———	None
7948	Mr. Sweetser, Falmouth, Me. City Hall Market, Portland, Me.	16	trace	None
7933	Swift & Co., Portland, Me. J. M. Edwards & Son, Portland, Me. "Small sausage with 5% cereal, Boston, U.S.A. U. S. Inspected and passed under the Act of Congress, June 30, 1906, establishment No. 27."	14	trace	None
7941	Swift & Co., Portland, Me. Libby & Chipman, Portland, Me. "Brookfield Brand Pork Sausage, Swift & Co., U. S. A."	18	———	None
7943	Mercier Meat Market, Portland, Me.	15	trace	None
7939	John P. Squire & Co., C. J. Pennell & Co., Portland, Me. "Squires Arlington Brand Sausage, U. S. Inspected and passed under the Act of Congress June 30, 1906, establishment No. 27D."	18	———	None
7940	Dearfoot Farm, Southbridge, Mass. C. J. Pennell & Co., Portland, Me. "Deerfoot Farm Sausage, Southborough, Mass."	28	———	None
7932	Mr. Elwell, South Portland, Me. Sullivan & Osgood, Portland, Me.	15	———	None
7949	J. P. Squire & Co., Portland, Me. G. A. Todd, Portland, Me. "Eastern Packing brand small sausage with 5% cereal, Boston, U.S.A. U. S. Inspected and passed under Act of Congress, June 30, 1906, establishment No. 27D."	13	2.78	None
7947	E. G. Elwell, So. Portland, Me. S. H. Verrill, Portland, Me.	15	starch	None
7931	J. H. Thompson, Woodfords, Me. H. P. Gillesse	14	———	None

* The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

Honey.

According to the standards adopted for Maine (Bulletin Maine Agricultural Experiment Station 135, page 240) *Honey* is the nectar and saccharine exudations of plants gathered, modified, and stored in the comb by honey bees (*Apis mellifica and A. Dorsata*); is lævo-rotatory, contains not more than twenty-five per cent of water, not more than twenty-five hundredths per cent of ash, and not more than eight per cent of sucrose. *Comb Honey* is honey contained in the cells of the comb. *Extracted honey* is honey which has been separated from the uncrushed comb by centrifugal force or gravity. *Strained honey* is honey removed from the crushed comb by straining or other means.

While some comb honey is sold in the State, the most of the honey on the market is extracted. The extracted honey is so much superior in appearance and quality to strained honey that the latter is practically never met with. There is little temptation to adulterate honey at present because the California product is sold in large quantities at a less price than cane sugar. Occasionally honey may be dark colored or strong in taste and to improve the appearance of such honey, it is sometimes adulterated by the addition of can sugar; or in case of a very wet season the honey may be of low consistency and the unscrupulous person may attempt to stiffen it by the addition of sugar.

The tables which follow give the results of the analyses of more than 30 samples of honeys collected in different parts of the State during the fall of 1907. All the goods collected were extracted honeys and the samples are arranged as to whether they were or were not produced in Maine, and alphabetically under the towns in which they were produced or packed. The polarization readings are given as they clearly indicate whether the goods are adulterated with cane sugar or glucose.

Adulterated and Misbranded Honey.

It will be noted that four samples,—Nos. 7780, 7026, 7050 and 7051, carried more sucrose than the standards allow for pure honey. The readings, however, were lœvo-rotatory. These are suspicious samples and at least two of them—7026 and 7050—probably had cane sugar added to them, either by feeding bees the cane sugar or else by putting cane sirup into the honey. It

was, however, thought wise to pass these at this time as though they were pure honey and the matter has not been followed up.

Two lots of Maine produced extracted honey were found to be adulterated. One of these was from the apiary of C. G. Greeley, Clinton, and found at the store of David King, Fairfield. According to Mr. Greeley's explanation a part of his honey made in 1907 did not have sufficient "body" and he gave it greater density by adding a heavy solution of sugar to it. It was not his intention to sell this for pure honey but through error it was put, by an assistant into bottles labeled Pure Honey. As Mr. Greeley appeared to be sincere, gave his affidavit to the above facts and withdrew the goods from sale, no prosecution was made.

At the store of B. F. Curtis, Richmond, a sample of extracted honey was found which contained cane sugar. It was put up by H. N. Jordan of Litchfield Corner. It seems that this honey was bottled by Mr. Jordan in the fall of 1906 and the sugar was put in to improve the flavor which was thought to be too strong. Before Mr. Jordan knew that there was any law relative to the adulteration of honey, he decided that he should use no more sugar in honey. Mr. Jordan made affidavit to these facts and withdrew the honey from sale. No prosecution was made.

At the store of L. O. Cowan & Company, Biddeford, a sample was purchased which was labeled White California honey put up by the Twitchell-Champlin Company, Portland and Boston. This honey carried glucose in quite large amount. Correspondence developed that the Twitchell-Champlin Company formerly put glucose into their honey but had not been doing so since the passage of the pure food law. They submitted a sample of the honey which they were then using. This was analyzed as No. 7089 and found to be pure and free from adulteration. It was claimed by L. O. Cowan & Company that these goods were purchased by them in October, 1907. The goods, however, had a very shopworn appearance. The Twitchell-Champlin Company furnished us with goods which they packed in June 1906, examination of which showed them to be pure honey free from adulteration. As it seemed very probable that these goods were packed prior to the enactment of the law and were not part of the lot delivered in October, 1907. No prosecution was made. The goods were withdrawn from sale.

ANALYSES OF HONEY.

Table showing the names of the wholesale and retail dealers, the exact copy of the brand and the results of the chemical analysis.*

Station number.	Retail dealer, Wholesale dealer and brand.	Polariscope Readings; Laurent Sugar Scale. Direct.	Invert.	Water.	Ash.	S crose.
	MAINE PRODUCED—Pure.			%	%	%
7806	Hanford Bros., Portland. W. S. Bradman, Dover. "Pure honey from H. B. Phillips, Auburn,	-12.31	-17.30	19.1	0.08	3.7
7157	G. E. Whitehouse, Brunswick. "Pure honey from the apiary of W. L. Baloon, Bowdoin."	-11.54	-16.16	16.1	0.05	3.4
7967	L. W. Jones, S. China. Merrill Bros., Augusta. "Pure extracted honey from the apiary of L. W. Jones, S. China,"	-13.08	-17.30	21.0	0.10	3.2
7137	L. H. Clark, Gardiner. Cash Market Co., Gardiner. "Extracted honey put up by L. H. Clark, Gardiner."	-13.47	-18.07	17.4	0.07	3.5
7965	A. R. Lehr, Hallowell. C. E. Daggett, Augusta. "Nothing is better for breakfast than hotcakes and white clover honey from the apiary of A. R. Lehr, Hallowell,"	-12.24	-16.16	19.6	0.08	3.0
7966	Longfellow Brothers, Hallowell. Merrill Brothers, Augusta. "Warranted pure extracted honey from the apiary of Longfellow Bros., Hallowell."	-12.00	-15.00	19.6	0.05	2.2
7050	Chas. P. Dutch, W. Kennebunk Littlefield & Webber, Kennebunk "Pure extracted honey, Chas. P Dutch, W. Kennebunk."	-6.93	-21.92	17.3	0.11	11.2
7846	C. G. Turner, Mechanic Falls. C. W. Moore, Livermore Falls. "Star honey registered analysis pure honey, C. G. Turner, Mechanic Falls."	-14.15	-18.69	20.9	0.11	3.4
7006	H. W. & W. R. Pennell, Westbrook. W. L. Craig, Westbrook. "One lb. fancy extracted, honey, guaranteed absolutely pure, produced extracted and bottled by H. W. & M. R. Pennell, Westbrook."	-12.92	-17.54	21.9	0.10	3.4
7975	Chas. H. Burnell, Woodfords, Me Hamilton Brothers, Woodfords "Choice Selected Honey from the apairy of Chas. H. Burnell, Woodfords." Extracted Honey.	-12.00	-17.70	21.2	0.02	4.1

* The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

ANALYSES OF HONEY.

*Table showing the names * of the wholesale and retail dealers, the exact copy of the brand and the results of the chemical analysis.*

Station number.	Retail dealer, Wholesale dealer and brand.	Polariscope Readings, Laurent Sugar Scale. Direct.	Invert.	Water.	Ash.	Sucrose.
	MAINE PRODUCED—Adultrated.					
7820	C. H. Greeley, Clinton. David King, Fairfield. "Warranted pure honey from the apiary of C. H. Greeley, Clinton."	7.39	−18.61	18.8	0.06	20.1
7960	C. H. Greeley, Clinton, David King, Fairfield. "Honey C. H. Greeley, Clinton."	10. 77	−17.01	18.8	0.06	20.6
7961	C. H. Greeley, Clinton. David King, Fairfield. "Honey. C. H. Greeley, Clinton, Me."	10.38	−18.46	18.8	0.06	21.5
7151	H. N. Jordan, Litchfield Corner. B. F. Curtis, Richmond. "Extracted Honey, H. N. Jordan, Litchfield Corner."	−39.23	−6.93	22.5	0.24	31.2
	BOTTLED IN MAINE—Pure.					
7898	Geo. E. Graffam, Bangor, Fred McAvey, Bangor. "Black Diamond Brand absolutely pure honey, put up by G. S. Graffam, Bangor.'	−10.15	−15.00	21.2	0.18	3.6
7195	G. W. Jordan, Brewer "Black Diamond Brand absolutely pure honey put up by G. S. Graffam, Bangor."	−12.69	−16.16	17.9	0.25	2.6
7089	Twitchell-Champlin Co., Portland "Superior Quality White California Honey, put up by Twitchell-Champlin Co., Portland."	20.00	−24.08	16.4	0.25	3.0
	BOTTLED IN MAINE-Adulterated					
7026	Twitchell-Champlin Co., Portland. L. O. Cowan & Co., Biddeford. "White California honey, put up by the Twitchell-Champlin Co., Portland, Me., and Boston, Mass."	53.13	35.08	19.4	0.11	13.7
	BOTTLED OUT OF STATE- Pure.					
7072	Cobb, Bates & Yerxa, Boston, Mass. Andrews & Horrigan Co., Biddeford. "California strained honey."	−15.00	−20.38	16.5	0.09	4.1
7184	F. E. Pettinglli, W. Sullivan. "Prepared stock, H. L. Hall & Co., Boston, pure honey."	−16.16	−19.61	16.7	0.27	2.6
7591	Chas. Lawrence Co., Boston, Mass. J. L. Rand, Oldtown,	−11.54	−19.61			6.1
7536	New England Maple Syrup Co., Boston. F. S. Jones & Co., Bangor. "Golden tree pure clover honey N.E.M Co., Boston, Mass."	−15.39	−25.62	15.9	0.19	5.93

* The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

ANALYSES OF HONEY.

*Table showing the names * of the wholesale and retail dealers, the exact copy of the brand and the results of the chemical analysis.*

Station number.	Retail dealer, Wholesale dealer and brand.	Polariscope Readings, Laurent Sugar Scale.		Water.	Ash.	Sucroce.
		Direct.	Invert.			
				%	%	%
7753	New England Maple Syrup Co., Boston. J. A. Lowe, Eastport. "Golden Tree Brand pure clover honey N. E. M. Co., Boston, Mass."	-15.39	-21.92	18.0	0.08	4.9
7185	Percy Kelley, Bar Harbor. "Clover Blossom Brand honey packed for S. S. Pierce Co., Boston, Mass., Guaranteed under the Food & Drug Act, June 30, 1906, serial No. 3336."	-14.62	-20.38	16.7	0.13	4.3
7177	W. J. Clark, Ellsworth. "Victor Brand pure honey bottled by the Simpson Spring Co., So. Easton, Mass."	-15.00	-20.61	16.3	0.13	4.3
7074	J. H. Folkins Co., Boston, Mass. Brinelle Bros., Biddeford. "Manhattan Club pure honey for clubs, parties, picnics and home use, F. H. Folkins Co., Lowell, Mass."	-16.15	-19.23	16.6	0.25	2.3
7106	W. J. Lamb, W. Somerville, Mass. E. W. Church, Augusta, Me. "Pure Orange Blossom honey, W. J. Lamb, 157 Elm St., W. Somerville, Mass."	-24.23	-31.16	17.0	0.07	5.2
7051	Elmer Bassett, Taunton, Mass. Littlefield & Webber, Kenneunk Guaranteed Pure Orange Bloom Honey for sale by Elmer Bassett, Taunton, Mass.	-13.85	-26.93	13.7	0.09	9.6
7148	Shaw, Hammond & Carney, Portland. H. W. Peaslee, Randolph. "Pure extracted honey, purity guaranteed put up by J. E. Crane & Son, Middlebury, Vt."	-17.31	-21.93	17.2	0.16	3.5
7780	Huntington Maple Syrup and Sugar Co., East Providence, R.I. G. E. Gingrass & Co., Van Buren. "Gold Leaf Brand pure honey Huntington Maple Syrup and Sugar Co., Providence, R.I."	-10.38	-21.92	17.7	0.04	8.6
7175	Kearnes & Cottle, Ellsworth. "Gold Leaf Brand pure honey, Huntington Maple Syrup and Sugar Co., Providence, R.I."	-10.38	-19.23	16.1	0.06	6.8
7144	Haskell-Adams Co., Boston, Mass. C. A. Cole, Hallowell. "Fancy California White Sage Honey, guaranteed absolutely pure, Pasadena Honey Co., Pasadena, Calif.	-8 85	-19.61	23.7	0.18	7.1
7067	W. P. Huelin, Kittery. F. E. Cooper, Kittery. "California White Sage Pure Honey. Mountain Honey Co., San Diego, California Warren F. Witherell Co., Boston, sole agents.	-14.85	-18.46	17.3	0.09	2.8

* The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

Molasses.

In July, August and September 1907, samples of different brands of molasses on sale in Maine were collected quite generally over the State. While, as was to be expected, some molasses in the hands of retailers were not being sold in conformity with the Maine Food and Drug Law, correspondence developed that for the most part they were apparently innocent of any intention of wrong and expressed themselves as ready to conform to the requirements of the law. In all cases the goods were correctly branded or withdrawn from sale. No prosecutions were made.

MOLASSES DEFINITIONS AND STANDARDS.

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.

Molasses is the product left after separating the sugar from massecuite, melada, mush sugar, or concrete, and contains not more than twenty-five (25) per cent of water and not more than five (5) per cent of ash.

Sugar-cane sirup is sirup made by the evaporation of the juice of the sugar-cane or by the solution of sugar-cane concrete, and contains not more than thirty (30) per cent of water and not more than two and five-tenths (2.5) per cent of ash.

Examination of the analytical data show that many samples of molasses which carry no glucose are below the standards in solids. It will also be noted that several samples of the molasses are low in ash, corresponding much more nearly to sugar cane sirup than to molasses. The standards for molasses were adopted from those of the U. S. Secretary of Agriculture for regulating interstate trade and imports. Instances came to notice in which the custom house authorities presumably acting under these instructions have admitted as molasses and in conformity with the pure food law, goods that are below the standards in solids. They have also passed under the name of molasses goods which have consisted practically of cane sirup. This has led to confusion and misunderstanding and until this matter is straightened out, there will be no prosecu-

tions made under the Maine Food and Drug Law relative to molasses that is free from adulteration even though it is below in solids, provided it carries not more than 30 per cent of water, the lawful amount for sugar-cane sirup.

THE BRANDING OF MOLASSES.

Molasses that is in accord with the standards and the definitions does not need to be labeled. If it is labeled at all, however, it must be strictly in accord with fact. The same general principles apply to labeling molasses as to compound maple sirups. Until an adverse decision is reached by the U. S. Secretary of Agriculture, corn sirup may be lawfully used as a synonym for glucose. If the molasses makes more than 50 per cent of the mixture, it can be lawfully sold as molasses and glucose, or molasses and corn sirup. If the molasses is less than 50 per cent of the mixture, it must be labeled glucose and molasses or corn sirup and molasses. If the molasses makes 10 per cent or less, it must be labeled glucose, molasses flavor, or corn sirup, molasses flavor.

Retailers must so place the package from which they are selling that the brand can be readily seen and read.

METHODS OF ANALYSES.

The methods of analyses followed in the analyses of molasses were practically those given in bulletin 107 of the Bureau of Chemistry of the U. S. Department of Agriculture. The reducing sugars were determined by Fehling's solution in the ordinary way. Sucrose was estimated by the polariscope using Clerget's formula. Glucose was also estimated by the polariscope using Leach's formula for commercial glucose.

In the first table which follows is given the results of the pure molasses and in the second table the results of the analyses of the compound and adulterated molasses. In each table they are arranged alphabetically by the towns in which the wholesale dealers reside.

ANALYSES OF MOLASSES.

Table showing the names and addresses of the wholesale and retail dealers, the date on which the sample was purchased and the price per gallon.

Wholesale dealer.	Retail dealer	Town.	Month in 1907.	Price per gal.	Station number.
Fuller-Holway Co. Augusta	G. A. Porter & Co.	No. Anson	Feb.	45	7496
	F. M. Noyes	Gardiner	July	40	7698
John Cassidy Co. Bangor	W. H. Doran	Ft. Fairfield	Aug.	40	7768
	Smith Grocery Co.	Presque Isle	"	33	7771
Arthur Chapin Co. Bangor	H. Johnson	Kingman	Oct.	50	7908
T. R. Savage Co. Bangor, Me.	Whitcomb & Cannon	Waterville	July	50	7677
F. G. Davis Co. Lewiston	D. Morrisette	Lewiston	Aug.	40	7726
	C. S. Childs	Buckfield	Sept.	35	7852
S. S. Pineo Milltown	Veazie Bros.	Calais	Aug.	35	7762
Conant-Patrick Co. Portland	L. Guptill & Co.	Portland	"	40	7713
J. B. Donnell & Co. Portland	Merrill & Crowell	Lewiston	"	40	7719
Chas. McLaughlin Co. Portland	Liv. Falls Coop. Assoc.	Livermore Falls	Sept.	29	7848
H. S. Melcher Co. Portland	J. A. Shaw	Corinna	"	25	7802
Milliken-Tomlinson Co. Portland	———	———	Feb.	—	7499
"	H. C. Haskell	Waterville	July	40	7684
"	Webber & Hewett	Augusta	"	50	7687
"	Merrill Bros.	Augusta	"	60	7689
"	A.W.Cunningham &Co.	Gardiner	"	45	7699
"	W. L. Wilson & Co.	Portland	"	50	7717
"	C. H. Libby	Lewiston	Aug.	50	7724
"	L. B. McIntyre & Co.	Warren	Dec.		7090
Shaw, Ham'ond & Carney Portland, Me	Palmer's Market	Lewiston	Aug.	40	7721
"	M. Gardiner & Son	Machias	"	35	7741
"	A. Howe	Presque Isle	"	45	7772

ANALYSES OF MOLASSES.

Table showing the exact copy of the brand and the results of the chemical analyses.

Station number.	Copy of brand.	Sucrose.	Total Sugar.	Water.	Ash.
		%	%	%	%
7496	F. H. Co. Fancy Pure Molasses	34.5	57.8	26.6	7.1
7698	No Marks	40.7	62.4	27.7	2.9
7768	M. & C. New York	48.4	59.8	29.9	3.3
7771	Choice Molasses, Barbadoes S. P. Musson Son & Co.	48.4	59.7	30.0	2.5
7908	Fancy Mayguez P. R.	35.8	65.3	28.7	2.3
7677	A. & Co. B. B. F. F.	43.4	63.7	28.1	3.1
7726	Two stars and the letter "M" on bbl.	42.5	66.1	25.5	5.0
7852	Pure Molasses	25.5	49.4	25.3	5.5
7762	Grocery Molasses, Barbadoes, W. I. shipped by Lacoco & Co.	42.7	61.0	28.9	4.7
7713	Choice Grocery	35.2	61.1	25.8	4.8
7719	Porto Rico	32.4	65.0	25.8	4.8
7848	L. & D.	31.0	57.0	26.3	5.8
7802	Pure Porto Rico High Test Feed Molasses, E. R. Co.	34.6	54.4	24.0	8.1
7499	Porto Rico molasses	43.0	67.3	24.7	3.0
7684	Fancy Ponce, M. T. Co. Importers	33.1	55.1	28.1	2.4
7687	Fancy Mayguez Porto Rico	46.0	67.6	27.4	1.8
7689	Reserve National Molasses Co. distributers, St. Louis, Mo. A. Geist inspector and Gagaer. Serial No. 4462, guaranteed under the Pure Food & Drug Act, June 30, 1906	38.6	60.2	25.7	5.3
7699	Fancy Molasses shipped by L. E. Acock & Co. Barbadoes, W. I.	46.9	69.5	28.8	3.4
7717	Moral & Co.'s Mayguez Molasses	41.8	63.2	25.4	3.1
7724	Fancy Barbadoes	38.8	64.5	29.0	1.0
7090	Fancy Mayguez Porto Rico	41.3	——	29.0	1.0
7721	Santiago for interstate trade compound 25% Porto Rico Molasses, 75% sugar sirup S. H. & Co. Portland	31.6	55.9	25.5	6.5
7741	Butterfly for interstate trade, compound Porto Rico 25% molasses, 75% sugar sirup S. H. & Co., Portland	41.9	62.3	25.4	5.8
7772	Old fashioned molass, pure molasses and corn* sirup Santa Anna Plantation, N. C.	33.3	58.9	26.4	3.7

*Probably error in marking and should have read sugar sirup

ANALYSES OF MOLASSES—Concluded.

Table showing the names and addresses of the wholesale and retail dealers, the date on which the sample was purchased and the price per gallon.

Wholesale dealer.	Retail dealer.	Town.	Month in 1907.	Price per gal.	Station number.
	C. H. Cheney	Monticello	Aug.	35	7791
	R. J. Kimball	Bridgewater	"	50	7792
Twitchell-Champlin Co.	Geo. C. Shaw Co.	Portland	Aug.	50	7700
Portland	Geo. C. Shaw Co.	Portland	"	50	7701
"	Geo. C. Shaw Co.	Portland	"	50	7702
"	Geo. C. Shaw Co.	Portland	"	70	7708
"	Geo. C. Shaw Co.	Portland	"	60	7716
"	John A. Smith	Calais	"	50	7761
C. A. Weston & Co. Portland, Me.	G. A. Kennison	Waterville	July	55	7680
John Bird Co. Rockland			Apr.		7505
John Bird Co. Rockland			July		7625
Bowers & Bartlett	E. W. Church	Augusta	"	50	7690
Boston, Mass.	W. P. Stewart & Co.	Waterville	"	35	7683
"	Whitcomb & Cannon	Waterville	"	25	7679
"	F. M. Mooers	Gardiner	"	40	7696
"	F. M. Mooers	Gardiner	"	50	7697
"	F. P. Sposedo	Portland	Aug.	32	7704
L. Brayton & Co. Boston, Mass.	Henry P. Clark	Portland	"	40	7710
Martin L. Hall & Co. Boston, Mass.	John W. McGregor	Eastport	"	50	7754
Haskell-Adams & Co.	G. R. Campbell & Co.	Cherryfield	"	50	7735
Boston, Mass.	H. W. Stewart	Calais	"	35	7759
"	Veazie Bros.	Calais	"	30	7763
Silas Pierce Co. Boston, Mass.	Palmer's Market	Lewiston	"	60	7720
Lyons Delany Pawtucket, R. I.	F. F. McLaughlin	Wytopitlock	Oct.	35	7909

ANALYSES OF MOLASSES—Concluded.

Table showing the exact copy of the brand and the results of the chemical analyses.

Station number.	Copy of brand.	Sucrose.	Total Sugar.	Water.	Ash.
7791	AAAA	30.3	56.4	29.0	5.5
7792	Ponce Porto Rico F. F. Fritze, Lunt & Co. Succs.	43.1	63.0	28.1	3.7
7700	Pure Mayguez	41.3	65.5	26.9	2.4
7701	Fancy Ponce P. R.	45.0	68.3	27.1	2.1
7702	Extra Choice Mayguez	42.9	67.8	26.7	2.3
7708	New Orleans Molasses	46.6	66.2	27.4	3.3
7716	Pure Porto Rico	42.7	66.0	27.8	2.2
7761	Fancy Barb.	41.9	64.6	30.3	0.8
7680	Fritz Lunt & Co. Succs.	40.0	63.3	27.4	2.9
7505	Pure West India Molasses	40.3	67.5	26.4	—
7625	No brand sold for Pure Molasses	40.4	67.0	29.1	1.7
7690	Carlos Goveny Fancy	40.5	63.1	28.5	4.1
7683	No marks on barrel	31.4	57.0	27.5	4.0
7679	Bower & Barlett, Boston Mass., R. W.	34.3	57.4	28.8	5.7
7696	Bower & Bartlett, Golden Robin No. 2	34.7	61.0	28.1	4.1
7697	Extra Fancy Carlos Joveny & Co., Boston, Mass	38.7	64.9	28.4	3.0
7704	Bower & Bartlett, Boston, Mass. Golden Robin No. 2	31.6	59.0	26.8	5.4
7710	No marks on barrel	37.7	59.9	25.4	5.9
7754	Fancy Neuvits	42.2	56.5	26.4	1.5
7735	Felicicosta & Co. Maltese Cross Brand, New Crop	37.0	57.9	27.2	4.4
7759	Orange Grove T. C.	31.7	59.2	24.4	6.0
7763	Haskell & Adams Co., Boston, Mass. M	33.1	59.4	27.1	6.3
7720	Antonio Rivera Star Brand	32.5	52.2	29.5	1.4
7909	Himelia Plantation J. B. H.	37.2	58.4	27.1	6.8

ANALYSES OF COMPOUND MOLASSES.

Table showing the names and addresses of the wholesale and retail dealers, the date on which the sample was purchased and the price per gallon.

Wholesale dealer.	Retail dealer.	Town.	Month in 1907.	Price per gal.	Station number.
Fuller-Holway Co. Augusta	Webber & Hewett	Augusta	July	40	7688
	J. E. Cunningham	Gardiner	"	40	7693
"	H. H. Ring & Son	Gardiner	"	40	7694
Arthur Chapin & Co. Bangor, Me.	Folsom, Prentiss Co.	Greenville	Sept.	40	7812
Linnell, Robinson & Co. Bangor, Me.	Gilman & Trafton	Guilford	"	38	7808
T. R. Savage & Co. Bangor, Me.	C. T. Small	Pembroke	Aug.	40	7756
J. B. Donnell & Co. Portland, Me.	Merrill & Crowell	Lewiston	"	50	7718
"	J. M. Edwards & Son	Portland	"	45	7712
"	C. H. Lombard	Portland	"	50	7706
Chas. McLaughlin Co. Portland, Me.	Albert Dingley	Portland	"	25	7703
	Peter Smith	Cherryfield	"	40	7733
H. S. Melcher Co. Portland, Me.	G. A. Kennison	Waterville	July	45	7681
	G. W. Wadleigh	Augusta	"	40	7692
	W. S. Cates	Machiasport	Aug.	30	7745
Milliken-Tomlinson Co. Portland			Jan.		7493
Milliken-Tomlinson Co. Portland, Me.	J. F. Turner	Augusta	July	40	7691
Steadman & Hawkes Portland, Me.	M. B. Lougee	Portland	Aug.	40	7709
	W. D. Clark	S. Paris	Oct.	40	7865
D. W. True & Co. Portland, Me.	A. F. Small & Son	Portland	Aug.	40	7715
	C. J. Gammon	Lewiston	"	40	7725
Twitchell-Champlin Co. Portland, Me.			Jan.		7492
	G. E. Barrows	Waterville	July	40	7685
"	Cash Market Co.	Gardiner	"	40	7695
"	Geo. C. Shaw Co.	Portland	Aug.	40	7707
"	E. J. Roche	Lewiston	"	40	7722
"	J. W. & C. A. Ridlon	Lewiston	"	40	7723
"	F. T. Waite	Calais	"	40	7758
C. A. Weston Co. Portland, Me.	W. D. Webber	Portland	"	40	7705
	S. L. Higgins	Portland	"	40	7711
"	Philbrook's Cash Groc.	Portland	"	40	7714
Bowers & Bartlett Boston, Mass.	Whitcomb & Cannon	Waterville	July	45	7678
	W. P. Stewart Co.	Waterville	"	48	7682
	L. S. Young	Augusta	"	35	7686
Boston Molasses Co. Boston, Mass.	S. S. Pineo	Milltown	Aug.	35	7765

ANALYSES OF COMPOUND MOLASSES.

Table showing the exact copy of the brand and the results of the chemical analyses.

Station number.	Copy of brand.	Sucrose.	Total Sugar.	Water.	Ash.	Est. Glucose.
		%	%	%	%	%
7688	Molasses and corn sirup	29.1	56.8	25.3	4.5	23.5
7693	The Fuller-Holway Co., Augusta, Me. glucose and molasses	35.6	59.0	25.8	4.1	11.7
7694	Fuller-Holway Co., Augusta, Me. pure molasses and corn sirup, F.	18.1	52.5	25.6	3.2	39.8
7812	Jose Beelavl Co., Ponce Porto Rico molasses and corn sirup	15.1	41.6	26.7	3.9	32.6
7808	Glucose and molasses	31.1	55.9	24.9	4.5	6.1
7756	Pure Molasses Trinidad and corn sirup	22.4	51.8	26.4	3.3	25.4
7718	No marks on barrel, diamond D on tag	25.7	52.6	25.0	4.2	27.5
7712	Molasses and glucose	20.9	46.2	27.5	2.3	42.4
7706	Congresso P. R.	38.3	62.6	26.0	3.5	11.1
7703	Pure molasses and corn sirup	35.0	60.8	26.2	3.3	15.7
7733	Major Gissasud & Co., XXX Ponce Porto Rico molasses and corn sirup	21.3	50.9	26.2	3.0	39.2
7681	Cazaza & Co. Ponce Porto Rico	19.6	24.2	27.6	3.7	40.1
7692	Glucose and molasses	19.6	45.9	26.6	3.8	41.5
7745	Aldecoa Porto Rico	24.5	53.3	27.3	4.2	15.9
7493	No marks on barrel	38.2	59.8	26.7	3.4	8.6
7691	Pure molasses and corn sirup B. P. R.	44.8	71.5	24.9	2.7	19.4
7709	Pure molasses Fancy Ponce and corn sirup	16.6	42.8	27.3	3.3	45.8
7865	Glucose and molasses, Porto Rico	25.1	53.9	23.7	3.7	29.1
7715	Marks on barrel could not be made out	31.4	57.7	27.3	4.2	13.0
7725	Glucose and molasses	36.3	61.7	25.9	3.8	20.1
7492		29.8	55.6	24.9	4.6	6.9
7685	No marks on barrel	43.7	56.5	25.1	5.0	7.7
6795	No marks on barrel	33.7	59.5	26.1	4.4	6.9
7707	Compound	36.7	61.5	24.4	4.4	10.8
7722	Riverside	31.0	56.0	27.2	4.2	10.0
7723	Pure molasses and corn sirup A1	31.0	55.9	24.9	5.0	7.3
7758	Choice Molasses from S. C. Musson Son & Co. Barbadoes, P. R.	31.6	56.2	26.8	4.0	9.6
7705	Gonzales & Co., Glucose and molasses	18.2	44.2	26.7	3.4	33.8
7711	Pure molasses and corn sirup	25.0	50.4	26.2	3.0	20.3
7714	Gonzales & Co., Ponce Porto Rico F.	19.6	46.6	25.5	3.3	41.5
7678	B. & B. Glucose and molasses	28.7	53.7	26.3	4.7	14.5
7682	B. & B., Boston, Mass., Excelsior	19.6	48.5	30.0	4.1	25.8
7686	B. & B. Eagle Brand Glucose and molasses	34.3	57.5	26.5	2.9	10.3
7765	Pure molasses and corn sirup	34.7	59.6	26.9	5.4	3.8

ADULTERATED AND MISBRANDED MOLASSES.

Practically the only adulterant found was glucose. Most of the samples examined carried sulphurous acid. In practically every instance the glucose was added to improve the color and "body" of the molasses. In most cases the goods were correctly branded although frequently the word corn sirup was used as a synonym for glucose. Corn sirup is objectionable as a synonym for glucose for many reasons, chief among which is that it is not a sirup as defined in the Maine food standards and it is misleading as the average consumer does not realize that glucose is meant by corn sirup. Pending the decision of the U. S. Department of Agriculture, the word corn sirup is allowed to be used though under protest. Dealers have been informed of the position of the Maine Experiment Station in this matter. It is hoped that a speedy decision will be reached by the U. S. Secretary of Agriculture. In a few instances the barrels were not marked at all and in some cases the barrels containing these compound molasses were not branded as such. In putting these mixtures on the market in many instances old molasses barrels or packages have been used and as a rule the original brand has not been removed from the barrel. In one or two instances where the barrel was plainly marked on one end "Molasses and Glucose" it bore upon the reverse end "Ponce P. R." or some other mark indicating a pure molasses. In such cases the retailer was just as likely to tap and place the barrel in such a way that the end carrying the molasses label was the visible as the properly labeled end. It is this tendency on the part of the retailer to substitute an inferior article for the better one that the consumer must be ever on his guard in order to avail himself of the advantages of the pure food law.

VINEGARS.

When alcohol is placed under favorable conditions, it takes up oxygen from the air and is converted into acetic acid,—the acid that gives the sour taste to vinegar. Whatever the source of the vinegar, and however it is made, the acetic acid is the same.

Besides acetic acid, vinegar made by fermentation of undistilled alcohol always contains more or less of other substances

which vary widely with the source of the sugar juices from which the vinegar is made. It is because of these foreign matters, characteristic of vinegar of the same kind, that it is possible for the chemist to distinguish one variety from another. The adulteration of vinegar is not so common as its misbranding, the substitution of one kind for another and the imposition of a lower priced distilled or sugar vinegar for the more expensively produced cider vinegar. Practically all vinegars are free from unhealthful ingredients. An uncolored vinegar made from distilled alcohol diluted with pure water is from the standpoint of the chemist the purest vinegar, while from point of view of the vinegar connoisseur, a well made and properly aged cider vinegar is the best in flavor.

VINEGAR DEFINED.

The word *vinegar* used alone always means pure apple cider vinegar without any additions and containing at least 4 per cent acetic acid.

The words *Cider Vinegar* by themselves always refer to pure apple cider vinegar as defined above.

Wine vinegar always means vinegar made from grape juice. There is practically no wine vinegar used in Maine. The so-called "white wine" vinegar is a distilled vinegar and not a wine vinegar.

Malt vinegar is made from barley malt. *Sugar vinegar* is made from cane sugar products and *glucose vinegar* from starch sugar.

The above are undistilled vinegars made by fermentation.

Distilled vinegar is the product of fermentation of dilute distilled alcohol from any source.

Vinegar of any kind must contain at least *4 per cent acetic* acid to be up to the standard required by the pure food law.

The word *pure* cannot be legally used if a vinegar is not up to standard or contains any added foreign material.

In case a vinegar is colored by the addition of a solution of caramel (burnt sugar), the word "colored" will be construed as covering that fact. If any other kind of coloring material be used, the kind and amount per gallon must be stated.

BRANDING VINEGAR.

Strictly pure apple cider vinegar containing not less than 4 per cent acetic acid does not require a label. All other kinds of vinegar must be "plainly labeled, branded or tagged so as to show the exact character thereof."

In order to be "plainly" branded the letters, if stenciled, should not be less than $\frac{3}{4}$ of an inch high, and applied with a waterproof ink to a clean painted surface. A printed label could be made up of somewhat smaller letters.

In case an apple cider vinegar carries any addition or is below strength it must be so labeled. For instance if the vinegar were considered too light in color and caramel (burnt sugar) is added the label must state this fact, e. g., "Apple Cider Vinegar, Colored," would be all right. If it is below 4 per cent acetic acid the label must state this fact, e. g., "Apple Cider Vinegar, $3\frac{1}{2}$ per cent acetic acid." The word *pure* cannot be used even if the vinegar is made from cider and is below the standard (4) per cent or is colored.

An uncolored distilled vinegar may be labeled grain vinegar, spirit vinegar, distilled vinegar, white vinegar or pickling vinegar.

A colored distilled vinegar may be labeled as above but the word colored must appear, e. g., Grain vinegar, colored, Colored distilled vinegar, etc.

If any kind of vinegar carries less than 4 per cent acetic acid, that fact must be stated, e. g., White distilled vinegar 3 per cent acetic acid, or Colored grain vinegar 3 per cent acetic acid, etc.

A distilled vinegar up to the standard strength and not colored may be labeled pure, thus Pure grain vinegar is in accord with the law. An artificially colored vinegar cannot be labeled pure.

While not required by the law, it is desirable that the name of the manufacturer or jobber be stated on the package.

Retailers must so place the barrel from which they are selling that the brand can be readily seen and read.

If customers will take pains to read the brand upon the package they will know much better what kind of vinegar they are using.

CIDER VINEGARS.

The analyses of cider vinegars collected are given in the table on page 36. It will be noted that quite a number of country vinegars ran below the standard strength of acid. Investigation indicated that apparently in every such case there was no attempt at fraud but that from different causes they were poorly made cider vinegars. In these cases affidavits were obtained both from the dealer and maker that the vinegars had never been watered and that previous to our analysis they believed them to be of standard quality.

There are many reasons that account for these poorly made country vinegars. The trade as a whole is pretty generally informed now relative to this class of goods and it will be as necessary for domestic country made vinegar to be up to standard as manufactured vinegars which are brought in from out of the State.

The cider vinegars were examined for total acidity, total solids and ash. For the most part the nature of the solids and ash were not studied. All vinegars which carried the requisite amount of acid, solids and ash and had the general appearance of cider vinegar have been passed as straight cider vinegar although it may be that in some instances these were skilfully adulterated goods. It is possible to so skilfully adulterate and blend vinegars as to render the detection difficult; ordinary adulterations are very readily detected.

There is more or less general opinion among some of the manufacturers and large handlers of vinegars that there are on the market spurious cider vinegars which are sold in competition with the genuine article. A few brands which were on sale in Maine were pointed out as being probable instances of these skilfully manipulated vinegars.

In order to give this something of a test, special examinations were made relative to the ash and solids and sugars in a bunch of country vinegars selected somewhat at random, and a group of cider vinegars made outside of the State which ran pretty close to the standards relative to the percentage of acetic acid. Among the samples of vinegars made outside of the State, there are several suspicious samples but the data at hand does not give sufficient evidence to enable us to positively state that the samples are other than genuine. With the most of these samples, if they are not genuine, they are very skilfully made up.

CIDER VINEGARS MADE OUTSIDE OF THE STATE.

Suspected of Adulteration.

No.	Acid	Solids	Ash	Percent reducing sugar in solids	Polarization		Malic acid precipitate	Chlorine precipitate
					Direct	Invert		
7736	4.03	2.82	.47	38.8	-3.23	4.62	normal	heavy
7737	4.23	2.27	.31	36.8	-3.10	-3.00	medium	none
7740	4.30	2.97	.33	32.4	+1.16	+1.00	normal	none
7746	4.25	2.52	.38	45.5	-4.23	-4.62	normal	light
7752	4.06	2.82	.32	36.3	-3.85	-3.72	normal	medium
7773	4.33	3.86	.30	27.0	0	0	medium	none
7774	4.03	3.07	.33	23.9	-2.30		nromal	none
7782	4.38	2.37	.21	47.5	-3.85	-3.85	light	none
7783	4.18	2.26	.32	41.5	-3.08	-3.08	normal	none
7784	4.40	3.30	.35	38.5	-2.30	-2.00	"	V. light
7785	4.28	2.50	.35	32.1	-1.92	-1.80	"	none
7793	4.23	2.18	.27	45.5	-3.08		"	V. light
7794	4.23	2.29	.33	23.1	-1.16	-1.16	"	none
7795	4.26	2.12	.28	32.2	-1.92	-1.80	"	none
7796	3.96	2.02	.28	50.0	-3.08	-3.08	medium	V. light
7906	4.38	2.29	.28	33.9	-1.54		"	none
7970	4.32	2.40	.27	31.6	-1.54		"	none
7971	4.08	2.71	.28	45.8	-4.62		"	none
7853	4.83	2.96	.43	36.4	-0.39		"	V. light
7757	4.90	2.31	.29	52.0	-0.77		"	none
7770	4.98	2.68	.33	47.2	-3.23		"	V. light
7085	4.25	2.20	.42	62.1	-2.08	-2.16	"	V. light
7086	4.18	2.50	.32	48.3	-1.93		"	V. light
7823	5.03	2.67	.38	43.2	-2.30	-2.30	normal	none
7779	5.14	2.43	.36	43.6	-4.08	-4.08	normal	

COUNTRY CIDER VINEGARS MADE IN MAINE.

No.	Acid	Solids	Ash	Percent reducing sugar in solids	Polarization	
					Direct	Invert
W.	6.15	1.47	.36	30.4	-1.39	-1.39
M.	2.85	2.31	.53	52.4	-3.85	-3.85
7775	5.16	2.14	.33	19.9	-1.16	-1.16
7797	6.00	2.63	.35	26.2	-3.23	-3.08
7800	2.79	1.64	.31	26.9	-1.16	-1.23
7801	2.52	1.59	.32	11.1	-1.16	-1.10
7822	4.26	2.01	.39	27.1	+1.16	+1.16
7826	4.68	1.86	.35	21.7	+2.30	+2.30
7829	5.37	1.78	.34	19.0	-1.16	-1.12
7830	1.92	1.31	.29	6.4	-0.39	-0.39
7833	2.87	3.21	.36	34.0	-2.30	-2.30
7834	6.45	1.93	.35	25.0	-0.31	-0.77
7835	3.57	2.26	.33	20.0	-1.70	-1.50
7853	4.83	2.96	.43	36.4	-0.39	
7856	4.59	2.89	.52	20.8	-1.16	-1.00

According to the standards, a pure cider vinegar is laevo-rotatory and the solids should not be more than 50 per cent reducing sugars. Most of the results obtained on the cider vinegars made outside of the State come within the range of these standards but in a few instances there are considerable deviations. For instance No. 7740 gives a right hand polariscope reading and No. 7773 a zero reading. In other respects these vinegars conform to the standards. It, however, will be noticed among the country vinegars which we have no reason for thinking sophisticated in any way, there are two samples that give right hand readings. It is very difficult to understand why these two samples of country vinegar should give positive readings with the polariscope.

To some extent the sugar content of the solids is a distinguishing factor between genuine and spurious vinegars. The results of the analyses for the imported vinegars averaged higher than those of the country vinegars and in two instances they exceed 50 per cent. Some authorities consider

over 30 per cent of sugar in the total solids as reason for suspicion. Four of the country vinegars examined carried more than 30 per cent of sugar and one lot carried 52 per cent of sugar. We have positive information that this latter sample was made from genuine cider without any addition of sugar but the low acid content and general appearance of the vinegar indicate that it was incompletely fermented. It is very probable that the high sugar content of some of the imported vinegars is indicative of the use of sugar wastes in their manufacture. Ordinarily a well fermented cider vinegar would not be likely to carry as much as 40 per cent of reducing sugars in its total solids and some of the goods, carrying these high percentages, do not appear to be incompletely fermented.

It will be noted that for the most part the imported vinegars are normal in regard to the amount of malic acid they carry. Several of the samples, however, were very high in the amount of chlorine present. A normal vinegar either carries no chlorine or very slight traces. While we would not be ready to suggest that any of these vinegars are entirely made up without cider vinegar, they have the appearance in several instances that sugar waste vinegars were used to some extent in their manufacture. It is of course somewhat suspicious for vinegars to run so close to the standards in acid content, as normal cider vinegars would usually carry considerably more acid than the standards call for. In the manufacture of vinegar by fermentation of all kinds of ciders either by the old style process or by the quick process, the product would not be likely to be so uniform as most of these samples show. It is, of course, very probable that if nothing more has been done, that these vinegars have been blended so that they carry practically the per cent of acid called for by the standards. It is claimed that in modifying the goods to meet the requirements of the law, artificial vinegars are frequently used and that in some instances the product is made up entirely of such vinegars reinforced with apple waste to make the required amount of solids and ash. Of course such products, if they exist, are illegal—a fraud on the public and the honest manufacturer of pure cider vinegar. While these are reasons for viewing some of these samples with suspicion, we have not obtained data that would justify us in pronouncing them adulterated.

SUGAR VINEGARS.

The results of the analyses of sugar and sirup vinegars are given on page 42. Although a few samples of sugar vinegars were found in the State, it is doubtful if these sugar vinegars are commonly sold to the consumer as a sugar or sirup vinegar. Made as they are from low grade refuse sugar products, they have sufficient color to resemble cider vinegar and consequently they can be lawfully sold without being labeled artificially colored. Some of these vinegars are made directly from a low grade brown sugar; others are made from sugar house refuse sirups. In the case of the sirup vinegars they will of necessity carry much of the residual products of the sugar cane so they are quite heavily loaded with chlorides, sulphates and lime salts. They probably can be produced at a lower price than cider vinegar and they retail at about the same price. While there is nothing objectionable in the use of these vinegars or of distilled vinegars, there is little reason to believe that the retail purchaser would buy them if, in the most cases, he did not suppose that he was obtaining cider vinegar.

DISTILLED VINEGARS.

The table on pages 43 to 46 shows the analyses of a large number of distilled vinegars of various kinds that were found on sale in Maine. Most of these vinegars as sold were properly labeled. The uncolored vinegars are in more or less demand for pickling purposes but are rarely used on the table. The colored distilled vinegars are usually retailed at a somewhat lower price than a strictly pure cider vinegar. It is probable, however, that most of the consumers suppose that they are getting cider vinegar.

As will be noted there were a few instances in which the distilled vinegars were below strength. These vinegars were either removed from sale or the guaranties changed to accord with fact. After investigation it was decided not to prosecute these offenses. The firms making these goods were warned and have promised to strictly follow the requirements of the law in the future.

ANALYSES OF CIDER VINEGAR.

*Table showing the kind of vinegar, the names * of the wholesale and retail dealers, the exact copy of the brand and the results of the chemical analysis.*

Station number.	Retail dealer, Maker or wholesale Dealer and Brand.	Total acids.	Total solids.	Ash.
	CIDER VINEGAR MADE IN MAINE. ABOVE STANDARD STRENGTH.			
7902	Payson & Hobbs, Brooks, Jerry Webb, Brooks,	5 48	2.77	0.36
7853	I. W. Shaw Co., Buckfield, W. H. Allen, Buckfield,	4.83	2.96	0.43
7854	B. Spaulding & Sons, Buckfield, M. A. Warren, No. Buckfield.	4.70	2.15	0.47
7856	J. H. Carey, Buckfield.. C. S. Atwood, Buckfield.	4.59	2.89	0.52
7822	Geo. S. Webb, Skowhegan. Geo. B. Wing, Fairfield.	4.26	2.08	0.39
7775	J. H. O'Donnell, Presque Isle "Pure cider vinegar manufactured by C. F. Dearth, Foxcroft."	5.16	2.14	0.33
7797	W. C. Wells, Brownville. "Pure cider vinegar manufactured by C. F. Dearth, Foxcroft."	6.00	2.63	0.35
7878	J. Ridlon & Son, Gorham. Frank Ridlon, Gorham.	6.66	3.10	0.47
7879	W. T. Libby, Gorham. Frank Harding, Gorham.	5.03	1.74	0.39
7842	A. P. Conant & Co., Lewiston, A. E. Odione, Jr., Greene.	5.39	1.67	0.32
7873	F. H. Ricker, Harrison. Carl E. Whitney & John Proctor, Harrison.	4.00	2.10	0.29
7864	W. D. Clark, South Paris. F. E. Gurney, Hebron.	4.70	2.73	0.41
7876	C. S. Milliken, E. Hiram, L. H. Fletcher, E. Hiram.	4.04	1.37	0.29
7843	J. Bowker, Lewiston. T. St. Clair, Lewiston.	5.48	1.81	0.34
7875	Cousins & Tucker Co., Steep Falls. J. F. Brackett, Limington,	7.61	1.92	0.47
7880	Langley's General Store, So. Waterboro. Erford Emmons, Lyman,	4.89	1.57	0.33

*The first na e given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

ANALYSES OF CIDER VINEGAR—Continued.

*Table showing the kind of vinegar, the names * of the wholesale and retail dealers, the exact copy of the brand and the results of the chemical analysis.*

Station number.	Retail dealer, Maker or wholesale Dealer and Brand.	Total acids.	Total solids.	Ash.
7810	W. A. Bray, Monson. Carroll Pullen.	5.96	2.52	0.51
7826	Brackett & Russell, Norridgewock. E. S. Miller, Norridgewock.	4.68	1.86	0.35
7829	M. Libby, Oakland. O. B. McKeshnie, Oakland.	5.37	1.78	0.34
7891	F. A. Doe, Palermo. Frank Morse, Palmero..	5.16	2.22	0.39
7834	G. W. & M. W. Manter, Readfield. The Manters made the vinegar. .	6.45	1.93	0.35
7506	S. E. & H. L. Shepard Co., Rockport. " Pure cider vinegar made by the Shepard Co."	6.20	2.13	0.36
7507	S. E. & H. L. Shepard Co., Rockport. "Pure cider vinegar made by the Shepard Co."	5.56	2.90	0.33
7809	Sanders Bros. & Co., Sangerville. Chas. Cleaves, E. Sangerville.	5.01	2.07	0.32
7887	B. R. Meservey, North Vassalboro. F. W. Washburn, N. Vassalboro.	4.64	2.48	0.35
7889	W. A. Lord, N. Vassalboro. A. S. Priest, N. Vassalboro.	4.44	1.60	0.37
7867	James N. Tubbs, Norway. E. B. Haskell, E. Waterford.	4.22	1.80	0.28
	CIDER VINEGAR MADE IN MAINE. BELOW STANDARD STRENGTH.			
7897	M. K. Pomeroy, Hampden Cor., Arthur Cowan, Bangor.	3.56	2.94	0.38
7868	Edwin C. Rowe, Bethel, dealer and maker.	3.69	1.54	0.31
7870	C. C. Bryant & Son, Bethel. C. L. Swan, Bethel.	3.22	1.90	0.37
7874	Gleason & Scribner, Bridgton. E. L. Otis, Bridgton.	3.33	4.65	0.36
7890	W. F. Hawes, S. China. A. K. Small, S. China.	2.40	2.34	0.35
7801	F. E. Knowles, Corinna. L. E. Jones, Corinna.	2.52	1.59	0.32

*The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

ANALYSES OF CIDER VINEGAR—Continued.

*Table showing the kind of vinegar, the names * of the wholesale and retail dealers, the exact copy of the brand and the results of the chemical analysis.*

Station number.	Retail dealer, Maker or wnolesale Dealer and Brand.	Total acids.	Total solids.	Ash.
7803	J. A. Shaw, Corinna. A. C. Knowles, Corinna.	2.79	3.25	0.42
7818	Fred Scott, Benton Station. Wm. Tobey, Fairfield Center.	1.65	1.38	0.28
7877	T. W. Charles, Freyburg. Albert Cole, E. Fryeburg.	2.38	3.46	0.30
7611	F. M. Mooers, Gardiner. R. C. Plaisted, Gardiner. Withdrawn from sale..	3.00	1.44	0.47
7815	R. C. Plaisted, Gardiner. In stock, not sold.	3.80	1.59	0.47
7816	R. C. Plaisted, Gardiner. In stock, not sold.	3.88	1.70	0.49
7817	R. C. Plaisted, Gardiner.	2.65	1.22	0.39
7807	J. A. Taylor, Dover. Geo. Lessor, Guilford.	3.60	3.75	0.45
7857	F. I. Dwinal, Mechanic Falls. S. L. Harris, Mechanic Falls.	3.43	2.64	0.28
7858	G. W. Coffin & Co., Mechanic Falls. Chas. Russell, Mechanic Falls.	3.46	1.96	0.34
7838	Prescott Bros., Monmouth. D. P. Boynton, Monmouth.	3.90	3.14	0.61
7800	F. P. Cook, Newport. "Warranted pure cider vinegar made from the apple by John R. Clark."	2.79	1.64	0.31
7830	McNally & Bremner, Oakland. Oakland Town Farm.	1.92	1.31	0.29
7833	F. I. Brown, Readfield. C. S. Kimball, Readfield.	2.87	3.21	0.36
7805	Dyer Bros., Dover. E. A. Flanders, Sangerville. An incompletely fermented cider vinegar.	3.75	5.14	0.35
7835	Holsom & Masterman, Readfield. Geo. Crane, Winthrop.	3.57	2.26	0.33

*The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

ANALYSES OF CIDER VINEGAR—Continued.

*Table showing the kind of vinegar, the names * of the wholesale and retail dealers, the exact copy of the brand and the results of the chemical analysis.*

Station number.	Retail dealer, Maker or wholesale Dealer and Brand.	Total acids.	Total solids.	Ash.
	CIDER VINEGAR OF FOREIGN MAKE. ABOVE STANDARD STRENGTH.			
7796	A. Ryder, Patten, "Pure cider vinegar, put up for John Cassidy Co. Bangor, Me."	4.00	2.02	0.28
7795	I. F. Cooper, Patten, "Pure cider vinegar, Mass. standard, Arthur Chapin Co., Bangor."	4.26	2.12	0.28
7793	W. E. Ramsey, Smyrna Mills. "Cider vinegar made for Fred Crowell, Bangor."	4.23	2.18	0.27
7782	Mrs. Peter Castonguay, Van Buren. Chas. Hayward & Co., Bangor. "Pine Hill Farm pure cider vinegar."	4.38	2.37	0.21
7737	F. J. Geary, Machias. "Pure cider vinegar made for Thurston and Kingsbury, Bangor,	4.23	2.27	0.31
7973	John Watson Co., Houlton. "John Watson Co., warranted pure apple cider vinegar, Houlton."	4.82	1.98	0.32
7752	J. A. Lowe, Eastport. "Warranted pure apple cider vinegar, E. E. Clifford & Co., Portland."	4.06	2.83	0.32
7746	Gray Bros. E. Machias. "H. S. Melcher Co., Portland, Me., pure cider vinegar XXX."	4.25	2.52	0.38
7570	Wm. Milliken & Co., Portland, "Shaker brand pure cider vinegar, E. B. Pettingill Sons Co., Portland."	4.55	2.57	0.26
7866	F. N. Wright, S. Paris. Steadman, Hawkes & Co., Portland. "Shaker Brand pure cider vinegar, E. B. Pettingill Sons Co., Portland."	4.86	3.02	0.35
7773	A. Howe, Presque Isle.. "Imperial Pure cider vinegar, Shaw, Hammond & Carney, Portland."	4.33	3.86	0.30
7736	W. S. Davis, Cherryfield "D. W. True & Co., Portland, Maine., warranted pure apple cider vinegar.".	4.03	2.82	0.47

*The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

ANALYSES OF CIDER VINEGAR—Continued.

*Table showing the kind of vinegar, the names * of the wholesale and retail dealers, the exact copy of the brand and the results of the chemical analysis.*

Station number.	Retail dealer, Maker or wholesale Dealer and Brand.	Total acids.	Total solids.	Ash.
7494	Twitchell-Champlin Co., Portland. "Guaranteed 4.5 per cent, made in New York."	5.99	2.76	0.34
7748	J. D. McGregor, Eastport. "Twitchell-Champlin Co., Portland, Me., Hatchett Brand pure country cider vinegar."	4.74	3.56	0.37
7770	H. N. Goodhue, Ft. Fairfield. "Hatchett Brand pure country cider vinegar Twitchell-Champlin Co., Portland, Me."	4.98	2.68	0.33
7813	W. M. Pratt, Farmington. Twitchell-Champlin Co., Portland. "Hatchet Brand pure cider vinegar."	4.78	3.45	0.59
7086	J. W. Hodner, Portland. "C. A. Weston Co., Portland. Marvel Brand apple cider vinegar, C. A. Weston Co., Portland."	4.19	2.50	0.32
7738	L. W. Longfellow & Co., Machias. "Perfection Pure Cider Vinegar, M. L. Hall & Co., Boston, Mass."	4.48	2.85	0.30
7739	F. C. Perry, Machias. T. R. Savage, Bangor. "Haynes-Piper Co., Boston, U.S.A., registered vinegar	5.00	3.07	0.40
7783	E. W. Tower, Washburn. T. R. Savage, Bangor. "Pure cider vinegar, our gold medal brand, Haynes-Piper Co., Boston, Mass."	4.18	2.26	0.32
7971	F. L. Frank & Co., Bangor. "Gold Medal pure cider vinegar Haynes-Piper Co., Boston, Mass., guaranteed under Food and Drug Act, June 30, 1906, serial No. 7084."	4.08	2.71	0.28
7823	J. M. Naughton Co., Anson. "Chas. E. Moody & Co., Boston, Mass., Pure cider vinegar, Matchless."	5.03	2.67	0.38
7732	E. S. Wilson, Cherryfield. C. E. Knights, Portland. "Pure cider vinegar put up for E. S. Wilson, Cherryfield, Me., Lawrence Co., Boston, Mass."	5.07	3.49	0.45
7757	L. G. Smith, W. Pembroke. H. S. Melcher Co., Portland. "American F. P. Co., Rochester, N.Y. N803."	4.90	2.31	0.29

*The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

ANALYSES OF CIDER VINEGAR—Continued.

Table showing the kind of vinegar, the names of the wholesale and retail dealers, the exact copy of the brand and the results of the chemical analyses.*

Station number.	Retail dealer, Maker or wholesale Dealer and Brand.	Total acids.	Total solids.	Ash.
7085	Wendell, Leighton, Portland. . J. B. Donnell Co., Portland. . "American F. P. Co., Rochester, N.Y." On other end "Pure cider vinegar, Duffy Cider Co., Rochester, N. Y."	4.25	2.20	0.42
7785	J. L. Woodman, Washburn. Milliken-Tomlinson Co., Portland. "American F. P. Co., Rochester, N. Y." On tag "Gold Seal cider vinegar, Duffy Cider Co., established 1842 Rochester, N. Y."	4.28	2.50	0.35
7740	Chandler & Co., Machias Milliken-Tomlinson Co., Portland. "Duffy Cider Co., Rochester, N. Y., established 1842 gold seal cider vinegar.".	4.30	2.97	0.33
7774	R. H. McDonald, Presque Isle. Milliken-Tomlinson Co., Portland, "pure cider vinegar, Duffy Cider Co., Rochester, N.Y." On other end of barrel "American F. P. Co., Rochester, N.Y. WS22."	4.03	3.07	0.33
7906	Spruce Bros., Milford. Arthur Chapin Co., Bangor. "pure cider vinegar, guaranteed under the Food and Drug Act, June 30, 1906. S. R. Deyo, Kingston, N. Y."	4.38	2.29	0.28
7970	Gallager Bros., Bangor. "S. R. Deyo Co., Kingston, N. Y., guaranteed under the Food and Drug Act., June 30, 1906."	4.32	2.40	0.27
7804	F. H. Hayes, Dexter. H. S. Melcher Co., Portland. "Diamond Seal pure cider vinegar, trade mark, Duffy Montford & Greene Cider Co., Newark, Wayne Co., N.Y.".	4.94	2.99	0.32
7784	J. M. Story & Co., Washburn. "Cider vinegar, Holley Mills, Genessee Fruit Co., Holley, Orleans Co., New York."	4.40	3.30	0.35
7794	W. H. Cunliffe Sons, Ft. Kent, Chas. Hayward & Co., Bangor. "Cider vinegar, Holley Mills, Genessee Fruit Co., Holley, Orleans Co., New York."	4.23	2.29	0.33
7730	F. C. Nash, Cherryfield. "Pure apple cider vinegar, fermented test No. 3892, Nov. 1903, H. J. Heinz Co., Pittsburg."	6.35	2.74	0.34
7779	Stockholm Lumber Co., Stockholm. "Pure apple cider vinegar, fermented test No. 4663, Nov., 1906, H. J. Heinz Co., Pittsburg."	5.14	2.43	0.36

*The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

ANALYSES OF CIDER AND SUGAR VINEGARS—Concluded.

*Table showing the kind of vinegar, the names * of the wholesale and retail dealers, the exact copy of the brand and the results of the chemical analysis.*

Station number.	Retail dealer, Maker or wholesale Dealer and Brand.	Total acids.	Total solids.	Ash.
7892	F. S. Perkins, Wiscasset. John Bird Co., Rockland. "Miller, Pettingill & Foster, Lansing, Mich., Silver brand cider vinegar."	4.80	3.76	0.48
	CIDER VINEGAR. FOREIGN MAKE BELOW STANDARD STRENGTH.			
7969	Waite & Pennell, Portland. "Warranted pure apple cider vinegar, E. E. Clifford & Co. Portland." Nearly up to standard strength.	3.84	1.71	0.31
	MALT VINEGAR.			
7592	Whiting Bros., Ellsworth. "Cross & Blackwell's Tarragon Vinegar." Old stock in bottles.	5.72	2.70	0.45
	SUGAR VINEGAR. FOREIGN MAKE ABOVE STANDARD STRENGTH.			
7827	Huntoon & Ames, Norridgewock. "Pure fermented syrup vinegar, Fuller-Holway Co., Augusta."	4.05	0.85	0.23
7900	F. M. McAllister, Burnham. "Pure fermented syrup vinegar Fuller-Holway Co., Augusta."	4.16	0.91	0.25
7040	F. G. Davis & Co., Lewiston. "Strictly pure legal brand vinegar, Guaranteed that purity and brand comply with Pure Food Laws, put up for F. G. Davis & Co., Lewiston."	4.72	2.50	0.93
7903	Shaw, Hammond & Carney, Portland. "Fermented sirup vinegar, natural color."	4.26		
7904	Shaw, Hammond & Carney, Portland. "Superior distilled syrup vinegar, New York state test."	4.69		
7734	G. R. Campbell & Co., Cherryfield. "Rex amber vinegar fermented, made exclusively from pure granule cane sugar, test No. H1858, H. J. Heinz Co., Pittsburg, U.S.A."	4.82	2.14	0.28
7769	Boyd Bros., Ft. Fairfield. "Rex amber vinegar, fermented. Made exclusively from pure granule cane sugar test Ho. H1866, H. J. Heinz Co., Pittsburg."	4.85	1.69	0.26
	SUGAR VINEGAR. FOREIGN MAKE BELOW STANDARD STRENGTH.			
7750	Union Market Co., Eastport. "Haskell-Adams & Co., Boston, Mass., pure syrup vinegar." Purchased in 1906. Lot was up to Mass. standard. Probably frozen in winter of 1906-7.	3.09	0.58	0.12

*The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

ANALYSES OF DISTILLED VINEGARS.

*Table showing the kind of vinegar, the names * of the wholesale and retail dealers, the exact copy of the brand and the results of the chemical analyses.*

Station number.	Retail dealer, Maker or wholesale dealer and Brand.	Total acids.
	DISTILLED VINEGAR. UNCOLORED. ABOVE STANDARD STRENGTH.	
7844	John LaCroix, Lewiston. F. J. Davis, Lewiston. "Fleischmann Vinegar Works, 34th St., N.Y., Superior distilled spirit vinegar."	4.35
7731	F. C. Nash, Cherryfield. "Pure pickling vinegar, distilled, H. J. Heinz Co., Pittsburgh."	5.38
7767	W. H. Doran, Ft. Fairfield. "H. J. Heinz Co., Pittsburgh, Pa., Pure food products."	4.83
7743	G. H. Harper & Co., Machias. "Libby, McNeal & Libby, Chicago, Ill., white wine vinegar."	7.55
	DISTILLED VINEGAR. UNCOLORED. UP TO GUARANTEED STRENGTH.	
7847	Livermore Falls Coop. Association, Livermore Falls. "Distilled white vinegar 3½% acetic acid, Chas. McLaughlin Co., Portland."	3.53
	DISTILLED VINEGAR. UNCOLORED BELOW STANDARD STRENGTH.	
7747	F. A. Hall, E. Machias, "White wine vinegar, T. R. Savage & Co., Bangor." Vinegar several years old. Thrown away.	2.89
7776	S. W. Collins & Son, Caribou. "E. E. Clifford & Co., Portland, Me., distilled white vinegar."	3.79
	DISTILLED VINEGAR. COLORED IN IMITATION OF CIDER VINEGAR. ABOVE STANDARD STRENGTH.	
7539	E. F. Piper, Bangor. "Pure XXX vinegar Chas. Hayward & Co., Bangor." Label changed, spring 1907.	4.20
7744	Erwin McEachan Machias. "Chas. Hayward & Co., Bangor, Me., distilled vinegar XXX, artificially colored."	4.00
7755	C. Laughlin, Pembroke. Chas. Haywood & Co., Bangor. "Chas. Hayward & Co., Bangor, Me., white wine vinegar colored with caramel." Label changed by omitting word "wine."	4.03

ANALYSES OF DISTILLED VINEGARS—Continued.

*Table showing the kind of vinegar, the names * of the wholesale and retail dealers, the exact copy of the brand and the results of the chemical analyses.*

Station number.	Retail dealer, Maker or wholesale dealer and Brand.	Total acids.
7751	S. A. Farris, Eastport. "Put up expressly for Thurston & Kingsbury Bangor, Me. Red Diamond vinegar." One barrel from an old lot. "Colored." added to label.	4.35
7798	O. A. Speed, Milo. Linell, Robinson & Co., Bangor. "Pure XXX vinegar, Geo. T. Wescott & Son, Bangor." Clerical error in omitting word "colored" from label.	4.23
7972	John Watson Co., Houlton. "John Watson Co. colored, distilled golden russet vinegar, Houlton, Me."	4.08
7760	J. B. Allen, Calais. "Pure Golden Rnsset vinegar colored distilled. S. S. Pineo."	4.03
7749	J. W. Whalen, Eastport. Shaw, Hammond & Carney, Portland. "White vinegar." Clerical error in omitting word "colored."	4.58
7781	Lebron Cyr, Van Buren. Shaw, Hammond & Carney, Portland. "White vinegar colored."	4.30
7905	Shaw, Hammond & Carney, Portland, Me. "Colored white vinegar."	6.03
7837	C. L. Thompson, Monmouth. Thompson-Hall Co., Portland. "White colored household vinegar."	4.43
7742	M. Gardner & Son, Machias. "Spirit vinegar colored, D. W. True & Co., Portland."	4.35
7926	D. W. True Co., Portland, Me. "Spirit vinegar colored"	4.68
7907	Geo. E. Lane, Danforth. Bangor Egg Co., Bangor. "Distilled spirit vinegar, artificially colored, F. E. Jewett & Co., Lowell."	4.16
7845	C. E. Davis & Co., Livermore Falls. F. G. Davis & Co., Lewiston. "Artificially colored distilled spirit vinegar, Fleischmann Vinegar Works, N.Y."	4.35

* The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

ANALYSES OF DISTILLED VINEGARS.—Continued.

Table showing the kind of vinegar, the names of the wholesale and retail dealers, the exact copy of the brand and the results of the chemical analyses.*

Station number.	Retail dealer, Maker or wholesale dealer and Brand.	Total acids.
7828	E. W. Allen, Norridgewock. Twitchell-Champlin Co., Portland. "Anderson & Edwards Grain vinegar, Smithville, N.Y." "Colored" added to label.	4.34
	DISTILLED VINEGAR. COLORED IN IMITATION OF CIDER VINEGAR. UP TO GUARANTEED STRENGTH.	
7790	James Gray, Monticello. "Colored distilled XXXX vinegar 3% acetic acid. Almon H. Fogg Co., Houlton."	3.57
7974	John Watson & Co., Houlton. "John Watson Co., colored distilled XXX vinegar, 3% acetic acid, Houlton, Me."	3.24
7764	Adams Bros., Milltown. "Fine Pure Old XXX Vinegar colored, distilled 3%."	3.66
7766	G. A. Holmes, Milltown.	3.15
7968	Wm. Wardell, Portland. "Colored distilled XXX vinegar, 3% acetic acid, E. E. Clifford & Co."	3.36
	DISTILLED VINEGAR. COLORED IN IMITATION OF CIDER VINEGAR. BELOW STANDARD STRENGTH AND BELOW GUARANTEED STRENGTH.	
7787	E. A. Gillin & Co., Houlton. Milliken-Tomlinson Co., Portland. "Distilled XXX vinegar artificially colored Chas. Hayward & Co., Bangor." Very nearly standard strength.	3.94
7788	John A. Miller, Houlton. "Distilled Golden Russet vinegar, colored, John Watson Co."	3.64
7832	F. W. Smith, Oakland. E. W. Gross, Lewiston. "E. E. Clifford & Co. Pure old XXX, 3 per cent distilled vinegar.' Old goods, probably frozen in winter of 1906-7.	2.25
7789	E. B. Jackson, Monticello, "Colored grain vinegar." Bought of Shaw, Hammond & Carney, Portland. This vinegar was fermented by E. D. Pettingill Sons Co., who claimed the vinegar 4.5 per cent acetic acid.	3.03

*The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

ANALYSES OF DISTILLED VINEGARS—Concluded.

*Table showing the kind of vinegar, the names * of the wholesale and retail dealers, the exact copy of the brand and the results of the chemical analyses.*

Station number.	Retail dealer, Maker or wholesale dealer and Brand.	Total acids.
7811	Henry Grover, Monson. "D. W. True & Co., Portland, Me. Spirit vinegar colored." Fermented by Haynes-Piper Co., Boston, Mass., who claimed the vinegar tested 4.15 per cent when shipped.	3.57
7778	C. W. Trafton, Limestone. Twitchell-Champlin Co., Portland. "Colored grain vinegar, Anderson & Edwards, Smithville, N.Y." Sold some time since. Makers claimed it to be above standard. strength.	3.50
7538	T. J. Daley & Co., Bangor. "XX Vinegar." Vinegar purchased for special purpose in 1905. Withdrawn from sale spring 1907.	2.69
7786	W. P. Mansur, Houlton. "XX Vinegar." Old vinegar in stock when Mr. Mansur purchased store.	2.69

*The first name given is the wholesaler or maker; the second name is that of the retailer. In case only one name is given, it is that of the retailer.

Cream of Tartar.

Samples of the more common brands of cream of tartar were collected. These were examined qualitatively and were, for the most part, found to be free from adulteration and branded correctly. Sample No. 7113 of the Smith Brockway Company was correctly labeled. Numbers 7111, 7118 and 7136 were illegal goods, affidavits were obtained and the goods were either correctly labeled or withdrawn from sale. As this seemed to be an innocent violation of the law on the part of the dealer, no prosecutions were made.

ANALYSES OF CREAM OF TARTAR AND CREAM OF TARTAR COMPOUND.

Tables showing the names of the wholesale and retail dealers, the exact copy of the brand and the results of the chemical analysis.

Station number.	Retail dealer, wholesale dealer and brand.	Sulphuric acid SO_3	Phosphoric acid P_2O_5	Calcium.	Aluminum.	Starch.
	CREAM OF TARTAR.					
7228	W. H. Sweet, Bath. Kimball Bros. Co., Bath. "Pyramid Cream Tartar, strictly pure, Kimball Bros. Co., Bath, Me."	None	None	None	None	None
7983	C. M. Bowker Co., Woodfords. J. B. Donnell Co.' Portland. "Stickney & Poors warranted pure cream tartar."	None	None	None	None	None
7984	F. H. Freese, Woodfords D. W. True & Co., Portland. "D. W. True & Co., wholesale grocers, 217 Commercial St., Portland, Me." On end of box labeled "Stickney & Poors Cream Tartar, 51 lbs. bulk."	None	None	None	None	None
7989	J. R. Cobb, Morrill's Corner, Woodfords. Twitchell-Champlin Co., Portland. "Hatchet Brand, absolutely pure, highest test cream tartar, manufactured by the Twitchell-Champlin Co., Portland, Me., and Boston, Mass."	None	None	None	None	None
7514	Consumer's sample John Bird Co., Rockland. "½ lb. warranted pure cream tartar, John Bird Co., Rockland."	None	None	None	None	None
7982	C. M. Bowker Co., Woodfords. John Bird Co., Rockland. "One quarter lb. warranted pure cream tartar."	None	None	None	None	None
7093	Geo. A. Kennison, Waterville. Dwinal-Wright & Co., Boston, Mass. Goods had been removed to a tea can. Bulk.	None	None	None	None	None
7497	G. A. Porter & Co., N. Anson. Dwinal, Wright & Co., Boston, Mass. Bulk.	None	None	None	None	None
7226	M. P. Moore, No. Anson. Chas. E. Moody, Boston. Mass. Bulk "Matchless Cream Tartar."	None	None	None	None	None
7229	W. H. Sweet, Bath. Silas Pierce & Co., Boston, Mass. "Expressly for first class trade, Cream tartar, Silas Pierce & Co., Boston, Mass."	None	None	None	None	None
7027	Joseph Barrier, Biddeford. D. & L. Slade, Co., Boston, Mass. "Slades Cream Tartar, absolutely pure."	None	None	None	None	None
7039	Nealey & Miller, Lewiston. D. & L. Slade Co., Boston, Mass. Bulk.	None	None	None	None	None

ANALYSES OF CREAM OF TARTAR AND CREAM OF TARTAR COMPOUND—*Continued.*

Station number.	Retail dealer, wholesale dealer and brand.	Sulphuric acid SO_3	Phosphoric acid P_2O_5	Calcium.	Aluminum.	Starch.
7498	J. A. Porter & Co., N. Anson. Stickney & Poor, Boston, Mass. "Warranted pure Cream Tartar. Stickney & Poors 182, 184 State St., Boston, Mass. Warranted ½ lb. full weight and guaranteed to test over 99.80 per cent purity."	None	None	None	None	None
7980	Fred B. Estes, Woodfords Stickney & Poor, Boston, Mass. "Stickney & Poor's Pure Cream Tartar, 50 lbs. Bulk."	None	None	None	None	None
7095	Me. Central Coop. Assoc., Waterville Berry-Dodge & Co., Newburyport, Mass. "Warranted strictly pure cream of tartar, 50 lbs., Berry-Dodge & Co', Newburyport, Mass."	None	None	None	None	None
7142	Hallowell Market Co., Hallowell Berry-Dodge & Co., Newburyport, Mass Bulk.	None	None	None	None	None
7189	C. C. Homer, Bucksport. Berry-Dodge & Co., Newburyport, Mass. "Berry-Dodge & Co.'s warranted pure cream tartar."	None	None	None	None	None
7037	Libby & Ettchell, Biddeford. A. F. Ross & Co., Newburyport, Mass. "A. F. Ross Co.'s Pure Cream Tartar."	None	None	None	None	None
159	H. T. Nason, Brunswick. Berry-Hall Co., Burlington, Vt. "Gold Star cream tartar, strictly pure, ground from finest French crystals, by Berry-Hall Co., New York, Burlington, Vt.	None	None	None	None	None
7178	H. P. Hopkins, Ellsworth. Berry-Hall Co., Burlington, Vt. "Gold Star cream tartar, strictly pure ground from finest French crystals, Berry-Hall Co., New York, Burlington, Vt."	None	None	None	None	None
	COMPOUND CREAM OF TARTAR IMITATION.					
7136	Geo. Wadleigh, Augusta, Me. Goods have been removed from the original package from which they came.	Found	Found	Found	Found	Found
7118	Fred Miller, Newport. E. J. Colbath, Vassalboro.	Found	Found	Found	Found	Found
7113	Cassavant & Clothier Co., Augusta. J. Smith Brockway, Co., Boston, Mass. "Queen Quality cream tartar compound." On top of package by rubber stamp "Ingredients, pure cream tartar, acid phosphate of calcium, basic alumina sulphate, corn starch."	Found	Found	Found	Found	Found
7111	Pomeleau & Huard, Augusta. Salesman did not know from whom it was purchased "Sub, C. Tartar, P. & H. Co., Augusta, Me., 127 lbs. net."	Found	Found	Found	Found	Found

BULLETIN No. 152.

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.

FREE ANALYSIS OF SEEDS.

The Station examines as promptly as possible all samples of seeds sent by dealers and others to assist them to decide (1) whether they should or should not purchase the seed, and (2)

what guaranty of purity should be placed upon the seeds. While it does not take long to examine a fine seed with high percentages of purity, a poor red-top or similar fine seed may take so much of the time of the analyst as to seriously delay reports upon other and more important seeds. For this reason in February, March and April when the call for seed analysis is greatest, frequently the examination of fine seeds such as red-top cannot be undertaken.

Correspondents desiring to forward seeds for analysis should observe carefully the directions given on the third page of cover of this bulletin.

While it is not easy to make an exact purity test, it is not difficult for a farmer to so acquaint himself with the seeds that he is ordinarily using that by the help of an ordinary reading or 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 a 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. The following simple instructions for performing germination tests at home without any special apparatus will enable the farmer to learn for himself whether the seed that he is using has good vitality or not. Germination tests may be made in two ways,—the so-called blotting paper methods, and the sand method. In making the germination test with blotting paper, blue blotting paper of common weight, cut into strips about 6 x 19 inches, should be used. This is laid folded twice so as to get a piece of three thicknesses and about six inches square, on an ordinary dinner plate or platter. The seeds if small are placed on the top of the paper and if large between the folds. The paper is kept moist (not soaked) and at a temperature of 70 to 80 degrees F.

If only a vitality test is desired the blotting paper method is preferable, but if it is desired to know how many seeds may be expected to grow, the sand method is in some ways preferable. In this method a thin layer of fine sand is sprinkled on the bottom of a flat dish and the seeds to be tested placed on it under a thin covering of sand. This must be kept moist and well

shaded and at a somewhat higher temperature than in the first case.

At the end of every second day in the case of some seeds, and the third day in the case of those germinating more slowly, the sprouted seeds should be removed from the blotters or the sand and counted, the per cent being readily found by referring back to the number of seeds which were taken for the test. If 100 seeds are used, the number that sprout give the vitality per cent.

VIOLATIONS OF THE LAW.

It will be noted that in quite a number of instances, seeds were sold in 1907 under a guarantee much too high. It developed in most instances that these seeds were bought from wholesale dealers in Maine and were sold by the retailer under the guarantees printed or stenciled on the bags as received from the wholesale dealer. As the seeds were, so far as it was possible to ascertain, bought and sold by the retailer in good faith, it did not seem right to prosecute him. On turning to the wholesale dealer who should have been the responsible party, it was not practicable to trace the goods to him. That is, it was not practicable to prove that the sample drawn at the store of the retailer was from a particular lot furnished by a wholesale dealer. While it would have been a simple matter to prosecute the retail dealer it was not as easy to press the case against the wholesale dealer.

In January at the invitation of the Director of the Station, representatives of the wholesale houses he believed to have violated the law, met at his office and the whole matter was gone over. As it seemed that by the amicable arrangement then made and the clearer understanding of the law on the part of the wholesalers, the future would be safeguarded, all cases for 1907 were dropped.

This is to be said as to the position of the wholesale dealer in Maine. He cannot anywhere buy seeds under a guaranty and he must by law guarantee the seeds he sells. This is a good deal of hardship. It is offset, however, by the fact that the Maine retailer cannot, so far as the writer knows, buy guaranteed seeds of any wholesale dealer outside of Maine and on this account the Maine wholesale dealer is in condition because of his guaranteed seeds to command the trade of Maine retailers.

THE WRITTEN GUARANTY THE RETAILERS SAFEGUARD.

In October, 1907, a signed circular relative to the protection afforded by a written guaranty was sent to all dealers in Maine in which the following statement was made. "I shall make no prosecutions against any handler of feeding stuffs, fertilizers, or agricultural seeds within the State provided he obtain at the time of purchase a *written guaranty* that the goods are in conformity with the law regulating their sale."

In February, 1907, the following was sent to all known handlers of grass and similar seeds in Maine.

The law regulating the sale of agricultural seeds was more particularly intended to apply to grass seeds than to ordinary vegetable seeds. Such seed to be lawfully sold must carry "a written or printed guaranty of its purity and freedom from foreign matter."

It is not enough that the package carries the figures but they must be accompanied by explanatory words naming the seed and what the figures mean. For example,—a bag of timothy seed labeled "99.5 per cent" is not lawfully branded; it should be labeled in some such a way as the following:—"Timothy 99.5 per cent pure."

Maine dealers will probably find it impossible to buy outside of the State, grass seed whose purity is guaranteed, hence Maine jobbers will have to fix the guaranty either by analysis made by themselves or by someone else. *The guaranty must be in accord with fact.* Maine retail dealers will have no difficulty in buying properly guaranteed seeds from Maine jobbers.

Although the written guaranty clause of the Maine food and drug law applies only to the sale of food and drugs, discretion is given to the Director regarding prosecutions under other laws. No prosecutions will be made against any handler of agricultural seeds within the State *provided* he obtain at the time of purchase, a guaranty *personally signed in ink* that the goods are in conformity with the Maine law regulating the sale of agricultural seeds. The guaranty to be of value should identify and may be attached to the bill of sale, invoice, bill of lading, or other schedule, giving the names and quantities of the seeds sold. The following is suggested as a form:—

"I (we) the undersigned to hereby guarantee that the following seeds (specify the seed as fully as possible, e. g. 5 bags Timothy, lot No. 28423, 3 bags Red Clover No. 34622) distributed or sold by me (us) to (give name, address of purchaser and date of each) are in conformity with the requirements of the Maine law regulating the sale of agricultural seeds."

This is to be signed in ink and in the case of a firm or corporation the name and title of the person signing must be given. For example "The Smith-Jones Co., *Chas. R. Doe,* Member of the Firm."

It is now nearly 10 years since the Maine law regulating the sale of agricultural seeds went into effect. The law will be much more strictly enforced in 1908 than in the past.

CHAS. D. WOODS, *Director.*

February, 1908.

RESULTS OF ANALYSES.

The tables on pages 54 and 55 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. The system of naming followed by Britton and Brown is used this year. We are indebted to Dr. M. A. Chrysler, Associate Professor of Botany in the University of Maine for the verification of the names.

The table on pages 56 to 58 summarizes the results of examination of samples of seeds examined by the Station in 190 .

The table on pages 59 to 84 contains the detailed analyses of samples collected by the Station and those sent in by correspondents. In the tables the kinds of seeds are arranged alphabetically and under each kind the samples are arranged alphabetically by the residence of the dealer.

Some of the samples were sent by 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.

A list of weed seeds found in seeds examined in 1907.

Britton and Brown, Nomenclature.

Common name.	Scientific name.
American pennyroyal.	Hedeoma pulegioides, (L) Pers.
American wild mint.	Mentha canadensis, L.
Beak grass.	Panicum rostratum, Muhl.
Black medick.	Medicago lupulina, L.
Black mustard.	Brassica nigra, Koch.
Black nightshade.	Solanum nigrum, L.
Bladder ketmia.	Hibiscus Trionum, L.
Blue vervain.	Verbena hastata, L.
Blue weed.	Echium vulgare, L.
Canada thistle.	Carduus arvensis, (L) Robs.
Canadian blue grass.	Poa compressa, L.
Catnip.	Nepeta Cataria, L.
Charlock.	Brassica arvensis (L) B. S. P.
Chicory.	Cichorium Intybus, L.
Common chickweed.	Alsine media, L.
Corn cockle.	Agrostemma Githago, L.
Corn mayweed.	Matricaria inodora, L.
Corn spurrey.	Spergula arvensis. L.
Crabgrass.	Syntherisma sanguinalis (L) Nash.
Crane's-bill.	Geranium maculatum, L.
Dandelion.	Taraxacum Taraxacum (L) Karst.
Dock Sp.	Rumex sp.
Dodder.	Cuscuta Epithymum, Bab.
English ryegrass.	Lolium perenne, L.
Ergot (spore clusters).	Claviceps (purpurea.?)
Evening primrose.	Onagra biennis (L) Scop.
Field peppergrass.	Lepidium campestre, R. Br.
Five finger.	Potentilla Monspeliensis, L.
Flax.	Linum usitatissimum, L.
Fowl meadow grass.	Poa flava, L. ?
Goosefoot.	Chenopodium album, L.
Green foxtail.	Chætochloa viridis, L. ?
Hairy stick seed.	Lappula texana, Britton.
Heal-all.	Prunella vulgaris, L.
Hedge mustard.	Sisymbrium officinale, L.
Hoarhound.	Marrubium vulgare, L.
Horse nettle.	Solanum carolinense, L. ?
Kidney vetch.	Vicia sp. ?
Knot grass.	Polygonum aviculare, L.
Lady's thumb.	Polygonum Persicaria, L.

Marsh elder.	Iva xanthifolia, (Fresen.) Nutt.
Mayweed.	Anthemis Cotula, L.
Meadow fescue.	Festuca elatior pratensis.
Menzies peppergrass.	Lepidium Menzesii, D. C. ?
Mint,. Unidentified.	
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.
Pennycress.	Thlaspi arvense, L.
Peppergrass.	Lepidium, sp. (virginicum, L. ?)
Pigweed.	Amaranthus retroflexus, L.
Pimpernel.	Anagallis arvensis, L. ?
Plantain.	Plantago sp.
Poppy.	Papaver sp. ?
Poverty weed.	Iva axillaris, Pursh.
Prickly poppy.	Argemone hispida. Gray ?
Ragweed.	Ambrosia artemesiæfolia, L.
Ribgrass.	Plantago lanceolata, L.
Rugel's plantain.	Plantago Rugelii, Dec.
Sheep sorrel.	Rumex Acetosella, L.
Shepherd's purse.	Bursa Bursa-pastoris, (L) Britton.
Sedge.	Unidentified.
Slender crabgrass.	Syntherisma filiformis (L) Nash.
Sow thistle.	Sonchus oleraceus, L.
Stinging nettle.	Urtica dioica, L.
Spurge.	Euphorbia nutans, Lag.
Suckling clover.	Trifolium filiforme, L.?
Tar weed.	Madia sativa L. ?
Tumbleweed.	Amaranthus græcizans, L.
Virginia three-seeded mercury.	Acalypha virginica L.
White vervain.	Verbena urticæfolia, L.
Wild buckwheat.	Polygonum Convolvulus, L
Wild carrot.	Daucus Carota, L.
Winged pigweed.	Cycloloma atriplicifolium (Spreng.) Coult.
Witch grass.	Panicum capillare, L.
Worm-seed mustard.	Erysimum cheiranthoides, L.
Yarrow.	Achillea Millefolium, L.
Yellow daisy.	Rudbeckia hirta, L.
Yellow foxtail.	Chætochloa glauca, L. ?
Yellow rocket.	Barbarea Barbarea, (L) MacM.
Yellow trefoil.	Trifolium dubium Sibth. ??
Yellow wood-sorrel.	Oxalis corniculata, L.

TABLE SHOWING RESULTS OF EXAMINATION OF SAMPLES OF SEED IN 1907.

Names of Weeds.	Kinds of Seed and number of Samples.									
	Red Clover.	Aliske Clover	Mammoth Clover.	White Clover	Timothy.	Red Top.	Alfalfa	Kentuckyblue grass	Wood Meadow	Hungarian.
NUMBER OF SAMPLES EXAMINED.	87	82	21	5	110	25	2	2	1	14
American pennyroyal	3	1	—	—	1	—	—	—	1	—
American wild mint	—	1	—	—	21	14	—	—	—	—
Beak grass	—	—	—	—	—	—	—	—	1	—
Black medick	36	60	4	1	1	—	1	—	—	—
Black mustard	—	—	—	—	1	—	1	—	—	—
Black nightshade	6	—	2	—	1	—	—	—	—	—
Bladder ketmia	—	—	—	—	—	—	—	—	—	1
Blue vervain	11	1	4	—	56	5	—	—	—	—
Blue weed	2	—	—	—	—	—	—	—	—	—
Bracted plantain	8	—	1	—	1	—	—	—	—	—
Bull thistle	8	—	—	—	—	—	—	—	—	—
Canada thistle	10	7	2	—	2	—	—	1	—	—
Canada blue grass	—	—	—	—	—	—	—	1	—	—
Catnip	6	5	—	—	2	—	—	—	—	—
Charlock	18	—	—	—	—	—	—	—	—	1
Chicory	23	—	3	—	—	—	—	—	—	—
Common chickweed	4	5	—	—	2	—	—	—	1	—
*Corn cockle	—	—	—	—	—	—	—	—	—	—
Corn mayweed	2	—	—	—	—	—	—	—	1	—
Corn spurrey	1	—	—	—	—	—	—	—	1	—
Crabgrass	21	—	1	—	4	—	—	—	—	9
Crane's-bill	7	—	—	—	—	—	—	—	—	—
Dandelion	1	1	—	—	4	—	—	1	—	—
Dock sp.	52	45	15	1	9	—	1	—	—	—
Dodder	29	—	6	—	—	—	—	—	—	—

* Found in spring wheat.

TABLE SHOWING RESULTS OF EXAMINATION OF SAMPLES OF SEED IN 1907—Continued.

Names of Weeds.	Kinds of Seed and number of Samples.									
	Red Clover.	Alsike Clover	Mammoth Clover.	White Clover.	Timothy.	Redtop.	Alfalfa.	Kentuckyblue grass.	Wood Meadow.	Hungarian.
†English ryegrass	—	—	—	—	—	—	—	—	—	—
Ergot	1	5	—	—	79	25	—	—	—	—
Evening primrose	9	11	6	—	87	10	—	—	—	1
Field peppergrass	6	—	—	—	—	—	—	—	—	—
Five finger	9	42	3	1	81	19	—	2	—	—
Fowl meadow grass	—	1	—	—	1	—	—	—	—	—
Goosefoot	56	55	15	5	61	2	1	—	—	9
Green foxtail	82	23	19	—	17	—	—	—	—	—
Hairy stick seed	1	—	1	—	—	—	—	—	—	—
Heal-all	24	3	4	—	4	—	—	—	1	—
Hedge mustard	6	43	1	1	13	5	—	2	—	—
Hoarhound	4	—	1	—	—	—	—	—	—	—
Kidney vetch	2	—	—	—	—	—	—	—	—	—
Knot grass	25	2	3	—	—	—	—	—	—	5
Lady's thumb	40	7	10	—	—	—	—	—	—	14
Marsh elder	—	—	—	—	—	—	—	—	1	—
Mayweed	15	28	3	2	28	—	—	1	—	—
Meadow fescue	5	—	—	—	—	—	—	—	—	—
Menzie's peppergrass	3	4	1	—	4	—	—	—	—	—
Mint family	—	—	—	—	25	3	—	—	—	—
Moth mullein	—	—	—	—	17	20	—	—	—	—
Mouse-ear chickweed	7	44	1	2	5	16	—	2	1	—
Night flowering catchfly	43	74	9	5	5	—	1	—	—	—
Orange hawkweed	—	—	—	—	—	—	—	—	1	—
Ox-eye daisy	—	3	—	—	—	—	—	—	—	—
Pale persicaria	—	—	—	—	1	—	—	—	—	12
Pennycress	—	3	—	—	—	—	—	—	—	—
Pepper grass	8	42	—	2	40	11	—	—	—	—
Pigweed	5	7	2	—	4	—	—	—	—	3

† Found in orchard grass.

TABLE SHOWING RESULTS OF EXAMINATION OF SAMPLES OF SEED IN 1907—Concluded.

Names of Weeds.	Kinds of Seed and number of samples.									
	Red Clover.	Alike Clover	Mammoth Clover.	White Clover.	Timothy	Red Top.	Alfalfa.	Kentuckyblue grass	Wood Meadow.	Hungarian.
Pimpernel	5	—	3	—	—	—	—	—	—	—
Plantain	4	34	1	4	5	14	—	2	—	—
Poppy	1	—	—	—	—	—	—	—	—	—
Poverty weed	2	—	—	—	—	—	—	—	—	—
Prickley poppy	1	—	1	—	—	—	—	—	—	—
Ragweed	13	—	2	—	—	—	—	—	—	6
Ribgrass	64	11	10	—	7	1	2	—	—	—
Rugel's plantain	49	18	9	1	86	5	—	—	1	1
Sheep sorrel	55	75	14	5	36	1	—	2	1	1
Shepherd's purse	4	21	—	3	10	6	—	2	—	—
Sedge family	—	—	—	—	17	20	—	—	—	—
Slender crabgrass	40	7	4	2	3	—	—	—	—	7
Sow thistle	10	—	1	—	—	—	—	—	1	—
Stringing nettle	1	27	—	—	65	13	—	2	1	—
Spurge	20	1	2	—	—	—	—	—	—	—
Suckling clover	5	5	—	—	1	—	—	—	—	—
Tar weed	—	—	—	—	—	—	—	—	—	1
Tumble weed	6	5	—	—	1	—	—	—	—	—
Virginia three-seeded mercury	5	—	—	—	—	—	—	—	—	1
White vervain	—	—	—	—	1	—	—	—	—	—
Wild carrot	28	—	4	—	—	—	1	—	—	—
Witch grass	38	28	5	1	19	8	—	—	—	13
Worm-seed mustard	—	19	—	—	6	2	—	—	—	—
Yarrow	—	—	—	—	14	25	—	—	—	—
Yellow daisy	—	—	3	—	71	12	—	—	—	—
Yellow foxtail	21	—	5	—	—	—	—	—	—	9
Yellow rocket	—	9	—	—	21	3	—	—	—	—
Yellow trefoil	2	—	—	—	1	—	—	—	—	—
Yellow wood-sorrel	—	7	—	—	2	1	—	—	—	—

ANALYSIS OF SEEDS, 1907.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity. Guaranteed.	Purity. Found.	Impurities. Inert matter.	Impurities. Harmless—Foreign seed.	Impurities. Noxious—Foreign seed.
	ALFALFA.					
6044*	W. F. Chick, Bangor.	—	99.5	0.2	0.1	0.2
6199	Kendall & Whitney, Portland.	99.0	98.7	0.2	0.5	0.6
	ALSIKE CLOVER.					
6069*	Oscar Holway Co., Auburn.	—	86.5	0.5	11.9	1.1
6247	Oscar Holway Co., Auburn.	98.0	91.1	1.5	6.4	1.0
6390*	Oscar Holway Co., Auburn.	—	93.6	3.6	2.5	0.3
	"S Alsyke"					
6039*	W. F. Chick, Bangor.					
	"Alsyke 40"	—	91.2	0.8	7.6	0.4
6040*	W. F. Chick, Bangor.	—	95.7	1.0	2.9	0.4
	"Alsyke Clover 40"					
6041*	W. F. Chick, Bangor.					
	"Alsyke 5"	—	85.5	1.2	11.4	1.9
6042*	W. F. Chick, Bangor.					
	"Alsyke 10"	—	88.2	1.9	8.0	1.9
6043*	W. F. Chick, Bangor.					
	"Globe Alsyke"	—	98.8	0.3	0.7	0.2
6192*	W. F. Chick, Bangor					
	"6 Alsyke"	—	89.1	1.3	8.0	1.6
6296	W. F. Chick, Bangor.					
	"Alsyke 13, 86209"	95.7	96.7	1.4	1.8	0.1
6297	W. F. Chick, Bangor.					
	"Alsyke 40, 6160"	91.2	90.6	1.0	7.7	0.7
6356*	W. F. Chick, Bangor.	—	95.9	1.2	2.8	0.1

*Sample sent by dealer. See statement on page 53

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity.		Impurities.		
		Guaranteed.	Found.	Inert matter.	Harmless—Foreign seed.	Noxious—Foreign seed.
	ALSIKE CLOVER—Continued.					
6178*	C. M. Conant Co., Bangor.					
	"Alsyke Clover (11)"	—	83.6	3.5	10.7	2.2
6179*	C. M. Conant Co., Bangor.					
	"Alsyke (12)"	—	94.0	1.1	3.7	1.2
6180*	C. M. Conant Co., Bangor.					
	"Alsyke clover (13)"	—	98.1	1.2	0.6	0.1
6306	R. B. Dunning & Co., Bangor.					
	"Ace Alsyke"	96.0	98.2	0.3	1.0	0.5
6089	Swan & Sibley, Belfast.					
	"Alsyke 86180"	97.0	96.0	1.2	2.6	0.2
6007*	Whitten Bros., Belfast.					
	"P. A. Alsyke"	—	91.1	2.1	6.8	—
6008*	Whitten Bros., Belfast.					
	"Choice Alsyke"	—	75.4	2.7	21.9	—
6406*	Joseph Breck & Sons, Boston, Mass.					
	"Alsyke Clover A1."	—	86.8	0.8	10.8	1.6
6407*	Joseph Breck & Sons, Boston, Mass.					
	"Alsyke Clover A2"	—	90.7	2.0	6.7	0.6
6408*	Joseph Breck & Sons, Boston, Mass.					
	"Alsyke Clover A3"	—	97.2	0.6	2.0	0.2
6086*	Mrs. E. K. Turner, North Bradford.	—	97.2	0.8	1.8	0.2
	"Choice Alsyke Clover"					
6353*	Caribou Grange Store, Caribou.	—	93.1	1.2	5.0	0.7
6126*	J. G. Gardener, Caribou.	—	89.0	1.5	7.6	1.9

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dea er. Special Marks.	Purity. Guaranteed.	Purity. Found.	Impurities. Inert matter.	Impurities. Harmless—Foreign seed.	Impurities. Noxious—Foreign seed.
	ALSIKE CLOVER—Continued.					
6149*	J. H. Glenn, Caribou.	—	98.5	0.6	0.8	0.1
	"Globe Alsyke"					
6150*	J. H. Glenn, Caribou.					
	"Alsyke Ace"	—	95.9	0.4	3.4	0.3
6167*	Shaw & Mitton, Caribou.					
	"Ace Alsyke"	—	94.2	1.5	4.2	0.1
6313*	W. C. Spaulding, Caribou.					
	"Ace Alsyke"	—	92.7	0.8	6.1	0.4
6077*	L. Decker & Son, Clinton.	—	85.3	1.1	12.6	1.0
6290*	L. Decker & Son, Clinton.	—	97.8	1.6	0.5	0.1
6363	W. M. Keene & Co., Clinton.	96.0	81.1	2.0	14.7	2.2
6334	Ireland Brothers, Corinna.					
	"B Alsyke Prime"	85.9	82.9	2.6	11.7	2.8
6346	W. E. Brewster, Dexter.					
	"Alsyke 86239"	99.0	87.4	1.2	9.6	1.8
6343	F. J. Carsley, Dexter.					
	"Alsyke 86239"	99.0	86.4	2.0	9.9	1.7
6348	G. A. Dustin Co., Dexter.	99.0	95.5	0.1	4.0	0.4
6330	S. L. Small, Dexter.	99.0	87.8	1.1	9.4	1.7
6379*	S. E. Coburn, Dexter.					
	"Pan American Alsyke clover seed."	—	89.1	1.1	8.2	1.6
6396*	D. E. Edwards, Ft. Fairfield.					
	"Globe Alsyke 207"	—	98.5	0.5	0.9	0.1
6208*	H. N. Goodhue, Ft. Fairfield.					
	"Fancy Alsyke"	—	91.9	1.0	6.5	0.6

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity.		Impurities.		
		Guaranteed.	Found.	Inert matter.	Harmless—Foreign seed.	Noxious—Foreign seed.
	ALSIKE CLOVER—Continued					
6374*	H. N. Goodhue, Ft. Fairfield. "Fancy Alsyke"	—	98.8	0.5	0.6	0.1
6391*	H. N. Goodhue, Ft. Fairfield. "Globe Alsyke"	—	97.7	0.1	1.9	0.3
6392*	H. N. Goodhue, Ft. Fairfield. "Ace Alsyke"	—	92.0	0.6	6.6	0.8
6156*	G. W. Parks, Ft. Fairfield. "Globe Alsyke"	—	98.9	0.5	0.5	0.1
6157*	G. W. Parks, Ft. Fairfield. "Ace Alsyke"	—	92.5	1.0	5.9	0.6
6382*	A. W. Gilman & Co., Foxcroft.	—	84.4	0.9	13.8	0.9
6385*	W. S. Ham, Foxcroft.	—	84.0	1.2	13.5	1.3
6327	A. J. McNaughton, Foxcroft. "Alsyke 86261"	96.0	83.0	1.8	14.1	1.1
6230	Gray-Hildreth Co., Gardiner.	98.0	90.3	1.9	6.8	1.0
6320	French & Elliott, Guilford.	99.0	98.0	0.1	1.8	0.1
6316	John Scales, Guilford.	99.0	97.7	0.2	1.9	0.2
6066*	A. H. Fogg Co., Houlton. "Globe Alsyke Clover"	—	98.6	0.5	0.6	0.3
6067*	A. H. Fogg Co., Houlton. "Ace Alsyke Clover"	—	94.6	1.0	3.9	0.5
6115	W. L. McGee, Houlton. "Kineo Brand Alsyke 86264"	98.0	90.7	0.9	8.0	0.4
6103	John Watson Co., Houlton. "Kineo Alsyke 86233"	88.1	88.5	0.6	10.0	0.9

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity. Guaranteed.	Purity. Found.	Impurities. Inert matter.	Impurities. Harmless—Foreign seed.	Impurities. Noxious—Foreign seed.
	ALSIKE CLOVER—Continued.					
6021*	John Watson Co., Houlton.					
	"210 Globe Alsyke"	—	99.0	0.5	0.5	
6022*	John Watson Co., Houlton.					
	"86233 King Alsyke"	—	88.1	1.0	10.9	—
6244	J. B. Ham, Lewiston.					
	"Alsyke 86238"	99.0	85.8	1.1	12.1	1.0
6120*	Geo. B. Haskell Co., Lewiston.					
	"Alsyke 86262, Prime."	—	85.5	1.2	12.5	0.8
6121*	Geo B. Haskell Co., Lewiston.					
	"Lot 01 Purity Alsike"	—	98.7	0.6	0.5	0.2
6210*	Judkins & Gilman, Newport.					
	"Alsyke, Pan American"	—	79.3	0.6	19.7	0.4
6260	C. B. Cummings & Son, Norway.	99.0	94.5	0.1	4.9	0.5
6261	C. B. Cummings & Son, Norway.					
	"Alsyke, Queen Brand 86085"	99.0	86.7	0.3	11.6	1.4
6415*	C. B. Cummings & Son, Norway.	—	94.2			
6263	A. C. McCrellis, Norway.	98.0	86.4	2.2	9.5	1.9
6314*	J. H. Huddilston, Orono.	—	95.9	1.0	2.7	0.4
6372*	Hunter & McMaster Co., Pittsfield.	—	89.8	0.6	8.5	1.1
6271	A. C. Maxim, S. Paris.					
	"Alsyke" 86239	99.0	86.0	2.6	9.5	1.9
6274	A. E. Shurtleff, So. Paris.	99.0	87.8	1.0	9.4	1.8
6254	E. C. Jordan, Poland.	99.0	94.6	0.3	4.8	0.3

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity. Guaranteed.	Purity. Found.	Impurities. Inert matter.	Impurities. Harmless—Foreign seed.	Impurities. Noxious—Foreign seed.
	ALSIKE CLOVER—Continued.					
6059*	Kendall & Whitney, Portland.					
	"Alsike No. 1"	—	95.0	0.2	4.5	0.3
6193	Kendall & Whitney, Portland.	99.0	94.5	0.1	4.9	0.5
6048*	Portland Coop. Corporation, Portland.	—	90.6	1.0	7.4	1.0
6107	E. W. Fernald, Presque Isle.					
	"Ace Alsyke"	99.5	97.2	1.0	1.7	0.1
6143*	G. H. Freeman Co., Presque Isle.					
	"Globe Alsyke"	—	99.0	0.5	0.4	0.1
6144*	G. H. Freeman Co., Presque Isle.					
	"Ace Alsyke"	—	91.0	0.7	7.7	0.6
6137*	A. M. Smith, Presque Isle.					
	"Globe Alsyke"	—	98.4	1.0	0.4	0.2
6138*	A. M. Smith, Presque Isle.					
	"Ace Alsyke"	—	93.8	0.4	5.3	0.5
6223	Saco Grain & Milling Co., Saco	99.0	97.3	0.6	1.7	0.4
6280	D. A. & W. E. Porter, Skowhegan.	99.0	97.5	0.3	2.0	0.2
6367*	Steward Brothers, Skowhegan.					
	"Fancy Alsike"	—	98.8	0.6	0.5	0.1
6276*	Merrill, Runnels & Mayo, Waterville.	—	90.0	2.0	7.1	0.9
	MAMMOTH CLOVER.					
6038*	W. F. Chick, Bangor.					
	"Choice Mammoth Clover"	—	96.7	0.9	0.8	1.6
6191*	W. F. Chick, Bangor.					
	"Globe Mammoth Clover"	—	99.2	0.2	0.6	0.0

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity. Guaranteed.	Purity. Found.	Impurities. Inert matter.	Impurities. Harmless—Foreign seed.	Impurities. Noxious—Foreign seed.
	MAMMOUTH CLOVER—Continued.					
6299	W. F. Chick, Bangor.					
	"Choice Mammoth Clover"	96.7	96.3	2.2	0.2	1.3
6173*	C. M. Conant Co., Bangor.					
	"Peavine clover (6)"	—	98.5	0.6	0.2	0.7
6174*	C. M. Conant Co., Bangor.					
	"Peavine clover (7)"	—	98.7	0.5	0.5	0.3
6084*	Mrs. E. K. Turner, Bradford.					
	"Prime Peavine clover."	—	89.9	0.9	6.9	2.3
6166*	Shaw & Mitton, Caribou.					
	"Globe Mammoth Clover"	—	99.9	0.0	0.0	0.1
6308*	W. S. Spaulding, Caribou.					
	"Armil Mammoth Clover"	—	98.5	0.4	0.9	0.2
6339	Ireland Bros., Corinna.					
	"Purity Mammoth Pea Vine Clover"	99.0	98.5	0.3	0.8	0.4
6350	G. A. Dustin Co., Dexter.					
	"Peavine Clover"	99.5	98.7	0.6	0.2	0.5
6375*	S. E. Coburn, Dover.					
	"Pea Vine Clover"	—	84.5	2.2	2.8	10.5
6394*	D. E Edwards, Ft. Fairfield.					
	"Mammoth Clover 74628"	—	99.9	0.0	0.½	0.½
6328	A. J. McNaughton, Foxcroft.	98.0	94.0	0.8	3.6	1.6
6064*	A. H. Fogg Co., Houlton.					
	"Globe Mammoth Clover"	—	99.6	0.4	0.0	0.0
6065*	A. H. Fogg Co., Houlton.					
	"Ace Mammoth Clover"	—	95.0	2.0	2.5	0.5

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity.		Impurities.		
		Guaranteed.	Found.	Inert matter.	Harmless—Foreign seed.	Noxious—Foreign seed.
	MAMMOUTH CLOVER—Continued.					
6023*	John Watson Co., Houlton.					
	"74473 Ace Mammoth Clover"	—	96.9	1.0	2.1	
6024*	John Watson Co., Houlton.					
	"74445 Globe Mammoth Clover"	—	98.6	0.3	1.1	0.0
6025*	John Watson Co., Houlton.					
	"74460 King Mammoth Clover"	—	96.5	1.0	2.5	0.0
6100	John Watson Co., Houlton.					
	"Ace Mammoth Clover 74473"	96.9	97.9	0.3	1.4	0.4
6101	John Watson Co., Houlton.					
	"Kineo Mammoth Clover 74460"	96.5	94.7	0.9	2.7	1.7
6270	A. C. Maxim, So. Paris.					
	"Pea Vine Clover"	99.0	95.2	2.9	0.1	1.8
	RED CLOVER.					
6068*	Oscar Holway Co., Auburn	—	92.2	1.2	4.9	1.7
6248	Oscar Holway Co., Auburn.	98.0	95.9	1.8	0.1	2.2
6389*	Oscar Holway Co., Auburn.	—	95.6	2.1	0.1	2.2
6226	Merrill Bros., Augusta.					
	"Clover, C 74456"	98.0	95.1	0.6	3.2	1.1
6035*	W. F. Chick, Bangor.					
	"Choice Clover"	—	95.8	2.1	0.6	1.5
6036*	W. F. Chick, Bangor.					
	"Prime Clover"	—	90.7	3.3	2.0	4.0
6037*	W. F. Chick, Bangor.					
	"Clover 15"	—	86.5	5.7	3.0	4.8
6049*	W. F. Chick, Bangor.					
	"16 Clover"	—	87.3	2.4	7.5	2.8
6188*	W. F. Chick, Bangor.					
	"A Clover"	—	85.9	3.9	8.2	2.0

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity. Guaranteed.	Purity. Found.	Impurities. Inert matter.	Impurities. Harmless—Foreign seed.	Impurities. Noxious—Foreign seed.
	RED CLOVER—Continued.					
6189*	W. F. Chick, Bangor.					
	"21 Clover"	—	91.7	3.0	2.7	2.6
6190*	W. F. Chick, Bangor.					
	"C. Clover"	—	95.1	2.7	0.4	1.8
6300	W. F. Chick, Bangor.					
	"Choice Clover"	95.8	96.5	1.3	0.6	1.6
6175*	C. M. Conant Co., Bangor.	—	93.8	1.9	2.6	1.7
6176*	C. M. Conant Co., Bangor.	—	98.0	1.2	0.4	0.4
6177*	C. M. Conant Co., Bangor.	—	99.7	0.1	0.2	0.0
6305	R. B. Dunning & Co., Bangor.					
	"Choice Red Clover'	98.0	95.5	.2	3.9	0.4
6090	Swan & Sibley, Belfast.					
	"Red Clover 60882"	97.0	97.3	0.2	1.9	0.6
6009*	Whitten Bros., Belfast.					
	"Choice Clover"	—	92.8	2.7	4.5	
6010*	Whitten Bros., Belfast.					
	"P. A. Clover"	—	98.6	0.6	0.8	
6403*	Joseph Breck & Sons, Boston.					
	"Red Clover C. 1"	—	93.4	0.9	3.8	1.9
6404*	Joseph Breck & Sons, Boston.					
	"Red Clover C. 2'	—	93.8	0.7	4.4	1.1
6405*	Joseph Breck & Sons, Boston.					
	"Red Clover C. 3"	—	97.0	0.5	1.4	1.1
6083*	Mrs. E. K. Turner, North Bradford.					
	"Choice N. Y. Clover"	—	97.0	0.3	1.5	1.2

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity. Guaranteed.	Purity. Found.	Impurities. Inert matter.	Impurities. Harmless—Foreign seed.	Impurities. Noxious—Foreign seed.
	RED CLOVER—Continued.					
6354*	Caribou Grange Store, Caribou.	—	98.2	1.0	0.1	0.7
6127*	J. G. Garden, Caribou.	—	92.6	1.5	3.6	2.3
6147*	J. H. Glenn, Caribou. "Globe Red Clover"	—	99.9	0.1	0.0	0.0
6148*	J. H. Glenn, Caribou. "Artifice Red Clover"	—	95.9	1.5	0.8	1.8
6163*	Shaw & Mitton, Caribou. "Globe Red Clover"	—	99.6	0.2	0.1	0.1
6164*	Shaw & Mitton, Caribou. "Ace Red Clover"	—	96.4	0.7	2.2	0.7
6165*	Shaw & Mitton, Caribou. "Artifice Red Clover"	—	96.5	1.1	0.9	1.5
6307*	W. C. Spaulding, Caribou. "Artifice Clover"	—	94.7	0.5	4.0	0.8
6310*	W. C. Spaulding, Caribou. "Blossom Clover"	—	95.5	0.2	3.8	0.5
6312*	W. C. Spaulding, Caribou. "Globe Clover"	—	99.6	0.1	0.1	0.2
6078*	L. Decker & Son, Clinton.	—	90.0	1.8	6.2	2.0
6362	W. M. Keene, Clinton.	98.0	91.8	0.8	6.1	1.3
6333	Ireland Bros., Corinna. "B. Prime Clover"	90.9	94.9	1.0	2.5	1.6
6331	S. L. Small, Dexter. "Clover C. 74457"	99.0	91.1	1.8	5.0	2.1

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity. Guaranteed.	Purity. Found.	Impurities. Inert matter.	Impurities. Harmless—Foreign seed.	Impurities. Noxious—Foreign seed.
	RED CLOVER—Continued.					
6342	F. J. Crasley, Dexter.					
	"Clover C 74457"	99.0	91.9	1.4	4.4	2.3
6344	W. E. Brewster, Dexter.					
	"Clover C 74457"	99.0	91.8	1.1	4.9	2.2
6376*	S. E. Coburn, Dover.					
	"Pan American Red Clover"	—	84.7	1.9	2.4	11.0
6081*	Sawyer & Gifford Co., Dover.					
	"B. Clover"	—	98.4	0.5	0.8	0.3
6082*	Sawyer & Gifford Co., Dover.					
	"D. Clover"	—	94.5	1.0	3.0	1.5
6207*	H. N. Goodhue. Ft. Fairfield.					
	"Fancy Clover"	—	99.5	0.2	0.1	0.2
6279*	H. N. Goodhue, Ft. Fairfield.					
	"Fancy Clover"	—	99.7	0.1	0.1	0.1
6158*	G. W. Parks, Ft. Fairfield.					
	"Globe Clover"	—	99.8	0.1	0.0	0.1
6159*	G. W. Parks, Ft. Fairfield.					
	"Ace Clover"	—	96.2	0.7	1.7	1.4
6381*	A. W. Gilman Co., Augusta.	—	89.4	2.7	6.1	1.8
6386*	W. S. Ham, Foxcroft.	—	91.8	1.6	3.6	3.0
6323	A. J. McNaughton, Foxcroft.					
	"Purity Clover"	99.0	99.8	0.1	0.0	0.1
6228	Gray-Hildreth Co., Gardiner.					
	"Red Clover C 74456"	98.0	95.5	0.4	2.6	1.5

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity. Guaranteed.	Purity. Found.	Impurities. Inert matter.	Impurities. Harmless—Foreign seed.	Impurities. Noxious—Foreign seed.
	RED CLOVER—Continued.					
6349	G. A. Dustin Co., Guilford.					
	"N. Y. Clover"	99.0	96.4	0.2	0.1	3.3
6319	John Scales, Guilford.					
	"N. Y. Clover"	99.0	95.9	2.2	0.5	1.4
6018*	John Watson Co., Houlton.					
	"C 123 King Clover"	—	95.1	0.7	4.2	
6019*	John Watson Co., Houlton.					
	"C 117 Ace Clover"	—	97.0	0.7	2.3	
6020*	John Watson Co., Houlton.					
	"74469 Globe Clover"	—	99.7	0.1	0.2	
6097	John Watson Co., Houlton.					
	"Ace Red Clover C 117"	97.0	96.9	0.8	1.0	1.3
6098	John Watson Co., Houlton					
	"Kineo Red Clover C 123"	95.1	96.5	0.8	2.0	0.7
6246	J. B. Ham, Lewiston.					
	"Clover C 74456"	99.0	93.5	1.0	3.6	1.9
6122*	Geo. B. Haskell Co., Lewiston.					
	"Lot No. 74537 Prime Clover"	—	90.9	1.6	5.6	1.9
6123*	Geo. B. Haskell Co., Lewiston.					
	"Lot No. 74106, Purity Clover"	—	99.7	0.2	0.0	0.1
6238	Geo. B. Haskell Co., Lewiston, Me.					
	"Purity Clover"	99.5	99.9	0.0	0.0	0.1
6239	Geo. B. Haskell Co., Lewiston.					
	"Choice Clover 60171"	99.0	95.5	0.5	3.1	0.9

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity. Guaranteed.	Purity. Found.	Impurities. Inert matter.	Impurities. Harmless—Foreign seed.	Impurities. Noxious—Foreign seed.
	RED CLOVER—Continued.					
6213*	Judkins & Gilman, Newport.					
	"Choice Clover"	—	92.0	1.9	3.6	2.5
6265	A. C. McCrellis, Norway.					
	"Clover C 74457"	98.0	92.1	1.5	3.9	2.5
6315*	J. H. Huddilston, Orono.	—	97.4	1.2	0.1	1.3
6273	A. E. Shurtleff, So. Paris.	99.0	91.9	1.2	4.4	2.5
6371*	Hunter & McMaster, Pittsfield.	—	83.6	1.9	2.7	11.8
6255	E. O. Jordan, Poland.					
	"N. Y. Clover C. 74122"	99.0	97.4	0.2	1.8	0.6
6060*	Kendall & Whitney, Portland.					
	"Red Clover No. 1"	—	99.5	0.2	0.1	0.2
6197	Kendall & Whitney, Portland.	99.0	99.7	0.2	—	0.1
6152*	Portland Coop. Corporation.	—	97.1	2.3	0.2	0.4
6001*	Shaw, Hammond & Carney, Fortland.					
	"Blossom Clover No. 10"	—	96.4	0.8	2.8	
6013*	Shaw, Hammond & Carney, Portland.					
	"No. 16 Pick Clover"	—	97.7	0.8	1.5	
6014*	Shaw, Hammond & Carney, Portland.					
	"Sample No. 21, Soap Clover"	—	90.3	6.7	3.0	
6027*	Shaw, Hammond & Carney, Portland.					
	"Sample No. 23, No. 36 Red Clover"	—	99.0	0.5	0.5	
6028*	Shaw, Hammond & Carney, Portland.					
	"Sample No. 22, No. 25 Clover"	—	96.7	1.1	2.2	0.0
6106	E. W. Fernald, Presque Isle.					
	"Ace Clover"		97.4	0.2	1.6	0.8

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity.		Impurities.		
		Guaranteed.	Found.	Inert matter.	Harmless—Foreign seed.	Noxious—Foreign seed.
	RED CLOVER—Continued.					
6109	E. W. Fernald, Presque Isle.					
	"Kineo Red Clover"	95.3	95.3	0.6	2.5	1.6
6141*	G. H. Freeman Co., Presque Isle.					
	"Globe Clover"	—	99.2	0.4	0.1	0.3
6142*	G H. Freeman Co., Presque Isle.					
	"Ace Clover"	—	93.0	0.6	5.4	1.0
6135*	A. M. Smith, Presque Isle.					
	"Globe Clover"	—	99.6	0.1	0.1	0.2
6136*	A. M. Smith, Presque Isle.					
	"Ace Clover"	—	96.3	0.4	1.7	1.6
6221	Saco Grain & Milling Co., Saco.					
	"N. Y. Red Clover"	99.0	95.6	2.9	0.4	1.1
6281	D. A. & W. E. Porter, Skowhegan.					
	"N. Y. Clover"	99.0	95.6	2.5	0.4	1.5
6288	Steward Bros., Skowhegan.					
	"Eureka Clover, W.C.S.Co., Buffalo."	98.0	97.6	0.1	0.4	1.9
6368*	Steward Bros., Skowhegan.					
	"Eureka Clover"	—	98.2	0.7	0.1	1.0
6277*	Merrill, Runnels & Mayo, Waterville.					
	"N. Y. Clover"	—	94.0	1.1	1.9	3.0
	WHITE CLOVER.					
6184*	C. M. Conant Co., Bangor.	—	96.0	0.6	3.0	0.4
6072*	Mt. Desert Nurseries, Bar Harbor.	—	98.6	0.1	1.2	0.1
6241	Geo. B. Haskell Co., Lewiston.	99.0	99.2	0.5	0.2	0.1

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity. Guaranteed.	Purity. Found.	Impurities. Inert matter.	Impurities. Harmless—Foreign seed.	Impurities. Noxious—Foreign seed.
	WHITE CLOVER—Continued.					
6132*	Kendall & Whitney, Portland.					
	"White Dutch Clover"	—	92.1	1.3	5.8	0.8
6222	Saco Grain & Milling Co., Saco.	99.0	96.7	0.2	2.9	0.2
	HUNGARIAN.					
6251	Oscar Holway Co., Auburn.					
	"Hungarian H 80637"	98.0	99.4	0.1	0.0	0.5
6225	Merrill Bros., Augusta.					
	"Hungarian H 80499"	98.0	97.6	0.3	0.1	2.0
6186*	C. M. Conant Co., Bangor.	—	97.9	0.4	0.0	1.7
6091	Swan & Sibley, Belfast.					
	"Hungarian H 80625"	98.0	99.7	0.2	0.0	0.1
6336	Ireland Bros., Corinna.					
	"B. Prime Hungarian"	99.0	99.5	0.2	0.0	0.3
6351	G. A. Dustin Co., Dexter.	99.0	99.6	0.3	0.0	0.1
6231	Gray-Hildreth Co., Gardiner.					
	"Hungarian H 80499"	98.0	97.9	0.6	0.0	1.5
6119*	Geo. B. Haskell Co., Lewiston.					
	"Lot H 80665, Purity Hungarian"	—	99.8	0.1	0.0	0.1
6212*	Judkins & Gilman, Newport	—	96.6	0.7	0.0	2.7
6267	A. C. McCrellis, Norway.					
	"Hungarian H 80499"	98.0	97.5	0.7	0.1	1.7
6256	E. C. Jordan, Poland.					
	"Hungarian H 80602"	99.0	99.6	0.2	0.0	0.2
6061*	Kendall & Whitney, Portland.					
	"Hungarian No. 1."	—	99.4	0.2	0.0	0.4

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity.		Impurities.		
		Guaranteed.	Found.	Inert matter.	Harmless—Foreign seed.	Noxious—Foreign seed.
	HUNGARIAN—Continued.					
6200	Kendall & Whitney, Portland.	98.0	99.5	0.2	0.0	0.3
6220	Saco Grain & Milling Co., Saco.					
	"Hungarian H 80627"	99.0	98.8	0.6	0.1	0.5
	MILLETT.					
6240	Geo. B. Haskell Co., Lewiston.					
	"Japanese Millett"	99.0	97.8	0.2	0.0	2.0
6130*	Kendall & Whitney, Portland.					
	"Japanese Barnyard Millett"	—	97.7	0.3	0.0	2.0
	KENTUCKY BLUE GRASS AND CANADIAN BLUE GRASS.					
6052*	W. F. Chick, Bangor.	—	95.2	3.3	1.3	0.2
6074*	Mt. Desert Nurseries, Bar Harbor.	—	95.0	4.7	0.1	0.2
	ORCHARD GRASS AND ENGLISH RYE GRASS.					
6053*	W. F. Chick, Bangor.	—	92.3	6.0	1.0	0.7
	REDTOP.					
6071*	Oscar Holway Co., Auburn.	—	78.7	5.9	12.6	2.8
6045*	W. F. Chick, Bangor.					
	"Baron Fancy Redtop"	—	81.5	5.1	10.9	2.5
6046*	W. F. Chick, Bangor.					
	"Sun Fancy Redtop"	—	97.6	2.1	0.1	0.2
6047*	W. F. Chick, Bangor.					
	"Vale Fancy Redtop"	—	79.3	7.4	9.6	3.7
6076*	Mt. Desert Nurseries, Bar Harbor.	—	96.8	0.6	1.7	0.9

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity. Guaranteed.	Purity. Found.	Impurities. Inert matter.	Impurities. Harmless—Foreign seed.	Impurities. Noxious—Foreign seed.
	REDTOP—Continued.					
6088	Swan & Sibley, Belfast.					
	"Redtop R. T. 92293"	86.0	86.8	0.8	11.5	0.9
6011*	Whitten Bros,. Belfast.					
	"Choice Redtop"	—	88.7	7.0	4.3	
6012*	Whitten Bros., Belfast.					
	"Redtop W 81"	—	67.1	15.9	17.0	
6217	Andrews & Horrigan, Biddeford.					
	"Fancy Redtop, R. T. 92698"	99.0	88.5	2.2	7.5	1.8
6409*	Joseph Breck & Sons, Boston, Mass.					
	"Clean Redtop R. 1"	—	67.8	13.2	14.0	5.0
6410*	Joseph Breck & Sons, Boston, Mass.					
	"Clean Redtop R. 2"	—	73.8	2.7	22.5	1.0
6087*	Mrs. E. K. Turner, Bradford.					
	"Prime Fancy Redtop"	—	78.8	7.3	10.2	3.7
6080*	L. Decker & Son, Clinton.	—	73.5	10.6	11.5	4.4
6337	Ireland Bros., Corinna.					
	"B. Prime Redtop"	99.0	72.8	11.5	11.2	4.5
6329	S. L. Small, Dexter.	99.0	87.3	6.2	4.0	2.5
6324	A. J. McNaughton, Foxcroft.					
	"Purity Redtop"	99.0	82.8	2.2	14.3	0.7
6229	Gray-Hildreth Co., Gardiner.					
	"Redtop R. T. 92346"	98.0	80.3	8.2	7.3	4.2
6318	John Scales, Guilford.					
	"Redtop, R. T. 92293"	99.0	87.8	0.8	10.5	0.9

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity.		Impurities.		
		Guaranteed.	Found.	Inert matter.	Harmless—Foreign seed.	Noxious—Foreign seed.
6026*	John Watson Co., Houlton.					
	"R. T. 92303 redtop"	—	76.6	4.3	19.3	
6104	John Watson Co., Houlton.					
	"Ace Redtop. R. T. 92303"	76.6	84.0	3.0	12.8	0.2
6236	Geo. B. Haskell Co., Lewiston.					
	"Purity Redtop"	99.0	99.0	0.4	0.2	0.4
6258	E. C. Jordan, Poland.					
	"Redtop, R. T. 92298"	99.0	86.8	0.7	11.5	1.0
6054*	Kendall & Whitney, Portland.					
	"Fancy Redtop No 1"	—	86.8	0.8	11.6	0.8
6198	Kendall & Whitney, Portland.					
	"Redtop, R. T. 92298"	90.0	82.8	1.5	15.2	0.5
6397*	Kendall & Whitney, Portland.					
	"Fancy Redtop"	—	98.4	1.5	0.0	0.1
	TIMOTHY.					
6070*	Oscar Holway Co., Auburn.	—	97.9	0.5	1.2	0.4
6249	Oscar Holway Co., Auburn.					
	"Timothy T 62881"	98.0	97.3	1.1	1.2	0.4
6388*	Oscar Holway Co., Auburn.					
	"G. Timothy"	—	98.9	0.2	0.8	0.1
6252*	A. M. Brown, Augusta.	—	97.9	0.8	0.9	0.4
6030*	W. F. Chick, Bangor.					
	"Bison or G. B. Timothy"	—	98.1	0.9	1.0	
6031*	W. F. Chick, Bangor.					
	"B. Globe Timothy"	—	99.6	0.2	0.1	0.1

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity.		Impurities.		
		Guaranteed.	Found.	Inert matter.	Harmless—Foreign seed.	Noxious—Foreign seed.
	TIMOTHY–Continued.					
6032*	W. F. Chick, Bangor.					
	"Choice Timothy"	—	95.6	1.9	2.0	0.5
6033*	W. F. Chick, Bangor.					
	"Grains of Gold Timothy"	—	99.7	0.2	0.½	0.½
6034*	W. F. Chick, Bangor.					
	"P. Timothy"	—	95.6	2.1	1.7	0.6
6294	W. F. Chick, Bangor.					
	"Choice Timothy"	95.6	96.3	0.9	2.2	0.6
6301	W. F. Chick, Bangor.					
	"Bison Brand Timothy"	98.0	98.2	0.7	0.7	0.4
6357*	W. F. Chick, Bangor.	—	97.3	0.4	1.8	0.5
6168*	C. M. Conant Co., Bangor.	—	90.2	4.0	3.6	2.2
6169*	C. M. Conant Co., Bangor.	—	97.1	0.7	0.4	1.8
6170*	C. M. Conant Co., Bangor.	—	98.8	0.4	0.5	0.3
6171*	C. M. Conant Co., Bangor.	—	99.4	0.4	0.1	0.1
6172*	C. M. Conant Co., Bangor.	—	99.5	0.1	0.3	0.1
6303	R. B. Dunning & Co., Bangor.					
	"Prime Timothy, Bell Brand."	99.0	98.9	0.4	0.6	0.1
6073*	Mt. Desert Nurseries, Bar Harbor.	—	99.6	0.2	0.1	0.1
6092	Swan & Sibley, Belfast.					
	"Timothy B,62052,Pine Tree Brand"	99.0	99.7	0.1	0.1	0.1
6005*	Whitten Bros., Belfast.					
	"Choice Timothy"		99.1	0.2	0.7	

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity.		Impurities.		
		Guaranteed.	Found.	Inert matter.	Harmless—Foreign seed.	Noxious—Foreign seed.
	TIMOTHY–Continued.					
6006*	Whitten Bros,. Belfast.					
	"Gold Medal Timothy"	—	99.6	0.3	0.1	
6218	Andrews & Horrigan, Biddeford.					
	"Choice Timothy T. 60032"	99.0	98.5	0.5	0.7	0.3
6216	Andrews & Horrigan, Biddeford.					
	"Timothy T 61798"	98.0	98.3	0.7	0.6	0.4
6398*	Joseph Breck & Sons, Boston, Mass.					
	"Timothy T 1"	—	92.7	1.8	3.9	1.6
6399*	Joseph Breck & Sons, Boston, Mass.					
	"Timothy T 2"	—	97.2	1.2	1.2	0.4
6400*	Joseph Breck & Sons, Boston, Mass.					
	"Timothy T 3"	—	97.1	0.7	2.1	0.1
6401*	Joseph Breck & Sons, Boston, Mass.	—	99.2	0.2	0.5	0.1
6402*	Joseph Breck & Sons, Boston, Mass.					
	"Timothy T 5"	—	99.7	0.1	0.1	0.1
6355*	Caribou Grange Store, Caribou.					
	"Gold Medal Timothy"	—	99.4	0.4	0.1	0.1
6128*	J. G. Garden, Caribou.	—	95.6	1.4	1.4	1.6
6145*	J. H. Glenn, Caribou.					
	"Globe Timothy"	—	99.8	0.1	0.½	0.½
6146*	J. H. Glenn, Caribou.					
	"Pine Tree Timothy"	—	99.3	0.3	0.2	0.2
6160*	Shaw & Mitton, Caribou.					
	"Globe Timothy"	—	99.7	0.1	0.1	0.1

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity.		Impurities.		
		Guaranteed.	Found.	Inert matter.	Harmless—Foreign seed.	Noxious—Foreign seed.
	TIMOTHY–Continued.					
6161*	Shaw & Mitton, Caribou.					
	"Pine Tree Timothy"	—	99.5	0.3	0.1	0.1
6162*	Shaw & Mitton, Caribou.					
	"Geyser Timothy"	—	99.3	0.4	0.2	0.1
6309*	W. C. Spaulding, Caribou.					
	"Globe Timothy"	—	99.9	0.1	0.0	0.0
6311*	W. C. Spaulding, Caribou.					
	"Pine Tree Timothy"	—	99.6	0.2	0.1	0.1
6079*	L. Decker & Son, Clinton.					
	"Pine Tree Timothy"	—	99.3	0.3	0.3	0.1
6358	W. M. Keene & Co., Clinton.					
	"Timothy 62817"	99.0	98.2	0.7	0.7	0.4
6359	W. M. Keene & Co., Clinton.					
	"Timothy T 286"	99.0	97.4	0.6	1.3	0.7
6338	Ireland Bros., Corinna.	99.0	97.0	0.8	1.6	0.6
6345	W. E Brewster, Dexter.					
	"Timothy T 61833"	99.0	97.8	0.9	0.7	0.6
6341	F. J. Carsley, Dexter.					
	"Timothy T 62791"	99.0	97.7	1.2	0.7	0.4
6347	G. A. Dustin, Dexter.					
	"Timothy T 61823"	99.0	98.4	0.5	0.7	0.4
6332	S. L. Small, Dexter.					
	"Timothy T 61833"	99.0	97.7	0.8	0.7	0.8
6377*	S. E. Coburn, Dover.					
	"Gold Medal Timothy"	—	98.8	0.8	0.4	0.0

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity.		Impurities.		
		Guaranteed.	Found.	Inert matter.	Harmless—Foreign seed.	Noxious—Foreign seed.
	TIMOTHY–Continued.					
6378*	S. E. Coburn. Dover.					
	"Choice Timothy"	—	97.9	0.9	0.8	0.4
6393*	D. E. Edwards, Ft. Fairfield					
	"Pine Tree Timothy E"	—	99.1	0.2	0.5	0.1
6395*	D. E. Edwards, Ft. Fairfield.					
	"Globe Timothy"	—	99.8	0.1	0.1	0.0
6209*	H. N. Goodhue, Ft. Fairfield.					
	"Fancy Timothy"	—	99.8	0.1	0.1	0.0
6373*	H. N. Goodhue, Ft. Fairfield.					
	"Fancy Timothy"	—	99.8	0.1	0.1	0.0
6278*	H. N. Goodhue, Ft. Fairfield.					
	"Fancy Timothy"	—	99.6	0.1	0.2	0.1
6153*	G. W. Parks, Ft. Fairfield.					
	"Bison Timothy"	—	98.4	0.5	0.8	0.3
6154*	G. W. Parks, Ft. Fairfield.					
	"Pine Tree Timothy"	—	99.7	0.1	0.1	0.1
6155*	G. W. Parks, Ft. Fairfield					
	"Globe Timothy"	—	99.8	0.1	0.1	0.0
6380*	A. W. Gilman & Co., Foxcroft.	—	98.0	0.6	1.0	0.4
6384*	W. S. Ham, Foxcroft.	—	98.1	0.5	1.0	0.4
6322	A. J. McNaughton, Foxcroft.					
	"Purity Timothy"	99.5	99.8	0.1	0.1	0.0
6326	A. J. McNaughton, Foxcroft.					
	"Timothy, T 61791"	99.0	97.8	0.7	1.1	0.4

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity.		Impurities.		
		Guaranteed.	Found.	Inert matter.	Harmless—Foreign seed.	Noxious—Foreign seed.
	TIMOTHY–Continued.					
6227	Gray-Hildreth Co., Gardiner.					
	"Timothy T 62882"	98.0	97.7	0.9	1.1	0.3
6232	W. M. Wood, Gardiner.					
	"Timothy T 61894"	99.0	97.4	0.8	1.2	0.6
6233	W. M. Wood, Gardiner.	98.0	97.9	0.4	1.5	0.2
6321	French & Elliott, Guilford.	99.0	96.9	1.6	0.9	0.6
6317	John Scales, Guilford.					
	"Timothy T. 62791"	99.0	98.4	0.5	0.7	0.4
6062*	A. H. Fogg Co., Houlton.					
	"Globe H. Grass"	—	99.9	0.1	0.0	
6063*	A. H. Fogg Co., Houlton.					
	"Pine Tree H. Grass"	—	99.1	0.4	0.4	0.1
6015*	John Watson Co., Houlton.					
	"Globe Timothy T 62547"	—	99.5	0.2	0.3	
6016*	John Watson Co., Houlton.					
	"62531, B. H. Globe Timothy"	—	99.5	0.4	0.1	0.0
6017*	John Watson Co., Houlton.					
	"Pine Tree Timothy 62236"	—	99.2	0.6	0.2	0.0
6245	J. B. Ham, Lewiston.					
	"Timothy T 62367"	99.0	98.0	0.6	1.0	0.4
6116*	Geo. B. Haskell Co., Lewiston.					
	"Lot T 62790, B. Pr. Timothy"	—	97.7	1.3	0.6	0.4
6117*	Geo. B. Haskell Co., Lewiston.					
	"Purity Timothy Lot 1907"	—	99.7	0.1	0.1	0.1

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity.		Impurities.		
		Guaranteed.	Found.	Inert matter.	Harmless—Foreign seed.	Noxious—Foreign seed.
	TIMOTHY–Continued.					
6118*	Geo. B. Haskell Co., Lewiston.					
	" Lot Pine Tree 61901 Fancy Timothy"		99.6	0.1	0.2	0.1
6237	Geo. B. Haskell Co., Lewiston.					
	"Purity Timothy, 62810"	99.5	99.6	0.2	0.1	0.1
6235	Geo. B. Haskell Co., Lewiston.					
	"Prime Timothy, T 62778"	98.0	97.3	0.9	1.2	0.6
6387*	Geo. B. Haskell Co., Lewiston.					
	"Equal Globe"	—	98.8	0.2	0.9	0.1
6221*	Judkins & Gilman, Newport.					
	"Pan American Timothy"	—	98.1	0.3	1.4	0.2
2614*	Judkins & Gilman, Newport.					
	"Strictly Prime Timothy"	—	95.6	1.5	1.8	1.1
6259	C. B. Cummings & Son, Norway.					
	"Timothy, T. 61581"	99.0	97.6	0.7	1.2	0.5
6262	C. B. Cummings & Son, Norway.					
	"Prime Timothy, T 61331"	99.0	96.5	0.7	2.2	0.6
6268*	C. B. Cummings & Son, Norway.					
	"Timothy, T 62423"	99.0	97.7	0.5	1.2	0.6
6370*	Hunter & McMaster Co., Pittsfield.	—	98.2	0.4	1.3	0.1
6257	E. C. Jordan, Poland					
	"Timothy, T 61581"	99.0	97.8	0.2	1.6	0.4
6055*	Kendall & Whitney, Portland.					
	"Timothy No. 1"	—	99.9	0.1	0.0	0.0
6056*	Kendall & Whitney, Portland.					
	"Timothy No. 2"	—	99.7	0.1	0.1	0.1

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity. Guaranteed.	Purity. Found.	Impurities. Inert matter.	Impurities. Harmless—Foreign seed.	Impurities. Noxious—Foreign seed.
	TIOTHY–Continued.					
6057*	Kendall & Whitney, Portland. "Timothy No. 3''	—	97.8	0.6	1.2	0.4
6196	Kendall & Whitney, Portland. ''Prime Timothy''	99.0	97.8	0.6	1.2	0.4
6411*	Kendall & Whitney, Portland. "Timothy T 64252''	—	98.4	—	—	—
6412*	Kendall & Whitney, Portland. ''Timothy, T"	—	98.6	—	—	—
6413	Kendall & Whitney, Portland. ''Timothy T 63592"	—	98.2	—	—	—
6414*	Kendall & Whitney, Portland. ''Timothy G."	—	99.8	—	—	—
6029*	Patrons Coop. Corporation, Portland.	—	99.1	0.5	0.4	0.0
6151*	Patrons Coop. Corporation, Portland.	—	99.7	0.1	0.1	0.1
6002*	Shaw, Hammond & Carney, Portland. ''Ginger Timothy No. 11''	—	98.5	0.5	1.0	0.0
6003*	Shaw, Hammond & Carney, Portland. ''Genius Timothy No. 12"	—	97.7	0.5	1.8	.00
6004*	Shaw, Hammond & Carney, Portland. "G. L. Timothy, No. 12"	—	99.5	0.4	0.1	0.0
6110	E. W. Fernald, Presque Isle. ''Pine Tree Timothy''	99.6	99.6	0.2	0.1	0.1
6111	E. W. Fernald, Presque Isle. "Globe Timothy''	99.8	99.8	0.2	0.0	0.0
6139*	G. H. Freeman Co., Presque Isle. ''Globe Timothy''	—	99.8	0.1	0.1	0.0
6140*	G. H. Freeman Co., Presque Isle. ''Pine Tree Timothy''	—	99.7	0.1	0.1	0.1

*Sample sent by dealer. See statement on page 53.

ANALYSIS OF SEEDS, 1907—Continued.

Table showing the kind of seed, name and location of dealer, and the results of the analyses.

Station number.	Kind of seed, name and town of dealer. Special Marks.	Purity.		Impurities.		
		Guaranteed.	Found.	Inert matter.	Harmless—Foreign seed.	Noxious—Foreign seed.
	TINOTHY–Continued.					
6133*	A. M. Smith, Presque Isle.					
	"Globe Timothy"	—	99.9	0.1	0.0	0.0
6134*	A. M. Smith, Presque Isle.					
	"Pine Tree Timothy"	—	99.6	0.2	0.1	0.1
6219	Saco Grain & Milling Co., Saco.					
	"Timothy T 61893"	99.0	97.2	1.3	0.9	0.6
6282	D. A. & W. E. Porter, Skowhegan.					
	"Prime Timothy"	99.0	97.9	0.8	0.8	0.5
6365*	Steward Bros., Skowhegan.					
	"P. T. Timothy"	—	99.5	0.3	0.1	0.1
6366*	Steward Bros., Skowhegan.					
	"G. Timothy"	—	99.8	0.1	0.1	0.0
6234	G. A. Kennerson, Waterville.					
	"Prime Timothy T 61331"	99.0	96.8	0.8	1.8	0.6
6275*	Merrill, Runnels & Mayo, Waterville.	—	97.9	0.5	1.0	0.6
	WOOD MEADOW.					
6075*	Mt. Desert Nurseries, Bar Harbor.	—	94.9	3.6	0.2	1.3
	SPRING WHEAT.					
6205	Kendall & Whitney, Portland.	99.0	99.6	0.1	0.2	0.1
	OATS.					
6187*	C. M. Conant Co., Bangor.					
	"White oats"	—	100.0	0.0	0.0	0.0
6243	Geo. B. Haskell Co., Lewiston.					
	"Silver Mine Oats"	99.5	100.0	0.0	0.0	0.0
6242	Geo. B. Haskell Co., Lewiston.					
	"Natural White Oats"	99.5	99.5	0.2	0.2	0.1
	TWO ROWED BARLEY.					
6058*	Kendall & Whitney, Portland.	—	99.9	0.0	0.1	0 0

*Sample sent by dealer. See statement on page 53.

BULLETIN No. 153

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 February 10, 1908. 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 correspondence 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 tables of analyses marked "insoluble in water" is organic nitrogen.

---

*Farmers Bulletin 44 of the U. S. Dept. of Agriculture, "Commercial Fertilizers, 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.

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 substances 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 amount 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 ordinary 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 materials 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, superphosphates, and similar articles, for which $20 to $75 per ton are paid, depend for their trade value exclusively on the sub-

stances, 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 manufacturer, 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 1908 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, 1908, 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 1908.

	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
citrate-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

RULES 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, 1908.

Station number.	Manufacturer, place of business and brand.
	AMERICAN AGRICULTURAL CHEMICAL CO., NEW YORK, N. Y.
1501	A. A. C. Co's Aroostook Complete Manure
1502	A. A. C. Co's Aroostook High Grade
1503	A. A. C. Co's Northern Maine Potato Special
1529	A. A. C. Complete Manure with 10% Potash
1530	A. A. C. Grass and Lawn Top Dressing
1531	A. A. C. High Grade Fertilizer with 10% Potash
1532	Bradley's Alkaline Bone with Potash
1533	Bradley's Complete Manure for Potatoes and Vegetables
1534	Bradley's Complete Manure with 10% Potash
1535	Bradley's Corn Phosphate
1536	Bradley's Eureka Fertilizer
1537	Bradley's Niagara Phosphate
1538	Bradley's Potato Fertilizer
1539	Bradley's Potato Manure
1540	Bradley's XL Superphosphate of Lime
1541	Clark's Cove Bay State Fertilizer
1542	Clark's Cove Bay State Fertilizer G. G.
1543	Clark's Cove Bay State Fertilizer for Seeding Down
1544	Clark's Cove Defiance Complete Manure
1545	Clark's Cove Great Planet Manure A. A.
1546	Clark's Cove King Phillip Alkaline Guano
1547	Clark's Cove Potato Fertilizer
1548	Clark's Cove Potato Manure
1549	Cleveland Fertilizer for all Crops
1550	Cleveland High Grade Complete Manure
1551	Cleveland Potato Phosphate
1552	Cleveland Seeding Down Fertilizer
1553	Cleveland Superphosphate
1504	Crocker's Ammoniated Corn Phosphate
1505	Crocker's Aroostook Potato Special
1506	Crocker's Grass and Oats Fertilizer
1507	Crocker's High Grade
1508	Crocker's New Rival Ammoniated Superphosphate
1509	Crocker's Potato Hop and Tobacco
1510	Crocker's Special Potato Manure
1554	Cumberland Potato Fertilizer
1555	Cumberland Seeding Down Manure
1556	Cumberland Superphosphate
1557	Darling's Blood, Bone and Potash
1558	Fine Ground Bone
1511	Great Eastern General
1512	Great Eastern Grass & Oats Fertilizer
1513	Great Eastern High Grade Potato Manure
1514	Great Eastern Northern Corn Special
1515	Great Eastern Potato Manure

Analysis of Manufacturers' Samples, 1908.

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.		
%	%	%	%	%	%	%	%	%	%	%	%	%	%
1501	0.01	1.40	2.41	2.47	3.08	3.20	2.00	6.28	6.00	8.28	.....	10.04	10.00
1502	2.88	1.62	4.50	4.12	4.31	2.21	2.83	6.52	7.00	9.35	.....	7.60	10.00
1503	2.42	1.98	4.40	3.70	5.31	2.09	1.53	7.40	7.00	8.93	.....	9.85	10.00
1529	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
1530	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
1531	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
1532	.....	.....	.....	.....	5.34	4.18	3.64	9.52	11.00	13.16	12.00	2.49	2.00
1533	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
1534	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
1535	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
1536	0.11	1.06	1.17	1.03	5.93	2.35	1.55	8.28	8.00	11.16	10.00	2.01	1.50
1537	0.40	0.64	1.04	0.82	5.41	3.15	1.38	8.56	7.00	9.94	8.00	1.49	1.00
1538	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
1539	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
1540	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
1541	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
1542	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
1543	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
1544	0.40	0.68	1.08	0.82	5.24	2.74	1.48	7.98	7.00	9.46	8.00	1.59	1.00
1545	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
1546	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
1547	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
1548	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
1549	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
1550	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
1551	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
1552	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
1553	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
1504	0.26	2.06	2.32	2.06	4.52	3.65	3.87	8.17	8.00	12.04	.....	2.26	1.50
1505	0.81	1.29	2.10	2.06	5.17	3.33	2.03	8.50	8.00	10.53	.....	6.61	6.00
1506	.....	.....	.....	.....	7.54	4.28	1.79	11.82	11.00	13.61	.....	2.03	2.00
1507	1.79	1.52	3.31	3.29	5.87	2.41	2.50	8.28	8.00	10.78	.....	7.41	7.00
1508	0.23	1.14	1.27	1.03	4.82	3.70	2.47	8.52	8.00	10.90	.....	2.12	2.00
1509	1.10	1.10	2.20	2.06	5.98	2.07	2.68	8.05	8.00	10.73	.....	3.34	3.00
1510	2.01	1.30	3.31	3.29	3.84	3.29	2.34	7.13	6.00	9.47	.....	10.80	10.00
1554	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
1555	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
1556	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
1557	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
1558	.....	.....	2.50	2.47	.....	.....	.....	.....	.....	25.31	22.80	.....	.....
1511	0.52	0.96	1.48	0.82	5.17	2.42	3.05	7.59	8.00	10.64	.....	4.73	4.00
1512	.....	.....	.....	.....	4.11	6.88	4.08	10.99	11.00	15.07	.....	2.15	2.00
1513	2.38	1.00	3.38	3 29	4.87	3.25	1.86	8.12	6.00	9.98	.....	10.64	10.00
1514	0.42	1.84	2.26	2.06	5.02	4.60	2.35	9.62	8.00	11.98	.....	2.26	1.50
1515	0.85	1.23	2.08	2.06	5.92	2.31	2.76	8.23	8.00	10.99	.....	3.37	3.00

Descriptive List of Manufacturers' Samples, 1908.

Station number.	Manufacturer, place of business and brand.
1516	Great Eastern Potato Special
1559	High Grade Sulphate of Potash
1517	Lazaretto Aroostook Potato Guano
1518	Lazaretto Corn Guano
1519	Lazaretto High Grade Potato Guano
1520	Lazaretto Propellor Potato Guano
1521	Lazaretto Special Potato Guano
1560	Muriate of Potash
1561	Nitrate of Soda
1562	Otis' Potato Fertilizer
1563	Otis' Superphosphate
1564	Pacific Dissolved Bone and Potash
1565	Pacific Grass & Grain Fertilizer
1566	Pacific High Grade General Fertilizer
1567	Pacific Nobsque Guano
1568	Pacific Potato Special
1522	Packer's Union Animal Corn Fertilizer
1523	Packer's Union Economical Vegetable Guano
1524	Packer's Union Gardners' Complete Manure
1525	Packers' Union High Grade
1526	Packer's Union Potato Manure
1527	Packer's Union Universal Fertilizer
1528	Packer's Union Wheat, Oats and Clover Fertilizer
1569	Plain Superphosphate
1570	Quinnipiac Climax Phosphate for all Crops
1571	Quinnipiac Corn Manure
1572	Quinnipiac Market Garden Manure
1573	Quinnipiac Mohawk Fertilizer
1574	Quinnipiac Potato Manure
1575	Quinnipiac Potato Phosphate
1576	Read's Farmers' Friend
1577	Read's High Grade Farmers' Friend
1578	Read's Potato Manure
1579	Read's Practical Potato Special
1580	Read's Standard Superphosphate
1581	Read's Sure Catch Fertilizer
1582	Read's Vegetable & Vine Fertilizer
1583	Soluble Pacific Guano
1584	Standard A. Brand
1585	Standard Bone & Potash
1586	Standard Complete Manure
1587	Standard Fertilizer
1588	Standard Guano for all Crops
1589	Standard Special for Potatoes
1590	Williams & Clark Americus Ammoniated Bone Superphosphate

Analysis of Manufacturers' Samples, 1908.

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.
%	%	%	%	%	%	%	%	%	%	%	%	%	%
1516	1.68	1.62	3.30	3.29	5.87	2.27	2.56	8.14	8.00	10.70	.....	7.57	7.00
1559	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	49.80	48.00
1517	0.19	0.78	0.97	0.82	5.69	3.36	2.11	9.05	8.00	11.16	.....	4.57	4.00
1518	0.95	1.02	1.97	1.64	4.47	3.20	2.74	7.67	8.00	10.41	.....	2.53	2.00
1519	1.21	1.82	3.03	3.29	4.00	1.90	2.27	5.90	6.00	8.17	.....	10.60	10.00
1520	0.70	1.30	2.06	2.06	5.69	2.56	2.88	8.25	8.00	11.13	.....	6.52	6.00
1521	1.69	1.56	3.25	3.29	5.85	2.27	2.55	8.12	8.00	10.67	.....	7.70	7.00
1560	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	49.63	50.00
1561	15.12	.....	15.12	15.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
1562	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
1563	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
1564	.....	.....	.....	.....	5.98	4.81	1.91	10.70	10.00	12.70	11.00	2.43	2.00
1565	0.42	0.64	1.06	0.82	5.46	3.01	1.43	8.47	7.00	9.90	8.00	2.99	1.00
1566	2.13	1.41	3.54	3.30	5.15	2.52	2.14	8.07	8.00	10.21	9.00	7.18	7.00
1567	0.45	0.80	1.25	1.03	5.53	2.31	2.73	7.81	8.00	10.57	10.00	2.14	2.00
1568	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
1522	0.31	2.10	2.41	2.47	5.64	3.22	3.46	8.86	9.00	12.32	.....	1.91	2.00
1523	0.26	1.42	1.68	1.25	4.65	2.55	2.15	7.20	6.00	9.35	.....	3.59	3.00
1524	1.38	1.16	2.54	2.47	5.58	0.47	2.06	6.05	6.00	8.11	.....	10.99	10.00
1525	1.75	1.56	3.31	3.29	5.85	2.41	2.55	8.26	8.00	10.81	.....	7.53	7.00
1526	0.96	1.10	2.06	2.06	4.85	3.16	1.85	8.01	8.00	9.86	.....	6.54	6.00
1527	0.25	0.96	1.21	0.82	6.05	3.22	1.46	9.27	8.00	10.73	.....	5.04	4.00
1528	.....	.....	.....	.....	.....	.....	1.20	10.92	11.00	12.12	.....	2.39	2.00
1569	.....	.....	.....	.....	10.21	3.91	1.30	14.12	14.00	15.42	15.01	.....	.....
1570	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
1571	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
1572	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
1573	0.03	0.83	0.86	0.82	2.60	4.87	3.86	7.47	7.00	11.33	8.00	1.58	1.00
1574	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
1575	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
1576	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
1577	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
1578	0.42	2.28	2.70	2.40	4.59	1.89	1.25	6.48	6.00	7.73	7.00	10.34	10.00
1579	0.42	0.74	1.16	0.82	1.64	2.56	1.99	4.20	4.00	6.19	5.00	8.03	8.00
1580	0.10	0.94	1.04	0.82	5.87	2.89	2.23	8.76	8.00	10.99	10.00	4.81	4.00
1581	.....	.....	.....	.....	5.42	3.90	3.09	9.32	10.00	12.41	11.00	2.59	2.00
1582	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
1583	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
1584	0.31	0.90	1.21	0.82	3.64	4.10	2.08	7.74	7.00	9.82	8.00	1.56	1.00
1585	.....	.....	.....	.....	7.66	2.60	1.96	10.26	10.00	12.22	11.00	2.08	2.00
1586	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
1587	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
1588	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
1589	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
1590	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

Descriptive List of Manufacturers' Samples, 1908.

Station number.	Manufacturer, place of business and brand.
1591	Williams & Clark Americus Corn Phosphate
1592	Williams & Clark Americus High Grade Special
1593	Williams & Clark Americus Potato Manure
1594	Williams & Clark Royal Bone Supherphosphate for all Crops
	ARMOUR FERTILIZER WORKS, BALTIMORE, MD.
1595	All Soluble
1596	Armour's Complete Potato
1597	Bone, Blood & Potash
1598	Fruit and Root Crop Special
1599	Grain Grower
1600	High Grade Potato
1601	Wheat, Corn & Oats Special
	BOWKER FERTILIZER CO., BOSTON, MASS.
1602	Bowker's Blood Bone & Potash
1603	Bowker's Bone & Potash, Square Brand
1604	Bowker's Complete Manure for Potatoes and Vegetables
1605	Bowker's Corn Phosphate
1606	Bowker's Early Potato Manure
1607	Bowker's Farm and Garden Phosphate
1608	Bowker's Fresh Ground Bone
1609	Bowker's Hill & Drill Phosphate
1610	Bowker's Market Garden Fertilizer
1611	Bowker's Potash Bone
1612	Bowker's Potash or Staple Phosphate
1613	Bowker's Potato & Vegetable Fertilizer
1614	Bowkers' Potato & Vegetable Phosphate
1615	Bowker's Six Percent Potato Fertilizer
1616	Bowker's Superphosphate with Potash
1617	Bowker's Sure Crop Phosphate
1618	Bowker's Ten percent Manure
1619	Monticello Grange Chemicals
1620	Special Potato Manure for the Grange
1621	Stockbridge's Manure A for Potatoes
1622	Stockbridge's Special Complete Manure for Corn and all Grain Crops
1623	Stockbridge's Complete Manure for Potatoes & Vegetables
1624	Stockbridge's Special Complete Manure for Quick Growth and Forcing
1625	Stockbridge's Special Complete Manure for Seeding Down, Permanent Dressing and Legumes
	COE-MORTIMER CO., NEW YORK.
1626	E. Frank Coe's Celebrated Special Potato Fertilizer
1627	E. Frank Coe's Columbian Corn Fertilizer
1628	E. Frank Coe's Columbian Potato Fertilizer
1629	E. Frank Coe's Double Strength Potato Manure
1630	E. Frank Coe's Excelsior Potato Fertilizer
1631	E. Frank Coe's Famous Prize Brand Grass & Grain Fertilizer
1632	E. Frank Coe's High Grade Ammoniated Bone Superphosphate
1633	E. Frank Coe's High Grade Potato Fertilizer
1634	E. Frank Coe's New Englander Corn & Potato Fertilizer

Analysis of Manufacturers' Samples, 1908.

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.
%	%	%	%	%	%	%	%	%	%	%	%	%	%
1591	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
1592	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
1593	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
1594	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
1595	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
1596	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
1597	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
1598	0.75	1.06	1.81	1.65	7.78	0.35	0.47	8.13	8.00	9.60	10.00	5.93	5.00
1599	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
1600	0.94	0.96	1.90	1.65	8.05	1.08	0.50	9.13	8.00	9.63	10.00	10.70	10.00
1601	0.22	0.60	0.82	0.82	5.04	2.24	2.02	7.28	7.00	9.30	9.00	1.24	1.00
1602	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
1603	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
1604	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
1605	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
1606	2.32	0.94	3.26	3.29	6.78	1.40	1.02	8.18	8.00	9.20	9.00	7.60	7.00
1607	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
1608	.....	.....	2.53	2.47	.....	.....	.....	.....	.....	21.42	22.80	.....	.....
1609	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
1610	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
1611	0.90	.....	0.90	0.82	3.05	1.93	3.03	4.98	6.00	8.01	8.00	2.10	2.00
1612	0.18	0.74	0.92	0.82	1.69	6.43	2.15	8.12	8.00	10.27	9.00	3.37	3.00
1613	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
1614	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
1615	0.35	0.65	1.00	0.82	1.39	4.82	3.05	6.21	6.00	9.26	7.00	6.48	6.00
1616	.....	.....	.....	.....	4.39	5.30	1.71	9.69	10.00	11.40	11.00	2.84	2.00
1617	0.35	0.72	1.07	0.82	4.93	3.50	2.42	8.43	8.00	10.88	9.00	2.37	2.00
1618	0.17	0.69	0.86	0.82	1.29	3.92	1.99	5.21	5.00	7.20	6.00	10.34	10.00
1619	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
1620	1.21	0.90	2.11	1.65	5.76	6.30	2.74	12.06	9.00	14.80	12.00	9.75	12.00
1621	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
1622	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
1623	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
1624	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
1625	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
1626	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
1627	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
1628	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
1629	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
1630	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
1631	.....	.....	.....	.....	6.64	3.96	3.06	10.55	10.50	13.61	12.00	2.59	2.00
1632	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
1633	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
1634	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

Descriptive List of Manufacturers' Samples, 1908.

Station number.	Manufacturer, place of business and brand.
1635	E. Frank Coe's Red Brand Excelsior Guano
1636	E. Frank Coe's Special Grass & Grain Fertilizer
	ESSEX FERTILIZER CO., BOSTON, MASS.
1637	Essex Complete Manure for Potatoes, Roots and Vegetables
1638	Essex Market Garden & Potato Manure
1639	Essex Potato Grower
1640	Essex Special Potato Phosphate
1641	Essex XXX Fish & Potash
	HUBBARD FERTILIZER CO., BALTIMORE, MD.
1642	Hubbard's Blood, Bone & Potash
1643	Hubbard's Farmers' IXL Superphosphate
1644	Hubbard's Five Percent Royal Seal Compound
1645	Hubbard's Royal Ensign
1646	Hubbard's Special Potato Compound
	LISTER'S AGRICULTURAL CHEMICAL WORKS, NEWARK, N. J.
1647	Lister's Animal Bone & Potash
1648	Lister's High Grade Special
1649	Lister's Oneida Special
1650	Lister's Potato Manure
1651	Lister's Special Corn Fertilizer
1652	Lister's Special Potato Fertilizer
1653	Lister's Success
	NATIONAL FERTILIZER CO., BOSTON, MASS.
1654	Chittenden's Complete Root Fertilizer
1655	Chittenden's Eureka Potato Fertilizer
1656	Chittenden's Excelsior Potato Fertilizer
1657	Chittenden's Market Garden Fertilizer
	NEW ENGLAND FERTILIZER CO., BOSTON, MASS.
1659	New England Complete Manure
1660	New England Corn & Grain Fertilizer
1661	New England Corn Phosphate
1662	New England High Grade Potato Fertilizer
1663	New England High Grade Special
1664	New England Market Garden Manure
1665	New England Potato Fertilizer
1666	New England Potato Grower
1667	New England Superphosphate
	PARMENTER & POLSEY FERTILIZER CO., BOSTON, MASS.
1668	A. A. Brand
1669	Aroostook Special
1670	Maine Potato Fertilizer
1671	Plymouth Rock Brand
1672	Special Potato Fertilizer
	PORTLAND RENDERING CO., PORTLAND, MAINE.
1673	Bone Dust Tankage
	R. T. PRENTISS, FERTILIZER CO., HOULTON, MAINE
1674	Prentiss Aroostook Complete
	PROVINCIAL CHEMICAL FERTILIZER CO., ST. JOHN, N. B.
1675	10% Complete Aroostook Potato
	SAGADAHOC FERTILIZER CO., BOWDOINHAM, MAINE.
1676	Acid Phosphate
1677	Aroostook Potato Manure
1678	Dirigo Fertilizer

Analysis of Manufacturers' Samples, 1908.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
			Total.					Available.		Total.			
	Soluble in water.	Insoluble in water.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Founff.	Guaranteed.
%	%	%	%	%	%	%	%	%	%	%	%	%	%
1635	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
1636	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
1637	1.98	1.38	3.36	3.25	4.31	2.70	1.20	7.01	6.00	8.21	7.00	10.06	10.00
1638	0.38	1.80	2.18	2.00	4.47	3.63	5.22	8.10	8.00	13.22	9.00	5.71	5.00
1639	1.66	1.10	2.76	2.46	4.86	1.78	1.02	6.64	6.00	7.66	7.00	10.57	10.00
1640	1.18	1.40	2.58	2.46	4.86	3.95	1.91	8.81	8.00	10.72	9.00	6.53	6.00
1641	0.40	2.22	2.62	2.00	6.54	2.44	1.91	8.98	8.00	10.89	9.00	3.95	3.00
1642	2.02	1.10	3.12	3.33	6.62	2.14	1.21	8.76	8.00	9.97	9.00	7.20	7.00
1643	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
1644	2.70	1.66	4.36	4.20	4.31	2.48	1.34	6.79	6.00	8.13	7.00	6.42	5.00
1645	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
1646	2.01	1.30	3.31	3.33	3.96	3.01	1.40	6.97	6.00	8.37	7.00	10.14	10.00
1647	.....	.....	.....	.....	3.30	6.81	4.12	10.11	10.00	14.23	11.00	2.17	2.00
1648	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
1649	0.34	0.83	1.17	0.83	4.42	3.71	2.48	8.13	7.00	10.61	8.00	1.16	1.00
1650	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
1651	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
1652	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
1653	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
1654	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
1655	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
1656	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
1657	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
1659	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
1660	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
1661	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
1662	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
1663	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
1664	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
1665	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
1666	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
1667	0.88	1.60	2.48	2.46	5.66	1.93	3.77	7.59	8.00	11.36	10.00	4.34	4.00
1668	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
1669	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
1670	2.38	1.26	3.64	3.29	5.10	0.90	1.85	6.09	6.00	7.94	7.00	10.90	10.00
1671	0.96	1.62	2.58	2.47	4.86	2.75	3.67	7.61	8.00	11.28	9.00	4.11	4.00
1672	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
1673	.....	.....	5.83	5.75	.....	.....	.....	.....	.....	16.91	14.50	.....	.....
1674	2.74	1.16	3.32	3.28	2.23	3.67	1.72	5.90	6.00	7.62	7.00	10.66	10.00
1675	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
1676	.....	.....	.....	.....	13.48	2.52	0.83	16.00	14.00	16.83	14.00	.....	.....
1677	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
1678	1.02	1.78	2.80	1.00	3.19	2.01	1.34	5.20	4.00	6.54	6.00	4.75	2.00

Descriptive List of Manufacturers' Samples, 1908.

Station number.	Manufacturer, place of business and brand.
1679	Muriate of Potash
1680	Nitrate of Soda
1681	Sagahahoc High Grade Superphosphate
1682	Sagadahoc Special Potato Fertilizer
1683	XX Chemical Fertilizer
1684	Yankee Fertilizer
1685	3-6 and 10 Fertilizer
1686	4-6 and 10 Fertilizer
	SWIFT'S LOWELL FERTILIZER CO., BOSTON, MASS.
1687	Acid Phosphate
1688	Muriate of Potash
1689	Nitrate of Soda
1690	Swift's Lowell Animal Brand
1691	Swift's Lowell Bone Fertilizer
1692	Swift's Lowell Cereal Fertilizer
1693	Swift's Lowell Dissolved Bone and Potash
1694	Swift's Lowell Empress Brand
1695	Swift's Lowell Potato Manure
1696	Swift's Lowell Potato Phosphate
1697	Swift's Lowell Potato Grower
1698	Swift's Lowell Potato Fertilizer
1699	Swift's Lowell Special Vegetable
1700	Swift's Lowell Superior Fertilizer
	TUSCARORA FERTILIZER CO., BALTIMORE, MD.
1701	Tuscarora Aroostook Special
1702	Tuscarora Complete Potato
1703	Tuscarora Fruit and Potato
1704	Tuscarora Trucker
	WHITMAN & PRATT RENDERING CO., LOWELL, MASS.
1711	Whitman & Pratt's Corn Success
1712	Whitman & Pratt's Potash Special
1713	Whitman & Pratt's Potato Manure
1714	Whitman & Pratt's Vegetable Grower
	THE WILCOX FERTILIZER CO., MYSTIC, CONN.
1709	Wilcox Premium Potato Fertilizer
1710	Wilcox Complete Bone Superphosphate

Analysis of Manufacturers' Samples, 1908.

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.
%	%	%	%	%	%	%	%	%	%	%	%	%	%
1679	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	53.20	50.00
1680	15.58	.....	15.58	15.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
1681	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
1682	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
1683	7.03	1.07	8.10	7.00	.....	.....	3.76	4.29	3.00	8.05	7.00	10.05	8.00
1684	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
1685	1.73	0.80	2.53	3.25	3.11	1.56	1.98	4.67	5.00	6.65	7.00	10.18	10.00
1686	2.65	0.80	3.45	2.35	3.19	3.75	1.70	6.94	5.00	8.64	7.00	10.57	10.00
1687	.....	.....	.....	.....	10.05	2.76	2.42	12.81	12.00	15.23	13.00	.....	.....
1688	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	51.80	50
1689	.....	.....	15.72	15.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
1690	1.04	1.54	2.58	2.46	4.60	4.69	3.97	9.35	8.00	13.32	10.00	4.19	4 00
1691	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
1692	0 34	0.50	0.84	0.82	5.22	1.76	1.32	6.98	7.00	8.30	8.00	1.18	1.00
1693	0.72	1.04	1.76	1.64	8.21	1.80	1.15	10.01	9.00	11.16	10.00	2.35	2.00
1694	0.87	0.54	1.41	1.23	4.85	2.50	2.32	7.35	7.00	9.67	8.00	2.15	2.00
1695	0.69	0.94	1.63	1.64	4.55	2.10	2.17	6.65	7.00	8.82	8.00	4.07	4.00
1696	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
1697	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
1698	1.71	0.88	2.59	2.46	5.34	1.77	1.02	7.11	6.00	8.13	7.00	10.51	10.00
1699	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
1700	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
1701	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
1702	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
1703	0.74	1.02	1.76	1.65	7.89	0.98	1.08	8.87	8.00	9.95	9.00	11.40	10.00
1704	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
1711	.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
1712	1.47	1.26	2.73	2.88	3.32	3.02	2.89	6.34	6.00	9.23	8.00	10.85	1 0.00
1713	1.34	1.01	2.35	2.45	2.44	4.81	1.28	1.25	7.00	8.53	9.00	5.41	5.00
1714	.....	.....	.....	3.29	.....	.....	.....	.....	8.00	.....	.....	.....	7.00
1709	1.76	1.98	3.74	3.70	4.86	2.88	1.91	7.74	7.00	9.65	8.00	10.36	10.00
1710	1.14	1.26	2.40	2 05	1.83	6.23	5.42	8.06	8.00	13.48	9.00	4.00	3.00

PRENTISS AROOSTOOK COMPLETE FERTILIZER.

While the spring fertilizer bulletin is primarily intended to discuss brands to be offered during the year, there has so much developed since the publication of the fall bulletin from the standpoint of the makers, the handlers and the users of one brand of fertilizer sold in 1907 that it seems imperative to depart from the usual custom and state at considerable length the situation regarding these goods.

In 1906 the R. T. Prentiss Company began to sell fertilizers in Maine. That year they licensed two brands bearing their own name, and one brand of the Tuscarora Fertilizer Company. In planning for their business in 1907, they arranged to sell most of their fertilizers on contract, taking their pay in the potatoes grown during the season at a stated price buying their good for this year from the Buffalo Fertilizer Company of Buffalo, N. Y.

In the spring of 1907 the R. T. Prentiss Company licensed two brands of fertilizers,—The Prentiss Aroostook Complete and the Prentiss Aroostook Standard. Apparently but little of the second brand was sold. The Prentiss Aroostook Complete was guaranteed to carry 3.29 per cent nitrogen, 6 per cent available phosphoric acid, 8 per cent total phosphoric acid and 10 per cent potash. The manufacturer's sample was up to the guaranty in the valuable constituents, carrying 3.53 per cent nitrogen; 6.34 per cent available phosphoric acid and 12.89 per cent of potash. The inspector drew two samples at the warehouse in the spring of 1907,—one in Houlton and one in Fort Fairfield. These samples both ran under guaranty, carrying respectively 2.36 and 2.42 per cent nitrogen; 4.48 and 5.52 per cent available phosphoric acid; and 8.18 and 9.48 per cent potash. When the analyses were completed, the results were reported to the Buffalo Fertilizer Company, and to the R. T. Prentiss Company. As a result of the analyses, Mr. Prentiss and the New England manager of the Buffalo Fertilizer Company called at the Experiment Station office, expressed surprise at the low analysis, and asked that other samples be taken and said that some of their 1907 goods were still in stock at Houlton and Presque Isle. Two other samples were taken. These differ greatly in composition and analyze respectively as folows:—Nitrogen 2.24 and 3.14 per cent; available phosphoric acid 5.66 and 5.50 per cent; potash 6.99 and 10.48 per cent. The fall bulletin was printed prior to the making of these analyses and they were not included therein.

Analysis of Prentiss 4-6-10 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.
	%	%	%	%	%	%	%	%	%	%	%	%	%
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	.....	1.67	3.85	1.73	5.52	.....	7.25	.....	9.48	.....
1341	1.94	0.30	2.24	.....	1.91	3.75	1.75	5.66	.....	7.41	.....	6.99	.....
1342	2.18	0.96	3.14	.....	2.11	3.39	1.15	5.50	.....	6.65	.....	10.48	.....
1343	2.20	0.72	2.92	.....	2.74	3.20	0.88	5.94	.....	6.82	.....	9.36	.....
1344	1.86	0.60	2.46	.....	1.75	3.07	1.56	4.82	.....	6.38	.....	9.24	.....
1345	1.49	0.95	2.44	.....	3.68	2.57	1.34	6.25	.....	7.59	.....	10.42	.....
1347	2.82	0.74	3.56	.....	3.35	2.30	1.30	5.65	.....	6.95	.....	9.57	.....
1348	2.12	0.80	2.92	.....	2.74	3.27	1.15	6.01	.....	7.16	.....	9.43	.....
1349	2.13	0.82	2.95	.....	2.22	3.21	1.44	5.43	.....	6.87	.....	10.03	.....
1350	2.09	0.92	3.01	.....	3.65	2.29	1.52	5.94	.....	7.46	.....	9.67	.....
1351	2.39	0.82	3.21	.....	1.90	4.03	0.92	5.93	.....	6.85	.....	10.06	.....
1352	2.28	0.94	3.22	.....	3.22	2.88	0.99	6.10	.....	7.09	.....	10.00	.....
Avg.	.....	.....	2.83	.....	.....	.....	.....	5.63	.....	7.57	.....	9.45	.....
"	below	guar.	0.46	.....	.....	.....	.....	0.37	.....	0.43	.....	0.55	.....

A sample was also sent to the Station by a farmer at Easton. This sample analyzed,—Nitrogen 2.92 per cent; available phosphoric acid 5.94 per cent; potash 9.36 per cent. Later this gentleman visited the Experiment Station and expressed his opinion relative to the quality of the Prentiss' 4-6-10 goods and stated that there were considerable of these goods still unused in his part of the county. As a result the Station chemist, who had drawn the official fertilizer samples, visited Easton and Presque Isle, putting himself is touch with the farmers at Easton who had used the goods, and drew samples wherever any unopened goods were still in stock, provided they had apparently been well stored. Also some farmers were visited in Presque Isle in company with one of the managers of the R. T. Prentiss Company. As a result 13 samples of the R. T. Prentiss Com-

pany's 4-6-10 goods, Prentiss Aroostook Complete Fertilizer, were analyzed with results given in the table on page 103. Sample 1290 was drawn at Houlton and 1306 at Fort Fairfield in the spring of 1907. Sample 1341 was taken at Houlton and 1342 at Presque Isle in October. Sample 1343 was sent to the Experiment Station from Easton. Samples 1344, 1345, 1347, 1348 and 1349 were drawn at Easton by a Station chemist in November, 1907. Samples 1350, 1351, and 1352 were drawn at Presque Isle.

It will be noted that on the average the 13 analyses show a shortage of .46 per cent nitrogen, .37 available phosphoric acid, .43 per cent total phosphoric acid, and .55 per cent potash.

The valuations placed upon fertilizing constituents by the directors of the New England States and New Jersey for 1907 are given in Bulletin 140 of this Station*. The valuation of the Prentiss fertilizer from the guaranteed analysis, following the rule for calculating given on page 71 of that bulletin, is as follows:

Total nitrogen, 3.29 per cent	$13 49
Available phosphoric acid, 6 per cent	5 40
Insoluble phosphoric acid, 2 per cent	80
Potash, 10 per cent	10 00
Valuation	$29 69

The valuation of the goods as shown by analysis,—average of the 13 samples, is as follows:

Total nitrogen, 2.83 per cent	$11 60
Available phosphoric acid, 5.63 per cent	5 07
Insoluble phosphoric acid, 1.94 per cent	78
Potash, 9.45 per cent	9 45
Valuation	$26 90

Difference in valuation, $2.70 or 9.1 per cent.

The goods were tested for the quality of the constituents. Available phosphoric acid may be fairly assumed to be of equal agricultural value irrespective of its source; the potash was apparently present in good form; the availability of the nitrogen

* The valuations for 1908 are the same as in 1907 and are given on page 90 of this bulletin.

by laboratory tests compared favorably with other equally high grade brands offered in Aroostook county in 1907. The nitrogen was practically all in the form of tankage of good grade and sulphate of ammonia. While in the opinion of the writer, it is desirable that a potato fertilizer for Maine and particularly Aroostook county carry nitrate nitrogen, there is nothing in the fertilizer law or the guaranty given by the R. T. Prentiss Company respecting the form of the nitrogen. The nitrogen which was used is practically as high priced a form as nitrate nitrogen.

As is well known, the season of 1907 was unfavorable for the growth of potatoes in Aroostook county; the late wet spring, the wet summer, the conditions favoring blight, and the early freezing all tended to make it difficult to obtain a satisfactory crop of potatoes. There seems to be quite a widespread dissatisfaction among the users of the R. T. Prentiss Company's goods, and the Station has received frequent letters asking if this can be due to the quality of the fertilizer. It is evident that the R. T. Prentiss Company's Aroostook Complete Potato Fertilizer was about 9 per cent short in its constituents, but a fertilizer carrying in good form 2.83 per cent nitrogen, 5.63 per cent available phosphoric acid and 9.45 per cent potash is still a high grade concentrated fertilizer. Applied as liberally as it was in most cases, it is doubtful if in a field experiment a difference between a fertilizer of this composition and one with the guaranteed analysis would show decisive results. Twelve hundred pounds to the acre of a fertilizer as shown by the analysis would carry 34 pounds of nitrogen; 68 pounds available phosphoric acid and 113 pounds of potash. A crop of 300 bushels of potatoes removes in the tubers about 55 pounds of nitrogen; 25 pounds of phosphoric acid and 85 pounds of potash. On sixteen hundred pounds of a fertilizer carrying 3 per cent nitrogen, 6 per cent available phosphoric acid and 5 per cent of potash, the Station grew in Houlton in 1907 on a measured acre of land, 167½ barrels (460 bushels) of merchantable potatoes. This fertilizer furnished 48 pounds of nitrogen, 96 pounds available phosphoric acid and 100 pounds of potash. Sixteen hundred pounds of Prentiss Aroostook Complete, on the average as analyzed would furnish 45 pounds of nitrogen, 90 pounds of available phosphoric acid and 151 pounds of potash.

All of these fertilizers carry less nitrogen than a large crop would remove, but in practice one should depend somewhat upon the nitrogen of the soil and particularly that of the roots and stubble which are plowed under. The phosphoric acid and potash being in marked excess, the question naturally arises in case of failure could it have been due to the lack of nitrogen. While the Prentiss Fertilizer did not carry nitrate nitrogen, it had about a third of its nitrogen in the water soluble form. Applied on wet land in such a season as 1907, it is possible that some of this may have leached out and there would have been a deficiency for this reason. The same loss from leaching, if it occurred, would have taken place had nitrate of soda been used.

While nitrogen in any available form can be used by plants, it is generally agreed by plant physiologists that plants only take it up after the nitrogen has been changed into nitrate nitrogen. In the case of ammonia salts and organic nitrogen, the change to nitrate nitrogen goes on in the soil due to the action of bacteria. This change takes place only slowly in cold and wet soil and does not proceed at all rapidly until the soil becomes warm. Hence in the first early days of spring, organic nitrogen applied in a fertilizer may be practically unavailable to a plant. For this reason the Station has always recommended that a potato fertilizer carry about a third of its nitrogen in the form of nitrate nitrogen. The potato seems to demand nitrogen in the early part of its growth and while organic nitrogen becomes available later, it might happen that in the early part of the season, a crop manured with only organic nitrogen or nitrogen in the form of ammonia salts, would make a poor growth during the first weeks. It is, of course, possible that loss, so far as the loss can be attributed directly to the fertilizer, was due to the lack of nitrate nitrogen in the fertilizer. There was apparently no fraud, or attempt at fraud, on the part of the manufacturers in omitting nitrate nitrogen because the nitrogen which they furnished in the form of ammonium sulphate was according to market prices in 1907 but little cheaper than the nitrogen in the form of nitrate and equally permissable under the State law.

One of the Station chemists spent a week beginning November 11, visiting farmers in the vicinity of Easton and Presque Isle and talked with them regarding the potato crop, particularly in connection with the R. T. Prentiss Company's fertilizer. Some

men were seen who used Prentiss fertilizer only and others who used Prentiss goods and other brands of high grade fertilizers. There was some diversity of opinion but many of the farmers claimed to have not had as good results with the Prentiss fertilizer as with other fertilizers. Some, on the contrary, were found to be satisfied with their crop.

Without attempting to pose as an exponent of law in the matter, it is the writer's opinion that the redress of the farmers is limited to the deficiency in plant food; that they are entitled to a rebate of about 1-11 of the price paid per ton for the fertilizer; and that they could not maintain a case against the company for loss of crop due to the fertilizer. While the fertilizer was deficient in plant food, it was not disastrously so. While in the opinion of the writer, a good potato fertilizer should carry nitrate nitrogen, there can be no fraud shown relative to the form of nitrogen in these goods. Whatever case the user has must be made on the deficiency of plant food, and the writer would not know where to turn for evidence to prove that this relatively small deficiency in plant food could result in any such failure of crop as some of the growers seem to think to have been the case.

In the sale of fertilizers in 1907, the R. T. Prentiss Company violated the Maine Fertilizer Law in three particulars. The goods were not branded in the same way as their certificate reads. Some of these goods were sold without being branded at all. And all of the samples examined were below in one or more constituents and on the average, the goods were about 9 per cent below their guaranty.

The first violation was clerical in that the brand put upon the barrels was printed after the certificate was filed and did not carry the name Prentiss Aroostook Complete.

It was also explained that in the case in which the goods were sent out unbranded that it was due to the lack of barrels and that the goods were sent out in the original bags in which they were received from the factory.

The shortage in plant food was the serious violation, but as it seemed no good could be served by prosecution, as at the most there could only be a small fine imposed, it was thought best to depend, as in other violations of the fertilizer law, upon publicity

to call attention to the shortage and to the promise of the company that these matters would be corrected in 1908.

The R. T. Prentiss Company are obtaining their fertilizer for 1908 from the Buffalo Fertilizer Company who made the goods for 1907. These goods are apparently compounded on practically the same formula as in 1907.

At the expense of the R. T. Prentiss Company a Station chemist has sampled all of the cars that have been received in the county up to February 1, 1908. All of the goods received up to early in January carried more nitrogen and potash than called for by the guaranty. The total phosphoric acid was also in excess; the available phosphoric acid was somewhat below guaranty. The makers claim that with their particular process of manufacture the availability of the phosphoric acid will increase so that by the time the goods are used, they will be up to the guaranty in available phosphoric acid. This point is being investigated by the Station. Ten cars received in February ran under in nitrogen and potash. For the most part these goods as in 1907 carry little or no nitrate nitrogen. The company advertises that it will attach to each lot of goods shipped out the exact analysis as found by the Station and base settlement accordingly. It is recommended by the Station that anyone using the Prentiss goods for potatoes in Maine, either make sure that the goods carry nitrate nitrogen, or else use nitrate of soda at the rate of 100 pounds to the acre in connection with the fertilizer. The R. T. Prentiss Company have arranged to supply nitrate of soda for this purpose if desired by their customers.

BULLETIN No. 154

PARIS GREEN.

CHAS. D. WOODS and H. H. HANSON.

Paris green is a definite chemical compound known to chemists as aceto-arsenate of copper. It is prepared from verdigris (acetate of copper) and arsenious oxide. When pure it carries 58.65 per cent arsenious oxide; 31.29 per cent copper oxide; and 10.06 per cent acetic acid. The value of Paris green as an insecticide depends upon the arsenic which it contains in combination with copper. The presence of free arsenious acid is harmful as it burns foliage. The ideal Paris green would carry a maximum amount of arsenious oxide in combination with copper; it would have as little as possible of free arsenious acid so as not to burn the foliage; and it would be in the finest possible powder in order that it may readily remain in suspension when mixed in water and that it may be more thoroughly distributed over foliage.

ANALYSES OF PARIS GREEN.

During the past two years the Station has received frequent complaints of the quality of Paris green, which has led to the examination of the samples herewith reported. Analyses of the Paris greens on sale in Connecticut in 1907 were reported by the Connecticut Agricultural Experiment Station, and those on sale in New Jersey by the New Jersey Agricultural Experiment Station.* The results of the analyses made by these respective Stations are here included with analyses made here. This examination of the fineness of many of these samples, which were kindly frunished us by these Stations, were made at the Maine Station and are reported on page 114.

---

* Bul. 157 Conn. Station and Bul. 205 N. J. Station.

The table which follows gives the results of the analyses of Paris green made at the Maine, Connecticut and New Jersey Stations in 1907.

TABLE SHOWING THE RESULTS OF ANALYSES OF PARIS GREEN MADE AT THE MAINE, CONNECTICUT AND NEW JERSEY STATIONS IN 1907.

Lab. No.	Name of Brand.	Copper oxide (CuO)	Arsenious oxide (As_2O_3)		
			Total.	Soluble in water in 10 days.	Required to combine with copper.*
N. J. 10	Adler	29.35	58.06	–	54.88
Me. 3324	Ansbacher	31.11	56.08	2.32	58.18
Me. 3416	"	30.20	58.42	2.33	56.47
Me. 3419	"	30.83	57.99	3.55	57.65
C. 19481	"	28.76	57.92	2.92	53.78
C. 18662	"	29.49	57.44	2.44	55.15
N. J. 16	"	30.16	57.43	–	56.40
N. J. 24	"	29.66	56.09	–	55.46
C. 18634	Barry	29.55	57.23	6.82	55.26
C. 18509	"	29.01	56.62	6.82	54.25
Me. 3417	Blanchard	29.73	58.48	3.55	55.59
Me. 3418	"	30.21	58.20	4.17	56.49
C. 18704	"	28.14	57.03	7.31	52.62
N. J. 6	"	30.16	57.80	–	56.40
N. J. 14	"	29.51	56.82	–	55.18
N. J. 20	"	29.67	57.68	–	55.48
N. J. 26	"	28.56	57.68	–	53.41
N. J. 29	Childs & Co	29.31	57.53	–	54.81
N. J. 25	Devoe & Raynolds	25.87	60.02	–	48.38
N. J. 1	H. W. Doughten	29.84	57.31	–	55.80
Me. 3421	Hertmann	30.05	57.80	3.92	56.19
C. 19547	"	28.54	56.20	4.87	53.37
N. J. 3	"	30.00	56.82	–	56.10
N. J. 19	"	30.16	57.56	–	56.40
N. J. 8	Lavanburg	29.84	57.43	–	55.80
N. J. 18	"	30.32	57.56	–	56.70
N. J. 22	"	30.49	57.07	–	57.01
C. 18569	Leggett	27.15	60.61	10.72	50.77
C. 18508	"	29.34	56.83	8.77	54.87
N. J. 27	"	28.83	56.05	–	53.91
N. J. 2	Lucas	30.14	56.20	–	56.20
N. J. 4	"	30.32	56.82	–	56.70
N. J. 7	"	30.00	57.56	–	56.10
N. J. 9	"	29.84	56.82	–	55.80
N. J. 15	"	29.67	56.82	–	55.48
N. J. 17	"	30.16	57.56	–	56.40
C. 18512	Pfeiffer	30.27	56.71	4.38	56.60
N. J. 5	"	29.02	57.19	–	54.27
N. J. 21	"	30.32	57.20	–	56.70
N. J. 23	"	30.16	56.95	–	56.40
Me. 3323	Raynolds	28.90	59.68	7.49	54.04
Me. 3420	"	27.85	61.83	7.96	52.08
C. 18510	"	26.56	60.83	6.32	49.63
C. 18511	"	27.15	61.19	9.74	50.77
C. 18663	Sherwin & Williams	29.88	56.56	2.92	55.88
N. J. 28	" " "	30.24	57.66	–	56.55
N. J. 11	Steelman and Archer	30.49	57.31	–	57.01
N. J. 12	" " "	29.84	57.68	–	55.80
N. J. 13	" " "	30.16	57.43	–	56.40

* On the supposition that Paris Green is copper aceto-arsenate.

ADULTERATIONS OF PARIS GREEN.

Paris Greens have been frequently examined in different parts of the country and while there have been occasional samples that have been found to be adulterated with materials which do not normally enter into the composition of the goods, for the most part, they are free from foreign admixtures. The most dangerour adulteration, if it may be so called, is the presence of an excess of arsenious oxide. This is the cheapest ingredient of Paris green and there is a constant temptation to add as great an excess of arsenious oxide as is possible and obtain a good color. From the standpoint of an insecticide, the presence of an excess of arsenious oxide is serious because it endangers foliage to which the green is applied.

From investigations made at the New Jersey Agricultural Experiment Station,* it is found that there is generally a shortage of weight and that while as a rule the gross weight of the packages is equal to or slightly in excess of what is claimed, they fall short in net weight from 4 to 10 per cent,—that is the purchaser usually pays for the container at the rate of 30 to 35 cents per pound.

ORDINARY IMPURITIES OF PARIS GREEN.

Six samples of Paris green were analyzed at this Station to determine the water, sand and sodium sulphate which they carried. The water ran from 1.14 to 1.50 per cent. A few years ago the Bureau of Chemistry of the U. S. Department of Agriculture analyzed 45 samples of Paris green, and the water run from .33 to 1.24 per cent. It will be noted in these samples, the water has been increased nearly a per cent and while the water in the Paris green does no harm, it is a shortage in weight.

The sand is incidental to the manufacturer but is practically the same as existed in the greens of a few years ago. Sodium sulphate is an impurity incident to the manufacture of Paris green but if the greens are at all carefully washed, there should be considerably less than one per cent. It will be noted in one instance that the sodium sulphate run up to 2.4 per cent. These ordinary impurities average in the 6 samples in the aggregate 2.75 per cent which is double what there should be in well made

* Bul. 205 New Jersey Station.

greens. These impurities will not injure the green in any way for the purpose intended, but they add weight and cause valueless materials to be sold at a high price.

TABLE SHOWING ORDINARY IMPURITIES OF PARIS GREEN.

Station Number.	Brand.	Water.	Sand.	Sodium Sulphate.
		%	%	%
3416	Ansbacher	1.50	0.12	0.77
3419	"	1.43	0.12	0.87
3417	Blanchard	1.36	0.11	1.98
3418	"	1.21	0.20	2.44
3421	Herrmann	1.14	0.08	1.52
3420	Raynolds	1.14	0.13	0.41

COPPER OXIDE.

The amount of copper oxide carried by a pure Paris green should be 31.29 per cent. Supposing a green to have 2.75 per cent of impurities, it would then carry 30.42 per cent of copper oxide. While only 4 of the 49 samples carried more than 30.42 per cent of copper oxide, 19 of them carried more than 30 per cent. While the presence of the copper oxide is of no importance in itself, a Paris green cannot carry its full content of green unless the copper oxide is practically up to the theoretical.

ARSENIOUS OXIDE.

A chemically pure Paris green would carry 58.65 per cent of arsenious oxide in combination with copper. Estimating that there would be 2.75 per cent of impurities, there should be 57.05 per cent of arsenious oxide in the green in combination with the copper. Only 15 of the 49 samples carried less than this amount of arsenious oxide; 24 carried between 57 and 58 per cent; 4 samples from 58 to 59; one between 59 and 60; 3 between 60 and 61; and 2 between 61 and 62 per cent arsenious oxide. Viewed from the standpoint of arsenious oxide then, the Paris greens examined would seem to be goods of high grade, but when it is remembered that all the arsenious oxide that is present that is not in combination with copper is a detriment and a danger, it is important to see how much of this arsenious oxide is soluble in water.

The burning effect of a Paris green upon foliage seems to depend upon the amount of water soluble arsenic it carries. The amount of arsenic that goes into solution varies with the time to which it is exposed to the water and to the fineness of the green, and with the care that is used in the manufacture of the green. The Connecticut Experiment Station determined the amount of arsenious oxide soluble in water when the green was treated one day and when treated 10 days and found that there was from 2 to 4 times as much arsenious oxide dissolved in 10 days as in one day. Investigations by the Bureau of Chemistry of the U. S. Department of Agriculture* have shown that with the water extraction method, some of the combined arsenious oxide and copper go into solution. This, however, was found to be due to a breaking down of the Paris green and in the case of well made Paris greens there was very much less of the combined arsenious oxide that went into solution, and it is evident from their examinations that it is possible to make Paris greens which can be ground very fine and will give a low figure for water soluble arsenious oxide and it is this class of greens that are desirable as insecticides.

The last column of the table on page 110 gives the amount of arsenious oxide which the copper present in the samples required. In 3 or 4 instances it will be noted that this amount is larger than the arsenious oxide actually found in the sample, showing that there was an excess of copper oxide present. As a rule, however, it is the arsenious oxide that is present in excess; so much so that in 3 of the samples which were examined under the microscope, a large amount of arsenious oxide was seen present in white crystals. See table on page 114.

FINENESS OF PARIS GREEN.

In the case of most insecticides, the smallest possible particle of poison would be a fatal dose to an insect. It is obvious then that the fineness of the Paris green is very important because not only the finer the green the better it will stay in suspension, but also the finer the green, the greater is the number of particles and hence, theoretically, the larger number of insects that may be killed with a definite weight of green. In some of the early

* Bul. 68, Bureau of Chem., U. S. Dept. Agr.

work by the Gypsy Moth Commission in Massachusetts it was found that the Paris greens upon the market were so coarse that even in the very destructive feeding of the gypsy moth, the particles were too large to be taken into the mouth of that insect and hence it could feed upon sprayed foliage with impunity. Finding that all of the greens on sale in Maine carried sufficient arsenic, an examination of some samples was made to determine the relative fineness. The results are given in the following table.

TABLE OF COMPARATIVE FINENESS OF PARIS GREENS.

Sta. No.	Make of Paris Green.	Particles counted.	Particles with diam. of 19.2 or more microns	Percentage of particles with diam. 19.2 or more microns.	Remarks.
N. J. 10	Adler	2345	16	0.68	
Me. 3324	Ansbacher	1039	58	5.58	
Me. 3416	Ansbacher	463	50	10.80	
Me. 3419	Ansbacher	664	48	7.23	
Conn. 18509	Barry	4537	14	0.31	
Me 3417.	Blanchard	544	16	2.94	
Me. 3418	Blanchard	597	8	1.34	
N. J. 29	Childs	1750	21	1.20	
N. J. 25	Devo-Raynolds	760	137	18.03	12.15% of particle counted in 15 fields As O crystals. 2 3
Me. 3421	Herrmann	845	34	4.02	
N. J. 8	Lavanburg	1668	51	3.06	
N. J. 18	Lavanburg	963	45	4.67	
Conn. 18508	Leggett	1617	21	1.30	
N. J. 2	Lucas	1078	58	5.38	
Conn. 18512	Pfeiffer	1014	58	5.72	
N. J. 5	Pfeiffer	2229	28	1.26	
N. J. 21	Pfeiffer	1202	94	7.82	
Me. 3323	Raynolds	641	21	3.28	5.96% of particles counted in 15 fields As O crystals. 2 3
Me. 3420	Raynolds	360	59	16.39	7.54% of particles counted in 15 fields As O crystals. 2 3
Conn. 18663	Sherwin-Williams	2196	26	1.18	Many small irregular particles.
N. J. 28	Sherwin-Williams	840	71	8.45	

Under the microscope it was found that the particles of Paris green were all quite regularly rounded and on this account were comparatively easy to measure. Several different kinds were examined and the largest particles in different fields were counted and notes made of the different diameters. It was found that the average diameter of about 250 of these large particles was 6.3 of the divisions in the micrometer eye piece used. In this work the best results were obtained by using a 1-inch micrometer eyepiece with a 1-6 objective and this combination was used throughout the determinations. On calibration it was found that 6 divisions of the micrometer scale equalled 19.2 microns, which has a value of .00077 of an inch. An examination of the green showed that there was a general gradation and that as a rule the larger the number of coarse particles, the coarser the whole green was. This was taken as the limit and all particles in the fields larger than 19.2 microns were counted. The greens were mounted in olive oil and examined without delay after mounting and 25 fields of these were counted and examined in each case.

RELATIVE FINENESS AND WATER SOLUBLE ARSENIC.

In the table which follows the relative fineness and percentages of water soluble arsenic in Maine collected samples are shown.

SUMMARY TABLE SHOWING RELATIVE FINENESS AND WATER SOLUBLE ARSENIC IN 4 BRANDS OF PARIS GREEN SOLD IN MAINE.

Station No.	Brand.	Year purchased.	Particles with diameter of 19.2 or more microns.	Water soluble arsenious oxide.
			Percent	Per cent
3324	Ansbacher	1906	5.6	2.32
3416	Ansbacher	1907	10.8	2.33
3419	Ansbacher	1907	7.2	3.55
3417	Blanchard	1907	2.9	3.55
3418	Blanchard	1907	1.3	4.17
3421	Herman	1907	4.0	3.92
3323	Raynolds	1906	3.3	7.49
3420	Raynolds	1907	16.4	7.96

There is no law in this State regulating the sale of Paris green but where a state inspection is in effect the requirements are generally very similar to those in the New Jersey law,* section 3 of which reads:

"Paris green, or any product analogous to it, when sold, offered or exposed for sale as such, in this State shall comply with the following requirements:

First. It shall contain arsenic, in combination with copper, equivalent to not less than fifty per centum arsenious oxide.

Second. It shall not contain arsenic in water-soluble forms equivalent to more than three and one-half per centum of arsenious oxide."

In the case of the Ansbacher and Raynolds greens, the samples obtained in 1907 were not as finely powdered as those of 1906. The large amount of water soluble arsenic as shown by both the microscope and by chemical analysis, as well as the relative coarseness of the particles make Raynold's greens the least desirable of the 4 brands found on sale in Maine. The reported cases of burning of foliage and failure to kill the potato bugs reported from some users of Raynolds green may perhaps be explained by these analyses. As noted above it is unlawful in the state of New Jersey to sell a Paris green carrying more than 3½ per cent water soluble arsenious oxide. Raynolds greens were found to carry more than double that amount.

HOW TO USE PARIS GREEN.

Paris green is more economically applied with water than any other way. It should always be applied with lime to diminish danger of injury to foliage. If green of good quality is used, one-half pound to 50 gallons of water is sufficiently strong if used just *before* slugs or caterpillars appear.

The following formulas for fungous enemies and insects which chew, are those that have been recommended by this Station for many years.

Formula 3. PARIS GREEN.

For insects that chew.

Paris Green	½ pound
Lime (unslaked)	3 pounds
Water	50 gallons

* Bul. 205, N. J. Station.

The standard remedy for the destruction of insects which eat the foliage or fruit. The lime is added to prevent the Paris green from burning the foliage. Slake the lime in a little water, make into a thin paste and strain. Wet the Paris green with a little water and make into a thin paste. Mix the lime and Paris green and add the remainder of the water.

Formula 6. BORDEAUX MIXTURE.

For potato blight and other fungous diseases.

Copper Sulphate	5 pounds
Fresh Lime (unslaked)	5 pounds
Water	50 gallons

The copper salt is dissolved in a wooden tub or earthern jar and the lime slaked in a separate vessel. Dissolve the copper sulphate ("Blue Stone") in about two gallons of hot water in a wooden or earthern vessel by stirring, or by suspending it from the top of the vessel in a cloth bag; pour the solution into the tank or barrel used for spraying and fill one-third to one-half full of water. Slake the lime by the addition of a small quantity of water, and when slaked add 10 or 15 gallons of water and stir freely. Pour the milk of lime thus made into the sulphate solution, passing it through a brass wire strainer of about 30 meshes to the inch (No. 50) or through cheese-cloth backed by common window screen. Stir constantly while adding the lime. Add water to make the amount desired.

Much time may be saved by preparing stock solutions. While other proportions may be used, the following is a convenient method of preparing the mixture:

The stock solution of copper sulphate is made by weighing out 50 pounds of copper sulphate, placing it in a bag and suspending it in the top of a barrel containing 30 gallons of water. The copper sulphate dissolves completely in a few hours. The stock solution of the lime is prepared by slaking 50 pounds of lime, and adding water so as to make up 30 gallons and straining through No. 50 brass screen cloth. To slake and strain this amount of lime takes less than one-half hour. For use, 3 gallons of each solution and 44 gallons of water make up the formula given above. The stock solutions should be kept well covered and be *thoroughly stirred before dipping out.*

Prepared lime for Bordeaux mixture is offered by some dealers. This if *strictly fresh* may be substituted for the unslaked lime and thus some time and trouble saved. "Pine Cone" brand is the only one yet tried at this Station. It will be found safe to use 6 or 7 pounds of prepared lime in place of the 5 pounds of quick lime.

Formula 7. PARIS GREEN AND BORDEAUX MIXTURE.

A combination of formulas 3 and 6.

Paris Green ..... ½ pound
Bordeaux Mixture ..... 50 gallons

PREPARED BORDEAUX MIXTURE.

CHAS. D. WOODS and H. H. HANSON.

For many years prepared Bordeaux mixtures both wet and dry have been on the market. As considerable dry mixtures were used in Maine in 1907 and the question of ready to use wet mixtures seemed to be more to the front than for several years, samples of the principal mixtures were obtained and analyzed for their copper content. The results are given in the table which follows.

TABLE SHOWING PERCENTAGES OF COPPER SULPHATE IN PREPARED BORDEAUX MIXTURES.

Station No.	Brand	Copper sulphate*
	Dry Preparations	Per cent
3412	Leggetts Dry Bordeaux (Fungiroid) (1)	51.5
3423	Leggetts Dry Blight Dust No. 2 (1)	26.9
3424	Leggetts Dry Blight Dust No. 2 (1)	28.1
3425	Bowker's Boxal (2)	42.0
3427	Sal Bordeaux (3)	37.9
	Wet Preparations	
3426	Bowker's Wet Bordeaux (2)	7.9
3415	Bowker's Paste Boxal (2)	21.6
3413	Blanchard's Lion Brand Bordeaux Mixture (4)	17.5
3414	Swift's Bordeaux Mixture (5)	76.5

(1) Made by Leggett & Bro., New York..

(2) Made by Bowker Insecticide Co., Boston.

(3) Made by Dust Sprayer Manufacturing Co., Kansas City, Mo.

(4) Made by James A. Blanchard, New York City.

(5) Made by Merrimac Chemical Co., Boston.

*Crystalized copper sulphate carrying 5 molecules of water.

THE EFFECTIVENESS OF PREPARED BORDEAUX MIXTURES, WET AND DRY COMPARED WITH FRESHLY PREPARED.

Wet read-to-use Bordeaux mixtures were compared with freshly prepared Bordeaux mixtures by the Station in 1900 * with the result that when these mixtures were used according to directions, the results were not as effective as the freshly prepared Bordeaux mixture. This was probably due to the fact that when the directions are followed, a much smaller amount of copper is used per acre than in the freshly prepared Bordeaux.

In one instance in 1900 a ready prepared Bordeaux mixture was used in sufficient quantity to furnish as much copper as is carried by ordinary Bordeaux mixture.

The results of the experiments indicated that ready prepared Bordeaux mixtures were about as effective as freshly made goods *provided they were used in such amounts as to supply an equal amount of copper.*

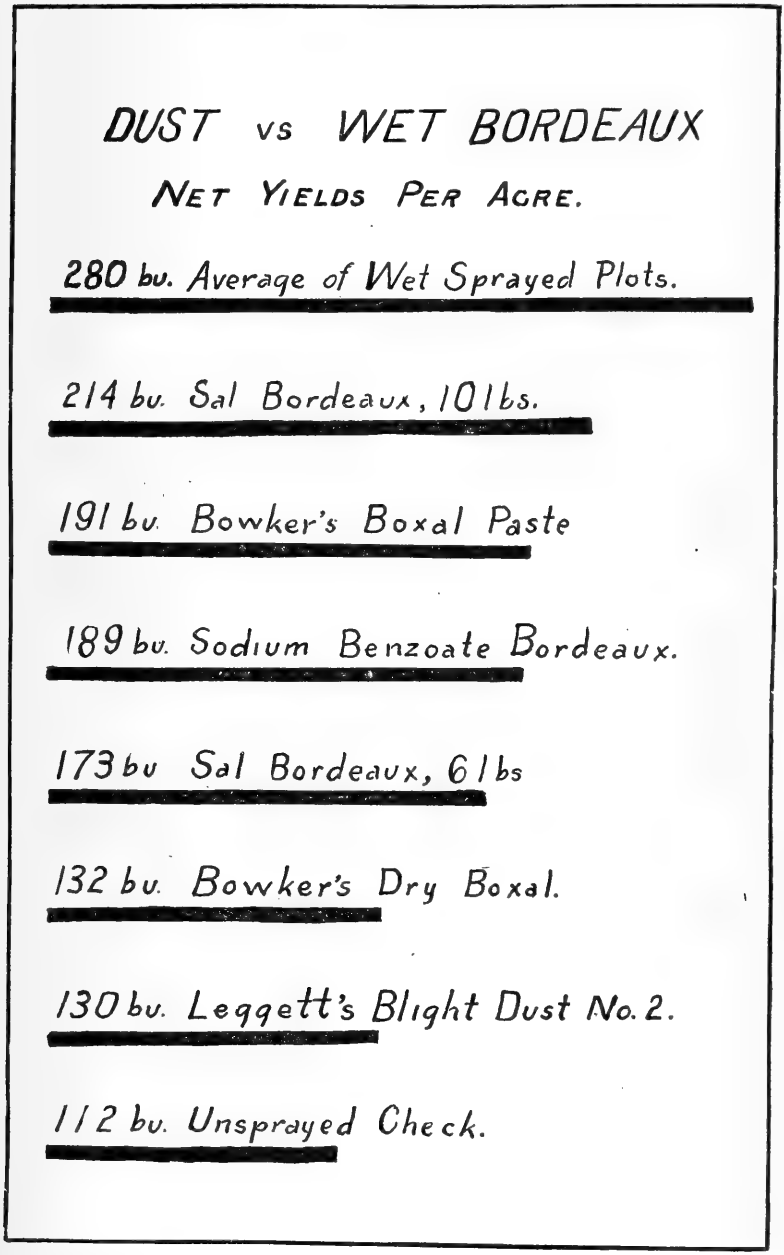
In 1907, a field experiment was made on quite a large scale the primary object of which was to compare dust spraying with wet Bordeaux. However one ready prepared wet Bordeaux (Boxal) was used. The results are reported in detail in Bulletin 149 of this Station and are shown graphically on the opposite page.

So far as the results of the 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.

---

* Bulletin 73, Maine Station.

DIAGRAM SHOWING RESULTS OF A FIELD EXPERIMENT IN 1907.



These experiments indicate that wet ready-to-use Bordeaux mixture cannot be depended upon to prevent blight unless used in quantities much larger than the directions call for and that dry Bordeaux mixtures are not nearly as effective as wet Bordeaux.

COPPER CONTENT OF PREPARED COMPARED WITH REGULAR BORDEAUX MIXTURE.

As may be noted in the table on page 120 prepared wet Bordeaux mixtures differ greatly in the amount of copper they carry. Even if they are equally efficient, in comparing their cost with that of freshly prepared Bordeaux mixture, the amount of copper carried must be taken into account. The following table shows the number of pounds of each that needs to be taken to furnish an amount of copper equivalent to that furnished by a barrel of Bordeaux mixture made up from 5 pounds of copper sulphate, 5 pounds of lime and 50 gallons of water.

TABLE SHOWING POUNDS OF DIFFERENT PREPARED BORDEAUX MIXTURES EQUIVALENT TO A BORDEAUX MIXTURE CARRYING 5 POUNDS COPPER SULPHATE.

Brand.	Pounds equal to 5 pounds copper sulphate.
Dry Preparations.	
Leggetts Dry Bordeaux (Fungiroid)	9.7
Leggetts Blight Dust No. 2	18.2
Bowker's Dry Boxal	11.9
Sal Bordeaux	13.2
Wet Preparations.	
Bowker's Wet Bordeaux	63.3
Bowker's Paste Boxal	23.1
Blanchard's Lion Brand Bordeaux	28.2
Swift's Bordeaux Mixture	6.5

MONEY VALUE PER POUND OF PREPARED COMPARED WITH REGULAR BORDEAUX MIXTURE.

The cost of preparing fresh Bordeaux mixture in 10 barrel lots does not exceed 75 cents a barrel, taking cost of materials and time of preparation into account, and it can probably be

made for not much if any more than 50 cents. The table which follows shows the price per pound one could afford to pay for the ready made goods, assuming that freshly prepared Bordeaux mixture carrying 5 pounds lime, and 5 pounds of copper sulphate costs either 50 or 75 cents a barrel. This would of course, if all the cost of materials and preparation is thrown upon the copper, make a pound of copper sulphate in freshly prepared Bordeaux mixture equal 10 cents in one instance and 15 cents in the other.

TABLE SHOWING VALUE PER POUND OF PREPARED BORDEAUX MIXTURES COMPARED WITH FRESHLY PREPARED BORDEAUX MIXTURE AT 50 AND AT 75 CENTS A BARREL.

Brand.	Value per pound at 50 cents a barrel.	Value per pound at 75 cents a barrel.
	CENTS.	CENTS.
Bowker's Wet Bordeaux	0.8	1.2
Bowker's Paste Boxal	2.2*	3.2*
Blanchard's Lion Brand Bordeaux	1.7	2.6
Swifts' Bordeaux Mixture	7.7	11.5

*This preparation carries an insecticide which adds to its value.

Bulletin 73 of this Station contains the following relative to the use and cost of Bordeaux mixture.

"The claim is justly made by the manufacturers that the prepared Bordeaux mixtures are ready for use, since they only need to be diluted with the requisite amount of water. If one is using much Bordeaux mixture this is of little practical importance; for by using stock solutions freshly prepared Bordeaux mixture (with allowance for time of preparing stock solution) can be as quickly prepared as the ready made goods can be stirred up and diluted."

"The materials for making a barrel (50 gallons) of Bordeaux mixture costs between 40 and 50 cents. The prepared goods *of this strength* are practically as good as the freshly prepared. The small grower will probably find the ready made goods enough more convenient to justify a somewhat higher cost. The large grower should not with present prices pay much more than at the rate of 50 cents for

enough material to make a barrel of the mixture. The trouble of preparing the mixture from lime and sulphate of copper is slight. Enough lime to make 10 barrels of the mixture was weighed out, slacked and strained by the writer in 23 minutes. Making the copper sulphate solution takes practically no labor, although it will be several hours after it is suspended in the water before it will be all dissolved."

It is true today as when the above was written that the large grower rarely, if ever, can afford to purchase prepared wet Bordeaux mixtures at any price at which they have been or can be offered. It is also true that, to say the least, freshly prepared Bordeaux mixture is in fully as good form to serve as a fungicide as old mixture. It apparently adheres to foliage better than old. There seems, therefore, to be little or no reason for the large grower to use ready made wet Bordeaux mixture. The experiments conducted at this Station clearly indicate the unwisdom of dust spraying for potatoes. Until some marked advance shall have been made in the preparation of commercial Bordeaux mixtures, wet or dry, they do not seem to fit in to the economical and effective combatting of the fungous diseases of the potatoes.

BULLETIN No. 155

ORCHARD NOTES, 1907.

W. M. Munson.

In Bulletin 139 of this Station records of the Station work in Kennebec County orchards were brought down to date, and suggestions were made as to further investigations. The almost unprecedented winter of 1906-7, however, with its destructive effects upon the orchards, was followed by the removal of the writer, who has been in charge of the work from its inception, to a distant state. This combination of circumstances brings to an inevitable close a work which has been full of interest and which promised much for the future of Maine orcharding. Though many trees were killed outright, and others seriously and permanently injured, by the effects of the winter of 1906-7, there was a fair crop of fruit in most sections of the state, and never in the history of the Station work has the fruit been larger or fairer than it was in 1907. Records of the season were made, as in former years, and a general summary of the investigations is presented in the present bulletin.

Studies of physiological and practical problems in orchard pruning were inaugurated, and will be continued, though in another state. The general principles involved are the same, whether the details be worked out is Maine or in California; and the lessons taught, if of any value, should be as applicable in the management of Maine orchards as elsewhere.

CULTURE AND FERTILIZATION—A SUMMARY.*

At the end of ten years, a remarkable change is presented in the condition and appearance of the two lots of trees discussed under the above heading in several bulletins of this Station. Unfortunately the Gravensteins included in the study, like all trees of this variety, proved unreliable as to hardiness, and many of them have been lost. The Tolmans, however, have made a very satisfactory growth and at present form the basis of a vigorous, productive orchard, just in its prime.

---

* For previous discussions of this subject see Bulletins of this Station as follows: 89, pp. 1-12; 122 pp. 182-190; and 139, pp. 51-52.

In 1898 a young Tolman and Gravenstein orchard of 80 trees, planted 8 to 10 years, was selected as the basis of operations. This orchard, located on the farm of Charles S. Pope, in Kennebec county, is situated on a high, rocky, sandy hillside, with an eastern exposure. While not an ideal situation, it represented fair average conditions, and the trees were just beside a large Baldwin orchard, which had been planted under similar circumstances. The land was used as a pasture, and had never been plowed. During the first 10 years, or until the Station work was begun, no special attention was paid the young trees, except to keep out borers and give an occasional mulching.

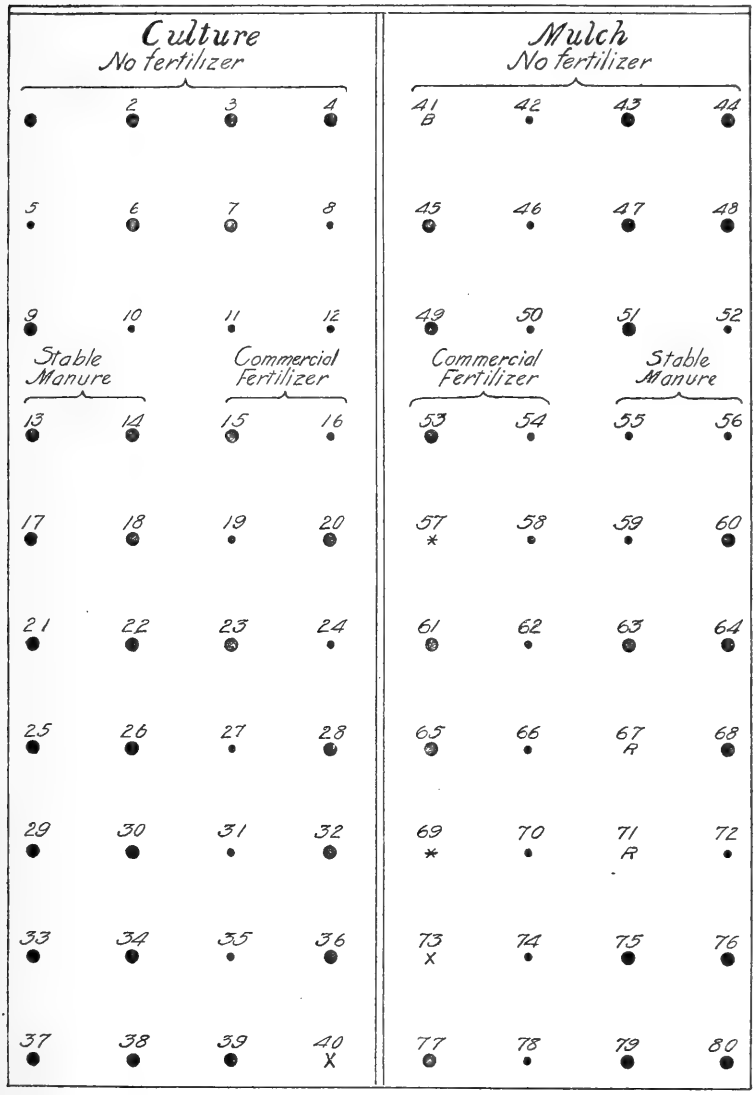
Subsequent treatment was, in brief, as follows:† In May, 1898, the whole area was given steamed bone at the rate of 500 pounds per acre. One half of the land, containing 40 trees, was then plowed and thoroughly harrowed; while the other half was mulched, partly with sawdust and partly with stable manure. On each plat thus made, 12 trees were left without an application of fertilizer. One-half of the remaining trees of each plat were given stable manure, and the other half a complete commercial fertilizer. In other words, on an area of approximately 2 acres, involving 80 trees, of 2 varieties,—Tolman and Gravenstein—the following distinct questions were under consideration: (1) a comparison of culture and mulching as a practicable treatment for young orchards. (2) Is an application of fertilizer necessary or desirable when trees are planted in virgin pasture lands. (3) The relative merits of stable manure and commercial fertilizers as sources of plant food for young orchards. Certain broader scientific problems, involving questions of plant physiology, must of necessity be omitted from this discussion because of incomplete data.

Exact figures are given in the accompanying tables, pages 128 and 129 compiled from field notes taken each year. These show the annual growth during a period of five years, since the trees commenced bearing, and the present condition of the several trees under observation. For previous records of condition and behavior, see Bulletin 89 of this Station, pages 5 and 6, and

† For detailed statements as to treatment, with diagrams, see Bulletin 89 of this Station, pp. 2-4; and Bulletin 122, p. 184. Treatment in 1906 and 1907, same as in 1905.

Bulletin 122, pages 185 and 186. The diagram of the orchard, published in Bulletin 89, is reprinted herewith, to give a clearer idea of the arrangement and relative position of the several plats and individual trees.

DIAGRAM OF THE ORCHARD, (From Bulletin 89).



Explanation of Diagram: The significance of the figures in the above diagram is as follows; ● = trees bearing in 1902; • =trees not bearing in 1902; X=vacancy; *=Bellflower tree; R=Roxbury Russet; B=Ben Davis.

Numbers 1-12 and 41-52, inclusive, have received no fertilizer of any kind during the 10 years. The first mentioned trees were cultivated, however, while the others were mulched, as shown in the diagram. Numbers 13-24 and 53-64, respectively, are Tolman. The remainder are Gravenstein, except as noted, and numbers 42, 46, 50, 66, 70, 74 and 78, which are Tolman.

Taking the orchard as a whole, there has been an average annual growth of from 4½ to 7 inches. The unfertilized

Annual Growth of Trees in Cultivated Area.

Number of tree.	Growth in inches.*					Average growth in inches for five years.	Condition of trees spring of 1907.†
	1902.	1903.	1904.	1905.	1906.		
1	6- 8	4- 6	4-6	3- 4	2- 4	4- 6	Standing still. Not recovered from injury of 1904-5.
2	6- 8	3- 5	1-2	0	0	2- 3	Practically dead; few blossoms.
3	8-10	5- 7	2-3	2- 4	1- 3	4- 6	Weak; few blossoms.
4	6- 8	5- 7	3-5	3- 6	2- 4	4- 6	Checked by cold, 1906-7.
5	8-10	6- 8	4-6	6- 8	4- 6	6- 8	Partly recovered from injury of 1904-5.
6	4- 6	1- 2	0	0	....	1- 2	Dead.
7	8-10	3- 4	3-4	1- 3	0	3- 4	Dying; few blossoms.
8	10-14	10-12	5-6	8-10	5- 7	8-10	Good condition; vigorous.
9	8-10	4- 6	3-6	3- 6	2- 4	4- 6	Weak.
10	10-12	6- 8	6-8	8-10	4- 6	7- 9	Good strong tree.
11	6- 8	4- 6	2-4	2- 4	3- 5	3- 5	Defective stock; failing.
12	10-12	7- 9	5-7	5- 7	6- 8	7- 9	Good type of tree.
13	8-10	4- 6	4-6	3- 4	4- 6	5- 6	Injured by mice 1906-7.
14	8-10	8-10	5-6	7- 9	8-10	7- 9	Fine tree; productive; vigorous.
15	8-10	5- 7	1-2	6- 8	3- 5	5- 6	Good condition.
16	4- 5	8-10	7-9	7- 9	3- 5	6- 8	Good condition.
17	8-10	6- 8	4-6	6- 8	4- 6	6- 8	Good condition.
18	6- 8	10-12	7	9-10	4- 6	7- 9	Vigorous; productive.
19	6- 8	4- 6	2-3	0	2- 4	3- 4	Injured at base; defective stock.
20	8-10	10-12	3-4	5- 8	4- 6	6- 8	Good condition.
21	10-12	6- 8	6-7	8-12	5- 7	7- 9	Fine type of tree and fruit.
22	0	.....	.....	.....	6	.....	Young tree set 1906.
23	10-12	10-12	4-6	8-10	6- 8	8-10	Very strong and vigorous.
24	6	10-12	2-3	4- 6	5- 7	5- 7	Good tree.
25	6- 7	4- 6	6-8	8-10	4- 6	6- 7	Good condition.
26	6- 8	5- 7	4-5	6- 8	4- 6	5- 7	Fair condition; injured by mice, 1906-7.
27	12	7- 9	4-5	1- 3	1- 3	5- 6	Nearly dead.
28	4- 6	6- 8	2-4	1- 3	3- 5	3- 5	Weak.
29	6- 8	4- 6	3-6	4- 6	5- 7	4- 6	Good condition.
30	6- 8	3- 5	.....	0	.....	.....	Vacant.
31	10	8-10	3-6	4- 6	4- 6	6- 8	Nearly dead; defective trunk.
32	12	6- 8	4- 6	5- 7	8-10	7- 9	Part of tree dying.
33	8	3- 5	5-7	1- 3	4- 6	4- 6	Good condition.
34	10	8-10	3-6	1- 3	6- 8	6- 7	Half of tree dead.
35	6- 8	5- 7	3	6- 8	0	4- 5	Dying; full bloom.
36	8	5- 7	4-6	8-10	4- 6	6- 7	Doing well.
37	6- 8	6- 8	6	6- 8	6- 8	6- 8	Doing well.
38	7- 8	4- 6	4-6	3- 5	5- 7	5- 6	Doing well.
39	8	6- 8	5-7	6- 8	6- 8	6- 8	Good condition.
40	.....	.....	.....	.....	.....	.....	Young tree, 1906; girdled by mice 1906-7; cions set in stub, 1907.

*Fractions less than one-half are disregarded.

†For previous records see Bulletin 89 of this station, p. 5, and Bulletin 122, p. 185, 186.

trees, in general, have made less growth than the fertilized trees, and the uncultivated than the cultivated. As noted in the last report of this work, however:* "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 noted in this respect in the relative effects of stable manure and commercial fertilizers." Another season's observations, following one of the most severe

Annual Growth of Trees in Mulched Area.

Number of tree.	Growth in inches.*					Average growth in inches for five years.	Condition of trees, Spring of 1907.
	1902.	1903.	1904.	1905.	1906.		
41	8–10	8–10	4–6	8–10	4 ft	.....	*Ben Davis.* Top-worked to Rome Beauty, 1906. Injured by cold 1906-7.
42	4– 6	5– 7	5–7	2– 4	4– 6	4– 6	Injured by cold, 1906-7.
43	4– 6	3– 5	3–5	2– 4	2– 3	3– 5	Injured by cold 1906-7.
44	6– 8	6– 8	4–6	5– 7	4– 6	5– 7	Injured by cold, 1906-7.
45	8–10	5– 7	3–5	1– 3	3– 5	4– 6	Top dying; injured by cold, 1906-7.
46	2– 4	4– 6	3–5	2– 4	3– 6	3– 5	Good condition.
47	4– 6	4– 6	3–5	2– 4	4– 6	4– 6	Fairly good tree.
48	3– 6	3– 5	4–5	1– 3	3– 5	3– 5	Moderately vigorous.
49	8–10	5– 7	5–6	4– 6	3– 6	5– 7	Good condition.
50	2– 3	1– 3	2–3	1– 3	2– 4	2– 3	Injured by borers.
51	6– 8	5– 7	4–7	2– 3	3– 5	4– 6	Good condition.
52	2– 3	1– 3	3–5	1– 3	3– 5	2– 4	Half of top weak.
53	6– 8	6– 8	1–3	4– 6	4– 6	4– 6	Good condition.
54	3– 5	4– 6	2–3	1– 3	5– 7	3– 5	Doing well.
55	4– 6	6– 8	3–4	4– 6	4– 6	4– 6	Good tree.
56	8–10	8-10	4–6	6– 8	4– 6	6– 8	Good tree.
57	10–12	7– 9	3–5	6– 8	10–12	7– 9	Bellflower. Fine tree; productive; good fruit.
58	5– 6	7– 9	5–7	3– 5	6– 8	5– 7	Doing well.
59	4– 6	8–10	6–8	3– 5	5– 7	5– 7	Good condition.
60	5– 6	5– 7	3–5	4– 6	3– 5	4– 6	Good condition.
61	6– 8	7– 9	4–6	3– 5	4– 6	5– 7	Moderately vigorous.
62	4– 6	6– 8	3–5	4– 6	3– 5	4– 6	Doing well.
63	8–10	8–10	4–6	4– 6	3– 5	5– 7	Noticeably good tree.
64	10–12	10–12	5–7	4– 6	4– 6	7– 9	Noticeably good tree.
65	10–12	3– 5	3–5	3– 6	4– 6	4– 7	Top dying.
66	2– 4	4– 6	1–3	1– 3	2– 3	2– 4	Weak.
67	10–12	8–10	4–6	6– 8	6– 8	7– 9	*Roxbury Russet.* Top-worked to *Rolfe*, 1906.
68	8–10	8–10	6–8	5– 7	3– 5	6– 8	Injured by cold, 1906-7.
69	12–14	8–10	4–6	6– 8	6– 8	7– 9	*Bellflower.* Very vigorous.
70	8	7– 9	3–5	8–10	3– 5	6– 7	Good condition.
71	5– 7	5– 7	1–2	5– 7	4– 6	4– 6	*Roxbury Russet.*
72	6– 8	6– 8	5–7	6– 8	6– 8	6– 8	Hurt by winter, 1906-7
73	.....	.....	.....	.....	.....	.....	Young tree, 1906; vigorous.
74	1– 3	5– 7	1–2	1– 3	2– 3	2– 4	Good condition.
75	6	6– 8	5–7	8–10	4– 6	6– 7	Good tree.
76	6– 8	6– 8	6–8	6– 8	5– 7	6– 8	Doing well.
77	10–12	6– 8	2–3	4– 6	1– 3	5– 6	Nearly dead.
78	4– 6	5– 7	3–5	6– 8	3– 5	4– 6	Good condition.
79	8–10	7– 9	5–7	8–10	4– 6	6– 8	Injured by cold, 1906-7.
80	8–10	7– 9	6–8	8–10	5– 7	7– 9	Injured by cold, 1906-7.

*Fractions less than one-half are disregarded.

* Bulletin 139 of this Station, p. 51.

winters in the history of Maine orcharding, confirms this statement, which is further emphasized by reference to the column of "Remarks" in the table. At the present time most of the Gravenstein trees on the cultivated area, and several of the mulched trees, are dead or dying. The Tolmans are nearly all in prime condition and bore an extra heavy crop of fruit in 1907.

The unfertilized trees show clearly that, on this soil, at least, additional plant food is an absolute necessity. While the rotting turf sets free a considerable amount of plant food when culture or mulch is first given, this material is soon exhausted and the trees assume the yellow, stunted appearance which is only too familiar. On the cultivated plat nearly all of the unfertilized trees were killed or seriously injured by the cold of the last winter. The mulched trees, while severely injured, suffered to a less marked extent than did the others. While at first glance this may seem an argument against the cultivation of trees, it would have no weight in the management of hardy varieties, and, as shown in previous reports, the cultivated trees live faster and produce more, during their life time than do the others.

Relative Yield of Fruit.

In 1902, the first bearing year of this young orchard, the following results, irrespective of fertilizers, were obtained: *

"Gravenstein—cultivated, 19 bearing trees, averaging .72 bbl. per tree; mulched, 14 bearing trees, averaging .59 bbl. per tree.

"Tolman—cultivated, 9 bearing trees, averaging .44 bbl. per tree; mulched, 6 bearing trees, averaging .50 bbl. per tree."

In the case of Gravenstein there was a decided difference, both in number of bearing trees and in average yield per tree, in favor of cultivation. With Tolman the number of bearing trees was greater by one-half on the cultivated area, but the average yield was slightly less.

Essentially the same results were obtained during the next two years. In 1904, the cultivated plat yielded,† "an average of 1.7 bushels per tree; while the mulched area, for the same number of trees, gave an average of 2 bushels per tree."

---

* Bulletin 122 of this Station, p. 188.

† *Ibid,* p. 189.

In 1905, the cultivated Tolman trees gave an average of 4 bushels per tree, while the mulched trees yielded but 2.8 bushels

In 1906, when the season was excessively dry during the late summer and fall, the difference between culture and mulch was * "about as 1 to 2½ 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 (one-half bushel) 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 1½ baskets the other 10 baskets." There is little doubt that the relatively late harvesting of the Tolmans, in connection with the dry fall, had much to do with the recorded yield.

In 1907, the largest crop in the history of the orchard was produced. As in the previous year, the mulched Tolmans gave better returns than did the cultivated trees; and the general health and vigor of the trees seemed about the same in each case. Unfortunately, in the absence of the writer, some thinning of the overloaded trees was done in this orchard, and this may vitiate the yield record for this year.

In general, the behavior of the several Tolman trees since coming into bearing is indicated by the table. The Gravensteins are omitted because of the great irregularity caused by destructive weather conditions.

From the table it will be seen that there is a marked individuality in the bearing habit of the several trees, *e. g.*, numbers 14 and 21, cultivated, and 53, 56, 58 and 61, mulched, may be characterized as heavy bearers. Numbers 16 and 24, cultivated, and 54, mulched, are noticeably light yielders. Numbers 13, 15, and 19, cultivated, and 55, 56, 58, 59, 60 and 63, mulched, bear regularly; while 16, 18, 20 and 23, cultivated, and 53, 60 and 64, mulched, are alternate in bearing habit.

---

* Bulletin 139 of this Station, p. 52.

As noted in the last report,* there is an apparent advantage from the use of stable manure, rather than that of "chemicals." This advantage, however, is not sufficient to warrant the extra expense incident to hauling the manure for long distances over rough roads. The supply of humus, wherein lies the chief advantage of the manure, may be more cheaply applied in the form of straw or meadow hay; or, on cultivated lands, in the form of green manures and cover crops. The same amount of plant food as is contained in a given amount of manure may, in many cases, be obtained and applied more economically in the form of concentrated fertilizers. Where stable manure is readily obtainable, however, and need not be hauled long dis-

Cultivation vs. Mulch—Annual Yields.

Number of trees.	1902.	1903.*	1904.	1905.	1906.	1907†	Remarks.
			CULTIVATED.				
			Bush.	Bush.	Bush.	Bush.	
13 Good			3.0	2.0	1.3	0.0	Injured by mice, 1906-7.
14 Good			2.8	6.5	2.0	8.8	
15 Small			1.0	2.4	2.0	2.0	
16			0.5	1.9	.3	2.0	
17 Medium			1.8	4.0	1.0	5.1	
18 Medium			2.0	7.0	.3	7.0	
19 Small			1.2	2.5	2.3	3.0	
20 Small			.5	4.8	0.0	3.4	
21 Full			4.0	5.0	2.5	7.0	Extra; both tree and fruit.
22 Full			.....	.....	.....	.....	Dead. Replaced in 1906.
23 Small			1.3	7.6	0.0	7.8	
24 Small			.3	.0	.3	5.5	
Total			18.4	43.7	12.0	51.6	
			MULCHED.				
53 Small			.8	4.5	3.3	8.2	
54			.0	0.0	0.0	2.5	
55			1.2	2.5	1.8	5.5	
56			3.0	4.2	2.8	9.5	
57 Small			Full	Medium	.....	.....	Bellflower.
58			5.0	2.5	7.5	8.8	
59			1.8	1.7	2.4	5.5	
60 Medium			1.8	3.0	.3	7.0	
61 Medium			2.6	2.2	6.8	9.0	
62			1.0	3.2	1.8	8.5	
63 Small			3.5	3.2	3.6	7.8	
64 Small			1.3	4.0	.8	10.	
Total			22.0	31.0	31.1	82.3	

*By an accident the records of 1903 were rendered useless and are omitted. There was a fair crop on most of the trees.

†The accuracy of the figures for 1907 is a little doubtful because of thinning. See text.

* Bulletin 139 of this Station, p. 52.

tances, or over rough roads, there is nothing better for use in the average Maine orchard.

THE POTASH ORCHARD.

Observations concerning the effects of different salts of potash upon the growth and behavior of apple trees have been continued.* Several of the trees injured by the winter of 1904-5 are forming new tops, and in some instances the "water sprouts" which were developed as a result of this injury, and subsequent severe pruning, bore fruit in 1907. The fact that a new head may profitably be formed on trees which are partially winter-killed is thus practically demonstrated.

In 1906-7, some of the trees in this orchard were again severely injured by the cold winter. Such trees as escaped, however, bore a full crop of extra fine fruit. The treatment of the orchard this year was similar to that in preceding years, and the effect of high culture and abundant plant food was very apparent in the size and character of the fruit. In 1907, 100 pounds of nitrate of soda and 200 pounds of acid phosphate were applied broadcast over the whole orchard. Fifty pounds of each of the potash salts, muriate, sulphate, and kainit, were applied to the several plats; instead of 70 pounds as in former years.

No report upon the physiological and chemical studies projected in connection with this work can be made. In behavior of tree, and in gross character of fruit, however, no specific effect of any particular potash salt can be observed. It may be that on some soils, and in certain conbinations, the particular form of potash used is of importance; but in no case, so far as the work of the Station has gone, does the significance of this factor appear.

ORCHARD RENOVATION.

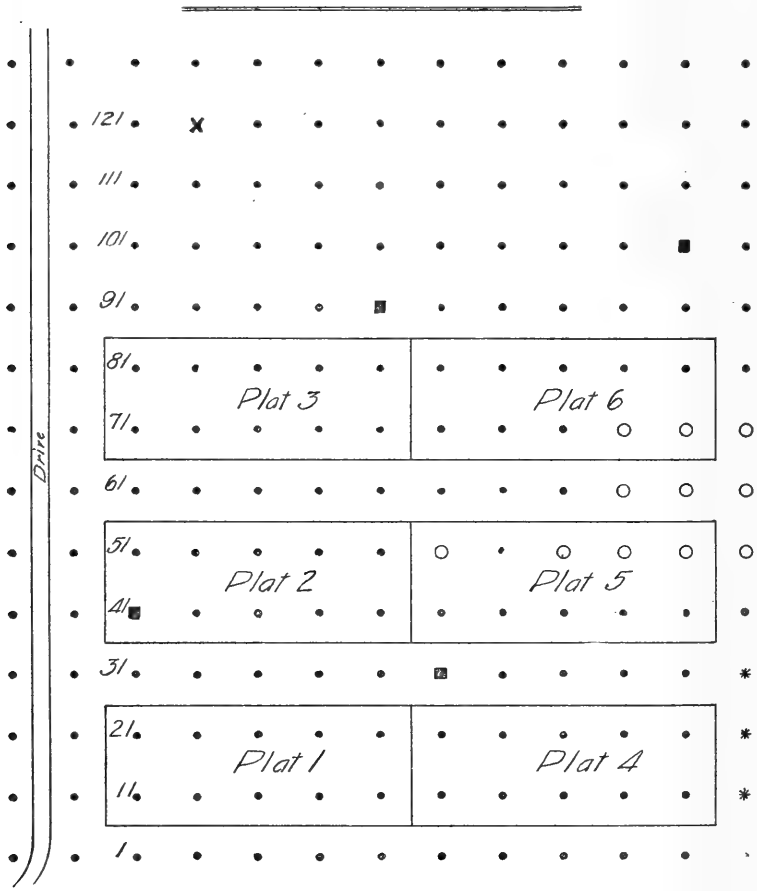
The work of "orchard renovation" was carried on as in previous years,† during the past season, and, as demonstrating possibilities in this direction, may be regarded as completed. The same may be said as to the fertilizer requirements of this par-

* For previous references to this work see Bulletin 89 of this Station, pp. 12-18; and Bulletin 122, p. 190.

† See Bulletin 89 of this Station, p. 18; Bulletin 122, p. 190; Bulletin 139, p. 53.

ticular orchard. As a field for studies in variation, however, the work is but just begun. Some interesting individual variations have been under observation for some time, and will be used in further investigations.

ORCHARD RENOVATION.—DIAGRAM OF THE ORCHARD.*



The accompanying table of annual yields (pages 137 and 138), gives the actual performance of the individual trees, during the past five years. The actual yield, in barrels, from 78 trees, not counting Gravensteins, vacancies, or the 10 trees in the outside row, for the several years is as follows:

* From Bulletin 89, of this Station, p. 20.

In spite of the injury wrought to many of the trees by the severity of the past winter, a full crop of very fine fruit was produced. A record of the yield is given in the accompanying table of annual yields.

The results of another season's observations but confirm the conclusions drawn last year,† viz.: "The effect of 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 differences 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 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 the soil, this is the poorest corner of the orchard."

The work in this orchard has clearly shown that it is wholly practicable to take an old, unprofitable, rapidly degenerating apple orchard and, in spite of three unusually severe winters, at close intervals, (1) to bring that orchard into a profitable bearing condition; (2) to force Baldwin trees, by proper feeding, to produce fruit every year, instead of on alternate years; (3) to produce profitable crops of fruit by the aid of "chemicals" only, in connection with intelligent culture, pruning and spraying. It has further been shown, (4) that upon the particular soil involved, all expenditures for fertilizers, unless these fertilizers contain some nitrogen, is an absolute waste of money; (5) that, apparently, the excessive use of nitrogen, in the absence of potash or phosphoric acid, or both, is distinctly injurious to the fruit; and (6) as a corollary to the other points, that the best results are obtained from a complete, well balanced fertilizer, rather than from an excessive use of any one element.

---

† Bulletin 139 of this Station, p. 53.

Annual Yield, in Barrels, Renovation Orchard.

Year	1903	1904	1905	1906	1907
Total yield	162	228	112	49	120
Average per tree	2.1	2.9	1.4	.6	1.5

These figures, in the face of two unusually severe winters, which wrought much damage to these trees, as well as to others all over the State, require no comment in connection with the question of the practicability of rejuvenating the orchards of Maine. The yield is not large, not as large as it should be, but it must be remembered that only 10 trees out of the lot received the treatment which has been recommended, and demonstrated, as best; while 26 of the trees were in the check rows between the plats.

As between the 10 trees receiving complete fertilizer (Plat I) and the adjoining check trees, which were in every way comparable, the following figures, showing the average yield per tree each year, are significant. Naturally, however, the check trees, being so close to the others, received some benefit from the fertilizer applied, and do not fairly represent the conditions in an untreated orchard.

Average Annual Yield of Fertilized and Unfertilized Trees.

Year	1903	1904	1905	1906	1907
Fertilized trees	bbls. 3.9	bbls. 2.6	bbls. 2.6	bbls. .9	bbls. 2.4
Unfertilized (check) trees	2.6	3.6	1.1	1.0	1.3

Orchard Renovation—Annual Yield.

Plat and number of tree.	Yield per Tree, in Barrels.					Remarks.
	1903.	1904.	1905.	1906.	1907.	
Plat I. Tree No.						
11	4.5	1.0	2.8	0.0	2.0	
12	3.5	0.0	2.6	0.0	2.2*	*Extra good fruit, 1907.
13	3.5	3.3	2.4	0.0	3.3	
14	2.0	3.0	3.4	.2	3.0	
15	6.5	1.7	3.0	0.0	3.3	
21	3.0	2.8	1.9	1.4	1.8	
22	3.0	6.0	1.0	3.8	1.1	
23	4.0	1.6	3.2*	0.0	2.6*	*Extra good fruit, 1905, and 1907; not well colored in 1907.
24	.5	3.0	.6	2.4	0.0	
25	8.5	4.0*	4.8*	0.8*	4.2	*Extra good fruit. Tree injured by cold, 1906–7.
Check Row Tree No.						
31	3.5	6.1	.1	2.8	.9	Tree injured by cold, 1906–7.
32	5.0	3.9	2.1	2.2	1.8	Fruit small in size
33	1.5	2.0*	2.1	0.0	2.5	*Extra good type.
34	1.5	4.2	0.0	0.0	.3	Injured, 1904-5. New top forming.
35	1.5	1.7*	1.5	0.0	1.1*	*Extra good type.
Plat II. Tree No.						
41	.....	.....	.....	.....	.....	Vacant.
42	3.0	8.7	0.0	0.0	1.4	Nearly killed, winter of 1904-5, Recovering.
43	0.0	2.5	0.0	1.0	1.3	
44	3.5	4.1	0.0	0.8	1.0	Badly injured by cold, 1906-7.
45	1.0	5.4	1.2	0.0	1.8	Badly injured by cold, 1906-7.
51	4.5	5.9*	2.4*	1.4*	2.1	*Extra good type of fruit. Injured, 1906-7.
52	1.0	3.4	0.0	0.0	.3	Injured by cold, 1906-7.
53	5.0	2.7*	3.3	0.0	2.1	*Extra good type. Injured by cold, 1906-7.
54	.5	4.7	0.0	0.0	.8	Injured by cold, 1904-5. Recovering.
55	.5	3.7	.1	0.6	1.4	Injured by cold, 1904-5. Recovering.
Check Row Tree No.						
61	.....	1.5	0.0	1.0	0.0	Nearly killed by winter, 1906-7.
62	2.5	3.8	0.0	5.0*	0.0	*Extra good type.
63	1.0	4.5	.1	4.4	0.0	
64	1.0	6.4	0.0	0.0	2.0	
65	2.0	4.0	0.0	0.0	1.4	Injured by cold, 1904-5. Recovering.
Plat III. Tree No.						
71	5.5	.4	2.1	0.0	2.5	
72	6.5	.0	3.4	0.0	.5	
73	1.5	.4	1.7	0.0	1.4	
74	1.0	1.0	.5	1.0	.9	
75	0.0	.8 †	1.0	0.0	3.2	
81	6.0	2.9	1.5	1.9	1.7	†Nearly all the fruit on this plat dropped early in 1904, remainder was soft and worthless as in April or May. Numbers 71, 72, 73, 81, 82, and 84, all injured by winter of 1906-7.
82	2.5	1.0	3.2	0.0	2.6	
83	3.5	1.5	2.6	0.3	3.6	
84	4.0	.9	4.8	0.0	2.4	
85	4.0	1.1	4.1	0.0	1.4	
Check Row Tree No.						
91	.....	3.5	.6	0.0	1.2	
92	.....	1.8	.5	0.0	.....	Dead.
93	.....	3.0	2.3	0.0	1.6	
94	.....	5.4	3.6	0.0	1.5	
95	.....	.....	.....	.....	.....	Vacant.

Orchard Renovation—Annual Yield—Concluded.

Plat and number of tree.	Yield per Tree, in Barrels.					Remarks.
	1903.	1904.	1905.	1906.	1907.	
Plat IV. Tree No.						
16	1.5	1.3	1.0	0.0	3.0	Tree injured by cold, 1906-7.
17	2.0	6.5*	.5	3.8*	.7	*Extra good type. Badly injured, 1906-7
18	.0	.4	.9	0.0	.5	
19	0.0	2.5	.7	0.2	1.0	
20	7.0	5.8*	1.3	3.0*	2.8	*Extra good type.
26	.0	2.5	.1	0.0	.7	
27	1.5	5.0	1.9	0.8	2.2	
28	.0	3.7	.4	0.0	1.3	
29	.0	5.1	2.3	0.0	3.3	
30	4.0	2.4	3.4	0.0	2.9	
Check Row Tree No.						
36	.....	.....	.....	.....	.....	Vacant.
37	.0	5.0	.2	1.6	.6	
38	.0	2.4	1.0	0.0	.8	
39	.0	5.8	.3	1.8	1.5	
40	.0	.4	.1	0.0	.....	Almost dead, 1906. Dead 1907.
Plat. V. Tree No.						
46	2.0	4.2	.0	0.0	1.0	Injured by winter 1904-5. Recovering.
47	5.0	5.8	3.4	2.2*	1.0	*Extra good type. Nearly killed by winter, 1906-7.
48	.0	2.2	1.6	0.0	1.3	
49	.0	2.5	1.2	0.0	.3	
50	.0	1.8	1.0	0.0	1.0	
56	.....	.....	.....	.....	.....	Gravenstein.
57	.0	.0	.9	0.0	.4	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	1.2	Injured by winter 1906-7.
67	2.0	2.3	.8	1.4	1.1	Injured by winter 1906-7.
68	2.5	1.3	.2	0.0	1.3	
69	.....	.....	.....	.....	.....	Gravenstein.
70	.....	.....	.....	.....	.....	Gravenstein.
Plat VI Tree No.						
76	3.0	1.0	1.0	.2	2.5	Fruit very large, 1907; not well colored.
77	6.5	0.0	1.3	0.0	.7	Forming new top.
78	.0	.0	.1	0.0	.5	
79	.....	.....	.....	.....	.....	Gravenstein.
80	.....	.....	.....	.....	.....	Gravenstein.
86	3.0	.7	1.6*	0.0	1.2	*Also .8 bbl. Starkey on portion of tree.
87	4.0	.0	2.8	0.0	2.9	Fruit large; not well colored.
88	3.5	2.8 †	3.5	1.6	3.5	†Condition of this fruit similar to that of plat 3, in 1904.
89	.0	1.1	.5	0.0	.6	
90	1.0	3.2	.9	1.1	.7	
Check Row Tree No.						
96	.....	7.0	.0	0.0	.9	
97	.....	2.6	1.0	0.2	1.8	
98	.....	3.4*	2.0	0.0	2.7	*Extra good fruit. Injured by cold, 1906-7.
99	.....	.5	1.0	0.0	1.2	
100	.....	4.2	1.1	0.0	.5	

THE TOP-WORKED ORCHARD.*

The work in top-grafting was suddenly terminated by the cold winter of 1906-7; practically every tree in the orchard being killed or badly injured. Not only the top-worked trees, but the Ben Davis trees left for comparison, suffered. The work is therefore abandoned without the possibility of drawing conclusions. The following record was made in October, 1907.

Condition of Top Grafted Orchard, October, 1907.

Baldwin—1 tree killed by winter, 1906-7; 1 tree, previously weak, dead; 4 trees badly injured.

Ben Davis—4 original trees, left as checks, more or less injured; several original trees, not directly included in this experiment, but intended for further trials, killed.

Sutton—4 trees killed by winter, 1906-7; 1 tree injured by winter; 1 tree apparently in good condition.

Jonathan—1 tree killed by winter, 1906-7; 4 trees badly injured by winter; 1 tree apparently in good condition.

THE FISHER FORMULA.†

For 4 years a comparison has been made between the highly nitrogenous fertilizer, made after the commonly known "Fisher formula," and a fertilizer containing less nitrogen and more phosphoric acid and potash. The "Fisher formula" ‡ calls for about 8.6 per cent nitrogen, 3.3 per cent phosphoric acid, and 11.9 per cent potash. The formula commonly known as the "Station formula," calls for about 3 per cent of nitrogen and 6 per cent phosphoric acid, and 8 per cent potash. The "Fisher" fertilizer costs about $42 to $43 per ton; the other about $32.

The total number of trees included in this comparison is 48, of which 40 are Baldwins, under cultivation, and the balance are Tolmans in "sod mulch." The Baldwins were about 30 years old and in an exhausted condition when the work was commenced; the Tolmans were about 20 years old and in good vigorous condition, though not large.

Both lots of trees responded freely to the treatment, and have borne every year since. The annual yields are given in detail

---

* Bulletin 122 of this Station, p. 198; and Bulletin 139, p. 56.

† Bulletin 122 of this Station, p. 196.

‡ loc. cit.

in the accompanying table. The stirring of the soil, and subsequent decay of the turf, in case of the cultivated trees, Baldwins, obscure specific differences in the relative merits of the two fertilizers used, during the first few years. To arrive at a true estimate, the work should be continued several years longer. Four years of treatment, however, with the record of 3 successive crops, are not without suggestive value.

Annual Yields, "Fisher" vs. "Station" Fertilizers,—Baldwin.

Treatment, and number of tree.	Yield per tree, in bushels.			Remarks.
	1905.	1906.	1907.	
Fisher Formula, No. 1	0.0	7.0	2.8	
2	4.0	0.0	2.3	Small tree, partly broken.
3	12.8	.8	12.3	
4	8.8	.5	6.8	
5	2.5	19.0	0.0	Nearly killed by winter, 1906-7.
6	12.3	0.0	10.8	
7	5.0	10.0	1.8	
8	10.8	1.6	14.0	
9	9.0	0.0	6.0	
10	14.0	0.0	8.0	
11	15.5	0.0	12.5	
12	12.5	6.5	9.3	
13	16.0	1.5	14.0	
14	6.8	2.0	6.5	
15	12.5	0.0	10.5	
16	21.0	2.5	13.8	
Average	10.2	3.2	8.2	*Average per tree for 3 years, 7.2 bushels.*
Check. (no fertilizer)				
17	3.3	6.0	0.0	Nearly killed by winter, 1906-7.
18	11.3	0.0	7.0	Injured by winter, 1907-6.
19	1.0	15.5	0.0	Injured by winter, 1906-7.
20	19.5	0.0	13.8	
21	0.0	17.5	0.0	Injured by winter, 1906-7.
22	0.0	5.8	0.0	Nearly killed, winter, 1906-7.
23	1.0	13.5	0.0	Injured by winter, 1906-7.
24	.....	.....	.....	Vacant.
Average.	5.1	8.3	3.0	*Average per tree for 3 years, 5.5 bushels.*
Station Formula				
25	15.5	0.0	7.0	
26	5.0	5.0	1.5	Making strong growth of new shoots.
27	0.0	2.3	2.0	Half of tree Dyer. Injured 1904-5; recovering
28	0.0	0.0	1.3	Part of tree dead; balance vigorous.
29	13.5	15.5	7.0	Strong growth of new shoots.
30	3.0	3.0	0.6	
31	1.0	14.0	0.0	Strong growth of new shoots.
32	2.0	.8	2.8	Injured by winter, 1906-7.
33	2.3	0.0	0.0	Small remnant of a tree.
34	7.3	0.0	3.9	
35	6.5	6.5	4.8	
36	15.5	7.0	4.3	Injured by winter, 1906-7.
37	2.5	13.0	0.5	Injured by winter, 1906-7.
38	0.0	15.0	0.0	
39	7.0	19.0	2.0	
40	0.0	0.0	8.3	
Average	5.1	6.4	2.9	*Average per tree for 3 years, 4.8 bushels.*

Annual Yields, "Fisher" vs. "Station" Fertilizers,—Tolman.

Treatment and number of tree.	Yield per tree, in bushels.			Remarks.
	1905.	1906.	1907.	
Fisher Formula				
No. 6	4.5	10.2	4.5	
11	1.1	8.3	7.3	
13	.5	2.1	2.0	
20	2.8	9.3	3.8	
Average	2.5	7.5	4.4	*Average per tree for 3 years, 4.8 bushels.*
Station Formula				
No. 4	...*	4.5	12.8	*Tag lost, 1905; Number 4 and 5 adjoined "hog-culture" orchard and were thus stimulated, 1906.
5	.8	9.0	14.5	
12	2.5	3.0	5.3	
19	1.8	6.3	3.0	
Average	1.7	5.7	8.9	*Average per tree for 3 years, 4.1 bushels.*

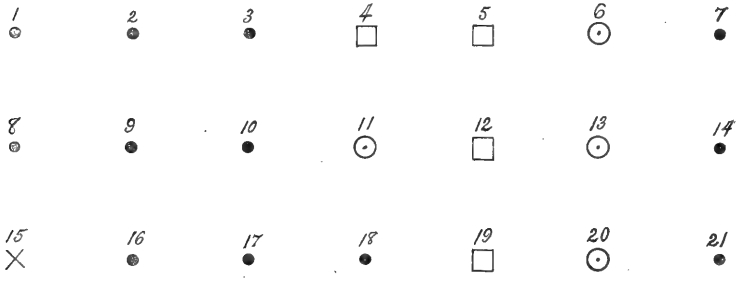
From field observations each year, from a study of annual individual yields, annual average yields, or the average total yields for 3 successive years, the writer is unable to point out definite results. While unquestionably the "Fisher formula" is useful in quickly starting a vigorous growth, in the case of neglected, sod-bound trees, it apparently is not, in a series of years, superior to a less expensive and better balanced formula.

After a study of all the factors involved, the following tentative conclusions seem justified: (1) The percentage of nitrogen in the Fisher formula is too high for the best results with fruit. (2) On most soils the Fisher fertilizer is unnecessarily expensive, and is wasteful of available nitrogen. (3) The Fisher fertilizer results in the production of fruit which is large but of poor color and coarse texture. (4) The Station fertilizer, or some similar mixture containing about 3 per cent of nitrogen, 6 per cent phosphoric acid and 8 to 10 per cent of potash, with a supply of humus in the form of cover crops or as a mulch, is most satisfactory for general orchard use for a term of years.

The following diagrams represent the orchards under observation.*

Fisher Formula – Diagram of Baldwin Orchard.

Fisher Formula – Diagram of Tolman Orchard.



Explanation of Diagram. □ – *Station formula;* ⊙ – *Fisher formula;* • – *untreated tree;* x – *vacancy.*

*From Bulletin 122.

SPRAYING EXPERIMENTS.

The fact of the financial gain to be derived from rational spraying of orchards, is no longer in doubt. As a matter of insurance, therefore, 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, as this application is specially valuable in checking fungous diseases whose spores have lived over winter. It is also the only possible time to fight the bud moth, which has become a serious menace to many orchards of the State.

The first application should consist of the standard Bordeaux mixture (5—5—50 formula) and arsenate of lead.* Should San Jose scale be suspected, the lime and sulphur mixture may be substituted for the first Bordeaux treatment. For later applications, weaker Bordeaux (3—5—50, or even 2—4—50) is safer, and apparently as effective.

For the purpose of investigating the question of "spray injuries," and certain points in field practice, a series of experiments, to extend over a period of 5 years, was inaugurated in the spring of 1907, in the orchard of Phineas Whittier, at Farmington Falls. A power sprayer of the best type was purchased, and practical orchard spraying, on a somewhat extensive scale, was carried on during the season.

From a practical point of view, this work was successful, and served its purpose of demonstrating to the orchardists in the vicinity the value of the work. McIntosh apples which, for several years, had been absolutely worthless because of scab, were this year clean and in good market condition; while on unsprayed trees near at hand, the fruit was worthless. Baldwins, likewise, showed unmistakable advantage from the spraying. More technical studies were prevented by the writer's absence from the State.

---

* "How to Fight Apple Enemies," containing formulas for various spraying mixtures, will be sent to any address in the State upon application to the Experiment Station.

ORCHARD WORK AT NEW GLOUCESTER.

The work at New Gloucester is not sufficiently developed to warrant conclusions. As noted in a previous report,* the value of a cover crop, with the dangers attending its wrong use, have been fully demonstrated in the orchard of Mr. John W. True. Further work in this direction has been dropped. A duplication of the study of the comparative merits of certain fertilizers for apples, described on pages 139-141, has been conducted for 3 years, with the results given below.

The Fisher Formula at New Gloucester.

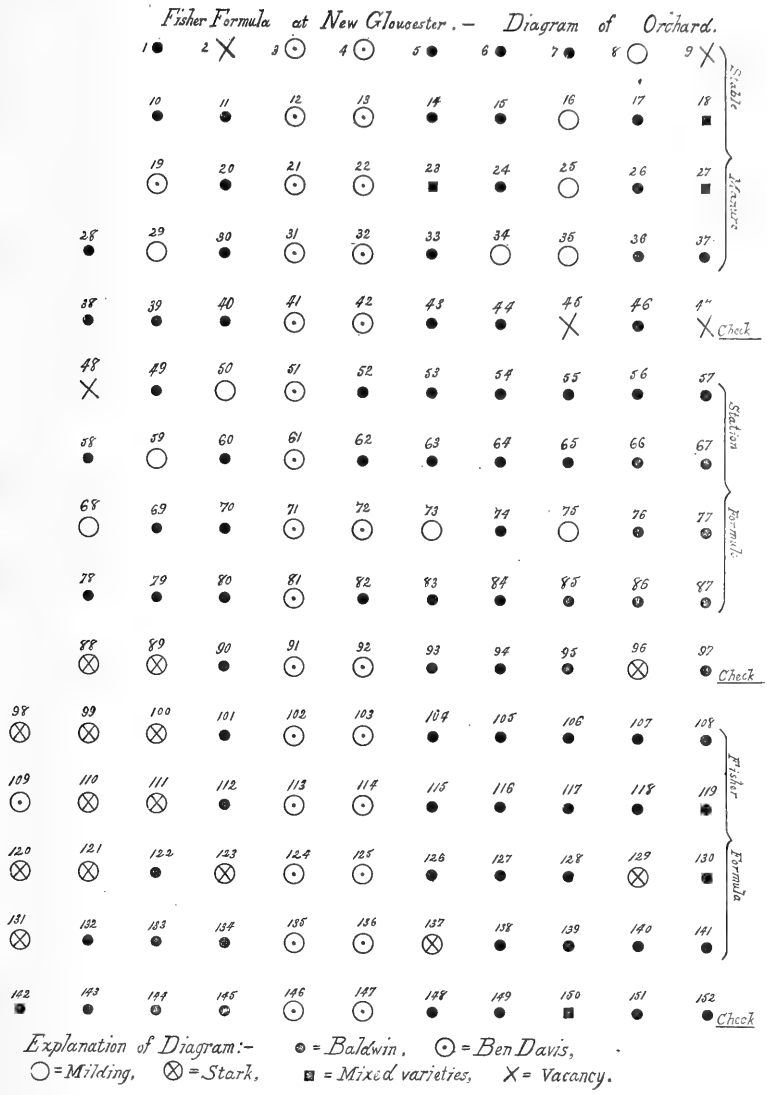
For the purpose of obtaining a fuller knowledge of the effects of highly nitrogenous manures, upon both tree and fruit, an orchard of Baldwins, set about 20 years, and sadly in need of pruning, was selected. The soil is a strong gravelly loam, well located, and altogether presenting the best possible conditions for the work. The trees were of a productive age, but not in a productive condition. Being but 20 feet apart, they were already beginning to crowd.

In 1905, the trees were pruned, the land was plowed, and thoroughly harrowed, and fertilizers were applied as follows: 4 rows were given stable manure; 4 rows Station fertilizer; 4 rows Fisher fertilizer; with a check row between each two plats, as shown in the diagram.

The stable manure was applied broadcast over the whole surface of the ground, at the rate of 1-10 cord per tree.

---

* Bulletin 122 of this Station, p. 203.



(With the exception of the two rows it was supposed to be a solid block of Baldwins. The other varieties have been put in to fill vacancies).

The Fisher fertilizer was made up after the well known "Fisher formula," and applied broadcast at the rate of 10 pounds per tree. As actually used, for the 40 trees, this fertilizer was as follows: Nitrate of soda, 140 lbs., sulphate of ammonia, 60 lbs., sulphate of potash, 92 lbs., acid phosphate, 88 lbs., kainite, 20 lbs. (Kainite was substituted for keiserite of the Fisher formula).

The Station fertilizer was applied at the rate of 10 pounds per tree, in the same way, and as used was made up as follows: Nitrate of soda 80 lbs., sulphate of ammonia 30 lbs., acid phosphate 200 lbs., muriate of potash 90 lbs.

The trees responded at once. Although no fruit was produced in 1905, the trees made a vigorous growth, and the difference in color between the check rows and the others was most noticeable.

In 1906, and again in 1907, because of the exceedingly vigorous growth induced, and because of the fact that the trees are so close together, only one-half the amount of fertilizer was used. Otherwise the treatment was as in 1905; a few young hogs being allowed to run in the orchard the latter part of the season.

In 1907, the orchard was almost ideal in its general appearance and behavior; except that the trees are beginning to crowd too much. The color of the fruit from the "Station" plat was, as a rule, superior to that upon either of the other plats. There were, however, as might be expected, individual exceptions to this rule. In every instance the check rows were distinctly noticeable by their relative lack of color and vigor; although they would naturally get some benefit from the fertilizer applied to adjacent plats. Records of annual growth were not kept, but the yield of individual trees is given below. No comment is necessary, as the work is incomplete. The records will be continued, however.

In the table, the trees of each row are placed in groups. With reference to fertilizers, numbers 1—37 receive stable manure; 48—87, Station fertilizer; 98—141, Fisher fertilizer; 38—47, 88—97, and 142—152, no fertilizer. Trees marked with a star (*), are Milding or Wealthy, and the fruit ripens earlier, so that no record is kept.

Annual Yields, Fisher vs. Station Fertilizer, New Gloucester.

No. of tree.	Yield per tree, in bushels.		No. of tree.	Yield per tree, in bushels.		No. of tree.	Yield per tree, in bushels.		No. of tree.	Yield per tree, in bushels.	
	1906.	1907.		1906.	1907.		1906.	1907.		1906.	1907.
1	0	7.5	38	2.4	5.3	78	8.3	1.8	120	3.1	.0
2	.....	.....	39	1.5	.....	79	.2	2.3	121	2.4	2.7
3	2.4	4.1	40	.0	3.8	80	1.8	5.3	122	.2	.5
4	6.3	.8	41	2.0	2.5	81	4.8	2.0	123	3.8	.....
5	.0	.8	42	.0	1.0	82	1.5	2.5	124	1.8	.0
6	4.0	1.0	43	.0	3.0	83	.5	2.8	125	1.5	.8
7	.0	5.3	44	.5	.3	84	1.7	5.5	126	3.3	1.8
8	*	*	45	.....	.....	85	6.7	5.3	127	3.5	3.0
9	.....	.....	46	1.0	4.3	86	3.0	6.3	128	3.0	4.4
			47	.....	.....	87	.0	.5	129	5.0	2.2
									130	2.8	7.9
10	.0	10.6	48	.....	.....	88	.0	4.5	131	5.3	1.2
11	2.8	3.7	49	.5	5.3	89	1.8	8.0	132	1.5	.3
12	3.0	.5	50	*	*	90	.0	4.5	133	2.8	7.3
13	.5	3.3	51	4.3	.8	91	2.4	1.5	134	2.0	3.5
14	.3	5.5	52	1.5	1.7	92	3.0	4.8	135	4.0	0.0
15	.0	1.5	53	.5	4.5	93	.0	3.2	136	1.8	.4
16	*	*	54	.0	.0	94	.0	.4	137	1.5	.0
17	2.0	3.5	55	1.3	3.0	95	.2	4.3	138	1.1	3.3
18	.8	1.0	56	.3	2.3	96	.3	2.0	139	2.5	4.0
			57	2.5	4.3	97	1.0	3.2	140	4.5	3.3
									141	.5	5.8
19	5.8	.5	58	2.9	4.5	98	3.3	.....	142	2.8	2.0
20	.0	6.8	59	*	*	99	4.3	4.5	143	1.3	9.2
21	6.4	1.5	60	1.3	2.0	100	4.5	2.8	144	.0	2.0
22	.4	2.5	61	.5	4.7	101	4.8	4.5	145	1.0	5.3
23	.....	.3	62	1.0	3.2	102	3.8	.3	146	1.0	.3
24	.3	5.4	63	.0	4.5	103	3.8	1.3	147	2.3	.7
25	*	*	64	.0	.3	104	3.8	4.0	148	1.0	6.3
26	.3	4.5	65	.3	6.0	105	.0	1.0	149	2.3	3.2
27	5.5	2.3	66	3.4	2.8	106	5.0	1.0	150	.0	.3
			67	2.4	1.5	107	1.6	4.0	151	2.0	4.0
						108	.0	.....	152	.8	.8
28	5.3	.5	68	*	*	109	6.5	2.0			
29	1.0	.....	69	5.9	8.5	110	4.9	.5			
30	.5	.8	70	.2	5.2	111	3.3	2.3			
31	1.4	2.0	71	.8	1.5	112	5.5	1.5			
32	.4	.7	72	.5	.9	113	5.0	.3			
33	.0	2.5	73	*	*	114	2.5	.8			
34	*	*	74	1.0	4.3	115	1.5	2.5			
35	*	*	75	*	*	116	4.5	1.5			
36	.3	5.0	76	1.3	.0	117	1.8	1.9			
37	.5	5.0	77	.0	.5	118	1.9	8.4			
						119	3.3	6.4			

THE APPLE ORCHARD AT ORONO.

In view of the behavior of many supposedly hardy varieties, under the stress of the hard winter of 1906-1907, and the fact that no similar collection is available for study in northern New England, the following notes on the behavior and present condition of the apples in the Station orchards at Orono are recorded. No account is given of the newer Russian varieties,

for reasons stated in Bulletin 82,* viz., that among the varieties of this class none have been found which are superior to well known commercial sorts; and furthermore that almost without exception these varieties drop badly from the tree and are of relatively inferior quality. Their one merit is that of hardiness.

There are 3 distinct parts to the Station orchard, and in the following alphabetical list of the leading varieties these orchards are designated I, II, and III respectively; the individual tree numbers being given in numerals: e. g., "Akin, I, 63," indicates that the tree under consideration is number 63 in Orchard I. "Reference" indicates former publications of this Station in which this variety has been mentioned.

Many of the varieties were obtained in 1890 before the writer's connection with the Station, and were held in nursery rows until transferred to the orchard in 1891 or 1892. During the earlier years of its history, the orchard was used as a vegetable garden; for the last 8 years, clean cultivation has been given until about August 10, when a cover crop has been sown for winter protection.

No attention is given other fruits in the accompanying notes, but as indicating the severity of the "test-winter" of 1906-1907, when the lowest officially recorded temperature was 40 degrees below zero, it may be said that practically every pear tree at the Station, both dwarf and standard, was destroyed. The same is true of many cherries. The small fruits, however, being protected by the deep snow, wintered in good condition. The notes are given without comment, simply as a matter of record and for general information.

AIKIN, I, 63.—Stark Brothers, Louisiana, Mo., 1899. First fruit, 1902; full crop, 1906. Vigorous and in good condition, 1907.

ALEXANDER, I, 83; II, 9.—Ellwanger & Barry, Rochester, N. Y., 1890. *References:* Annual Report, 1898, pp. 69-72; Bulletin 82, pp. 83, 86.

Permanently set May, 1891. First fruit 1895; 1902, 3 bushels; 1905, 3 barrels. Prolific, profitable. Good condition, 1907.

ARCTIC, I, 84; II, 3.—Ellwanger & Barry, Rochester, N. Y., 1890. *Reference:* Annual Report, 1898, pp. 69, 70; Bulletin 82, p. 89.

Permanently set, May, 1892. First bloom 1896; first fruit 1898; good crop, 1901. Has borne freely nearly every year since 1901. Badly injured by winter of 1906-07, after a full crop in 1906.

---

* Bulletin 82 of this Station, p. 85.

ASTRACHAN, I, 13-17.—Ellwanger & Barry, Rochester, N. Y., 1891. *Reference:* Annual Report, 1898, p. 69.

Three-year trees, permanently set May, 1891; first bloom 1895; first crop fruit, 1896. All trees of this variety have borne freely since 1896. Good condition, 1907.

BOIKEN, I, 46; III, 27 and 47.—S. D. Willard, Geneva, N. Y., 1901. *Reference:* Bulletin 82, p. 89.

Top worked on Russian varieties (13 M., and Hibernal). Hardy, productive. In good condition, 1907. Not of high quality, but a promising sort.

CHENANGO, II, 6.—Ellwanger & Barry, Rochester, N. Y., 1889. *Reference:* Annual Report, 1896, p. 69.

Nursery row 2 years; permanently set May, 1891. First fruit 1896 (few, poorly colored); full crop 1898. Always bore well, but tree never thrived. Nearly killed by winter of 1906-07.

CRIMSON BEAUTY, I, 64; III, 54.—George L. McCabe, North Bangor, Me., 1904.

Top worked on a Russian sort, No. 50 Voronesch, (III, 54), the variety has made a vigorous growth. Fruited in 1907. A promising early, hardy sort; largely grown in Aroostook county and in New Brunswick. Of good quality and high color; early as Yellow Transparent.

DARTMOUTH, I, 9, 10.—Ellwanger & Barry, 1891.

Three-year tree, set 1891. First fruited 1898, and has borne nearly every year since. Hardy, vigorous, productive. Good condition, 1907.

DOCTOR, III, 6; I, 28.—U. S. Department of Agriculture, 1896. *Reference:* Bulletin 82, p. 89.

Top-worked into Alexander and into Haas. A vigorous grower and heavy annual bearer. Killed by winter of 1906-07.

FALLAWATER, I, 57. Ellwanger & Barry, 1893. *Reference:* Annual Report 1896, p. 69.

Set May, 1893. First fruit, 1902. Not a vigorous tree, (growing in sod, because of encroachment of lawn, since 1895); bore full crop fruit 1906. Killed by winter, 1906-07.

FAMEUSE, I, 18-22, II, 2.—Ellwanger & Barry, 1889. *Reference:* Annual Report 1896, p. 69.

Permanently set May, 1891. First fruit, small crop, 1898. Hardy, vigorous, productive. Subject to attack of apple scab. Good condition, 1907.

FLORENCE, II, 14. Peter M. Gideon, Excelsior, Minn., 1889.

Permanently set, May, 1891. The tree is very productive and as a result is small and deformed; having been broken by weight of fruit. One of Gideon's seedlings. A handsome early crab.

GIDEON, II, 8.—Peter M. Gideon, 1890. *Reference:* Bulletin 82, p. 83.

Tree killed by mice 1892. Replaced 1896. Tree vigorous, hardy, productive. Fruit beautiful in appearance, but drops badly and is of no special value. Good condition, 1907.

GOLDEN RUSSET (of Western New York) I, 76; III, 61.—Ellwanger & Barry, 1890.

Permanently set May, 1891. First bloom 1896; first fruit, 1897. Hardy, vigorous, productive. Good condition, 1907.

HAAS, I, 26-30.—Ellwanger & Barry, 1890. *Reference:* Annual Report 1896, pp. 69, 70.

Permanently set, May, 1891. First bloom 1894; first fruit 1896. Bore freely every year after 1896 until top-grafted to other sorts, 1901, and 1902. Hardy, vigorous, and very productive. The fruit does not keep well, however.

HURLBUT, II, 10.—Ellwanger & Barry, 1889. *References:* Annual Report, 1898, p. 69; Bulletin 82, p. 89.

Permanently set, May, 1891. First fruit 1898. Prolific, annual bearer. Nearly killed by winter of 1906-07.

HYSLOP (crab), I, 3, 4.—Ellwanger & Barry, 1891.

Three-year old trees, set permanently May, 1891. Small amount of fruit 1893; full crop 1896, and nearly every year since. Good condition, 1907.

JONATHAN, I, 27.—George T. Powell, Ghent, N. Y., 1902.

Top-grafted on bearing trees of Haas. Made strong growth every year. Killed by winter of 1906-07.

MANN, I, 82. Ellwanger & Barry, 1890. *Reference:* Annual Report, 1896, p. 69.

Transferred from orchard III, to fill vacancy, in 1895. Vigorous grower and very productive, but fruit of poor quality. Tree died, 1903-04, after a full crop.

MARENGO (crab), I, 5.—Ellwanger & Barry, 1891.

Three-year tree, set May, 1891. Bore a few fruits, 1896, but no full crop till 1900. Hardy, vigorous; good condition, 1907.

MCCLELLAN, I, 29.—J. J. Towle, South Carthage, Maine, 1902.

Top-graft inserted in Haas, 11 years old, April, 1902. Vigorous, healthy, promising. Good condition, 1907.

MILDING, I, 43-47.—R. G. Chase & Co., Geneva, N. Y., 1891. *References:* Annual Report, 1896, pp. 69, 71; Bulletin 82, p. 89.

Permanently set, May, 1891. First fruited 1899; full bearing 1903. Somewhat injured, 1906-07, after a full crop.

MONTREAL BEAUTY, I, 7, 8.—Ellwanger & Barry, 1891.

Three-year tree set permanently, May, 1891. First fruit, small crop, 1896. Vigorous, hardy. Good condition, 1907.

MUNSON SWEET, III, 62.—Ellwanger & Barry 1890. *Reference:* Bulletin 82, p. 89.

First fruited 1895. Vigorous, hardy, a free bearer of excellent fruit. Died from canker at base of tree, 1904.

NORTHERN SPY, III, 65; I, 78.—J. E. Bennoch, Orono, Maine, 1906.

Number 65, top-grafted into bearing tree of the Russian variety Arabka; Number 78 grafted on young seedling stock. All cions made a

vigorous growth in 1906, and every one was killed by the winter following.

NORTHWESTERN GREENING, I, 86. Storrs & Harrison Co., Painesville, Ohio, 1895. *Reference:* Bulletin 82, p. 90.

Set May 1895; first fruit 1902. Vigorous, hardy, productive. Not of high quality. Specially promising as a stock for top-grafting. Good condition, 1907.

OLDENBURG, I, 35-39.—Ellwanger & Barry, 1890. *References:* Annual Report 1896, p. 69; Bulletin 82, p. 84.

Permanently set, May, 1891. Full crop on all trees 1896, and nearly every year since. Numbers 35, 36 and 37 are on a poor sandy knoll, and have never thrived. The other trees have been exceptionally productive.

PARADISE SWEET, I, 30.—Chas. S. Pope, Manchester, Me., 1902.

Top-grafted into Haas, 11 years old, April, 1902. Has made strong growth every year. Somewhat injured by cold, 1906-07.

PEWAUKEE, I, 75; II, 4.—Ellwanger & Barry, 1890. *Reference:* Annual Report, 1896, pp. 69, 71.

Permanently set, May, 1891. First fruit 1894 (few specimens). No. 4 bore 1½ bushels in 1896, and has given a fair crop nearly every year since. Vigorous, hardy. Is being grown in some parts of Maine as a stock for top-grafting to Baldwin.

PORTER, I, 31-34 and 72, 73.—Ellwanger & Barry, 1891. *Reference:* Annual Report, 1896, p. 69.

Permanently set, May, 1891. Nos. 31 to 34 were top-grafted in the nursery, while 72 and 73 were nursery budded trees. The top-worked trees fruited freely after 1899; the others were disturbed by removal of soil in 1893 and never fully recovered, though fruiting freely after 1901. All trees of this variety were fatally injured by cold of 1906-07.

PRIMATE, III, 67.—Ellwanger & Barry, 1894.

First fruits in 1900. Badly attacked by canker, and half of tree cut away, 1905; in weakened condition, killed by winter of 1906-07. Apparently one of the best early varieties for home use.

PRINCESS LOUISE, I, 53. Ellwanger & Barry, 1891. *Reference:* Annual Report, 1896, p. 69.

First fruit, 1896; usually a few fruits every year thereafter. The tree was on poor, sandy soil, and was always "black hearted" and feeble. Killed by winter of 1906-07.

RALL (Rall's Janet), I, 85.—Ellwanger & Barry, 1890.

Grown in nursery row till 1892. Fruited freely since 1900. Attacked by woolly aphis, 1905. Killed by winter of 1906-07, after a full crop of fruit in 1906.

RED FAMEUSE, III, 55; I, 80.—B. M. Titcomb, Farmington, Me., 1903.

Cions top-grafted into (No. 55) a bearing tree of the Russian variety, Large Anis. No. 80 is crown grafted on seedling stock. First fruit 1906. A very highly colored type of Fameuse, grown freely in Franklin county. Source unknown; hardy, vigorous.

ROLFE, III, 34.—H. L. Leland, Sangerville, Me., 1902. *References:* Annual Report 1896, pp. 69, 71, 81; Bulletin 82, p. 90; Bulletin 143, pp. 114, 130.

Very strong grower and gave good crop of fine fruit in 1906; but was nearly destroyed by the winter following. This destruction must have been due to immaturity of season's growth, as the variety is largely grown at much more northerly points.

SHIAWASSEE, II, 5.—Ellwanger & Barry, 1889. *References:* Annual Report, 1896, pp. 69, 72; Bulletin 82, pp. 84, 90.

Permanently set, May, 1891. First fruit 1896; full crop 1897. Vigorous, productive, hardy.

STARK, I, 58-62.—R. G. Chase & Co., Geneva, N. Y., 1891. *Reference:* Annual Report, 1896, p. 69.

First bloom 1896; first fruit 1898. Owing to encroachments of buildings and lawn, these trees have not been cultivated since 1895. Hardy, productive.

SUTTON, III, 17, 38.—S. D. Willard, Geneva, N. Y., 1898.

Top-grafted into Russian varieties, these cions grew very vigorously and produced fruit freely in 1904, 1905 and 1906. No. 17 began to fail in 1905, died 1906-07. No. 38 was badly injured by cold of 1906-07. Top-grafts in Porter (Orchard I, No. 31, cions from George T. Powell, Ghent, N. Y.) grew vigorously but were badly checked by the winter of 1906-07. A young tree from the Station nursery, set (I, 87) in 1904, was also killed by the winter of 1906-07.

THOMPSON SEEDLINGS.—Jewell Nursery Co., Lake City, Minn., 1892. *Reference:* Annual Report 1896 p. 69.

Thompson seedlings Nos. 24, 26, 29, 42, and 43, under trial by request, proved to be hardy, vigorous and productive, but only of moderately good quality, and of no special value for New England. They would be classed with the Russian and other "iron-clad" varieties.

TRANSCENDENT (crab) I, 1, 2.—Ellwanger & Barry, 1891.

Three-year trees, set 1891. Full crop 1894, and almost every year since. Like the other crabs, is perfectly hardy and vigorous.

VAN WYCK (crab), I, 6.—Ellwanger & Barry, 1894.

Three-year trees, set 1891. Full crop 1894, and almost every year year since. Hardy, productive.

WALBRIDGE, I, 79.—Stark Brothers, Louisiana, Mo., 1889. *Reference:* Annual Report, 1896, p. 69.

Grown in nursery row until 1892. First fruit 1896. Tree broken by weight of fruit, in 1903, and removed. Very vigorous and productive, but of poor quality.

WEALTHY, I, 11, 12, 23-25, III, 68.—Ellwanger & Barry, 1890. *References:* Annual Report, 1896, p. 69, 77; Bulletin 82, p. 85, 90.

Permanently set, May, 1891. First full crop, 1896. Hardy, vigorous, and very productive. Trees liable to overbear and break under weight of fruit.

WESTFIELD, I, 69. Ellwanger & Barry, 1891. *References:* Annual Report, 1896, p. 69; Bulletin 82, p. 90.

Tree lowered on account of grading, 1904. Soil not suitable, and tree was never vigorous, but fruited for several years. Full crop, 1906. Tree in weakened condition killed by winter of 1906-07.

WINESAP, I, 48-52.—Ellwanger & Barry, 1891. *Reference:* Annual Report, 1896, p. 69.

The trees were vigorous and productive; first fruits (few specimens) 1895. Every tree killed by winter of 1906-07. The fruit is very disappointing in New England. The typical Winesap flavor is not developed, and its quality is not much better than that of Ben Davis.

WOLF RIVER, I, 74.—Storrs & Harrison Co., Painesville, Ohio, 1895. *Reference:* Annual Report, 1896, p. 69.

First fruited 1902; full crop 1904, also 1906. Tree hardy, vigorous, productive. Stood the winter of 1906-07 well, and blossomed full in 1907.

THE MAINE STATION AND POMOLOGY.

CHAS. D. WOODS.

Since the establishment of the department of horticulture in the Maine Agricultural Experiment Station, in 1891, the subject of orcharding has received considerable attention. As is well known, the Station is located too far north to successfully grow the apples for which Maine is most noted, and the soil at the University of Maine is illy adapted to orcharding. Aside from a study of hardy fruits for northern Maine, it was not until co-operative experiments were begun with Mr. Chas. S. Pope at Manchester, about ten years ago, that very definite advance was made in studies of orcharding by the Maine Station. Mr. Pope very kindly placed his orchards at the disposal of the Station, and what has been accomplished during the past ten years has been largely due to this liberality on the part of Mr. Pope. These investigations in orcharding were planned and conducted by Professor W. M. Munson, and have been reported in the bulletins of this Station from time to time. The present bulletin summarizes and brings up to date the results obtained. As is known to most of the pomologists of the State, Professor Munson resigned his position with this Station in July, 1907, and is now connected with the West Virginia Experiment Station.

It has sometimes been urged at the meetings of the State Pomological Society, and elsewhere, that the Maine Agricultural Experiment Station should devote more of its energies to the fruit interests of Maine; that these interests are important; and that there are many questions which are pressing for solution. The management of the Station appreciates the value of the pomological interests of the State, and the need of investigations, both scientific and practical. It may be fitting to outline here the reasons why it is not hoped, in the immediate future, to undertake further fruit studies; although it is recog-

nized by the management that such studies are eminently desirable.

It is possible, as illustrated by the studies which the Station has made upon the potato, to carry on successfully in co-operation with farmers, studies upon an annual crop. It is not practicable however, to carry on fundamental investigations upon a crop requiring many years for its growth, upon land and in orchards which are not under absolute control, for a long period of years. Valuable as the results are that have been obtained through the co-operation of Mr. Pope, obviously experiments extending over long series of years could not be undertaken. Recognizing this, the fruit interests of the State asked the legislature of 1907 to consider the question of purchasing for the use of the Station a farm that should be located in the apple growing section of the State and provided with orchards and equipment suitable for pomological investigations. The organized agricultural interests of the State, including the State Pomological Society, the State Dairyman's Association and the State Grange, passed resolutions asking that such opportunity for orchard investigations be provided. At the legislative hearing many appeared in favor of the bill, and no one in opposition, and so far as known the matter was not opposed by any member of the legislature. For some reason not clearly evident, the legislature, on the recommendation of the committee on agriculture, voted to refer the matter of the purchase of a farm to the legislature of 1909.

Early in the winter of 1907, Professor Munson received a flattering invitation to leave the Maine Station and take up work elsewhere. At that time it was confidently expected that the legislature would provide a farm and opportunities for pomological research. With that thought in mind, this offered position was declined and Professor Munson decided to remain with the Maine Agricultural Experiment Station, as he believed there to be a valuable field for investigation and he confidently hoped that facilities would be provided. After the adjournment of the legislature, an offer came to him from West Virginia which he accepted, largely because the opportunities which were there offered along pomological lines were so much greater than the Maine Station had or was likely to have in the near future.

The question has frequently been asked,—"Who will take Professor Munson's place at the Experiment Station?" It does not seem to be practicable at present to invite anyone to come to the Station to take up this line of work as Professor Munson's successor. The same reason that led to his resignation would prevent the right kind of a man coming to the Maine Station in pomological lines. Until orchards and suitable buildings for the study of pomological problems are provided for the Station, in the apple section of the State, it will be impossible to offer facilities for work that would be attractive to a man who wants not merely a salary, but opportunities for work and investigation. Obviously the kind of a man that would come for the sake of the salary, is not the man wanted. The Station will continue to study orchard insects and the fungous and other diseases of the orchard as it has in the past, but the direct pomological questions, many of which are pressing and urgent, cannot be taken up until such time as suitable facilities are available. The Station has funds enough which can be used for the purpose of these studies, but has no funds which can be used for the purchase or rental of lands or orchards or buildings needed for the successful carrying out of investigations fundamental to orcharding.

At the annual meeting (November, 1907) of the State Pomological Society, great interest was shown in the work which the Station has been able to accomplish, and strong expressions on the part of the officers and others prominent in the management of the Society were made relative to the desirability of suitable facilities being provided the Station for making these needed studies. This matter of providing orchards and facilities in the apple section of the State will come before the next legislature, and it is hoped that it may meet with favorable action. Until then, the Station will continue to show its interest in the orcharding of Maine by doing what it can along the lines of entomological and pathological studies. It cannot hope to take up the direct problems of pomology at once, nor can it, under present conditions, hope to invite to this Station an earnest student of pomology.

BULLETIN No. 156.

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.

The Guaranty.

The law regulating the sale of commercial feeding stuffs is now so generally recognized that practically all feeds shipped into the State are lawfully branded. It not infrequently happens, however, that some feeding stuffs do not equal the guaranty in protein and the dealer is liable to the penalties of the law. To impress upon the jobbers and the manufacturers the necessity of making their goods conform to the guaranties and at the same time afford protection to the honest handler a circular entitled "A Written Guaranty the Dealer's Safeguard" was sent to the Maine trade. In this the following statements are made:

No prosecutions will be made against any handler of feeding stuffs within the State provided he obtain at the time of purchase a *written guaranty* that the goods are in conformity with the law regulating their sale. Failure to obtain such a guaranty on the part of the dealer will be presumptive evidence that he is not sufficiently interested in the purity of the goods which he handles, and unless there are especially extenuating circumstances, the Director will feel it his duty to begin prosecution for a violation of the laws regulating the sale of concentrated commercial feeding stuffs.

Any form of guaranty covering the facts may be used. The guaranty must be signed in ink. The signature of a corporation should be made in the following form. First the legal corporate title of the company; second the autograph of a duly authorized officer of the company; third the title or designation of his office. For example—The Smith-Jones Company, *Chas. R. Doe,* Member of firm.

The guaranty should identify and may be attached to the bill of sale, invoice, bill of lading or other schedule giving the names and quantities of the articles sold. The following or some similar form may be used.

"I (we) the undersigned do hereby guarantee that the commercial feeding stuff manufactured, packed, distributed, or sold by me (us) (specify the same as fully as possible) is in conformity with all the requirements of the Maine law regulating the sale of commercial feeding stuffs.

(Signed in ink.)

. . . . . .

(Name and place of business of wholesale dealer, manufacturer, jobber, or other party.)"

If it is preferred a general guaranty may be given by a manufacturer or dealer for a period of time and the following or a similar form may be used.

"I (we) the undersigned do hereby guarantee that the feeding stuffs packed, distributed or sold by me (us) (state name of consignee) during the year 19— shall be in conformity with the requirements of the Maine law regulating the sale of commercial feeding stuffs."

To be signed as above.

Results of the Inspections for 1907-8.

The last bulletin on feeding stuff inspection was published in April, 1907. During the year, April 1907 to April 1908, upwards of 500 samples of feeding stuffs have been analyzed. About 300 of these were taken by the inspector and rather more than 175 were submitted by dealers and manufacturers, and the remainder came from consumers. It sometimes happened that sufficient data was not obtained to make the analysis valuable for publication, and during the year there have been about 50 analyses made that are not reported herewith.

It is evident that there is a very general understanding in the trade, both wholesale and retail, relative to the law regulating the sale of concentrated commercial feeding stuffs and an evident desire on their part to conform. It is very rarely that goods are found offered for sale in the State that are not regularly branded and guaranteed in accord with law and in most instances the goods run well up to guaranty.

In the tables, the general classes of feeding stuffs are grouped according to their protein content, beginning with cottonseed meal. The wheat offals are given at the end of the table. Under each group they are arranged alphabetically, by brand where there is a special brand, or by the name of the manufacturer.

Quite a large number of the samples collected were examined for foreign weed seeds. This matter is discussed at considerable length on pages 189 and following.

The table on pages 161 to 175 gives the results of the analyses. These results are discussed on pages 176 and beyond. Protein was determined in each sample. Fat was determined in one of the samples of each brand taken by the inspector.

DATE OF RECEIPT OF SAMPLES.

The times of drawing the samples are not given in the tables showing the results of the analyses but can be readily ascertained by comparing the sample number with the following list which shows the dates of receipt of the sample.

Samples 2561 to 2590 received in March, April and May, 1907.
Samples 2591 to 2634 received in June, July and August, 1907.
Samples 2635 to 2657 received in September, 1907.
Samples 2658 to 2718 received in October, 1907.
Samples 2719 to 2768 received in November, 1907.
Samples 2769 to 2838 received in December, 1907.
Samples 2839 to 2900 received in January, 1908.
Samples 2001 to 2033 received in January, 1908.
Samples 2033 to 2069 received in February, 1908.
Samples 2069 to 2087 received in March, 1908.

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.	Source of sample.
COTTON SEED MEAL.						
Prime Cotton Seed Meal..... Alabama Cotton Oil Co., Hentsville, Ala.	O	36.75	38.61	8.80	8.00	2684
Choice Cotton Seed Meal American Cotton Oil Co.....	D	42.31	41.00	–	9.00	2782
	D	42.88	41.00	–	9.00	2883
	O	42.38	41.00	11.21	9.00	2027
Battle Brand Choice Cotton Seed Meal W. P. Battle & Co.....	O	42.94	41.00	9.47	9.00	2017
Cotton Seed Meal.....	D	40.25	41.00	–	9.00	2739
H. E. Bridges & Co., Memphis, Tenn....	D	43.75	41.00	–	9.00	2761
	D	30.88	41.00	–	–	2762
	C	44.06	41.00	–	9.00	2771
	D	44.38	41.00	–	9.00	2775
	C	41.88	43.00	–	9.00	2776
	C	44.06	41.00	–	9.00	2781
	D	42.81	41.00	–	9.00	2784
	C	46.75	43.00	–	9.00	2817
	C	44.63	41.00	–	9.00	2848
	D	42.82	41.00	–	9.00	2984
	O	42.13	41.00	–	9.00	2896
	O	43.63	41.00	9.50	9.00	2953
	O	43.19	41.00	–	9.00	2048
	O	46.00	41.00	–	9.00	2063
	C	41.75	41.00	–	9.00	2081
Cotton Seed Meal..... F. W. Brode, & Co., Memphis, Tenn.	O	35.38	36.00	9.03	7.00	2715
Cotton Seed Meal Chapine & Co., Boston, Mass.....	D	39.25	41.00	–	9.00	2562
Dixie Brand Cotton Seed Meal.....	C	40.75	38.00	–	9.00	2689
Humphreys-Godwin Co., Memphis, Tenn	O	41.69	38.00	–	9.00	2692
	D	37.88	38.00	–	9.00	2707
	D	42.00	38.00	–	9.00	2720
	D	40.13	38.00	–	7.00	2754
	D	40.63	38.00	–	9.00	2755
	D	43.31	41.00	–	9.00	2758
	D	45.50	41.00	–	9.00	2772
	D	44.19	41.00	–	9.00	2783
	O	45.06	41.00	–	9.00	2787
	C	39.06	41.00	–	8.00	2795
	D	40.00	41.00	–	8.00	2796
	D	45.81	41.00	–	9.00	2804
	D	44.13	41.00	–	9.00	2807
	D	44.38	41.00	–	9.00	2819
	O	43.38	41.00	–	9.00	2825
	C	41.13	41.00	–	9.00	2833
	D	42.38	41.00	–	9.00	2835
	D	40.50	41.00	–	9.00	2844
	O	41.50	41.00	10.15	9.00	2854
	O	40.75	41.00	–	9.00	2859
	D	43.00	41.00	–	7.00	2884

*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.
COTTON SEED MEAL—Continued.						
Dixie Brand Cotton Seed Meal —Continued	O	43.25	41.00	8.29	9.00	2890
	D	42.57	41.00	–	7.00	2910
	D	39.88	41.00	–	9.00	2934
	D	40.25	41.00	–	9.00	2937
	D	39.94	41.00	–	9.00	2950
	C	41.25	41.00	–	9.00	2935
	O	43.13	41.00	–	9.00	2946
	O	43.50	41.00	–	9.00	2957
	D	42.88	–	–	–	2971
	D	40.69	41.00	–	9.00	2973
	O	42.25	41.00	–	9.00	2982
	D	41.25	41.00	–	9.00	2986
	O	42.63	41.00	–	9.00	2992
	O	41.94	41.00	–	9.00	2010
	C	40.07	41.00	–	9.00	2031
	O	42.25	41.00	–	9.00	2087
Green Diamond Brand Choice Cotton Seed Meal	O	42.69	41.00	8.21	9.00	2790
Chapin & Co., Boston, Mass	C	40.63	41.00	–	9.00	2808
	O	46.69	41.00	–	9.00	2820
	D	42.94	41.00	–	9.00	2829
	D	42.63	41.00	–	9.00	2843
	O	43.13	41.00	8.59	9.00	2939
	O	43.38	41.00	–	9.00	2038
	D	43.07	41.00	–	9.00	2071
Prime Cotton Seed Meal	C	42.07	41.00	–	9.00	2054
Hunter Bros. Milling Co., St. Louis, Mo.	D	47.38	41.00	–	9.00	2598
	D	41.38	41.00	–	9.00	2608
	D	42.75	41.00	–	9.00	2743
	D	43.44	41.00	–	9.00	2745
	D	45.75	41.00	–	9.00	2753
	D	43.13	41.00	–	9.00	2769
	D	43.38	41.00	–	9.00	2792
	D	44.00	41.00	–	9.00	2794
	O	43.63	41.00	9.25	9.00	2815
	D	43.63	41.00	–	9.00	2838
	D	40.63	41.00	–	9.00	2936
	O	43.63	41.00	–	9.00	2976
	D	44.44	41.00	–	9.00	2030
Prime Cotton Seed Meal	D	42.44	41.00	–	9.00	2839
H. B. Johnson Co., Memphis, Tenn	D	41.44	41.00	–	9.00	2846
	O	44.75	41.00	9.52	9.00	2911
	D	42.07	41.00	–	9.00	2014
High Grade Cotton Seed Meal	D	46.75	45.00	–	9.00	2563
Oscar Holway Co., Auburn, Me	D	47.44	45.00	–	9.00	2576
	D	47.19	45.00	–	9.00	2577
	D	47.00	45.00	–	9.00	2580
	D	49.44	45.00	–	9.00	2588
	D	46.75	45.00	–	9.00	2596
	C	47.63	45.00	–	9.00	2599
	C	46.13	45.00	–	9.00	2605
	C	46.94	45.00	–	9.00	2610

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.
COTTON SEED MEAL—Continued						
Prime Cotton Seed Meal						
Mc Caw Mfg. Co	D	41.88	41.00	–	9.00	2013
Old Gold Brand Pure Cotton Seed Meal	D	41.00	41.00	–	9.00	2570
T. H. Bunck, Little Rock, Ark	D	39.75	41.00	–	9.00	2581
	O	39.50	41.00	9.36	9.00	2668
	C	42.57	41.00	–	9.00	2073
Owl Brand Cotton Seed Meal	C	36.50	–	–	–	2624
F. W. Brode & Co., Memphis, Tenn	C	37.69	–	–	–	2625
	C	41.38	–	–	–	2626
	D	35.88	41.00	–	–	2629
	C	33.32	41.00	–	7.00	2635
	O	36.63	41.00	–	7.00	2697
	O	41.63	41.00	–	7.00	2726
	D	46.00	41.00	–	7.00	2741
	D	41.88	41.00	–	7.00	2744
	D	43.00	41.00	–	9.00	2747
	C	45.75	41.00	–	7.00	2738
	D	44.07	41.00	–	7.00	2748
	D	41.19	41.00	–	7.00	2749
	O	42.63	41.00	–	7.00	2750
	O	42.44	41.00	–	7.00	2751
	D	41.32	41.00	–	7.00	2752
	C	40.75	38.00	–	7.00	2780
	D	35.31	41.00	–	7.00	2810
	D	42.44	41.00	–	9.00	2828
	C	42.19	41.00	–	7.00	2831
	D	45.13	41.00	–	7.00	2834
	D	42.88	41.00	–	7.00	2840
	D	44.13	41.00	–	7.00	2842
	D	42.63	41.00	–	7.00	2845
	D	41.75	41.00	–	7.00	2849
	O	41.63	41.00	–	7.00	2860
	O	47.00	41.00	–	7.00	2876
	D	42.00	41.00	–	7.00	2885
	O	44.38	41.00	8.63	7.00	2908
	D	40.44	41.00	–	7.00	2949
	D	41.88	41.00	–	–	2952
	O	41.63	41.00	–	7.00	2965
	D	42.63	41.00	–	7.00	2974
	O	44.63	41.00	–	7.00	2983
	D	44.00	41.00	–	7.00	2011
	D	44.19	41.00	–	–	2052
	O	41.50	41.00	–	7.00	2062
	C	41.75	41.00	–	7.00	2074
Phoenix Brand High Grade Cotton Seed Meal	D	34.63	41.00	–	9.00	2566
D. L. Marshall Co., Boston, Mass	D	35.38	41.00	–	9.00	2567
	O	37.25	41.00	9.12	9.00	2686
Cotton Seed Meal	D	41.38	38.63	–	–	2568
Piedmont Oil & Refining Co., Faunsdale Ala	C	37.50	38.63	–	–	2578
	O	40.38	38.63	8.25	–	2669

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.
COTTON SEED MEAL—Continued						
Cotton Seed Meal	C	42.94	41.00	–	10.00	2778
Planter's Oil Mills, Greenwood, Miss.	D	43.88	41.00	–	9.00	2785
Purity Brand Cotton Seed Meal	D	44.50	41.00	–	9.00	2023
J. F. Walker, Memphis, Tenn.	D	42.82	41.00	–	9.00	2076
Red Arrow Brand Cotton Seed Meal	O	43.38	41.00	8.04	9.00	2002
Choice Cotton Seed Meal	C	38.50	–	–	–	2593
Richmond Cotton Oil Co., Memphis, Tenn.						
Choice Cotton Seed Meal	D	45.13	41.00	–	9.00	2759
Robert's Cotton Oil Co.						
Cotton Seed Meal	D	40.50	38.50	–	–	2841
J. E. Soper & Co., Boston, Mass.	O	40.38	38.50	–	–	2051
	O	43.07	41.00	9.50	8.00	2059
Star Brand Cotton Seed Meal	D	35.63	41.00	–	9.00	2564
J. Lindsey Wells Co., Memphis, Tenn.	C	31.13	41.00	–	9.00	2579
	C	37.88	41.00	–	9.00	2582
	D	32.75	41.00	–	9.00	2585
	D	33.88	41.00	–	9.00	2586
	D	32.50	41.00	–	9.00	2587
	D	37.88	41.00	–	9.00	2604
	D	37.13	41.00	–	9.00	2609
	D	38.19	41.00	–	9.00	2611
	D	39.38	–	–	–	2612
	D	34.94	–	–	–	2613
	D	40.69	41.00	–	9.00	2615
	D	40.69	–	–	–	2616
	D	39.37	–	–	–	2617
	D	39.37	–	–	–	2618
	D	38.63	41.00	–	9.00	2619
	D	39.63	41.00	–	9.00	2620
	D	37.19	41.00	–	9.00	2621
	D	38.53	41.00	–	9.00	2622
	C	43.44	41.00	–	9.00	2623
	D	39.56	41.00	–	9.00	2627
	D	40.44	41.00	–	9.00	2628
	D	41.06	41.00	–	–	2630
	D	41.00	41.00	–	–	2631
	C	39.25	41.00	–	9.00	2633
	D	33.88	–	–	–	2672
	C	37.06	41.00	–	9.00	2701
	O	41.13	41.00	–	9.00	2714
	D	41.19	41.00	–	7.00	2728
	D	41.75	41.00	–	9.00	2742
	D	41.38	41.00	–	9.00	2746
	D	41.81	41.00	–	9.00	2764
	O	44.63	41.00	–	9.00	2873
	O	41.13	41.00	–	9.00	2921
	O	43.75	41.00	–	9.00	2959
	D	41.32	41.00	7.21	9.00	2970

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.
COTTON SEED MEAL—Continued						
Star Brand Cotton Seed Meal—Continued						
	O	41.75	41.00	–	9.00	2977
	C	31.75	41.00	–	9.00	2003
	D	44.13	41.00	–	9.00	2004
	D	46.63	41.00	–	9.00	2034
	C	41.00	41.00	–	9.00	2035
	O	45.69	41.00	–	9.00	2057
Sun Brand Choice Purely Ground Cotton Seed Meal..... L. Lindsey Wells Co., Memphis, Tenn...	O	39.57	41.00	–	9.00	2734
	C	37.13	41.00	–	9.00	2763
	D	38.00	41.00	–	9.00	2765
	O	42.69	41.00	8.08	9.00	2993
COTTON SEED FEED						
Creamo Brand Cotton Seed Feed..... Tennessee Fiber Co., Memphis, Tenn.	O	22.38	22.00	5.58	5.00	2725
Fox Brand Standard Cotton Seed Feed Meal F. W. Brode & Co., Memphis, Tenn	O	21.19	22.00	6.08	5.00	2814
	O	21.13	22.00	–	5.00	2902
Glenwood Brand Cotton Seed Feed D. L. Marshall Co., Boston, Mass.....	O	25.38	22.00	–	5.00	2695
	D	20.25	22.00	–	5.00	2729
	O	20.75	22.00	4.93	5.00	2737
LINSEED OIL MEAL						
Linseed Oil Meal..... American Linseed Co., Chicago, Ill.....	D	36.13	36.00	–	1.00	2571
	O	34.13	36.00	–	1.00	2654
	O	35.82	36.00	–	1.00	2666
	O	35.25	36.00	–	1.00	2677
	D	36.00	36.00	3.04	1.00	2909
	O	36.38	36.00	–	1.00	2955
	O	36.25	36.00	–	1.00	2995
Old Process Oil Meal..... American Linseed Co., Chicago, Ill.....	D	34.63	32.00	–	5.00	2575
	O	35.13	32.00	–	5.00	2721
	O	34.63	32.00	7.09	5.00	2855
	O	35.19	32.00	–	5.00	2865
	O	35.38	32.00	–	5.00	2886

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.
GLUTEN FEED						
Bay State Gluten Feed	O	21.00	24.00	3.21	3.00	2723
J. E. Soper & Co., Boston, Mass	O	20.50	24.00	–	3.00	2894
Buffalo Gluten Feed	O	24.75	23.00	–	2.50	2652
Corn Products Mfg. Co., Chicago, Ill	O	24.44	23.00	–	2.50	2660
	O	25.25	23.00	–	2.50	2667
	O	25.25	23.00	–	2.50	2673
	O	22.50	23.00	–	2.50	2683
	O	26.44	24.00	–	2.50	2806
	D	26.19	23.00	–	2.50	2818
	O	25.69	23.00	–	2.50	2822
	C	25.25	–	–	–	2830
	O	25.13	23.00	2.77	2.50	2857
	O	24.25	23.00	–	2.50	2917
	O	26.13	23.00	–	2.50	2047
Clinton Gluten Feed	O	19.25	24.00	3.49	2.50	2698
Clinton Sugar Refining Co., Clinton, Iowa	O	16.63	24.00	–	2.50	2702
Continental Gluten Feed Contenental Cereal Co	O	31.69	33.00	14.39	14.00	2006
Golden Rod Gluten	D	24.25	25.00	–	3.00	2005
Jenks' Gluten Feed	O	27.50	27.00	–	7.50	2872
Huron Milling Co	O	25.38	27.00	11.06	7.50	2875
	O	29.38	36.00	–	5.00	2049
New England Gluten J. E. Soper Co., Boston, Mass	D	22.38	24.00	–	9.00	2688
Tiger Gluten Feed St. Louis Syrup and Preserving Co., St. Louis, Mo.	O	24.25	25.00	4.11	2.75	2682
Warner's Gluten Feed	O	25.25	24.00	4.11	2.56	2680
Corn Products Refining Co., Chicago, Ill.	C	24.50	24.00	–	2.50	2797
	O	25.82	24.00	–	2.50	2968
	O	26.07	24.00	–	2.50	2022
DISTILLERS GRAINS						
Ajax Flakes	O	32.13	33.00	14.12	12.00	2710
Ajax Milling & Feed Co	O	33.25	33.00	–	12.00	2871
	O	31.44	33.00	–	12.00	2979
	O	31.63	33.00	–	12.00	2037
Corn Distillers Grains (Proteina)	O	27.50	31.00	–	9.00	2670
C. F. Keck & Co., Milwaukee, Wis	O	28.75	31.00	10.58	9.00	2718
	C	29.00	31.00	–	9.00	2760
	O	29.63	31.00	–	9.00	2816

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.
DISTLLERS GRAINS—Continued.						
Corn Distillers Grains (Proteina)—Continued	M	28.00	31.00	–	9.00	2603
	O	28.75	31.00	–	9.00	2852
	O	28.63	31.00	–	9.00	2891
	O	28.63	31.00	10.94	9.00	2065
	C	26.82	31.00	–	9.00	2070
Corn Protegran	D	2532	33.00	11.65	14.00	2565
The Dewey Bros. Co., Blanchester, Ohio	D	24.63	36.00	–	12.00	2569
	D	25.00	–	–	–	2592
Fourex Grains	O	31.00	33.00	13.41	11.00	2709
J. W. Biles Co., Cincinnati, O	O	33.75	33.00	13.36	11.00	2975
BREWERS GRAINS AND MALT SPROUTS						
Pure Dried Brewers Grains	D	25.19	27.00	–	7.00	2799
Atlantic Export Co., Milwaukee, Wis.		24.13	25.00	–	7.00	2708
Brewers Grains	O	23.75	25.00	–	7.00	2589
Chas. A. Krause Grain Co., Milwaukee, Wis.		24.13	25.00	–	7.00	2708
Malt Sprouts	O	28.38	25.00	3.62	2.00	2805
American Malting Co.						
MISCELLANEOUS REINFORCED FEEDS						
Badger Dairy Feed	M	18.13	18.00	–	4.50	2836
Chas. A. Krause Milling Co., Milwaukee, Wis.	C	17.88	18.00	–	4.50	2053
Daisy Dairy Feed	D	11.94	16.00	–	3.00	2634
Great Western Cereal Co., Chicago, Ill.	D	12.31	16.00	–	3.00	2649
	O	13.44	16.00	3.84	3.00	2658
	O	13.38	16.00	–	3.00	2662
	O	12.07	16.00	–	3.00	2736
	D	13.94	16.00	–	3.00	2786
	O	13.00	16.00	–	3.00	2802
	O	12.25	16.00	–	3.00	2874
	O	14.57	16.00	–	2.00	2056
	D	14.63	14.00	–	3.00	2077
Hammond Dairy Feed	O	15.32	17.00	5.06	3.00	2705
Western Grain Products Co., Hammond, Indiana.						
H. J. Flax Feed	M	23.31	17.34	–	17.37	2632
Henry Jennings, Boston, Mass.	C	15.00	17.34	–	17.37	2636
	O	17.44	17.34	–	17.37	2656
	O	15.82	17.34	–	17.37	2665
	O	16.63	17.34	15.65	17.37	2678

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. Guaranteed—per cent.	Protein. Guaranteed—per cent.	Fat. Found—per cent.	Fat. Guaranteed—per cent.	Station number.
MISCELLANEOUS REINFORCED FEEDS—Continued.						
H. J. Flax Feed—Continued	O	17.88	17.34	–	17.37	2717
	D	14.13	17.34	–	17.37	2773
	D	17.50	17.34	–	17.37	2774
	O	17.88	17.34	17.81	17.37	2821
	O	14.50	17.34	–	17.37	2826
	O	14.75	17.34	–	17.37	2864
	O	17.88	17.34	–	17.37	2920
	O	15.13	17.34	–	17.37	2943
	O	15.13	17.34	–	17.37	2944
	M	16.75	–	13.92	–	2036
Merritt's Jersey Cow Feed	C	17.13	–	–	–	2793
E. Merritt & Sons, Houlton, Me.	M	21.38	–	–	–	2809
	M	17.25	–	–	–	2951
Premium Calf Meal American Cereal Co., Akron, O.	M	14.07	14.50	5.94	4.50	2597
Protena Dairy Feed Purina Mills, St. Louis, Mo.	O	19.38	20.00	–	3.50	2060
Rye Protegran	O	18.44	21.00	8.03	6.00	2735
Dewey Bros., Co., Blanchester, O.	O	19.19	21.00	9.05	6.00	2009
Union Grains	D	21.94	–	–	–	2595
J. W. Biles Co.	O	22.82	24.00	–	7.00	2657
	O	22.00	24.00	–	7.00	2791
	O	22.38	24.00	6.13	7.00	2878
	O	23.57	24.00	–	7.00	2996
MOLASSES AND SUGAR FEEDS						
Molac Molasses Dairy Feed	O	13.63	11.00	3.43	3.00	2892
Quaker Oats Co., Chicago, Ill.	O	16.50	16.00	5.81	3.00	2912
	O	17.00	15.50	4.24	3.00	2018
Sucrene Dairy Feed	O	17.19	16.50	–	3.50	2675
American Milling Co., Chicago, Ill.	O	17.63	16.50	7.22	3.50	2722
	C	17.63	16.50	–	3.50	2756
	O	18.13	16.50	–	3.50	2915
	O	18.63	16.50	–	3.50	2851
	O	16.50	16.50	–	3.50	2960
	C	18.75	16.50	–	3.50	2072
Sucrene Horse Feed American Milling Co., Chicago, Ill.	D	13.32	13.50	–	3.50	2757

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.
CORN, BARLEY & OAT FEED.						
Ideal Corn, Barley & Oat Feed..... E. T. & H. J. Ide, St. Johnsbury, Vt.	O	7.44	9.00	2.81	3.28	2954
CORN AND OAT FEEDS						
Boss Chop Feed.....	O	9.44	8.50	–	3.50	2779
Great Western Cereal Co.....	O	9.07	8.50	5.00	3.50	2967
Chop Feed David Stott, Detroit, Mich.....	O	9.19	–	4.48	–	2990
Fine Ground Eclipse Feed..... Husted Milling & Elevator Co., Buffalo, N. Y.	O	10.00	9.00	4.14	4.00	2711
Empire Feed for Stock.....	C	7.19	7.68	–	3.97	2606
Empire Mills, Orlean, N. Y.....	O	8.00	7.68	–	3.97	2693
	O	8.13	7.68	–	3.97	2724
	D	8.94	–	–	–	2832
	O	8.82	7.63	–	3.97	2900
	O	8.32	7.63	3.97	3.97	2964
Haskell's Stock Feed.....	O	10.25	8.00	–	6.25	2659
W. H. Haskell & Co., Toledo, O.....	O	9.07	8.00	7.64	6.25	2674
	O	9.25	8.00	–	4.00	2898
	O	8.88	8.00	–	4.00	2045
Horse Feed.....	O	12.50	12.00	4.58	4.50	2727
Buffalo Cereal Co.....	O	12.57	12.00	–	4.50	2897
Husted Stock Feed..... Husted Milling Co., Buffalo, N. Y.	O	9.38	8.00	5.24	4.00	2050
O. O. Feed..... E. S. Woodworth & Co., Minneapolis, Minn.	C	11.25	10.51	–	5.75	2766
Pearl Cooked Horse & Cow Feed.....	O	8.07	8.00	3.38	3.00	2681
Flint Mills Co., Milwaukee, Wis.....	O	8.63	8.00	–	3.00	2919
	O	10.13	8.00	–	3.00	2930
Schumachers Stock Feed.....	O	10.63	10.00	4.48	4.00	2671
Quaker Oats Co., Chicago, Ill.....	O	11.31	10.00	–	4.00	2803
	O	11.50	10.00	–	4.00	2823
	O	10.25	10.00	–	4.00	2850
	O	11.25	10.00	–	4.00	2895
	O	12.07	10.00	–	4.00	2021
	O	11.44	10.00	–	4.00	2067
Victoria Chop.....	O	9.13	8.11	–	3.05	2069
Royce & Coon Grain Co., Bowling Green, Ohio.....	O	7.07	8.11	3.38	3.05	2893

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.	
CORN AND OAT FEEDS—Continued.						
Vigo Corn and Oat Feed. Indiana Milling Co.	D	8.25	10.00	–	4.00	2602
Wirthmore Stock Feed. Chas. M. Cox Co., Boston, Mass.	O	9.19	10.00	6.47	4.00	2767
HOMINY FEEDS						
Star Hominy Feed. Toledo Elevator Co., Toledo, O.	D	8.88	7.00	–	6.50	2770
Susquehanna Hominy Chop. Oneonta Milling Co.	O	10.94	10.00	–	7.00	2028
Wirthmore Hominy Feed. Chas. M. Cox Co., Boston.	O	10.50	10.50	–	7.50	2043
RICE FEED						
Ground Rice. Quaker Oats Co., Chicago, Ill.	O	8.00	9.61	0.26	0.38	2768
POULTRY FEEDS						
Crescent Chick Feed	O	10.00	–	–	–	2583
Dry Mash Feed. Park & Pollard Co.	O	19.00	23.00	3.78	3.00	2889
Purina Baby Chick Feed. Ralston Purina Mills Co., St. Louis. Mo.	D	11.19	11.00	–	3.50	2594
Schumahers Scratching Feed. Quaker Oats Co., Chicago, Ill.	O	9.75	10.50	3.03	3.00	2906
Sun Chick Starter	O	9.50	–	–	–	2584

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.
WHEAT OFFALS						
Acme Feed	O	16.57	16.00	–	4.00	2856
Acme Milling Co., Indianapolis	O	16.75	15.00	–	4.00	2877
Apex Fancy Mixed Feed Allen Baker Corn Co., St. Louis	O	17.44	14.00	–	4.00	2025
Gem Mixed Feed Allen Baker Corn Co.,St. Louis	O	17.69	14.00	–	4.00	2653
	O	16.44	14.00	–	4.00	2927
	O	17.32	14.00	–	4.00	2961
Trojan Middlings Pure Wheat Feed Allen & Wheeler Co., Troy, O	O	16.38	–	–	–	2942
Bran Ansted & Burk Co., Springfield, O	O	14.88	14.00	–	3.00	2713
Middlings	O	16.94	15.00	–	4.00	2881
Ansted & Burk Co., Springfield, O	O	17.13	15.00	–	4.00	2931
Mixed Feed	O	16.32	–	–	–	2861
Ansted & Burke Co., Springfield, O	O	16.57	–	–	–	2932
Pure Wheat Bran Ashton Flouring Mills.	O	16.75	16.00	–	4.00	2055
Badger Standard Middlings Badger Crittenden Milling Co., Milwaukee, Wis.	O	18.69	16.50	–	4.00	2907
Bull's Eye Mixed Feed Blish Milling Co., Saymour, Ind.	O	15.32	–	4.31	–	2858
	O	16.25	–	–	–	2998
Gopher Middlings Brooks Elevator Co	O	17.19	16.00	–	5.00	2958
Purity Pure Winter Wheat Bran Cairo Milling Co	O	15.50	14.00	–	3.50	2058
Clover Leaf Bran Seymour-Carter	O	14.38	14.30	5.61	5.20	2966
Erie Winter Mixed Feed Chapin & Co., Boston	O	17.82	–	–	–	2956
Pure Wheat Bran Chapin & Co., Boston	O	14.69	14.00	–	3.00	2019
Jersey Bran Pure Wheat Geo. C. Christain, Minneapolis	O	14.88	15.00	–	4.00	2926
Bran H. C. Cole Milling Co	O	16.38	14.50	–	3.75	2068

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.
WHEAT OFFALS—Continued.						
Middlings H. C. Cole Milling Co	D	18.07	16.00	–	4.50	2985
Winter Wheat Bran. Wm. A. Coombs Milling Co., Coldwater, Mich	O	15.63	14.00	–	3.00	2947
Winter Wheat Mixed Feed, Wm. A. Coombs Milling Co., Coldwater, Mich	O	15.44	–	–	–	2690
	O	15.32	15.00	–	3.00	2691
	O	16.13	–	–	–	2948
Columbia Mixed Feed	D	15.50	–	–	–	2600
Chas. M. Cox Co., Boston	O	15.38	–	–	–	2887
	O	15.25	–	–	–	2962
Adrian Pure Winter Wheat Bran Detroit Milling Co., Detroit	O	15.00	–	–	–	2015
Winter Wheat Bran Dow & King, Pittsfield, Ill.	O	14.50	–	–	–	2731
Bran Dow & King, Pittsfield, Ill.	O	14.57	–	–	–	2999
Middlings Dow & King, Pittsfield, Ill.	O	16.63	–	–	–	2732
Boston Mixed Feed	D	16.25	16.00	–	4.50	2798
Duluth Superior Mills Co., Duluth	O	16.19	16.00	–	4.50	2869
	O	16.19	16.00	–	4.50	3000
Bran Dwight Flour Mills, Minneapolis	O	13.88	12.00	–	3.00	2868
Eaco Mixed Feed	O	16.82	15.00	–	3.00	2866
Everett, Aughenbauch & Co., Waseca, Minn	O	16.94	15.00	–	3.00	2941
Ideal Mixed Feed Fergus Flour Mills Co., Fergus Falls, Minn	O	15.69	–	–	–	2903
Frontier Pure Wheat Mixed Feed Flint Mills Co., Milwaukee.	O	17.13	14.00	–	3.00	2020
Mixed Vermont Feed	O	16.38	15.00	–	4.00	2676
Flint Mills Co., Milwaukee	O	17.00	15.00	–	4.00	2685
	O	17.19	14.00	–	4.00	2879
	O	16.94	14.00	–	4.00	2040
	O	17.13	14.00	–	4.00	2933
Bran & Shorts Glen Villin Roller Mills	O	17.25	–	–	–	2024
Sanford Mixed Feed Griswold & Mackinnon, St. Johnsbury, Vt.	O	15.88	–	–	–	2913
Pure Winter Wheat Bran	D	15.94	14.00	–	–	2700
Hunter Bros. Milling Co., St. Louis, Mo	O	16.56	14.00	–	3.50	2899

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.
WHEAT OFFALS—Continued.						
Hunter,s Matchless Mixed Feed	O	14.69	15.00	–	4.00	2026
Hunter Bros. Milling Co., St. Louis, Mo						
Hunter's Sunshine Mill Feed	O	15.06	15.00	–	4.00	2704
Hunter Bros. Milling Co., St. Louis, Mo.	O	17.69	15.00	–	4.00	2882
	O	17.32	15.00	–	4.00	2938
	D	16.50	15.00	–	4.00	2811
Mixed Feed	O	14.50	–	–	–	2719
Huron Milling Co., Harbor Beach, Mich.						
Kehlor's Mill Feed	D	17.19	14.00	–	4.00	2800
Kehlor's Flour Mills Co., St. Louis, Mo.	O	16.57	14.00	5.52	4.00	2016
Fancy Mixed Feed	O	17.38	–	–	–	2923
Kelley Milling Co., Kansas City, Mo.	O	18.00	–	–	–	2972
Bran	D	15.75	–	–	–	2601
Kelley & Lysle Milling Co., Leavenworth Kansas.						
Snowflake Middlings	O	18.50	–	–	–	2969
Lawrenceburg Roller Mills Co	O	15.82	–	–	–	2928
	O	15.88	–	–	–	2039
Gold Heart Mixed Feed	O	16.50	16.50	–	5.30	2703
Missouri Valley Milling Co	O	17.38	16.50	–	5.30	2924
	O	16.88	16.50	–	5.30	2001
Bran	O	14.50	–	–	–	2929
Morris City Mills, Morris, Minn.						
Bran	O	15.63	14.25	–	4.00	2916
Northwestern Consolidated Co.						
Pillsbury's Pure and Unadulterated Wheat Bran	O	15.82	13.00	–	4.00	2922
Pillsbury, Minneapolis, Minn	O	15.25	13.00	–	4.00	2940
Pillsbury's B. Middlings						
Pillsbury, Minneapolis	O	17.38	14.00	–	4.50	2901
Champion Mixed Feed	O	15.69	–	–	–	2945
Portland Milling Co	O	15.75	–	–	–	2991
King Feed	O	16.13	14.00	–	3.70	2997
R. P. Moore Milling Co.						
Bran	O	16.32	–	–	–	2042
Quality Mills, Enterprise, Kans.						
Buck Eye Mixed Feed	O	15.32	13.00	–	4.00	2694
Quaker Oats Co., Chicago, Ill	O	16.38	13.00	4.55	4.00	2863
	D	16.07	13.00	–	4.00	2086
Bran	O	16.00	–	–	–	2032
Red Lake Falls Milling Co.						

C, from the feeder; D, from the dealer; M, from the manufacturer; and O, the 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.
WHEAT OFFALS—Continued.						
Occident Mixed Feed. Russell-Miller Milling Co.	O	17.69	15.00	–	4.00	2041
Gold Mine Mixed Feed. Sheffield-King Milling Co., Minneapolis, Minn.	O	16.63	17.00	–	4.50	2789
Pure Winter Wheat Bran. Shellabarger Mill & Elevator Co., Salem,	O	17.69	14.00	–	3.50	2788
Kansas	O	18.75	14.00	–	3.50	2853
Star Middlings. Star & Crescent Milling Co.	O	17.57	15.00	–	4.00	2075
Bran. F. W. Stock & Son, Hillsdale, Mich.	O	15.07	–	–	–	2867
Stock's Monarch Mixed Feed. F. W. Stock & Son, Hillsdale, Mich.	O	16.19	–	–	–	2870
Bran. David Stott, Detroit, Mich.	O	16.63	–	–	–	2987
Stott's Climax Middlings. David Stott, Detroit, Mich.	O	19.25	–	–	–	2989
Stott's Honest Mixed Feed	O	16.63	–	–	–	2988
David Stott, Detroit. Mich	O	17.00	–	–	–	2044
Farmer's Favorite Winter Wheat	O	14.75	–	–	–	2699
Vinco Mixed Cow Feed	O	16.00	–	–	–	2914
Valley City Milling Co., Grand Rapids, Mich	O	15.56	–	–	–	2980
Michigan Winter Wheat Bran. Valley City Milling Co. Grand Rapids, Mich.	O	14.00	–	–	–	2591
Vinco Bran. Valley City Milling Co., Grand Rapids,	O	15.07	–	–	–	2981
Mich	O	14.94	–	–	–	2994
Voight's Choice Winter Wheat Bran	O	14.38	–	–	–	2590
Voight Milling Co., Grand Rapids	O	15.32	–	–	–	2904
	O	15.07	–	–	–	2888
	O	15.13	–	–	–	2905
	O	15.13	–	–	–	2978
Mill Run Brand Mixed Feed. Waggoner Gates Milling Co.	O	16.50	–	–	–	2046
Unadulterated Wheat Bran. Washburn Crosby Co., Minneapolis.	D	15.50	–	–	–	2812
Unadulterated Coarse Wheat Bran	O	14.63	15.00	–	4.00	2925
Washburn-Crosby Co., Minneapolis	D	14.50	15.00	–	4.00	2012
Snow's Flaky Bran. E. S. Woodworth & Co.	O	15.69	14.25	–	4.10	2061

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.
ADULTERATED WHEAT OFFALS						
Blue Grass Mixed Feed	O	10.13	10.00	2.65	2.50	2661
A. Waller & Co., Henderson, Ky	O	10.19	10.00	–	2.50	2679
	O	9.38	10.00	–	2.50	2730
	O	10.56	10.00	–	2.50	2813
	O	10.50	10.00	–	2.50	2033
	O	9.88	10.00	–	2.50	2064
Jersey Mixed Feed	O	9.25	10.00	–	2.00	2733
Indiana Milling Co	O	11.69	12.05	2.82	3.20	2963
BEEF SCRAPS						
Bowker's Fresh Ground Beef Scrap	O	52.50	40.00	13.95	5.00	2696
The Bowker Co., Boston, Mass.						
Breck's Ground Beef Scrap	O	47.38	45.00	16.90	12.00	2918
Breck						
Dow's Ground Beef Scrap	O	45.06	45.00	–	15.00	2716
John C. Dow Co.	O	42.38	50.00	–	15.00	2654
	O	43.13	45.00	22.68	12.00	2824
Ground Bone & Scrap	O	39.56	39.10	29.30	35.67	2827
S. H. Nash, Bangor, Me.						
Beef Scrap	O	46.69	40.00	–	15.00	2655
Portland Rendering Co., Portland	O	45.32	40.00	–	15.00	2664
	O	42.94	40.00	15.10	15.00	2687
	O	37.32	40.00	–	15.00	2862
	O	38.25	40.00	–	15.00	2880
	D	40.38	40.00	–	15.00	2083
Bone & Meat Meal for Poultry	O	38.00	40.00	–	8.00	2663
Portland Rendering Co., Portland	O	38.57	40.00	12.33	8.00	2007
Swift's Lowell Edible Bone Meal	O	24.13	10.00	–	5.00	2712
Swift's Lowell Fertilizer Co., Boston, Mass.						
Swift's Lowell Edible Bone Meal for Cattle and Poultry	O	24.75	10.00	0.20	5.00	2008
Swift's Lowell Fertilizer Co., Boston, Mass.						

Cottonseed Meal.

Analyses pages 161 to 165.

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.

GRADES OF COTTONSEED MEAL.

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. Most of the meal sold in Maine in 1907-8 was guaranteed 41 per cent protein and 7 or 9 per cent fat.

Two grades of meal, "choice and prime," were shipped from the crop of 1907. The grade "extra prime" of the 1906 crop was not shipped in 1907-8.

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

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

Meal below prime in quality is classed as "*Off*" meal and includes any cottonseed meal which is distinctly deficient in any of the requirements of prime quality, either in color, odor, texture or analysis, or all.

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 a 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.

A SIMPLE TEST FOR QUALITY.

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.

ANALYSIS OF DEALERS SAMPLES.

The cottonseed meal situation in Maine in 1906-7 was very unsatisfactory, chiefly because of the great damage to the cotton crop of 1906 by the severe storms in the Gulf States. Fearing that conditions might again lead to the shipping of low grade meal the following circular was sent to Maine dealers in October, 1907.

"The cottonseed meal situation in the fall of 1906 and winter of 1907 was very unsatisfactory. Something has been done towards correcting this matter through the Interstate Cottonseed Crushers Association. Also many shippers are apparently desirous of doing the right thing. There is reason however, to fear that low grade goods may be shipped into the State again this year. To guard against this and to protect the dealer, the following suggestion is made.

If immediately on the arrival of a car, the dealer will open not less than 6 packages and take samples in accordance with directions which will be sent on application and forward to me by prepaid express, a prompt free analysis will be made of the sample and the result reported promptly. In case the goods should not prove to be up to the guaranty under which they were sold, the dealer will then have a chance to immediately put in a claim for rebate which I am confident will, under these conditions, be allowed by a reputable shipper. Furthermore the dealer can change the guaranty on the packages so it shall be in accord with fact. He will thus protect himself from imposition or mistake on the part of the shipper, and from the penalties of violating the feed inspection law, and protect his customers as well.

In case my deputy should find samples of cottonseed meal bought in carload lots that should fall below the guaranty, *samples of which had not been submitted to me as above outlined,* I should feel it my duty to at once institute proceedings against the dealer for violation of the law regulating the sale of concentrated commercial feeding stuffs.

CHAS. D. WOODS, Director."

In response to this a very unusual number of samples were submitted by dealers, particularly early in the season before the quality of the shipments from the 1907 crop was assured.

RESULTS OF THE ANALYSIS.

The results of the analysis show that practically all of the samples received from the crop of 1907 were of good quality. All of the samples numbered lower than 2719, with the exception of those ranging from 2001 to 2087, were from the 1906 crop. The other numbers were for the most part from the 1907 crop. It will be noted that these analyses ran for the most part well up to the guaranty. It has not been unusual during the present winter for cottonseed meals to carry as high as 44, 45, 46 and even 47 per cent protein and only in rare instances have they fallen below 40 per cent protein. In case the goods have run below the guaranty of 41 per cent, the dealers have in most instances changed the guaranties to accord with fact, before the good have been distributed.

Cottonseed Feed.

Analyses page 165.

A few lots of cottonseed feed have been found in the State. For the most part these were reasonably in accord with the guaranty of 22 per cent protein and 5 per cent fat. The differences in price between choice cottonseed meal and these low grade cottonseed feeds have been slight. They are not economical feeds at any price which they have been or are likely to be offered. A ton of choice cottonseed meal carrying 41 per cent protein carries 680 pounds of digestible protein. A ton of cottonseed feed with an analysis of 22 per cent protein would only have 340 pounds of digestible protein; in other words as a source of protein, one pound of choice cottonseed meal is equal to two pounds of cottonseed feed.

Linseed Meal.

Analyses page 165.

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 from which the fat has been 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 advance of price of the cottonseed meal which was relatively greater than that of linseed. 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. Apparently considerably more of the meal was used in Maine in 1907-8 than for many preceding years.

Gluten Meals and Feeds.

Analyses page 166.

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.

Buffalo Gluten feed is apparently much more largely used in the State than the other brands and this is sold under a guaranty of 23 per cent protein and 2½ per cent fat, which analysis is well maintained. In only one instance was a sample found running below this guaranty and then only slightly.

Bay State Gluten feed cannot be depended upon to carry much more than 20 per cent protein, and the *Clinton Gluten feed* of the Clinton Sugar Refining Company is even poorer than this. Only three samples of *Jenks gluten feed* were found and these were sold under two guaranties,—one was 27 per cent protein and 7½ per cent fat, and the other 36 per cent protein and 5 per cent fat. One sample, with the lower guaranty, was up to the guaranty;—the meal carrying the high guaranty fell far below, and the guaranty was changed by the dealer but not until after considerable of the meal had been sold.

Warner's Gluten feed is made by the people that make Buffalo gluten feed and closely resembles it in guaranty and analysis.

COLORING MATTER AND ACID IN GLUTEN FEEDS.

Because of some complaint and special information received, the gluten feeds on sale in Maine were examined both for acidity and for foreign coloring matters with the results which follow. The acidity was determined by titrating with a tenth normal sodium hydrate and in each instance two grams of the material were used for the determination. The Sostegni and Carpentieri method was used for testing for coal tar color. The results are given in the table which follows. It will be noted that 3 samples of corn meal were also tested as standards for comparison.

ACIDITY AND COLOR OF GLUTEN MEALS AND FEEDS.

Sta. No.	Brand	Acidity %	Appearance	Color
2723	Bay State	.015	Somewhat dark	No coal tar color found
2894	" "	.033	" "	No coal tar color found
2652	Buffalo	.193	" "	Not tested
2660	"	.118	Reddish yellow	Not tested
2667	"	.193	Somewhat dark	Coal tar color found
2673	"	.118	Reddish yellow	Not tested
2683	"	.100	Slightly dark	Not tested
2806	"	.055	" "	Not tested
2818	"	.068	Reddish yellow	Not tested
2822	"	.053	Slightly dark	Not tested
2830	"	.110	Reddish	Not tested
2857	"	.163	Reddish	Coal tar color found
2917	"	.123	Slightly dark	Coal tar color found
2047	"	.063	Reddish yellow	Coal tar color found
2698	Clinton	.023	Natural	No coal tar color found
2702	"	.030	"	No coal tar color found
2801	Golden Rod	.010	Quite dark	No coal tar color found
2005	" "	.013	Quite dark	Not tested
2875	Jenks	.025	Yellow	Coal tar color found
2872	" (Meal)	.038	"	Not tested
2049	" "	.055	"	Coal tar color found
2688	New England	.010	Light reddish yellow	Coal tar color found
2682	Tiger	.140	Very slightly dark	No coal tar color found
2680	Warner's	.070	Reddish	Not tested
2797	"	.063	"	Not tested
2022	"	.055	"	Coal tar color found
–	Corn meal (coarse)	.020	Natural	No coal tar color found
–	" " "	.020	"	Not tested
–	" " (bolted)	.008	"	Not tested

All of the samples in above table were tested qualitatively for sulphuric acid and hydrochloric acid. All the samples, including the corn meals, exhibited traces of sulphuric acid but those glutens which gave the highest percentages of total acidity usually seemed to carry more sulphuric acid than the others. The greater part of the acid present in excess, however, was hydrochloric, which varied considerably in the different samples, the variations for the most part, agreeing quite closely with the variations in total acidity.

It will be noted that the Buffalo and Warner's gluten feeds made respectively by the Corn Products Manufacturing Co., and the Corn Products Refining Co. of Chicago, and the Tiger gluten feed, made by the St. Louis Preserving Co., carried in many instances inexcusable and dangerous amounts of acid,

apparently showing that sufficient attention was not given in the manufacture of the goods to prevent an excess of acid accumulating. A feed containing such amounts of free mineral acids as these goods carried would be apt to be destructive to the teeth and harmful to the digestive apparatus of the animals. The coloring matter used is apparently not one of those that are allowed by the U. S. Board of Food and Drug Inspection. It is apparently free from arsenic and is not a particularly dangerous material. There seems, however, to be nothing gained by its addition to the goods. Its use is to be deprecated and is contrary to the National Food and Drug Act.

Distillers Grains.

Analyses pages 166 and 167.

In composition, dried distillers grains resemble the gluten feeds. They are made chiefly from corn from which the starch is removed by fermentation. They are more bulky than the gluten feeds and when of good quality run higher in protein. A feeding test with distillers grains was reported in bulletin 92 of this Station. It will be noted than in the analyses the goods fall somewhat below their guaranty in protein. The Ajax Flakes carry on the average about 32 per cent protein and Keck's Corn Distillers grain carry a scant 29 per cent protein. In one instance both Ajax Flakes and Fourex grains were above their guaranteed percentage of protein. Corn Protogran was apparently not sold very much in the State. The inspector did not find it at all. The three samples sent in by dealers showed it to carry about 25 per cent protein. It was sold to them under different guaranties, but the guaranties were changed to accord with fact. All of these distillers grains with the exception of the Corn Protogran, carried practically as much *total* fat and protein as the guaranties called for; while for the most part they were somewhat below in protein, they over-ran in fat. As was to be expected no weed seeds were found in any of the samples of distillers grains.

Brewers Grains.

Analyses page 167.

Rather more dried brewers grains were apparently used in Maine than in preceding years. It will be noted that these goods for the most part carried about 25 per cent protein. The

brewers grains were, as would be expected, free from weed seeds.

Miscellaneous Reinforced Feeds.

Analyses pages 167 and 168.

There are included under this head feeds which run from about 14 to 20 per cent protein; there is no special reason for grouping them together other than that they are nitrogenous feeds, in contrast to the refuses from the milling of oats, corn, etc., which are low in protein.

The *Badger Dairy Feed* is about up to its guaranty in protein. One sample, No. 2836, examined was found to have about 10 per cent of weed seeds, among which were pigweed, mustard, yellow foxtail, wild buckwheat, lady's thumb and flax.

Daisy Dairy feed. In the early part of the season the Daisy Dairy feed was sold by the Great Western Cereal Company under a guaranty of 16 per cent protein and 3 per cent fat. The samples from the dealers ran, however, considerably below this and the guaranties were changed to accord with fact. The representative of the Great Western Cereal Company said that they intended to make these goods up to the guaranty but in order to be safe, later in the season they lowered the guaranty to 14 per cent protein and the later samples fairly maintained that guaranty. It was stated in explanation of the earlier goods running as low as 12 and 13 per cent protein that the miller had taken upon himself to change the composition of the feed. Be that as it may, the goods have been from the standpoint of the feeding stuff law one of the most unsatisfactory that have come into the State the present season. They are, however, quite free from weed seeds and practically none of the seeds germinated.

Hammond Dairy feed. Only one sample of Hammond Dairy feed was examined,—none being sent to us by customers. Evidently it is not much used in the State. About 5 per cent of the goods were weed seeds, including pigweed, lady's thumb, mustard, wild buckwheat, green foxtail and hedge mustard. In this sample the pigweed germinated readily and an ordinary 100 pound bag would furnish at the rate of over 18,000 pigweed plants.

H. J. Flax Feed is discussed on page 200.

Merritt's Jersey Cow feed. E. Merritt & Sons of Houlton are local millers and grind native grains to which is added cottonseed meal in order to make a feed for milch cows. They use native grains together with the pinched wheat, oats, barley and weed seeds that came from the cleaning of wheat in their flour mill. They grind this with western corn and add to the feed, ground second quality buckwheat, without hulls. To this grain mixture they add a third by weight of good grade cottonseed meal. It will be noted therefore that this feed, if thoroughly mixed, is made up of three-fourths mixed grains and mill screenings and one-fourth cottonseed meal. Four years ago they sent a sample to the Station and based upon that analysis they claimed for it 28 per cent protein and 6 per cent fat. The analysis as reported in bulletin 102 of this Station showed it to carry 29.13 per cent protein and 6.65 per cent fat. These goods were not sold in bags but were sold in bulk and put into the customers' bags and for this reason they had never been sampled officially. In the winter of 1907-8 a sample of this feed was sent in by a correspondent, analyzed as No. 2793 and found to carry only 17.13 per cent protein. These goods were not sold under a guaranty but on request of the consumer, E. Merritt & Sons sent one of their advertising tags which claimed 28 per cent protein for the goods. This particular sample carried about 10 per cent weed seeds including mustard, pigweed, persicaria, lady's thumb, corn cockle, horsemint, flax, wild buckwheat and green foxtail. The seeds were not finely ground and when subjected to a germination test those that germinated were chiefly mustard and at the rate of about 36,000 plants per 100 pounds. It will be noted from the table of weed seeds found in feeds given on page 191 that all of these goods are heavily loaded with weed seeds, many of which will germinate. Naturally this led to correspondence with the makers and a sample was sent to us from the mill which was found to carry 21.38 per cent protein. They also submitted a sample of the grain mixture before it had been reinforced by cottonseed meal and it was found to carry 12.32 per cent protein.

The manufacturers seem to have placed this guaranty upon their goods in good faith and state "The demand for this feed is largely local from persons who have used it for years and would not care for analysis." They made affidavit that they

would in the future place proper guaranty upon these goods as sold and that "in our advertising and in our guaranty, place the per cent of protein and fat even lower than an unevenly mixed sample could possibly show it." For these reasons the case was allowed to rest.

Premium Calf Meal was first submitted as a manufacturer's sample and then an official sample was taken. As will be noted from the analyses these two samples differ very widely in guaranty and in composition.

Union Grains continue to be quite largely used in the State. They are still sold under a guaranty of 24 per cent protein and 7 per cent fat; they fall about 2 per cent below their guaranty in protein and somewhat under in fat. The manufacturers state that other states are finding these goods to be well up to the guaranty but that they would make special tags of 22 per cent protein for goods shipped into the State. Our inspector, however, has failed to find any changed guaranties.

Molac Molasses Dairy feed. Three samples of these goods were obtained, two of which were found to run well up to the guaranty. One sample, No. 2912 was examined for weed seeds and about 10 per cent of the material consisted of seeds of green foxtail, yellow foxtail, mustard, lady's thumb, pigweed, wild buckwheat, hedge mustard, and samples No. 2892 and 2018 carried rather similar percentages of about the same kind of weeds. In one sample pigweed and foxtail germinated at the rate of over 125,000 weed plants per 100 pound bag.

Sucrene Dairy feed. This feeding stuff ran well up to the guaranty in protein and above in fat. This carried about 5 per cent or more of weed seeds, including pigweed, wild buckwheat, green foxtail, yellow foxtail, hedge mustard, flax, goosefoot, lady's thumb, pale persicaris, dock, mustard, ragweed, field peppergrass and evening primrose. In one sample over 180,000 pigweed per 100 pounds germinated.

Refuses from Milling Oats, Corn, Etc.

Analyses pages 169 and 170.

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 per cent 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.

One sample of *Ideal Corn, Barley and Oat feed* was found in the western part of the State; it was below guaranty in protein and fat. It, however, contained no weed seeds. These goods probably have a small sale and only in the western part of the State.

The *Boss Chop feed* was above the guaranty in both protein and fat. It carried a few mustard seeds.

One sample of *Chop feed* made by David Stott was found which was not guaranteed according to law. It had about the ordinary analysis of a chop feed, but carried from 3 to 5 per cent of weed seeds, including pigweed, lady's thumb, ragweed, common mallow, green foxtail, yellow foxtail, and wild buckwheat. These seeds were alive and in sufficient quantity to furnish upwards of 18,000 weed plants per 100 pounds feed.

One sample of *Fine Ground Eclipse feed* for stock was found and ran above the guaranty in protein. It carried from 3 to 5 per cent of weed seeds, of which wild buckwheat was the most common. There was, however, considerable ragweed, corn cockle, flax, pigweed, yellow foxtail and wild sunflower.

The *Empire feed for stock* was for the most part above the guaranty and was free from weed seeds. *Haskell's stock feed* ran above the guaranty and with the exception of a few ragweed seeds, no foreign seeds were found. The *Horse feed* of the Buffalo Cereal Co. was up to guaranty and carried a few wild buckwheat and mustard seeds. *Husted Stock feed* was up to guaranty. *Pearl Cooked Horse and Cow feed* was above

guaranty and carried no weed seeds. *Schumacher's Stock feed* ran, for the most part, well above the guaranty. It carried few seeds of mustard and lady's thumb; which, however, did not germinate.

Victoria Chop feed ran uneven,—one sample being well up and the other below guaranty. It, however, carried no weed seeds. The *Vigo Corn and Oat feed* fell considerably below guaranty. It had a few foxtail and pigweed seeds, which, however, did not germinate. The *Wirthmore Stock feed* was below guaranty in protein, but considerably above in fat; it had no weed seeds. The *Hominy feeds* were all up to guaranty. One lot of *Ground Rice feed* was found and was considerably below guaranty.

Poultry Feeds.

Analyses page 170.

These mixed goods are difficult to sample and hence it is possible that the samples did not fairly represent the goods. The *Dry Mash feed* was considerably below the guaranty as was also *Schumacher's Scratching feed.* These all carried more or less weed seeds. The *Purina Baby Chick feed* was about a fourth weed seeds, such as pigweed, mustard, green foxtail, yellow foxtail, wild buckwheat, flax, raspberry and lady's thumb. While these seeds would germinate, it is very likely that they would be so acted upon in the digestive apparatus of the chickens as to loose vitality.

Wheat Offals.

Analyses pages 171 to 174.

The wheat offals do not come under the requirements of the feeding stuffs law provided they are not adulterated. In many instances, these goods are guaranteed and for the most part they are well up to the guaranties placed upon them by the makers. On page 193 there will be found the examination of these goods for weed seeds. Except in one sample of *Gem Soft Wheat Mill Run* mixed feed made by the Allen Baker Corn Co., which carried about 2 per cent of corn cockle,* there were no more foreign seeds than would naturally be expected. Not only was

* See page 202 relative to poisonous weed seeds.

there much corn cockle in this mixed feed, which is poisonous to animals, but the seed germinated at the rate of upwards of 45,000 plants per 100 pound bag of the feed, so there was great danger of spreading this pernicious weed from its use.

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. 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 175.

With the exception of the mixed feeds from Kentucky, sold chiefly under the names of *Blue Grass* and *Jersey* mixed feeds, no adulterated wheat offals have been found upon the market. These goods as 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. 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 175.

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 guaranty as

placed upon the goods is only a very general guide to the actual composition.

Weed Seeds in Feeding Stuffs.

In connection with the regular inspection of feeding stuffs during the season of 1907-08 it was thought best to make an investigation of the noxious weed seeds which are found in some of these feeds. Attention was drawn to this matter by the recent introduction into Maine of several feeds which are heavily loaded with weed seeds and which seem to find ready sale in many sections.

One or more samples were selected as representative of each of the various feeding stuffs which seemed at all likely to contain weed seeds either because of accident, imperfect separation, or intentional addition. These included brans, brewers and distillers grains, mixed feeds, chop feeds, stock and dairy feeds, flax feeds, malt sprouts, middlings, molasses feeds, scratch feeds, union grains, etc. Oil meals, gluten feeds, and similar feeds were not examined for weed seeds. Each sample selected was carefully examined by the seed analyst and an estimate made of the amount of weed seeds present. The principal kinds were identified and noted. These weed seeds are designated by the common name used in this section. In order to identify them conclusively they may be referred to the list given on pages 54 and 55 in bulletin 152 of this Station. The results of this examination are given in the table which begins on page 190.

VIABLE WEED SEEDS.

Those feeds which contained the largest amounts of weed seeds were tested for germination in order to determine whether or not the seeds present would grow under favorable conditions. A germinator of the Geneva type was used and 5 gram charges of each feed were taken for the test. At the end of 5 days the samples were covered thickly with mold and it seemed improbable that any more seeds would germinate so the tests were stopped at the end of this period. The results of this 5 day germination test are given in the table which begins on page 196.

TABLE SHOWING WEED SEEDS FOUND IN FEEDS.

Kind of feed.	Manufacturer.	Sta. No.	Weed seeds found.
NITROGENOUS FEEDS			
Rye Protegram	Dewey Bros. Co.	2009	Few wild buckwheat
Union Grains	J. W. Biles Co	2878	No weed seeds
Ajax Flakes	Ajax Milling & Feed Co.	2710	No weed seeds
Continental Gluten Feed	Continental Cereal Co.	2006	No weed seeds
Distillers Grains	C. F. Keck & Co	2816	No weed seeds
Fourex	J. W. Biles Co	2709	No weed seeds
Brewers Grains	C. A. Krause Grain Co.	2708	No weed seeds
Malt Sprouts	American Malting Co.	2805	About one per cent weed seeds including wild buckwheat, rape, yellow foxtail, mustard, and corn cockle.
MISCELLANEOUS REINFORCED FEEDS			
Acme Feed	Acme Milling Co	2877	Few hulls of wild buckwheat and mustard
Badger Dairy Feed	C. A. Krause Milling Co.	2836	About ten per cent weed seeds including pigweed, mustard, yellow fox tail, wild buckwheat, lady's thumb and flax. Few hulls of corn cockle.
Daisy Dairy Feed	Great Western Cereal Co.	2736	Wild buckwheat, ragweed, and mustard.
Daisy Dairy Feed	Great Western Cereal Co.	2874	Wild buckwheat, yellow foxtail and mustard.
Daisy Dairy Feed	Great Western Cereal Co.	2802	Wild buckwheat and mustard.
Daisy Dairy Feed	Great Western Cereal Co.	2874	Wild buckwheat, yellow foxtail, mustard, pale persicaria
Hammond Dairy Feed	Western Grain Products Co	2705	About five per cent weed seeds including pigweed, lady's thumb, mustard, wild buckwheat, green foxtail, and hedge mustard
H. J. Flax Feed	Henry Jennings	2665	Between 40 and50 per cent weed seed including wild buckwheat, yellow foxtail, green foxtail, lady's thumb, flax, pigweed, mustard, wild sunflower, ragweed and field peppergrass
H. J. Flax Feed	Henry Jennings	2632	About 20 per cent weed seeds including pigweed, mustard, green foxtail, mustard, green foxtail, yellow foxtail, and flax
H. J. Flax Feed	Henry Jennings	2636	From 30 to 40 per cent weed seeds, lady's thumb, green foxtail, yellow foxtail, mustard, flax, wild buck wheat and persicaria
H. J. Flax Feed	Henry Jennings	2656	From 25 to 30 per cent, weed seeds including pigweed, mustard, green foxtail, yellow foxtail, flax, wild buckwheat, and hedge mustard

TABLE SHOWING WEED SEEDS FOUND IN FEEDS.

Kind of feed.	Manufacturer.	Sta. No.	Weed seeds found.
MISCELLANEOUS REINFORCED FEEDS—Continued.			
H. J. Flax Feed.....	Henry Jennings.....	2678	From 25 to 30 per cent weed seeds includ ing pigweed, mustard, yellow foxtail, green foxtail, flax, lady's thumb, hedgemustard and wild buck wheat
H. J. Flax Feed.....	Henry Jennings.....	2717	About 20 per cent weed seeds including pigweed, green foxtail, yellow foxtail, flax, mustard and field peppergrass
H. J. Flax Feed.....	Henry Jennings.....	2773	From 50 to 60 per cent weed seeds including pigweed, mustard, green foxtail, yellow foxtail, hedge mustard, flax, lady's thumb wild buckwheat and ragweed
H. J. Flax Feed.....	Henry Jennings.....	2774	About 25 per cent weed seed including pigweed, mustard, green foxtail, yellow foxtail, flax and lady's thumb
H. J. Flax Feed.....	Henry Jennings.....	2826	About 30 per cent weed seed including pigweed, green foxtail, yellow foxtail, lady's thumb, flax, mustard, persicaria, wild buckwheat and field peppergrass
H. J. Flax Feed.....	Henry Jennings.....	2864	From 30 to 40 per cent weed seeds including pigweed, green foxtail, yellow foxtail, mustard, wild buckwheat, lady's thumb and flax
H. J. Flax Feed.....	Henry Jennings.....	2920	Between 40 and 50 per cent weed seeds including mustard, pigweed, green foxtail, yellow foxtail, wild buckwheat, lady's thumb flax and hedge mustard
H. J. Flax Feed.....	Henry Jennings.....	2943	Between 40 and 50 per cent weed seeds including mustard, pigweed, green foxtail, yellow foxtail, hedge mustard, lady's flax, thumb, wild buckwheat and ragweed
H. J. Flax Feed.....	Henry Jennings.....	2944	About 25 per cent weed seeds including wild buckwheat, mustard, green foxtail, yellow foxtail, pigweed, flax and lady's thumb
Merritt's Jersey Cow Feed.....	E. Merritt & Sons.....	2793	About 10 per cent weed seeds including mustard pigweed, persicaria, lady's thumb, corn cockle, horse mint, flax, wild buckwheat, and green foxtail

TABLE SHOWING WEED SEEDS FOUND IN FEEDS.

Kind of feed.	Manufacturer.	Sta. No.	Weed seeds found.
MISCELLANEOUS REINFORCED FEEDS—Continued.			
Merrett's Jersey Cow Feed	E. Merrett & Sons	2777	About 5 per cent, weed seeds including mustard, pigweed, persicaria, horse nettle, lady's thumb, corn cockle, ragweed, wild buckwheat, horse mint and knotgrass
Merrett's Jersey Cow Feed	E. Merrett & Sons	2809	About 5 per cent weed seeds including yellow foxtail, night flowering catchfly, persicaria, horse nettle, pigweed, and lady's thumb
Foundation of Merrett's Jersey Cow Feed	E. Merrett & Sons	2847	From 8 to 10 per cent weed seeds including lady's thumb, persicaria, pigweed, mustard
Molac Molasses Dairy Feed	Quaker Oats Co	2018	From 5 to 10 per cent weed seeds including wild buckwheat, lady's thumb, green foxtail, yellow foxtail, mustard, pigweed and flax
Molac Molasses Feed	American Cereal Co	2892	From 5 to 7 per cent weed seeds including wild buckwheat, mustard, yellow foxtail, lady's thumb and flax
Molac Dairy Feed	Quaker Oats Co	2912	About 10 per cent or more weed seeds encluding green foxtail, yellow foxtail, mustard, lady's thumb, pigweed, wild buckwheat, hedge mustard, and night flowering catchfly
Sucrene Dairy Feed	American Milling Co	2960	About 5 per cent weed seeds including pigweed, wild buckwheat, green foxtail, yellow foxtail, hedge mustard and flax
Sucrene Dairy Feed	American Milling Co	2756	Goosefoot, lady's thumb, pale persicaria, dock, mustard, ragweed, field peppergrass, evening primrose
Sucrene Dairy Feed	American Milling Co	2757	Goosefoot, lady's thumb, pale persicaria, dock, mustard, ragweed, field peppergrass, evening primrose
CORN, BARLEY AND OAT FEEDS			
Ideal Corn, Barley, and Oats Feed	E. T. & H. K. Ide	2954	No weeds
Boss Chop Feed	Great Western Cereal Co.	2967	Few mustard seeds
Boss Chop Feed	Great Western Cereal Co.	2779	No weed seeds
Chop Feed	David Stott	2990	From 3 to 5 per cent weed seeds including pigweed, lady's thumb, ragweed, common mallow, green foxtail, yellow foxtail, and wild buckwheat

TABLE SHOWING WEED SEEDS FOUND IN FEEDS.

Kind of feed.	Manufacturer.	Sta. No.	Weed seeds found.
MISCELLANEOUS REINFORCED FEEDS—Continued.			
FineGround Eclipse Feed	Husted Milling & Elevator Co.	2711	From 3 to 5 per cent weed seeds. Wild buckwheat most common, others are ragweed, corn cockle, flax, pigweed, yellow foxtail and wild sunflower
Empire Feed	Empire Mills	2964	No weed seeds
Haskell's Stock Feed	W. H. Haskell & Co.	2898	Very few ragweed
Horse Feed	Buffalo Cereal Co.	2897	Few wild buckwheat and mustard
Pearl Cooked Horse and Cow Feed	Flint Mills Co.	2919	No weed seeds
Schumacher's Stock Feed	American Cereal Co.	2895	Few mustard and lady's thumb
Victoria Chop	Royce & Coon Grain Co.	2893	No weed seeds
Vigo Corn & Oats Feed	Indiana Milling Co.	2602	Few foxtail and pigweed
Wirthmore Stock Feed	C. M. Cox Co.	2767	No weed seeds
POULTRY FEEDS			
Dry Mash Feed	Park & Pollard	2889	Few hulls of wild buckwheat and mustard
Schumacher's Scratching Feed	Quaker Oats Co.	2906	Few corn cockle, mustard, and yellow foxtail
Purina Baby Chick Feed	Ralston Purina Mills	2594	About 25 per cent weed seeds including pigweed, mustard, green foxtail, yellow foxtail, wild buckwheat flax, raspberry, and lady's thumb
WHEAT OFFALS			
Adrian Bran	Detroit Milling Co.	2015	Few wild buckwheat hulls
Bran	Ansted & Burk Co.	2713	Few mustard
Bran	David Stott	2987	Few yellow foxtail
Bran	Dwight Flour Mills	2868	Few yellow foxtail. Few cockle hulls
Bran	F. W. Stock & Sons	2867	Few hulls of cockle and wild buckwheat
Bran	Hunter Bros	2700	No weed seeds
Bran	Kelley & Lysle Milling Co	2601	No weed seeds
Bran	Morris City Mill	2929	Few hulls of cockle and wild buckwheat
Bran	Northwestern Consolidated Co.	2916	Few hulls of cockle and wild buckwheat
Bran	Pillsbury	2922	Few hulls of wild buckwheat
Bran	Red Lake Falls Milling Co	2032	Few hulls of cockle
Bran	Washburn-Crosby Co.	2812	Few pigweed
Bran & Shorts	Glen Villin Roller Mills	2024	Few wild buckwheat, few cockle hulls

TABLE SHOWING WEED SEEDS FOUND IN FEEDS.

Kind of feed.	Manufacturer.	Sta. No.	Weed seeds found.
Clover Leaf Bran	Seymour Carter	2966	Few hulls of wild buckwheat and mustard
Jersey Bran Winter Wheat	Geo. C. Christian	2926	Few hulls of wild buckwheat and cockle
Pure Wheat Bran	Chapin & Co	2019	No weed seeds
Pure Winter Wheat Bran	Shellabarger Mill & Elevator Co	2788	No weed seeds
Vimco Bran	Valley City Milling Co.	2978	Few hulls of cockle and tearthumb
Winter Wheat Bran	Dow & King	2731	No weed seeds
Badger Standard Middlings	Badger Crittenden Milling Co	2907	No weed seeds
Gopher Middlings	Brooks Elevator Co	2958	Some pigweed and mustard
Middlings	Doten Grain Co	2029	Some pigweed, wild buckwheat and mustard
Middlings	Wm. A. Coombs Milling Co	2691	Few wild buckwheat hulls
Middlings	Ansted & Burk Co	2981	No weed seeds
Middlings	Dow & King	2732	No weed seeds
Middlings	H. C. Cole Milling Co	2985	No weed seeds
Pillsbury's B Middlings	Pillsbury	2901	Some weed seeds ground too fine to be identified
Snow Flake Middlings	Lawrenceburg Roller Mills Co	2969	No weed seeds
Stott's Climax Middlings	David Stott	2989	Few wild buckwheat and mustard hulls
Trojan Middlings	Allen & Wheeler	2942	No weed seeds
Apex Fancy Mill Run Mixed Feed	Allen Baker Co	2025	No weed seeds
Blue Grass Mixed Feed	A. Waller & Co	2033	Few corn cockle hulls
Boston Mixed Feed	Duluth Superior Mills Co.	2869	Few hulls of mustard and wild buckwheat
Boston Mixed Feed	Duluth Superior Mills Co.	2000	Some wild buckwheat, pigweed, and corn cockle. Pigweed most common
Buck Eye Mixed Feed	Quaker Oats Co	2863	Few yellow foxtail. Some hulls of wild buckwheat and corn cockle
Bull's Eye Mixed Feed	Blish Milling Co	2858	Few corn cockle. Few hulls of wild buckwheat
Bull's Eye Mixed Feed	Blish Milling Co	2998	Some corn cockle seeds and some corn cockle hulls
Champion Mixed Feed	Portland Milling Co	2991	Some corn cockle hulls
Columbia Mixed Feed		2887	About one per cent weed seeds including wild buckwheat, mustard, and yellow foxtail. Some crushed seeds also
Eaco Mixed Feed	Everett Augenbaugh & Co	2941	Few mustard seeds and some wild buckwheat hulls
Erie Mixed Feed	Chapin & Co	2956	Few wild buckwheat hulls
Fancy Mixed Feed	Kelley Milling Co	2923	Some pigweed, some hulls of cockle and wild buckwheat
Farmers' Favorite Mixed Winter Wheat, cow feed	Valley City Milling Co	2914	Some corn cockle and wild buckwheat badly crushed

TABLE SHOWING WEED SEEDS FOUND IN FEEDS.

Kind of feed.	Manufacturer.	Sta. No.	Weed seeds found.
Frontier Pure Wheat Mixed Feed	Flint Mills Co	2020	Few corn cockle hulls
Gem Soft Wheat Mill Run Mixed Feed	Allen Baker Corn Co	2927	About two per cent corn cockle
Gem Soft Wheat Mill Run Mixed Feed	Allen Baker Corn Co	2961	Few corn cockle seeds and hulls
Gold Heart Mixed Feed	Mo. Valley Milling Co	2924	Small quantity mustard and wild buckwheat badly crushed
Gold Mine Mixed Feed	Sheffield, King, Milling Co	2789	Few hulls of buckwheat, mustard and corn cockle
Hunter's Matchless Mixed Feed	Hunter Bros. Milling Co.	2026	No weed seeds
Hunter's Sunshine Mill Feed	Hunter Bros. Milling Co.	2938	Few wild buckwheat and corn cockle
Ideal Mixed Feed	Fergus Flour Mills Co	2903	Few hulls of corn cockle and wild buckwheat
Jersey Mixed Feed	Indiana Milling Co	2963	No weed seeds
Kehlor's Mill Feed	Kehlor Flour Mills	2016	No weed seeds
King Feed	R. P. Moore Milling Co	2997	Few corn cockle
Mixed Feed	Ansted & Burk Co	2932	No weed seeds
Mixed Feed	Huron Milling Co	2719	Few hulls of corn cockle
Mixed Feed	Wm. A. Coombs Milling Co	2948	Few hulls of corn cockle
Sanford Mixed Feed	Griswold & Mackinnon	2913	Few hulls of mustard and wild buckwheat
Snow Flake Mixed Feed	Lawrenceburg Roller Mills Co	2938	Few hulls of corn cockle and wild buckwheat
Stock's Monarch Mixed Feed	F. W. Stock & Sons	2870	About 2 per cent weed seeds including wild buckwheat yellow foxtail, and ragweed
Stott's Honest Mixed Feed	David Stott	2988	Few hulls of corn cockle and wild buckwheat
Vermont Mixed Feed	Flint Mills Co	2933	Few hulls of corn cockle and wild buckwheat
Voight's Winter Mixed Feed	Voight Milling Co	2904	Few hulls of corn cockle and wild buckwheat

TABLE SHOWING WEED SEEDS GERMINATED IN FEEDS.

Sta. No.	No. weed seeds sprouted per bag (100 lbs. of feed)	Principal kinds of weed seeds sprouted
	MALT SPROUTS	
2805	9,072	Mustard
	RYE PROTOGRAN	
2009	.....	.....
	MOLAC FEED	
2892	.....	.....
2912	127,008	Pigweed, foxtails
2018	9,072	Pigweed
	SUCRENE DAIRY FEED	
2960	.....	.....
	H. J. FLAX FEED	
2632	225,800	Pigweed, mustard, foxtails, flax
2636	18,144	Pigweed
2656	335,664	Pigweed, foxtails, flax
2665	272,160	Pigweed, mustard, foxtails, lady's thumb, wild buckwheat, flax
2678	290,304	Pigweed, mustard, foxtails
2717	81,638	Pigweed, foxtails
2773	1,886,976	Pigweed, mustard, foxtails, lady's thumb, wild buckwheat, flax
2774	117,936	Pigweed, mustard, foxtails
2826	344,736	Pigweed, mustard, foxtails
2864	934,416	Pigweed, mustard, foxtails, flax, wild buckwheat lady's thumb
2920	99,792	Pigweed, foxtails
2943	1,224,720	Pigweed, mustard, foxtails, lady's thumb, flax
2944	789,265	Pigweed, mustard, foxtails, flax, wild buckwheat lady's thumb
	MERRITT'S JERSEY COW FEED	
2777	36,288	Mustard
2793	.....	.....
2809	.....	.....
2847	18,144	Lady's thumb
	BADGER DAIRY FEED	
2836	.....	.....
	BOSS CHOP FEED	
2967	.....	.....
	DAISY DAIRY FEED	
2874	.....	.....
	ECLIPSE FEED	
2711	.....	.....
	HAMMOND DAIRY FEED	
2705	18,144	Pigweed
	HASKELL'S STOCK FEED	
2898	.....	.....
	HORSE FEED (Buffalo)	
2897	.....	.....
	DSTOTT'S CHOP FEE	
2990	18,144	Foxtails
	KING FEED	
2997	.....	.....
	SCHUMACHER'S STOCK FEED	
2895	.....	.....

TABLE SHOWING WEED SEEDS GERMINATED IN FEEDS.

Sta. No.	No. weed seeds sprouted per bag (100 lbs. of feed)	Principal kinds of weed seeds sprouted
	VIGO CORN AND OATS FEED	
2602	.....	.....
	POULTRY SCRATCH FEEDS	
2594	680,400	Pigweed, foxtails, some flax
2906	.....	.....
	BRAN	
2713	.....	.....
2812	72,576	Pigweed
2868	.....	.....
2987	.....	.....
2024	.....	.....
	MIDDLINGS	
2958	27,216	Foxtails, pigweed
2989	.....	.....
2025	.....	.....
	MIXED FEED	
2858	.....	.....
2863	.....	.....
2870	18,144	Wild buckwheat
2887	.....	.....
2914	.....	.....
2923	.....	.....
2927	45,360	Corn cockle
2938	.....	.....
2941	.....	.....
2961	.....	.....
2998	.....	.....
3000	27,216	Foxtails

GERMINATION HINDERED BY MOLD.

It was thought that the first trial of 5 days was not conclusive on account of the growth of the mold, which might in itself prevent the growth of the seed, or indirectly, by necessitating too short a period, in this way prevent its growth. In order to determine whether or not more seeds would germinate if the mold was lessened or prevented, several trials were made with the result that a number of the brands of feeds which showed no germination in the first test did, under more favorable conditions, sprout numbers of the weed seeds which they contained. In making these trials in one case the weed seeds contained in one gram of the feed were separated from the rest of the feed and germinated in small Petrie dishes; and in the other cases two grams of the feed were moistened with a dilute solution of formaldehyde (1 part 40 per cent formaldehyde in 400 parts water) and then germinated in the Geneva germinator. These results are tabulated on the next page.

TABLE SHOWING SEEDS GERMINATED AFTER TREATMENT WITH FORMALDEHYDE.

Sta. No.	No. weed seeds sprouted per bag (100 lbs. of feed)	Principal kinds of weed seeds sprouted
	H. J. FLAX FEED	
2636	226,800	Pigweed
	MERRITT'S JERSEY COW FEED	
2793	68,040	Mustard
2809	.....	.....
2847	.....	.....
	MOLAC FEED	
2892	22,680	Pigweed
2018	45,360	Pigweed, foxtail
	SUCRENE DAIRY FEED	
2960	45,360	Pigweed, foxtail
2960*	181,440	Pigweed

*Weed seeds separated from rest of feed and seed germinated in Petrie dish.

DISCUSSION OF RESULTS OF GERMINATION.

The negative results which are here recorded are of course not conclusive. The weed seeds which did not germinate in some of these samples might under more favorable conditions sprout and grow. The positive results, on the other hand, show conclusively that the weed seeds present are alive and will grow when suitable conditions are at hand. It is quite certain that many of these weed seeds would pass unharmed through the digestive organs of the animals to which they were fed and would find their way to the fields of the owner. A recent bulletin of the Vermont Experiment Station, No. 131, has the following to say in regard to this question of weed seeds:—"Sheep and poultry handle them well; but the digestive system of neither horse nor cow is able to destroy them. To employ materials carrying viable weed seed in the mixture of "dairy" or "horse" feeds, even though they are plastered over with molasses, is little short of atrocity."

CORN COCKLE IN WHEAT OFFALS.*

As may be readily seen in the tables only a very few of the wheat offals, such as the brans, middlings, and mixed feeds contained more weed seeds than should be the case when proper care is used in the separations and grindings. One

* See page 202 relative to poisonous weed seeds in feeding stuffs.

seed which occurs in this class of feeds is the corn cockle, which is quite poisonous. In bulletin No. 20 of the United States Department of Agriculture, Division of Botany, and also in Farmers' Bulletin No. 86, Chesnut calls attention to the corn cockle in part as follows:—"The poison is found in nearly all parts of the plant, but mainly in the kernel of the seed. Cases of poisoning have been noted among all sorts of poultry and household animals, but are rarely due to any portion of the plant as growing in the field. The poisoning is generally produced by a poor grade of flour made from wheat containing cockle seeds. Machinery is used to remove these seeds from the wheat but the difficulty of separating them is so great that the result is not entirely accomplished." According to Chesnut, flour containing corn cockle has often been used for bread and eaten sometimes with fatal results.

In Bulletin No. 36 of the Maryland Agricultural College attention is called to "8 or 10 cases of poisoning of poultry by feeding stuff sold as middlings." These cases were all traced to one lot of the feed which, upon examination, was found to contain considerable corn cockle. A feed which contains as much of this seed as does No. 2927 is objectionable not only on account of the crop of plants which might be grown but because of its possible injury to stock.

WEED SEEDS IN MADE UP FEEDS.

The most flagrant offenders carrying live weed seeds are the molasses or sugar feeds, which include the molac feeds, sucrene dairy feed, Hammond dairy feed, etc., the Merritt's Jersey Cow feed, some of the scratch feeds and the H. J. Flax feed.

In the case of the *molac feeds,* it will be noted that in the first germination test, recorded in the table on page 196, one sample did not sprout at all and a second sprouted a comparatively small number; but on referring to the table on page 198 it will be seen that under more favorable conditions both these samples sprouted quite large numbers of seeds. The same is partially true of Merritt's cow feed. In the first trial two samples did sprout and one did not. The sucrene dairy feed, which did not germinate in the first test, showed good germination in the second test both by separating the weed seeds and by treating

with formaldehyde. The *H. J. Flaxfeed,* however, is the greatest offender. The 13 samples shown in the tables represent the feed as it was found on the Maine markets from August 1907 until the time of making these tests (March, 1908). By referring to table on page 190 it will be seen that from 20 to 60 per cent of this feed is made up of weed seeds. including many of the most troublesome plants found in fields and gardens; and referring to tables 196 and 198 it will be seen that these seeds are alive and that, under suitable conditions they will grow to the number of nearly two millions per each 100 pound bag of the feed. This, taken in connection with the other fact that nearly every sample of this feed, which we have examined, has been below its guaranty of protein, stamps this feed as one of the least desirable brands on the market.

The matter of the quality of the H. J. Flaxfeed was taken up with the shipper several times during the winter and he professes willingness to conform to the desires of the Station relative to this feed. He claims that under the name of H. J. Flaxfeed "a new process feed is being shipped, free of seeds and finer quality at a low price." It is to be guaranteed 16 per cent protein and 14 per cent fat. The shipper submitted a sample to us of this new process feed which differs materially from the goods that have been shipped under the name of H. J. Flaxfeed. No samples, however, have as yet been received from customers in Maine. It is recommended that anyone desiring to handle or use this feed, send samples to the Experiment Station for analysis in accordance with the directions on the back cover.

The *Daisy Dairy feed* contains a considerable amount of weed seeds but the manufacturers claim that the feed has been treated at so high a temperature that it is highly improbable that the seeds would germinate. As this feed has quite an extensive sale it was thought best to try each sample in order to see if this statement was borne out by the facts. Ten different samples were treated with formaldehyde and kept in the germinator for 11 days. With one exception there was no germination, and it seems quite probable that the very small number sprouted in the one case was due to accident in manufacture of the goods.

STATE LEGISLATION AGAINST WEED SEEDS IN FEEDS.

The great tendency to introduce into these waste products foul seeds is a serious one. For the most part there is little known as to the nutritive qualities of these weed seeds; occasionally, notably the case with corn cockle, they are poisonous. They are a great menace to clean fields. Naturally the use of these feeds high in foreign weed seeds will tend to the introduction of undue numbers of undesirable plants and sometimes of plants unknown to the state. In some of the feeding stuffs in the method of preparation, they are heated to a high enough temperature so as to kill the seeds.

As wheat milling offals will always carry more or less foreign weed seeds, a law making it a misdemeanor to sell feeding stuffs that carry weed seeds would be somewhat impracticable. There might, however, be placed a limit to the amount and kinds of foul seeds that would be allowed. It might be practicable to enforce a law that was made specific against any particular weed, as for instance corn cockle. The weed question in feeding stuffs is a very important one. It would seem unwise to attempt to regulate the amount of weed seeds that are present in grass seeds and allow an unrestricted sale of feeding stuffs carrying in some cases more dangerous seeds than grass seeds carry.

Unfortunately, however, the trouble is not confined to wheat offals and the various feeds coming under the requirements of the law. Whole grains, particularly oats, frequently carry large amounts of weed seeds. A sample from a car of oats shipped into Bangor the present year consisted of 80.7 per cent of oats, 4 per cent of inert matter and 15.3 per cent of foreign seeds. Over 9 per cent of these seeds were harmless, such as wheat, timothy, barley, Kentucky blue grass, redtop and white clover, but about 6 per cent were made up of lady's thumb, mustard, goosefoot, winged buckwheat, yellow foxtail, wild buckwheat, pale persicaria, green foxtail, meadow fescue, Menzie's pepper grass, hedge mustard, five finger flax, ragweed, American wild mint, horse nettle, evening primrose, witch grass, night-flowering catchfly, penny cress, yellow wood sorrel and field pepper grass. While this is probably an extreme case and would not be so likely to occur in years when oats were low in price, yet it is

very suggestive of the methods by which large amounts of foreign weed seeds may be brought into the State and distributed broadcast over the farming lands.

WEED SEEDS IN FEEDING STUFFS AND THE FOOD AND DRUG LAW.

After this bulletin was in type a very important decision (Food Inspection Decision 90) was made by the U. S. Board of Food and Drug Inspection, bearing on weeds in feeding stuffs. The two most important points are:

(1) If the screenings of wheat are put in the bran it shall be labeled "Bran and Screenings."

(2) Poultry and cattle foods which contain poisonous weed seeds in appreciable quantities will be considered as adulterated in accordance with the provisions of the law forbidding the presence of poisonous or deleterious ingredients.

As the Maine Food and Drug law is identical with the National law in its requirements, and by it the Director of the Experiment Station is empowered to make rules, regulations and standards which shall "when possible, conform to and be the same as the rules and regulations adopted from time to time for the enforcement of" the National Food and Drug Law, F. I. D. 90 respecting weed seeds becomes a part of the Maine Food and Drug Law and will be enforced in Maine after July 1, 1908.

To avoid possible violations, dealers should avail themselves of the written guaranty as outlined on page 158.

BULLETIN No. 157

POULTRY WORK AT THE MAINE AGRICULTURAL EXPERIMENT STATION.

By Chas. D. Woods, Director.

During the past year a number of changes have occurred in the poultry work of the Station. It is desirable that a clear statement should be made, setting forth the facts regarding these changes. It is the purpose of this bulletin to give such a statement. It is proposed to consider the following topics in order: The poultry work of the Station up to 1908; poultry investigations now under way; general outline of plans for future work with poultry.

The Poultry Work of the Station Up To 1908.

Poultry investigations were begun at the Station in 1897. In that year a poultry breeding house was built. In the fall birds were installed and experiments begun. The work was in charge of Professor G. M. Gowell. An account of the plant, and a brief statement of the experiments begun that year were given by Professor Gowell in the Annual Report for 1897 (pp. 97-103). At the outstart the experiments simply dealt with the practical questions of managing the birds in the new house so as to maintain their health and productiveness. In the second year of the work (1898) an experiment in breeding fowls for increased egg production was begun, with the invention of a trap nest and the taking of records of the egg production of individual hens. This work has continued to the present time. From the beginning of the work there has been carried on one other general line of poultry investigation besides breeding for egg production; namely, studies in poultry management, including housing, feeding, rearing chickens, and other equally important matters.

The work of the Station in these two directions (breeding for egg production and poultry management) has attracted wide attention not only in this country but abroad as well, and has been very generally held to have been of notable practical benefit to the poultry industry at large. A brief "account of stock" of what has actually been accomplished in the two general lines of poultry work followed will be useful here. The work in poultry management will be first considered.

THE CURTAIN-FRONT HOUSE.

Of all the improvements which have been made in poultry management at this Station undoubtedly the so-called "curtain-front system" of housing ranks first. Up to the time when Professor Gowell began the first tentative experiment in the direction of making a more open house for laying poultry it was practically universally believed by poultrymen that in order to get good winter egg production it was necessary to imitate in the poultry house, so far as possible, summer conditions. The Experiment Station itself constructed its first poultry house on the plan of a tight house with a system of supplying artificial heat. It was very soon demonstrated after the "curtain-front" principle was tried in a small house (the so-called "Pioneer house" of Station bulletins) that the old idea of the necessity for a warm house for winter egg production was essentially wrong. It clearly appeared that a low temperature in itself had no bad influence on egg production during the winter months. Further it appeared that getting the birds into the open air every bright, sunshiny day during the winter was a great stimulus to egg production. This is practically what the "curtain-front" house does. During bright days the curtains are up and to all intents and purposes the birds are in the open air. The house, however, gives two conditions which could not be duplicated in the open air during the winter months. First, the birds are protected from drafts and, second, they scratch in a dry litter. The general idea that the lowness of the temperature does not matter in egg production provided the birds have plenty of fresh air and the house is dry, has proved itself in the experience of the Station a correct one.

The essential correctness of the underlying idea in this "curtain-front system" of housing is further indicated by the fact

that it has been widely adopted by practical poultrymen all over the world. In fact it may now be said that this is the dominant plan of housing poultry for laying purposes at the present time. While the Station makes no claim that this idea is absolutely original with itself, still the fact remains that at the Maine Experiment Station this scheme of housing was first tried on any extensive scale.

DRY MASH FEEDING.

Probably next in practical importance to the "curtain-front system" of housing in the achievements of the Station in poultry management should stand its demonstration on an extensive scale of the value of the dry mash system of feeding laying birds. Here again the Station makes no claim of absolute priority. It is a significant fact, however, that the dry mash system of feeding which at the present time is probably more widely used than any other system of feeding poultry by the largest and most up-to-date poultry plants throughout the country, was very little used until after the appearance of the bulletins of this Station detailing its success with the method. It is, furthermore, a significant fact that anyone who will take the trouble to read the correspondence and advice columns of the leading poultry journals in this country will find that the Maine Experiment Station formula for mixing the dry mash feed is more often recommended by the editors of these journals than any other.

CRATE FATTENING.

Another line of experimentation in poultry management at the Station which was at the time it was carried out pioneer work for this country was the demonstration of the practical value of crate fattening of chickens to be sent to market. While crate fattening had long been practiced in Europe before the Station did any work on the subject it was neither generally known nor generally practiced in this country. The Station clearly demonstrated the value of the method by its own experiment. It cannot be doubted that the results of these experiments have stimulated many American poultrymen to try crate fattening for themselves, and in so far have contributed to the commercial development of the poultry industry in this country.

METHOD OF REARING CHICKENS.

Finally one other line of work in poultry management which has been developed at the Station and which has attracted wide and favorable attention among practical poultrymen is the study of the best methods of rearing chickens. While it is by no means to be supposed that the last word has been said on this subject it is a fact that the methods of rearing chickens which have been tried at this Station and have been published in its bulletins have been adopted by many poultrymen. This can only be considered as an indication that these methods, if not the best possible, are, at least, regarded by practical poultrymen as better than what they had been using in the past.

FARMERS' BULLETIN ON POULTRY MANAGEMENT.

Before leaving the subject of the poultry management work it may be stated that at the request of the Bureau of Animal Industry a Farmers' Bulletin of the U. S. Department of Agriculture on methods of management of poultry practiced at the Maine Experiment Station is now in course of preparation. The demand for this information the Station has never been able to meet with the editions which it was possible to print of its own bulletins.

BREEDING FOR EGG PRODUCTION.

Turning now to the work of the Experiment Station in breeding for egg production it should be said that at the time when this work was undertaken it was truly pioneer work. The larger domestic animals like beef and dairy cattle, sheep, horses, etc., had been bred from earliest times for utility purposes and had been greatly improved by such breeding. No serious attempt had ever been made, however, to apply any consistent plan of breeding poultry for such a pure utility point as egg production. The breeding of poultry for fancy or show points (feather, form and the like) had long been practiced and had reached a high state of perfection. It was felt on the inauguration of the work that in consideration of the fact that the vast majority of all domestic fowls were kept for their value as producers of either eggs or meat or both that it was highly desirable to learn whether better qualities in regard to these

utility points could not be bred into standard varieties of poultry.

TWO EXPERIMENTS PLANNED.

The general plan of the investigation on this matter was simply to try on a large scale selection experiments in egg production. The working basis of the original plan was the assumption that small fluctuating variations in egg production were inherited. Proceeding on this assumption two experiments were planned by the writer. One of these experiments had as its object to determine whether by breeding only from relatively high layers the average annual egg production of the flock could be increased. This experiment was carried out by Professor Gowell through 9 consecutive years. The limit of "relatively high laying" was taken at 150 eggs. All birds laying more than that in their first laying year were used as breeders during the 9 years which this experiment was continued. The cockerels used in this breeding experiment were sons of birds laying 200 or more eggs in their first laying year. The second experiment planned which was of obviously equal importance to the first, was intended to determine whether if only relatively poor laying hens were used as breeders it would be possible to lower the annual average egg production. This second experiment was never tried, a fact which is greatly to be regretted in the light of what is now known regarding the results of the first experiment (see p. 210 below). A word may perhaps be advisable to point out clearly why it was necessary to perform this second experiment before any definite conclusions could be drawn as to the meaning of any results obtained in the first experiment. Suppose that in trying the first experiment favorable results are obtained, i. e., that the annual average production increases from year to year concurrently with the selective breeding. Is it to be concluded that the breeding is the cause of the increase? Such a conclusion obviously cannot be drawn, if, *as was the case in the actual performance of this "breeding for egg production" work at this Station,* there are made improvements in housing, feeding and other details of management, each one of which by itself might tend to increase annual average egg production. Nobody can tell how much of the observed improvement is due to breeding and how much to housing, feeding, etc.

EFFECT OF THE BREEDING EXPERIMENT UPON PRACTICE.

Leaving this matter for the moment it may be pointed out that whatever the detailed results of the experiment in breeding fowls for increased egg production, there can be no doubt that the experiment itself has served as a decided stimulus to the better breeding of poultry in this country. A great number of poultrymen at the present time are using trap nests and selecting birds for breeding with reference to their performance in egg production. In the advertising columns of every poultry journal will be found advertisements of strains of all of the standard breeds "bred to lay." At the time when the work of this Station in this direction was begun it would have been extremely difficult, if not impossible to find any poultryman who was making any systematic attempt to increase the egg production of his flock by breeding. Whatever the results of the Station's experiment, and whether or not methods of breeding based on its supposed results have a sound foundation, it is a great gain to have brought about a wide spread recognition of the importance of improving the methods of breeding poultry for egg production.

Another respect in which the breeding work of the Station has been of great value lies in the fact that in the course of the experiment a remarkable collection of data regarding egg production has been accumulated. Since 1898 trap nest records of substantially all the birds kept in the Station's poultry plant have been made. It is probable that nowhere else does there exist a set of records of egg production covering a period of 9 years and including several thousand birds. Quite regardless of the outcome of the breeding experiment itself these records collected in the prosecution of the experiment have a definite, permanent and considerable value.

STUDY OF THE EGG RECORDS.

Up until the summer of 1907 no particular attempt had been made to analyze these records of egg production and to see what light they threw on the laws governing the process itself. In July, 1907, the department of biology of the Station was organized and commenced its work. One of the first tasks undertaken in this department was the analysis of the egg record

statistics. The complete analysis of the statistics is an extremely laborious task and will take considerable time for its completion. It is gratifying to state, however, that the first part of this work has been finished and is now in the hands of the U. S. Government printer awaiting publication. This first portion of the discussion of the records of egg production deals with the annual records. That is to say, that unit of this part of the investigation is the total production of the birds during the first laying year. A brief summary of some of the more significant results of the study of annual egg production which have a practical bearing on the future policy of the Station in its poultry work are included here. It is to be understood that this summary is a direct compilation from the extended and detailed paper by Doctors Raymond Pearl and F. M. Surface, the biologists of the Station, setting forth the results which are to be published as a bulletin by the Bureau of Animal Industry. In such a summary the evidence on which apparently dogmatic statements are made obviously cannot be given.

The chief reason or indeed necessity for making a detailed study of the annual egg production during the course of the breeding experiment obviously lies in the following considerations: The initial purpose of the experiment was to find a way to breed poultry so that an increase in egg production might be obtained. In order to get at this knowledge a specific method of breeding was tried during a period of 9 years. The only way in which it is possible to get any light at all as to whether this particular method of breeding is the best or even a good one to attain the desired end is to find out precisely what happened in egg production in each year covered by the experiment. If the method of breeding is a good one for its desired purpose then it would be expected that, barring accidents, in each successive year of the experiment there ought to be an increase in the average production of the flock. As a result of unavoidable accidents it might happen in any such experiment that in a particular year the average production would drop below that for the preceding year. Consequently in order to form any just estimate of the value of the method of breeding it is necessary to consider the results over the whole period of the investigation together. That is to say, the general trend of the egg production over the whole period must be taken account of and

the minor fluctuations in individual years must be neglected. The statistical examination of the annual egg records therefore, derives its justification from the necessity of determining what the value to the practical poultry man is of the method of breeding which has been followed in this experiment at the Station.

CONCLUSIONS REACHED FROM THE ANNUAL RECORDS.

The detailed study of the annual records, using adequate mathematical methods of analysis leads to the following conclusions:

I. There is a large amount of variation among individual birds in respect to annual egg production. The range of variation extends from zero to approximately 250 eggs in the records of the Station. The *amount of variation* in regard to egg production is substantially the same at the end of the selection experiment as it was at the beginning. That is to say, after 9 years of selection with respect to egg production the birds breed no truer to a definite type of egg production than they did at the beginning. It will be recognized by every stock breeder that this is an important fact to be taken into consideration in passing opinion on the value of the method of breeding poultry which was tried in the experiment.

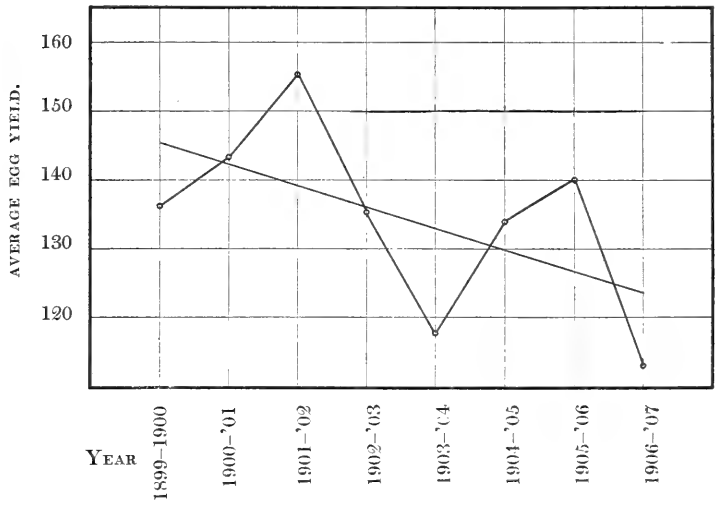
II. The general trend of average annual egg production has been slightly downward throughout the course of the experi-

Year and pen.	Birds completed the year.	Eggs laid.	Actual average production.
1899-1900	70	9,545	136.36
1900-1901	85	12,192	143.44
1901-1902	48	7,468	155.58
1902-1903	147	19,906	135.42
1903-1904	254	29,947	117.90
1904-1905 * 50 bird pens	283	37,943	134.07
1905-1906 * 50 bird pens	178	24,827	140.14
1906-1907 * 50 bird pens	187	21,175	113.24

* In these years the "floor space" experiments referred to below (p. 212) were conducted. Birds were kept in flocks of 50, 100, and 150 birds each. The highest annual averages have been made in each year by the 50 bird flocks. Consequently only these are included in this table. To include the others would simply be to lower the averages of these years below the figures given in the table.

ment. This is shown in the following table which gives the annual egg production for the years 1899 to 1907.

It will be seen from the last column of this table that the annual average production increased during the first three years of the experiment. A second maximum was reached in 1905-1906. The general trend of the figures, however, can best be appreciated if they are shown graphically as in the following figure.



Showing change in average annual egg production.

The zigzag line in this figure is the plotting of the last column of the table. The straight line is the line which best fits this zigzag line as determined by accurate mathematical methods. The downward slope of the lines is apparent.

It should be said that in the later years of the experiment (from 1902 on) there occurs in all but one year some accident which may be held to have diminished the egg production below what it should normally have been. In the detailed discussion of these figures in the complete report the most liberal allow-

ance possible is made for these accidents and it is there shown that even after making these allowances the general trend of the line of annual averages is only horizontal. That is to say, *there is no evidence of any increase in the average production of the flock.*

It will be noted by those who have followed the previous reports of the Station with reference to its poultry breeding work that the averages set forth in the above table do not agree with those which have previously been published. It is an unfortunate fact that the averages published in the earlier reports of this Station were in several cases in error. So far as can be learned from the records themselves the causes of these errors fall into two categories: namely, (a) faulty methods of handling the statistical material and (b) arithmetical mistakes. As soon as the detailed paper of which the present discussion is an abstract appears it will be possible for any interested person to verify for himself the averages which are given in the above table since in the complete paper there will be published the annual egg production of every single bird during the whole 8 years for which complete records exist.

III. Another point which throws light on the value of the method of breeding for increased egg production lies in the consideration of the relative number of "drones" and of high producers in each successive year of the experiment. Defining a very poor laying hen as one which produces less than 45 eggs in its first laying year and as an exceptionally good laying hen one which lays more than 195 eggs in its first laying year, it is found that there has been no substantial change during the course of the breeding experiment in the relative proportions of either very high layers or very poor layers in the flocks of the successive years. At the beginning of the experiment there were relatively few "drones" in the flock. The relative proportion of such has not practically changed.

IV. During the 3 last years of the breeding experiment there was carried on in connection with it an experiment on the effect of the amount of floor space per bird and the size of the flock on annual egg production. Without going into the details of this experiment, which were entirely consistent in the whole of the

3 years, it may be said that it clearly appears that these factors of flock size and floor space have a definite and measurable effect on the average annual production. This effect is quite considerable in amount. The bearing of the results of this floor space experiment on the breeding experiment with which we are chiefly concerned here lies in the fact that the figures which will be given in detail in the complete paper show beyond any doubt that these environmental factors can, even after the close selection for more than 5 years, still cause very marked changes in the character (egg production) which it was hoped to fix in the strain by breeding. There is a considerable amount of detailed evidence which is presented in the complete paper all of which tends to show that the quality of high productiveness cannot be regarded as any more a fixed characteristic of the Station's strain of Barred Plymouth Rocks now than it was at the beginning of the experiment.

The general conclusion regarding the results of the breeding experiment may be quoted from the complete paper. "The practical conclusion to be drawn from the results of this breeding experiment seems to the authors to be clear. It is that the improvement of a strain of hens in egg producing ability by selective breeding is not so simple a matter as it has been supposed to be. Nothing could be simpler than breeding from high producers to get high producers. But if this method of breeding totally fails to get high producers—in other words, if the daughters prove not to be like the mothers in egg production—it cannot fail to excite wonder as to whether the simplicity of the method is not its chief (possibly its only) recommendation. Anyone who makes a thorough, first-hand study of an extensive selection experiment carried out, as was this one, by the so-called German method without testing of the centgener power of the individual organisms, cannot fail to be impressed, we believe, with the fact that the improvement of a race by selective breeding is a vastly more complicated matter than it is assumed to be by those who maintain that one need only to breed from the best to insure improvement. The supposed "facts" of heredity on which the practical stock breeder (working for utility points) operates are in very large part inferences rather than facts. What is needed more than anything else for the advancement of the stock breeding industry in all its phases

is an accumulation of definite knowledge of the fundamental principles of the hereditary process. All breeding operations must be based on the laws of inheritance in organisms. The practical stock breeder is able to work out the *applications* of these laws for himself. What he most needs is broader and deeper knowledge of the laws themselves. This knowledge must come from thorough-going, purely scientific investigations."

THE EXPERIMENT A SUCCESS AS AN EXPERIMENT.

It must not be concluded from what has been set forth above that the experiment in breeding for egg production is to be regarded as having failed. To draw such a conclusion is to misunderstand completely the purpose with which the work was begun. The purpose of the experiment was to find out whether high egg productiveness could be bred into a strain of fowls by the method of breeding practiced. The experiment has answered this question in the negative. There could be but one of two answers to the question. It is no more to be counted as a failure of the experiment if the answer turns out to be "no" than if it had turned out to be "yes." To have the question answered so clearly and definitely is a great gain. It clears the ground to start a new experiment to see whether another method of breeding will make it possible to breed high egg production into a strain.

Furthermore it must not be concluded that the strain of Barred Plymouth Rocks carried by the Station is at the present time anything other than an excellent strain in respect to egg production. In spite of the fact that there is no evidence of any gain in respect to egg production during the course of the breeding experiment the strain itself is without doubt an unusually good one in respect to this character. When the number of birds carried and the length of time over which trap nest records exist are taken into consideration it is doubtful if there is any where a strain of Barred Plymouth Rocks which surpasses the stock of the Station in record egg production. The stock of the Experiment Station poultry plant is unusually healthy and vigorous. None of the infectious diseases which so commonly cause serious difficulty in the operation of large commercial poultry plants has ever appeared in the Station's

flocks. The small annual death rate which has existed throughout the poultry experience of the Station can only be regarded as a normal mortality for hens fed and managed for high egg production. The inherent value of the strain of Barred Plymouth Rocks with which this work has been done is attested by the almost uniform satisfaction which has been expressed by those who have bought either eggs or cockerels from the Station for the purpose of infusing new blood into their own flocks.

Poultry Investigations Now Under Way.

In December, 1907, Professor Gowell resigned his position on the Station staff in order to devote his entire time and attention to his private poultry interests.* On January 1, 1908, the poultry investigations of the Station were put in charge of the biologist, Dr. Raymond Pearl. This change in the supervision of the work has not involved, nor is it anticipated that it will cause any essential change in the general policy of the Station relative to poultry work. The Station will continue in the future as in the past to investigate problems relative to poultry husbandry; problems will be chosen which are of fundamental practical significance. The work at present and in the future on poultry will, as hitherto, fall into two main lines; namely, investigations in breeding and investigations in poultry management.

IMPROVEMENTS IN METHOD.

During the present year a number of improvements have been made relative to the methods of conducting poultry work on a large scale and at the same time with scientific accuracy. A system of keeping pedigree records has been devised and put into practice which makes it possible with a minimum expenditure of time and labor and with entire accuracy to keep exact pedigree records of every individual chick. Hitherto the pedigree records in connection with the breeding work of the Station have been of a general rather than a detailed character. It is believed to be of fundamental necessity that the individual father and mother of each particular chick shall be known. In

* It is with feelings of the deepest regret and sorrow that one has to record that while this bulletin was passing through the press Professor Gowell's death occurred.

this way it will be possible to trace exact individual pedigrees just as they can be traced for pure bred registered animals of any kind.

In an experiment looking to the improvement of egg production it is essential that the trap nest records of egg production should be absolutely accurate within the limits of human possibility. It has been found that the trap nest which has been used in the Station's poultry plant throughout the breeding investigation, while sufficiently accurate for ordinary, practical purposes, falls short of that degree of accuracy which is necessary in scientific work on pedigree breeding for egg production. The chief defect from which the old trap nest suffers is that it is possible for a bird to lay in the front of the nest without springing the trap and hence without being caught and making a record for the egg. Actual test indicated that this laying in the front of the nest more or less frequently happens. To remedy this defect a new trap nest has been devised and is now being installed in the houses. This best overcomes the few objections which exist to the old type of nest. A description of this new trap nest will be published shortly in a bulletin relative to the poultry work.

In addition to the breeding work particular attention is being paid during the current year to problems connected with fertility, and hatchibility of eggs and the rearing of chickens. It is expected that during the year a bulletin giving notes relative to new points in poultry management will be published.

Plans For Future Work With Poultry.

As has been said, the poultry work in the future will fall into the same two general lines as in the past; namely, breeding investigations and poultry management investigations. It does not seem practicable at this time on account of limitations of space to set forth in detail the complete plans for experimentation with poultry which the Station either has under way or expects to undertake soon. These detailed plans will be described in bulletins dealing specifically with the poultry investigations. It is desirable, however, that a general idea of the way in which it is expected that the poultry work will develop should be given here.

POULTRY MANAGEMENT.

The poultry management investigations will be of the same general character as those hitherto conducted. From year to year, as in the past, definite practical experiments on isolated topics in poultry management will be tried with large flocks of hens.

POULTRY BREEDING.

Two general problems will be investigated in this direction. The first of these is whether it is possible by another method of breeding than that which has been tried at the Station to fix the characteristic of high egg production in the Station's strain of Barred Plymouth Rocks. It is not necessary at this place to enter upon a detailed discussion of what the method of breeding to be tested in this experiment is. It may in general be said, however, that it will be an attempt to apply to poultry breeding for a utility characteristic the same fundamental principles in breeding which have led to such brilliant and important results in the breeding of cereals by the Hon. W. M. Hays, Assistant Secretary of Agriculture, and of Doctor Hjalmar Nilsson at the Swedish Experiment Station at Svalöf, Sweden. The fundamental idea underlying the method of breeding which is to be tried is to base the selection of breeding stock on mutative rather than fluctuating variations. The past experience of the Station demonstrates that the individual *performance* of a hen in respect to egg production is not necessarily an adequate indication of her desirability as a breeder in attempting to found a strain of high laying hens. It is the purpose to test the *transmitting* power of individual hens and cockerels always with regard to the character egg production just as in wheat breeding work the centgener power of an individual head is tested. The experiment will have a very considerable scientific interest derived from the fact that it will be the first attempt on a large scale to apply to practical animal breeding those principles which are proving of such wonderful value in plant breeding.

In addition to the experiment in breeding for increased egg production an experiment will be tried to determine whether by a combination of hybridization and selection it will not be possible to breed a strain of fowls of superior quality for table use. A development of the meat type of poultry has been very much

neglected in this country as compared with England and France. It is felt to be of considerable importance to conduct experiments likely to give results of practical significance for this phase of the poultry industry.

While the poultry work of the Station will be concentrated on practical problems which every poultryman wants light upon, the treatment of these problems will be broad and thoroughly scientific. The problems of breeding are exceedingly complicated and difficult ones. No narrowly conceived or carelessly executed experiments will ever give any results of any permanent *practical* value in this field. The underlying fundamental laws of heredity must be investigated before the Experiment Station or anyone else can tell the practical breeder how to proceed to get what he wants and be certain of it. The aim of the Station in its breeding work *will not be in the future, as it has not been in the past, simply to produce an improved strain of hens.* It is not a part of its function to enter into the commercial poultry business. The function of the Experiment Station is to experiment, and by experimentation to learn, in so far as may be, facts and principles which will help to advance the theory and practice of agriculture.

BULLETIN No. 158.

FOOD OF MAN STUDIES.

L. H. Merrill.

The contents of this bulletin are of a somewhat miscellaneous character, although they all pertain to the food of man. With the exception of the digestion experiments with hulled corn, the work here reported was undertaken in response to demands made upon the Station and not as the result of definitely made plans. For convenience of reference the materials analyzed have been grouped into several classes, the distinctions between which are necessarily more or less arbitrary.

Tropical Foods and Vegetables.

The samples of tropical or subtropical fruits and vegetables, mostly from Florida and Porto Rico, were sent to the Station for analysis by the United States Department of Agriculture. While many of these products are not often met in the north, it is not impossible that our rapidly extending commerce will in the course of a few years place them upon our home markets. In the case of those less generally known, a few descriptive notes are added.

5007-5008. Yautia or tanier. (*Xanthosoma* sp.). This plant is a native of tropical America and closely resembles the taro, with which it is frequently confounded. The portion eaten is the tuber, which is a horizontal branch of the vertical root stock. It is one of the most important root-crops of Porto Rico, and in the interior of the Island it fills a large place in the food supply of the people. With the laboring classes the tubers are prepared for the table simply by boiling, although they are said to be more palatable when fried or baked. An average crop is from 8 to 15 tons per acre.*

Two distinct varieties were received, the flesh of one being white and the other yellow. The coating of the second was

*Barrett. The Yautias or Taniers of Porto Rico. Porto Rico Agr. Expt. Sta., Bul. No. 6.

much rougher than that of the first, and the flesh coarser in texture and more leathery. The skin was removed and only the edible part analyzed. In the white, smooth coated variety the refuse amounted to 14 per cent; in the yellow the refuse was larger, amounting to about 23 per cent.

6522. AIR POTATO. (*Dioscorea bulbifera*). This is a native of Tropical Asia. The angular tubers are aerial, being borne in the axils. Those of some varieties are said to weigh several pounds each. They are palatable and potato-like in flavor.*

Two specimens were received. These were shaped like huge, swollen beechnuts, were about 4 inches in length and weighed a little over one-fourth of a pound each. The skin was nearly black, but within the color and texture were much like that of a potato. The skin was very thin and only four per cent of the whole tuber was rejected as inedible.

6524. AVOCADO OR ALLIGATOR PEAR. (*Persea gratissima*). This is native to the West Indies, Mexico to Peru, and Brazil. "The fruits are large, more or less pear-shaped, and covered with a green or deep purple skin and containing a large quantity of a firm yellowish-green pulp, inclosing a single large seed. * * * The pulp is marrow-like and is eaten as a salad, usually with the addition of pepper, salt, and vinegar. The pulp contains an abundance of oil, which may be used for illuminating purposes, also for soap making." ***

The avocado is now cultivated in Florida, the Hawaiian Islands, and to some extent in California.† Small amounts are shipped from the tropics to northern cities and the demand is far in excess of the supply. On account of the scarcity and excellence of the fruit, prices are very high, often ranging from 35 to 75 cents for single fruits.‡

A single specimen of the fruit was received, weighing a trifle over a pound (480 grams). The pulp made up 65 per cent of the whole; the skin 11 per cent; and the seed 24 per cent. The analysis given on page 224 is that of the pulp or edible portion. It is said ** that the avocado contains no soluble carbohydrates and that it is therefore well adapted to the use of diabetics.

---

* Bailey, Cyclopedia of American Horticulture, Vol. II, p. 487.
*** Bailey. Cyclopedia of American Horticulture.
† Rolfe. The Avocado in Florida. Bureau of Plant Industry, Bul. 61, U. S. D. A.
‡ Collins. The Avodado. Bureau of Plant Industry, Bul. 77, U. S. D. A.
** Chem. Abstracts, Vol. 2, No. 7, p. 1019.

6528. CASSAVA. (*Manihot* sp.). This is a plant of the milkweed family, widely grown in the tropics and to some extent in Florida, for the production of starch and also as a food for stock. For these purposes only the roots are used. These are from one to two inches in diameter and from one to four feet in length. They grow in clusters, the roots from a single plant weighing from 5 to 30 pounds, and the yield per acre averaging from five to seven tons.*

Four small roots were examined, weighing about 110 grams each. The outer skin, amounting to 4 per cent of the whole, was rejected.

6530. COCOANUT (*Cocos nucifera*). This well known fruit needs no description. The single specimen gave the following proportions of shell, meat and milk:

Shell	175.4 grams	22.53 per cent
Meat	441.0 "	56.66 "
Milk	162.0 "	20.81 "

Only the meat was analyzed.

6533. PAPAYA, PAPAW. (*Carica Papaya*). The tree is a native of tropical America, but is widely naturalized. The young fruit is cooked and eaten, while the ripe fruit is often eaten raw. According to Bailey, it is also employed as a vermifuge and a cosmetic. A remarkable property of the plant is the possession of a proteolytic ferment, capable of converting proteids into soluble forms (proteoses and peptones). Advantage is taken of this property in the preparation of meats for the table. The flesh is rolled in the bruised leaves and allowed to stand several hours before cooking, the effect being to make the meat very tender.†

A single specimen was received, weighing a little over half a pound (277.8 grams). Only 40 per cent of the fruit could be considered edible, nearly 60 per cent being removed as skin and seeds.

6534-6. SWEET POTATO. (*Ipomoea Batatas*). This vegetable is too well known to require a detailed description here. It seems to have been in general use by the aborigines of tropical and subtropical America and its cultivation has been greatly

---

* Tracy, Farmers' Bulletin 167, U. S. D. A.

† Bailey, Cyclopedia of American Horticulture, Vol. II, p. 246.

extended. In the Southern States it now fills the place which the Irish potato takes in the North.

Three varieties were received, readily distinguished by the color of the flesh, and here characterized by the simple terms the "white" the "red," and the "yellow." The refuse (skin) from these potatoes was small, amounting on the average to about 7 per cent.

6537. TAYOTE OR CHAYOTE. (*Sechium edule*). This is a vegetable of the gourd family, pear-shaped, deeply marked with longitudinal grooves, and having a single large seed. It was described by Hernandez in the sixteenth century and appears to have been cultivated by the aborigines for so many centuries that the wild form is no longer known. Today it is not only cultivated throughout tropical America, but it has been introduced into British India, Algeria, Australia, and to some extent into California and the Gulf States. The vegetable is said to form an acceptable substitute to the summer squash, but is of finer texture and better flavor.*

The fruits received weighed about 130 grams each, of which 95 per cent was edible.

6538. SOUR-SOP. (*Anona muricata*). This is the fruit of a small evergreen tree, a native of the West Indies, now introduced into southern Florida and to some extent into the Old World. The fruit varies in weight from a few ounces to two or three pounds, is dark green in color, with a soft juicy and somewhat acid pulp. Its principal use is in the preparation of cooling summer beverages.†

A single specimen of the fruit was received, weighing nearly two pounds (870.4 grams). About 71 per cent of this was edible; 21 per cent was outer coating; and 8 per cent was seed.

6539-6541. YAM. (*Dioscorea* spp.). The origin of this vegetable is unknown, but it has been long grown in the British West Indies, and has to some extent been introduced into the Southern States. It is the staple food among the blacks of Jamaica. The better varieties when roasted are said to be very palatable,‡ and there seems to be no reason why their exportation

---

*Cook, The Chayote, Division of Botany, Bul. 28, U. S. D. A.

†Bureau of Chemistry, Bul. 87, p. 22, U. S. D. A.

‡Div. of Botany, Circ. 21, U. S. D. A.

should not became a matter of commercial importance. Three varieties, the Amarillo, Havana and White, were examined.

6717. EGG FRUIT OR MARMALADE PLUM. (*Lucana mammosa*). This occurs in the wild state in the West Indies and the Philippines and is cultivated in southern Florida and southern California. The fruit is about six inches long, has a russet, rough skin, and contains but a single seed. The flesh is reddish in color, soft and sweet. It has been compared to a very ripe pear, but is more luscious.*

This fruit was grown at No Name Key, Key West, Florida. Three specimens gave the following results:

Pulp	143.4 grams	82.70 per cent
Peel	12.0 "	6.92 "
Seed	18.0 "	10.38 "

6718. SAPODILLA OR NASEBERRY. (*Achras Sapota*). The sapodilla is a small evergreen tree, native to tropical America. In appearance the fruit resembles a small russet apple, while the flavor is more like that of a sweet pear. It is very little known in northern markets, although its merits entitle it to a more extended use. The juice of the green fruit and the sap of the tree furnish the commercial article known as chicle, extensively used as the basis of chewing gums.†

Three fruits were received through the Division of Pomology, U. S. Department of Agriculture. These were grown at Key West, Florida. They weighed about 5 oz. each (150 grams). Edible portion 88 per cent; skin 8 per cent; seed 4 per cent.

5162. LOQUAT. (*Eriobotrya Japonica*). The loquat is native to China and Japan, but is much planted in the Gulf States and westward. It blooms from August until the approach of winter, and ripens its clustered fruit in very early spring. The fruit is often seen in northern markets.‡

The fruits analyzed were grown in the greenhouses of the U. S. Department of Agriculture at Washington. Thirty-six fruits weighed nearly a pound (413 grams). About 40 per cent was refuse (skin and seeds).

---

*Bailey. Cyclopedia of American Horticulture, Vol. III, p. 948.
†Bureau of Chemistry, Bul. 87, p. 24, U. S. D. A.
‡Bailey. Cyclopedia American Horticulture Vol. II, p. 543.

TROPICAL FRUITS AND VEGETABLES.

Composition of fresh material. (Edible portion).

Station number.	Name.	Water.	Nitrogen.	Protein.	Ether extract.	Crude fiber.	N-free extract.	Ash.	Heat of combustion.
		%	%	%	%	%	%	%	Cal. per gram.
5007	Yautia	30.43	.64	4.00	.49	1.36	60.96	2.76	2.789
5008	Yautia	47.10	.71	4.44	.32	1.16	45.87	1.11	2.195
6522	Air potato	79.79	.30	1.86	.39	.65	16.25	1.06	.813
6523	Ajonjoli	4.17	3.79	23.69	49.39	–	18.26	4.77	6.853
6524	Avocado	77.18	.18	1.14	13.78	–	7.14	.76	1.664
6525	Bananas	60.43	.26	1.60	.15	–	31.56	1.26	1.290
6526	Bananas	78.64	.13	.81	.07	–	19.68	.80	.809
6527	Peach Bananas	70.65	.13	.81	.48	.55	26.60	.91	1.168
6528	Cassava	68.94	.25	1.59	.22	.70	27.12	1.43	1.235
6529	Cassava Bread	13.43	.04	.29	.29	1.73	83.56	.70	3.499
6530	Cocoanut	44.40	.53	3.35	29.42	2.38	19.48	.97	4.015
6531	Corn	10.92	1.41	8.81	4.08	1.93	72.79	1.47	3.993
6532	Kidney Beans	5.93	6.57	41.06	1.62	5.75	42.14	3.50	4.191
6533	Papaya	90.75	.13	.80	.10	1.09	6.32	.94	.324
6534	Sweet Potato, white	64 25	.09	.55	.46	.91	32.87	.96	1.413
6535	Sweet Potato, red	59.20	.27	1.66	.34	74	37.28	.78	1.655
6536	Sweet Potato, yellow	82.66	.16	1.09	.18	.63	14.99	.45	.692
6537	Tayote	90.40	.25	1.57	.16	1.40	5.73	.74	.380
6538	Sour Sop	80.83	.12	.78	.07	–	17.18	1.14	.745
6539	Yam, Amarillo	73.09	.21	1.32	.17	.48	24.38	.56	1.115
6540	Yam, Havana	69.23	.33	2.03	.17	.55	27.16	.85	1.156
6541	Yam, white	76.31	.34	2.14	.14	.88	19.15	1.38	.929
6542	Yuquilla	70.30	.27	1.73	.16	1.11	25.60	1.10	1.198
6713	Green Pepper	90.97	.26	1.60	.15	2.43	4.54	.31	.398
6717	Egg Fruit	51.40	.54	3.37	1.86	1.27	41.02	1.08	1.958
6718	Sapodilla	77.03	.09	.58	1.44	1.12	19.35	.48	.961
5162	Loquat	74.85	. 05	.29	–	.65	23.00	1.21	.991

TROPICAL FRUITS AND VEGETABLES.

Composition of water-free material of edible portion.

Station number.	Name	Nitrogen.	Protein.	Ether extract.	Crude fiber.	N-free extract.	Ash.	Heat of combustion.
		%	%	%	%	%	%	Cal. per gram.
5007	Yautia	.92	5.75	.71	1.96	87.62	3.96	4.009
5008	Yautia	1.33	8.39	.61	2.19	86.72	2.07	4.150
6522	Air Potato	1.47	9.18	1.94	3.24	80.40	5.24	4.023
6523	Ajonjoli	3.95	24.72	51.54	–	19.08	4.66	7.151
6524	Avocado	.80	4.98	60.44	–	31.27	3.31	7.292
6525	Bananas	.74	4.62	.43	–	91.31	3.64	3.731
6526	Bananas	.61	3.80	.32	–	92.12	3.76	3.789
6527	Peach Bananas	.45	2.82	1.65	1.88	90.57	3.08	3.980
6528	Cassava	.82	5.11	.72	2.26	87.29	4.62	3.977
6529	Cassava Bread	.05	.34	.33	2.00	96.52	.81	4.042
6530	Cocoanut	.96	6.03	52.92	4.28	35.03	1.74	.722
6531	Corn	1.58	9.89	4.58	2.17	81.71	1.65	4.482
6532	Kidney Bean	6.98	43.65	1.72	6.11	44.80	3.72	4.455
6533	Papaya	1.38	8.62	1.05	11.75	68.45	10.13	3.508
6534	Sweet Potato, white	.25	1.54	1.29	2.55	91.93	2.69	3.952
6535	Sweet Potato, Red	.65	4.08	.83	1.81	91.37	1.91	4.056
6536	Sweet Potato, yellow	1.01	6.31	1.05	3.64	86.40	2.60	3.994
6537	Tayote	2.62	16.38	1.70	14.54	59.70	7.68	3.964
6538	Sour Sop	.65	4.06	.40	–	89.60	5.94	3.889
6539	Yam, Amarillo	.78	4.90	.65	1.80	90.56	2.09	4.143
6540	Yam, Havana	1.06	6.61	.57	1.79	88.26	2.77	4.081
6541	Yam, white	1.44	9.05	.59	3.72	80.81	5.83	3.922
6542	Yuquilla	.92	5.82	.55	3.74	86.18	3.71	4.033
6713	Green Pepper	2.85	17.82	1.62	26.95	50.22	3.39	4.411
6717	Egg Fruit	1.11	6.94	3.83	2.61	84.40	2.22	4.029
6718	Sapodilla	.42	2.53	6.28	4.88	84.22	2.09	4.183
5162	Loquat	.18	1.15	–	2.58	91.46	4.81	3.940

Miscellaneous Food Products.

There are here included the analyses of a number of materials which in the table are designated "Miscellaneous Food Products" that were sent for analysis chiefly from the Office of Experiment Stations, U. S. Department of Agriculture, and the analyses of wheat, flours and other cereal products examined in connection with the work of investigation or in response to requests from private individuals who, in most instances, paid the cost of the analysis.

5156. Sanitas almond butter. Sanitas Nut Food Co., Battle Creek, Mich.

5161. Paradise nuts. (*Lecythis zabucajo*). The shells made up 45 per cent of the weight of these nuts.

5198. Seeds of Canarium commune or Java almond.

5157. French marrons glaces. Chestnuts in vanilla syrup. The analyses are of the nuts alone from which the syrup has drained, and of the same in the air dried condition.

5158. French marrons in brandy. Analyses are given of both the freshly drained and the air-dry nuts.

5159. Wallnusskerne a la vanille. Conserven-Fabrik von Wilhelm Laaff. The analyses are of the fresh nuts drained and of the nuts and syrup together.

5168. Ginger. Imperial Brand, Extra Quality, Crystallized.

6592. Desipota. Standard Food Co., Aberdeen, S. Dak. A cooked and desiccated potato.

5161. Oyster-plant or salsify. The analysis of the fresh scraped root.

5165. Cassava cakes. Park & Tilford, New York.

5169. Svea wafers. G. L. Jaquin, New York.

6441. Red Turkish wheat. Bred at the Iowa Experiment Station and distributed by the U. S. Department of Agriculture.

6932. Entire wheat flour. From macaroni wheat. Prepared by the Franklin Mills Co.

6933. Entire wheat flour. Franklin Mills Co. Purchased in Bangor.

6442. Graham flour. Received from Prof. Snyder, Minnesota Experiment Station.

5094. CORN MEAL. Prepared by Boyd Bros., Melville Station, Newport, R. I. This was a white meal, ground from Rhode Island corn.

6990. MEAD'S FLAKED RYE. Minneapolis Cereal Co., Minneapolis. "Made from the very choicest western white rye."

5199. CORN CRYSTALS. Corn Crystal Co., Worcester, Mass.

5026. EGG-O-SEE. Egg-O-See Co., Quincy, Ill. Price per package 10c. Cost per pound 11.8 cents.

6586. HAZARD'S WHEAT PROTEIN. E. C. Hazard & Co., New York.

MISCELLANEOUS FOOD PRODUCTS.

Composition of edible portion of fresh material.

Laboratory number.		Water.	Nitrogen.	Protein Nx6. 25.	Ether extract.	Carbo-hydrates. Crude Fiber.	Carbo-hydrates. N-free extract.	Ash.	Heat combustion.
		%	%	%	%	%	%	%	Calories per gram
5156	Almond Butter	2.25	3.61	21.66	61.50	–	11.59	3.00	7.368
5161	Paradise nuts	2.31	3.55	22.19	62.60	–	10.22	2.68	7.450
5198	Java almonds	2.24	2.48	15.50	74.37	–	4.11	3.78	7.984
5157	French Marrons, fresh	26.38	.19	1.19	.43	–	71.72	.28	3.037
5157	French Marrons, dry	18.15	.20	1.32	.48	–	79.74	.31	3.377
5158	Brandied Marrons, wet	33.88	.22	1.41	.57	–	63.85	.29	2.748
5158	Brandied Marrons, dry	21.63	.27	1.67	.68	–	75.68	.34	–
5159	Walnusskerne, wet	16.94	2.18	13.60	20.02	–	48.50	.94	6.117
5159	Walnusskerne, with syrup	31.70	1.17	7.31	9.75	–	50.70	.54	–
5163	Angelica stalks	10.47	.01	.05	.07	1.47	87.34	.60	3.417
5164	Apricots, candied	14.40	1.07	.67	.13	1.13	82.98	.69	3.183
5166	Cherries, candied	12.11	.08	.49	.15	.48	86.17	.60	3.205
5167	Citron	18.20	.01	.09	.07	.97	77.62	3.05	3.039
5168	Ginger, crystallized	12.29	.05	.34	.18	.72	86.12	.35	3.347
6592	Desipota	8.57	1.44	9.00	.15	1.75	75.32	5.21	3.606
6988	Bread fruit, flour	8.54	.49	3.06	.42	3.85	81.06	3.07	3.709
6989	Evaporated potato	8.22	1.27	7.87	1.09	2.10	77.34	3.38	3.731
5161	Oyster plant	85.37	.68	4.26	.33	1.98	6.85	1.21	.585
5165	Cassava cakes	10.32	.17	1.06	.21	1.57	85.22	1.62	3.677
5169	Svea wafers	6.48	1.74	10.87	.35	.08	78.89	3.30	3.975

6520. HAZARD'S WHEAT PROTEIN BREAKFAST FOOD. E. C. Hazard & Co., New York.

6991. UNCLE SAM'S MACARONI WHEAT BREAKFAST FOOD. Minneapolis Cereal Co. "It contains every element of absolute perfection."

5022. MACARONI. Extra Taganrok, Ancehat. Made in France for Acker Newall & Condit Co., New York.

5023. GLUTORINI. Same source as 5022. "Glutorini contains over 20 per ecnt gluten."

WHEAT, FLOURS AND OTHER CEREAL PRODUCTS.

Composition of fresh material.

Laboratory number.		Water.	Nitrogen.	Protein Nx6.25.	Ether extract.	Crude fiber.	N-free extract.	Ash.	Heat of combustion.
		%	%	%	%	%	%	%	Calories per gram
6441	Wheat	11.63	1.92	12.00	1.80	2.25	70.56	1.76	3.874
6932	Entire wheat flour	11.36	2.42	15.13	2.32	.75	69.26	1.18	–
6933	Entire wheat flour	12.33	2.27	14.18	2.07	.54	69.95	.93	–
6442	Graham flour	10.61	2.50	15.63	2.09	2.47	67.44	1.76	3.991
5094	Corn meal	11.51	1.44	9.00	4.70	1.19	72.03	1.57	–
6990	Mead's flaked rye	9.80	1.77	11.06	1.75	1.49	73.82	2.08	–
5199	Corn crystals	6.33	.96	6.00	.33	.40	86.67	.27	4.015
5026	Egg-O-See	8.03	1.55	9.69	1.77	1.47	76.66	2.38	–
6586	Hazard's wheat protein	6.99	6.69	41.81	1.23	.31	41.02	.64	4.561
6520	Hazard's breakfast food	8.53	6.41	40.06	1.04	–	49.66	.71	–
6991	Uncle Sam's food	9.72	2.37	14.81	2.18	1.60	69.85	1.84	–
5022	Macaroni	8.99	1.98	12.37	.36	.24	77.31	.73	3.973
5023	Glutorini	10.82	2.68	16.75	.73	.22	70.82	.66	4.020

Effects of Popping upon the Chemical Composition of Indian Corn.

The physical effects of heat upon the dried kernels of certain varieties of Indian corn is well known. Not only does the corn acquire a marked flavor, agreeable to the average palate, but the kernels expand enormously, while the texture is radically changed so that it is easily masticated. Some varieties of corn when thus heated swell quietly without bursting the outer covering; others, like the sweet corn, expand explosively, but without breaking the outer skin; still others suddenly burst open with sharp detonations, exposing the clear white of the starchy endosperm. The latter varieties have thus received the distinctive name of "pop-corns."

The expansive force which results in popping was formerly believed to be due to the vaporization of the volatile oils present. Storer,* however, states that corn from which the oils had been extracted with ether continued to pop well. Brewer,† Wilbert,‡ Sturtevant ** and others, attribute the popping to the rupture of the individual starch grains, due to the formation of steam. In proof of this statement mention is made of the fact that even the best varieties, if too old or too dry, will not pop unless the grains are previously soaked and then dried for 4 to 12 hours, when the popping qualities are regained.*** The effects are most marked in those varieties of corn in which there is a large amount of the dense corneous endosperm.

The chemical changes, although less manifest, are of interest. Experiments made at this Station and recorded below indicate that the physical changes are more important than the chemical. Three varieties were examined:

No. 6934. Popcorn. Purchased in Orono.

No. 6936. Yellow Canada corn. From Bangor seedsman.

No. 6938. White Corey sweet corn. Purchased in Bangor.

The popping was done over a coal furnace fire in an ordinary wire popper. While it was thoroughly done, great care was taken to avoid scorching. The analyses of these corns, before and after popping, are given in the table on the following page.

---

* Stover, D. A. Bul. Bussey Inst., 3 (1904), pp. 77-79.

† Brewer, Wm. A. Tenth Census United States, Vol. 3, p. 103.

‡ Wilbert, M. I. Amer. Jour. Phar. 75 (1903), No. 2, pp. 77-79.

** Sturtevant, E. Lewis, Bul. Torrey Bot. Club, 21 (1894), p. 522.

*** Kraemer, Henry. Science, 17 (1903), pp. 683-694.

COMPOSITION OF CORN BEFORE AND AFTER POPPING.

Laboratory number	Kind of Corn.	Water.	Protein.	Ether extract.	Crude fiber.	N-free extract.	Ash.
	As analyzed	%	%	%	%	%	%
6934	Pop corn, before	10.09	12.12	4.68	2.15	69.35	1.61
6935	after	3.56	12.87	5.50	2.46	73.67	1.94
6936	Yellow Canada corn, before	9.57	10.62	5.09	1.59	71.51	1.62
6937	after	5.54	11.12	5.29	1.73	74.70	1.65
6938	White Corey sweet corn, before	9.51	11.75	5.24	2.08	69.73	1.69
	after	3.90	12.81	7.21	2.49	71.85	1.74
	Water-free						
6934	Pop corn, before	–	13.49	5.21	2.39	77.13	1.79
6935	after	–	13.34	5.71	2.55	76.39	2.01
6936	Yellow Canada corn, before	–	11.74	5.63	1.75	79.09	1.79
6937	after	–	11.77	5.60	1.83	79.06	1.74
6938	White Corey sweet corn, before	–	12.98	5.79	2.29	77.07	1.87
6939	after	–	13.33	7.50	2.59	74.77	1.81

So far as analyses go, the corn seems to suffer little chemical change beyond that resulting from a loss of water, the loss amounting to from one-half to two-thirds of the total water content. How slight these changes are is better shown when the results are calculated to a water-free basis. Similar results are given by Brewer. A determination of the water soluble carbohydrates in the corn would probably have shown a gain in every case. Such gains were found by Kraemer in sweet corn, dent, and pop corn, the gain being greatest in the case of the latter.

The Digestibility of Hulled Corn.

By treating corn with an alkali the hull or indigestible outer coating of the kernel may be so loosened that it can be easily removed. If the alkali is then thoroughly removed by washing and the product steamed, the result is the so-called "hulled corn," a very acceptable food with many. So far as the writer is aware, there are no published results which cast any light upon the digestibility of this article of diet. Sixteen experiments have been made at this Station in eight of which hulled corn and milk formed the sole articles of diet (simple diet). In eight other experiments the same foods were used with the addition of bread, butter, meat, and canned peaches (mixed diet). The details were much the same as those observed in earlier and later work in these laboratories, and need not be repeated here. The composition of the hulled corn as purchased and in the water-free condition is shown in the following table.

COMPOSITION OF HULLED CORN USED IN DIGESTION EXPERIMENTS.

Lab. No.		Water.	Nitrogen.	Protein Nx6.25.	Ether extract.	Crude Fiber.	N-free extract.	Ash.	Heat of combustion.
	Fresh	%	%	%	%	%	%	%	Calories per gram.
5171		79.67	.32	2.02	1.08	.31	15.30	1.62	.903
5172		79.73	.29	1.81	1.01	.14	15.66	1.65	.844
5178		81.32	.30	1.88	1.05	.15	14.17	1.43	.864
	Water-free								
5171		–	1.59	9.96	5.30	1.51	75.26	7.97	4.440
5172		–	1.43	8.92	5.00	.69	77.27	8.12	4.164
5178		–	1.61	10.05	5.65	.78	75.89	7.63	4.625

The experiments were carried out in the order indicated in the table which follows. For each period of four experiments

fresh samples of corn were used. It will be noted that the average results obtained with the protein in the first period are quite different from those of the third period, although both were made with the simple diet. So, too, the average results of the second and fourth periods, with the mixed diet, differ by over three per cent. How far this variation is due to differences in the corn itself it is impossible to say.

DIGESTIBILITY OF NUTRIENTS AND AVAILABILITY OF ENERGY OF TOTAL FOOD.

	Experiment number.	Subject.	Protein.	Carbo-hydrates.	Heat of combustion.
			%	%	%
	201	C	85.4	95.5	91.1
	202	D	78.6	96.1	89.9
Hulled corn, simple diet	203	M	85.3	98.9	91.9
	204	S	90.3	97.4	94.2
Average			84.9	97.0	91.8
	205	C	90.9	97.5	94.3
	206	D	86.6	97.2	93.3
Hulled corn, mixed diet	207	M	88.1	87.2	95.1
	208	S	91.7	98.6	95.8
Average			89.3	95.1	94.6
	209	C	78.3	96.6	90.7
	210	D	75.1	97.4	91.3
Hulled corn, simple diet	211	R	77.8	99.2	92.3
	212	S	82.7	97.8	93.1
Average			78.5	97.7	91.8
	213	C	92.8	98.8	96.3
	214	D	92.5	98.7	96.7
Hulled corn, mixed diet	215	R	91.5	99.3	96.4
	216	S	93.0	98.8	96.6
Average			92.5	98.9	96.5

The advantages of a mixed diet are here well illustrated. That the digestive power is in part an individual characteristic is also well shown, since the subject S. in every period digested the largest proportion of the protein, and in every case but one D. digested the least. The protein of the corn was less digestible than that of the milk, and when the results are calculated to the corn alone, only 61.2 per cent of the protein was found to be digested.

DIGESTIBILITY AND AVAILABILITY OF ENERGY OF HULLED CORN AND WHITE BREAD.

Summary.

	Protein.	Carbo-hydrates.	Heat of Combustion.
	%	%	%
Hulled corn, simple diet, average of 8 experiments	81.7	97.3	91.8
Hulled corn, mixed diet, average of 8 experiments	90.9	97.0	95.5
Hulled corn alone, average of 8 experiments	61.2	96.4	86.7
White bread, simple diet, average of 7 experiments	93.9	99.1	97.3
White bread alone, average of 7 experiments	92.6	98.9	97.5

These results are summarized in the above table in which the coefficients are compared with those obtained at another time with white flour bread. The following points may be regarded as established:

1. The digestibility of the protein and the availability of the energy of the hulled corn are very low when the corn is compared with white bread.

2. The mixed diet was much more completely utilized by the body than the simple diet.

Examination of Graham Flours.

Two samples of graham flours were recently sent to this Station for examination. One of these (Lab. No. 5191) was milled in this State under such conditions that its genuineness was beyond question. The second sample (Lab. No. 5190) bore the brand of a well known milling firm of the middle west. For some reason this second flour had fallen under the suspicion of the parties sending it, who believed it to be a "made up" flour, i. e., a low grade white flour mixed with bran. As previous complaints of inferior products of this character had reached the Station, it was thought advisable to make a comparative study of these two flours.

MECHANICAL ANALYSIS.

The samples were subjected to a mechanical analysis, two sieves being used for the purpose, one having 20 and the other 40 meshes to the inch. The coarse portion which failed to pass the 20 mesh sieve is here called bran. That passing the coarse sieve and retained by the second is here referred to as the middle product; while that passing the 40 mesh sieve is called fine flour. The results are shown below.

Lab. No.	Bran Per cent.	Middle product Per cent.	Fine flour Per cent.
5190	8	6	86
5191	7	30	63

GENERAL CHARACTERISTICS.

A microscopical examination of the brans revealed no marked differences except in the color and opacity of the various coatings. The aleurone cells were about equally abundant in the two samples. In the case of the lighter bran there seemed to be a somewhat larger proportion of the apical hairs, but this may not indicate a closer separation in one case than in the other, but rather a characteristic of the grain itself.

The most marked physical difference in these flours is in the relative size of the constituent particles. In the western flour

the bran particles are very large and the flour fine, while the amount of the intermediate product is small, amounting to but 6 per cent of whole. The home ground graham is much more homogeneous, the bran rather fine, and the proportion of the intermediate product large, forming 30 per cent of the whole, the coarser particles passing into the finer by imperceptible gradations.

The two flours were evidently from very different grains and the products show many points of dissimilarity. These characters are most readily compared in the table below.

Lab. No.	Graham.	Bran.	Middle Product	Fine Flour.
5190 Western	Dingy Texture uneven	Brown Fragments large. Diameter up to 5–6 mm. More adherent flour than with other bran.	Brown	A dirty grayish color.
5191 Eastern	Yellowish More homogeneous than the former.	Yellowish Fragments much smaller and apparently thinner. Diameter up to 3–4 mm.	Distinctly yellowish, much lighter than above.	A uniformly clear and slightly yellowish product.

ANALYSIS OF THE GRAHAM FLOURS AND THE MECHANICALLY SEPARATED PRODUCTS.

Lab. No.	Kind of Flour.	Water.	Nitrogen.	Protein Nx5. 7.	Fat.	Crude Fiber.	N-free extract.	Ash.
		%	%	%	%	%	%	%
5190	Graham	11.73	2.47	14.08	3.04	1.88	67.25	2.02
5192	Bran	10.84	2.41	13.74	4.87	8.55	56.66	5.34
5193	Middle product	9.84	2.90	16.53	4.63	5.26	58.92	4.82
5194	Flour	11.24	2.47	14.08	2.98	1.00	69.07	1.63
5191	Graham	13.21	1.50	8.55	1.89	2.46	72.21	1.68
5195	Bran	11.43	1.92	10.94	2.13	9.07	61.16	5.27
5196	Middle product	12.60	1.78	10.15	2.55	4.81	66.61	3.28
5197	Flour	13.30	1.38	7.87	1.55	.62	75.93	.73

The preceeding analyses of the grahams and of the mechanically separated products reveal several marked peculiarities.

1. In No. 5190 the fine flour contains the same amount of nitrogen as the original graham. In No. 5191 the difference is but slight, the graham carrying but .12 per cent more than the fine flour.

2. In No. 5190 the bran is slightly less rich in nitrogen than the graham. On the other hand the bran of No. 5191 contains nearly 30 per cent more nitrogen than the graham from which it was separated.

DISTRIBUTION OF NITROGEN.

		Grams of nitrogen from 100 grams graham.	Proportion of the whole nitrogen carried by each part.
5192	Bran (.0241x8)	.1928	7.8
5193	Middle product (.029x6)	.1740	7.0
5194	Fine flour (.0247x86)	2.1242	85.2
	Calculated for whole graham	2.491	100.0
	Actual content as found	2.47	
5195	Bran (.0192x7)	.1344	8.7
5196	Middle product (.0178x30)	.5340	34.7
5197	Fine flour (.0138x63)	.8694	56.6
	Calculated for whole graham	1.5378	100.0
	Actual content as found	1.50	–

In graham No. 5190 over 85 per cent of the nitrogen of the graham is in the finer product, and 7 per cent in the middle product. In No. 5191, less than 57 per cent of the total nitrogen is in the fine flour and nearly 35 per cent in the middle product. In other words, the finer portion of the first graham is not only actually, but relatively much richer in nitrogen than the finer part of the second graham. The proportions of nitrogen carried by the brans are about the same.

It has been suggested that wheat can be so milled that the first grade flour can be removed and the remainder placed upon the market as a graham flour. Some years ago this Station made a number of milling tests with wheat and from the analyses then made it is possible to calculate the composition

of such a residual graham.* The calculation is made in the following manner:

One hundred pounds of wheat (No. 6348) yielded on milling 48 pounds of first grade flour. In the following table is shown the pounds of nutrients carried by the original wheat, from which are deducted the nutrients found in the 48 pounds of first grade flour (No. 6349). The balance represents the nutrients which would be found in the 52 pounds of the resulting "residual graham." From these weights the percentage composition of such a graham is calculated.

COMPOSITION OF A RESIDUAL GRAHAM.

Lab. No.		Water.	Nitrogen.	Protein N.x5. 7.	Fat.	Crude Fiber.	N-free extract.	Ash.
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
6348	Wheat, 100 lbs.....	12.80	2.06	11.74	2.53	2.46	68.35	2.12
6349	First grade flour, 48 lbs.....	6.20	.88	5.03	.46	.17	35.92	.21
	Residual graham, 52 lbs....	6.60	1.18	6.71	2.07	2.29	32.43	1.91
		%	%	%	%	%	%	%
	Residual graham.....	12.69	2.23	12.90	3.98	4.40	62.36	3.67

Since the first grade flour is rich in carbohydrates (mostly starch) its removal leaves a product (here referred to as "residual graham") richer in the other constituents than either the flour or the genuine graham. Such a product might pass undetected, although it would be poor in gluten upon which so much of the superior bread-making qualities of a wheat flour depend.

It may be stated that the composition of the suspected graham, No. 5190, does not suggest such a preparation as that noted above. If the composition of the fictitious graham be compared with that of the two grahams under examination (page 235) it will be found to be much richer in both fiber and ash than these. Wheat carries on the average 2.40 per cent crude fiber,

* Maine Agr. Exp. Sta., Bul. 97, p. 165.

and the low percentage in graham No. 5190 strengthens the suspicion that it is a made-up product, carrying a considerable proportion of low grade flour. It should be noted also that the removal of the high grade flour, poor in ash constituents would raise the proportion of ash in the residual graham (3.67) far above that found in the genuine graham (1.68).

Some of the results obtained with the western flour seem to strengthen the suspicion of sophistication. Thus, the sharp line which separates the coarser from the finer particles in No. 5190 might easily be accounted for in this way. One of the by-products in the manufacture of patent flour is known as "red dog" flour. This is frequently richer in nitrogen than the patent flour from the same wheat, but is dark in color and does not make good bread. Such a flour might be judiciously combined with bran so as to form a product closely resembling a poor but genuine graham. Attention has already been called to the fact that the finer portion of No. 5190 is dark in color while the table of composition shows it to be as rich in nitrogen as the original graham. As contrasted to this, attention is called to No. 5191, which is a guaranteed graham, the finer portion of which is less rich in nitrogen and of a lighter color than the original graham. It is fair to add, however, that the wheats in these two cases were evidently of very different quality, and it is not safe to draw too sweeping conclusions from the examination of but two samples.

BULLETIN No. 159.

APPLIANCES AND METHODS FOR PEDIGREE POULTRY BREEDING.*

By Raymond Pearl and Frank M. Surface.

The primary and most fundamental requirement in all breeding work, whether conducted for scientific or utilitarian purposes, is that at any stage of the work there shall be an exact knowledge of the ancestry (to as remote a degree as possible) of each of the individuals composing the breeding stock. A successful outcome of such work depends upon, among other things, an adequate system of keeping pedigree records. Not only must the pedigree records be accurate and systematic on paper, but they must also be *trustworthy*. To insure that they shall be trustworthy it is necessary that the concrete breeding operations be carried on in such systematic fashion that errors in or contamination of the pedigrees either will not occur, or if they do occur will be at once detected. That is to say, breeding operations must be so systematized that, for example, there cannot arise in the breeder's mind any doubt that the actual parents of a given individual are the animals which he supposes to be the parents.

Now so long as breeding operations are conducted on a restricted scale involving few individuals and pedigrees, the matter of keeping pedigrees is a tolerably simple one. But when the breeding stock rises to considerable numbers, as it very quickly does with small animals like poultry, the pedigree records and the whole machinery of breeding tend to become very intricate and complicated. With this increase in complexity inevitably comes an increased tendency towards error in the records. To gain and maintain simplicity and accuracy in the pedigree breeding of poultry involves the practical solution of a whole series of rather complicated problems of technique. In the breeding work at this Station working solutions of some of these technical problems have been reached. In every

---

* Papers from the Biological Laboratory of the Maine Experiment Station, No. 6.

instance the methods which have been devised and put into practice are known or believed to be different in some particulars from those which have been used by other workers along similar lines. Since these methods have proved to be useful in actual practice it seems desirable to publish them for the benefit of other breeders who may be interested in keeping exact pedigrees of poultry either for scientific or for practical purposes.

In order that a concrete idea may be gained of the nature of the technical problems which present themselves in pedigree breeding work with poultry, it may be well to trace the operations which demand attention in the production of a chicken of known ancestry. In the first place there must be a record on each egg of the hen which laid that egg. This record coupled with a knowledge of the male bird kept in the breeding pen with the hen which laid the egg in question gives the first step in the knowledge of the ancestry of the chick. But in order to get an exact record of the hen which lays a particular egg it is necessary to resort to the use of trap nests. The first technical problem which presents itself in pedigree poultry breeding is then to get a trap nest which shall be as nearly as possible ideal.

Having made a record of the egg the next problem is that of properly storing the eggs laid by the different hens until such time as a sufficient number shall have accumulated to fill an incubator.* It is obvious that under usual conditions enough eggs will not be laid in the same day to warrant starting their incubation at once. The eggs must be stored to make economical incubation possible. Furthermore it is not only highly desirable but almost absolutely necessary that the eggs originating from different mothers should be kept separate from the time they are laid so that at any time all the eggs which have come from a given mother since the last date of incubation may be found together. In order to attain this end various forms of egg sorting devices have been made. One of the best of these devices is an egg distributing table recently described by Rice and Lawry.** This egg distributing table, planned by

* It is assumed throughout this bulletin that incubators are used to hatch the chicks. This is not the proper place to enter upon a discussion of the relative merits of natural and artificial incubation. It need only be said that as a matter of fact few who have tried artificial incubation attempt to do any pedigree poultry breeding work on an extensive scale using hens as incubators.

** Cornell Experiment Station, Bulletin No. 248, pp. 219 and 220.

Professor Rice suffers from one defect, however, when it is used to hold eggs which are to be incubated. The defect consists in the fact that the eggs which are put on this table must be turned individually by hand from day to day. It is generally held that eggs awaiting incubation should be turned at least once every 24 hours. To turn a large number of eggs individually by hand involves a large amount of labor. It was formerly the practice of this Station to store the eggs awaiting incubation in an ordinary egg shipping crate and then to turn this crate from side to side or end to end each day. In that way all the eggs in the case would be turned daily without the considerable labor involving in handling each one of them separately. A mechanical turning device of this sort is put on the market by several poultry supply firms. It is practically impossible, however, to keep the eggs properly sorted as to mothers in such a crate. The desideratum is an egg distributing table on which the eggs can be mechanically turned all together.

Arriving at the actual incubation there presents itself in all pedigree poultry breeding work the matter of keeping the eggs originating from a given mother and the chicks which hatch from them together in the incubator so that the pedigree of the chicks at the time of hatching may be accurately recorded. This means that some sort of a device must be perfected for holding individual eggs and chicks of the same ancestry together in the incubator, and separate from all others.

After the chicks are hatched it is necessary to give each individual a distinguishing mark which will be a reference to the records wherein will be told its parentage. This necessitates methods of expeditiously and accurately handling chick leg bands.

Finally it is necessary to have a system of book keeping for keeping the pedigree records proper, which shall be accurate, easy of reference, and simple enough to be operated rapidly so that it can withstand the stress involved in the recording of 500 or 600 chickens all hatching at the same time.

The methods and appliances which have been devised in connection with the breeding work at the Maine Station bear upon each of the matters enumerated at one point or another. The remainder of the bulletin is devoted to detailed descriptions of these methods and devices.

The New Maine Station Trap Nest.*

The experience of the Station in trap-nesting large numbers of laying hens has served to bring out very clearly and forcibly what are the points to be desired in an ideal trap nest. These points are:

1. The nest must be so constructed that it will be impossible for a hen to enter it without causing it to close and lock. Whether a trigger, treadle, or spring device is used it must be so adjusted as to operate without fail. Furthermore the ideal trap nest should be so sensitive that the same nest will be adapted to hens of different breeds. This is a matter of particular importance in hybridizing work where one may have in the same pen, for example, Bantam and Cochin or Langshan hens. Obviously one cannot insure that in a mixed pen a Bantam hen will invariably go to a nest which is built especially for her. All the nests should be so constructed that they will operate equally well with either a Bantam or a Langshan, for example.

2. The nest must be so constructed as to be absolutely certain to lock after it has once been sprung, so that a second hen may not enter while the first one is on the nest. Practical experience shows that this is an important matter. Types of trap nests satisfactory in other ways, often fail at just this point and to see 7 hens and 3 eggs taken from the same trap nest at the same time, as has been the experience of the writers, is certainly not a recommendation for that particular type of nest.

3. It is desirable that a nest be built in two compartments; a rear compartment in which is the actual nest in which the egg is laid and a front compartment where the bird may stand after having laid and before she is taken out of the nest. If a front compartment is not provided there is great danger that

---

* This nest was invented by Mr. F. D. Sterry, Laboratory Assistant. While this bulletin was passing through the press the writers were informed that a trap nest involving some features similar to those in the nest here described has been in use for some time at the Utah Agricultural Experiment Station. Careful scrutiny of the bulletins of that Station fails to disclose any description of such a nest. Hence it is impossible to make any further acknowledgement of priority in the matter than what is here set down. In Bulletin 92 of the Utah Experiment Station is given on Plate 12, a photograph of the trap nest in use at that Station, but from this picture it is impossible to make out etails o construction and operation.

the hen will break the egg by stepping on it after it is laid. Having two compartments, however, makes necessary a further provision. The nest must be so constructed that it will be impossible for a hen to lay in the front compartment without causing the trap to operate. A number of well known types of trap nests, including the nest which has formerly been used at this Station, which are otherwise very satisfactory, are so arranged that the trap is not sprung until the hen enters the second compartment of the nest. It has been demonstrated in our work here that in such a nest there will always be a number of hens which will lay in the front compartment of the nest without entering the rear compartment at all. Such a hen after having laid passes out of the nest without springing the trap, and hence makes it impossible to obtain a record for that egg. It has been the theory in the construction of two compartment nests of the type mentioned that the hen would go into the rear compartment where the nest proper was made in order to lay. This may be good theory but as a matter of actual fact hens will more or less frequently lay in the front compartment of trap nests of this type.

4. A trap nest to be ideal must be as simple as possible in construction and in operation. There are various types of trap nests on the market which no doubt are very satisfactory for the man who operates perhaps two or three such nests all told. These nests, however, are so complicated that it would be hopelessly impossible to operate and keep them in repair and working order for a flock of say 2000 hens. If one is to use trap nests on a large scale and continuously they must not only be simple in construction but must be such that it will take a minimum of time for the caretaker to empty and set them. Trap nesting is an expensive operation at best and it becomes more expensive the more complicated the nest is.

5. The nest should be durable and not likely to get out of order in such way that it will not operate satisfactorily.

The trap nest now in use at this Station was devised to meet these requirements and has been found to do so in a very satisfactory manner.

DESCRIPTION OF THE NEST.

The nest is a box-like structure, without front, ends, or cover, 28 inches long, 13 inches wide, and 16 inches deep, inside measure. A division board with a circular opening 7 1-2 inches in diameter is placed across the box 12 inches from the rear end and 15 inches from the front end. The rear section is the nest proper. Instead of having the partition between the two parts of the nest made with a circular hole it is possible to have simply a straight board partition extending up 6 inches from the bottom as shown in Figure 1. The partition with circular opening is, however, recommended. There are several reasons why the circular opening appears to be better than the straight board across the bottom of the nest. Experience has shown that a hen is less likely to go back and forth between the two compartments after she has laid when there is only the relatively small circular opening between them, than when there is a larger opening. This reduces the likelihood of broken eggs.

The front portion of the nest has no fixed bottom. Instead there is a movable bottom or treadle which is hinged at the back end (Figure 1). To this treadle is hinged the door of the nest. The treadle is made of 1-2″ pine stuff with 1 1-2″ hard wood cleats at each end (Figures 2 and 3) to hold the screws which fasten the hinges. It is 12″ wide and 12 1-4″ long. Across its upper face just behind the hinges holding the door is nailed a pine strip 4″ wide bevelled on both sides as shown in Figures 2 and 3. The door of the nest is not made solid but is an open frame (Figures 1 and 3) to the inner side of which is fastened (with staples or cleats) a rectangular piece of 1-8″ mesh galvanized screening (dimensions 8″ x 9″). The sides of the door are strips of 3-4″ beech stuff 12″ long and 1 1-2″ wide halved at the ends to join to the top and bottom of the door. The top of the door is a strip of hard wood 13″ long and 1 1-2″ wide, halved in 2 3-4″ from each end. The projecting ends of this top strip serve as stops for the door when it closes (Fig. 1).

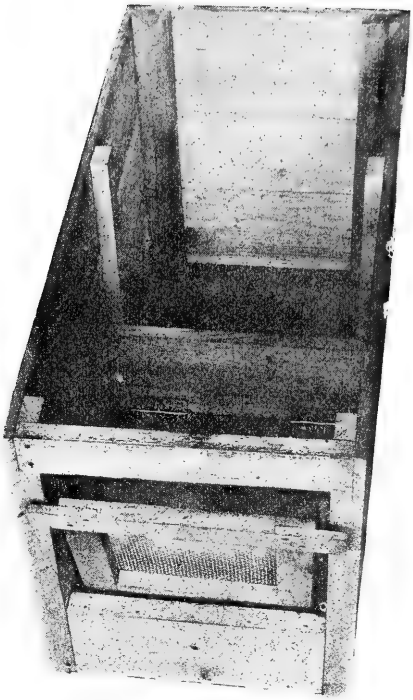


FIG. 1. Top view of trap nest closed.

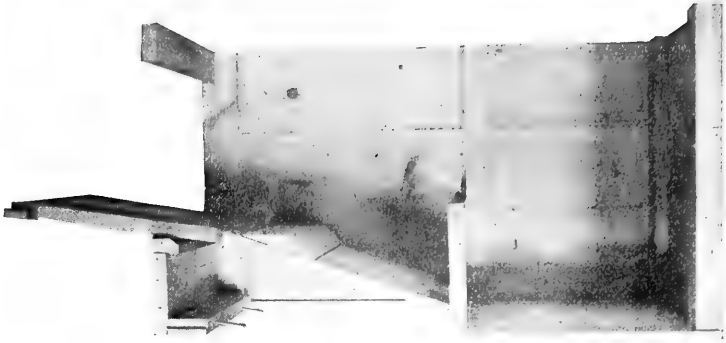


FIG. 2. Trap nest with one side removed. Nest open.

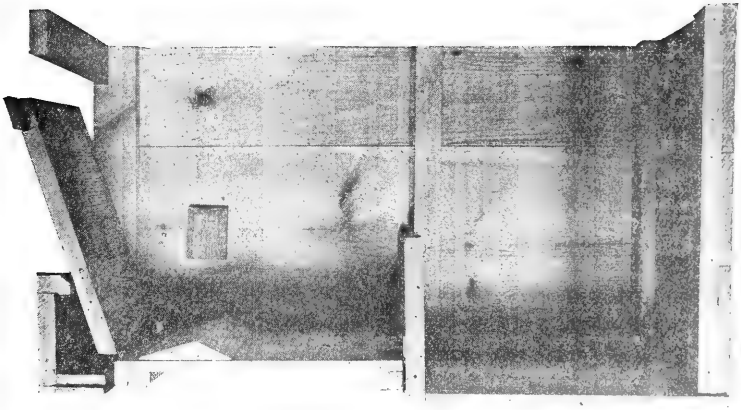


FIG. 3. Trap nest with one side removed. Nest closed.

The bottom of the door is a hard wood strip 10 1-4″ by 4″. The side strips are fitted into the ends of this bottom strip in such way as to project slightly (about 1-32″) above the front surface of that strip for a reason which will be apparent.

When the nest is open the door extends horizontally in front as shown in Figure 2. In this position the side strips of the door rests on a strip of beech 1 1-2″ wide beveled on the inner corner. This beech is nailed to a board 4″ wide which forms the front of the nest box proper. To the bottom of this is nailed a strip 2″ wide into which are set 4″ spikes from which the heads have been cut (compare Fig. 2). The treadle rests on these spikes when the nest is closed. The hinges used in fastening the treadle and door are narrow 3″ galvanized butts with brass pins made to work very easily. It will be recognized that the proper working of the nest depends to a very large degree on these hinges. It has been found necessary to have the hinges made to order in order to get any which would be sufficiently loose. This can be done, however, without any cost above the regular price of the hinges provided the order is placed for a considerable quantity at one time. Hinges such as those used in the nests at the Station may be obtained through the Rice and Miller Company, Wholesale Hardware, Bangor, Maine.

The manner in which the nest operates will be clear from an examination of Figures 2 and 3 which show a sample nest with one side removed to show the inside. A hen about to lay steps up on the door and walks towards the dark back of the nest. When she passes the point where the door is hinged to the treadle her weight on the treadle causes it to drop. That at the same time pulls the door up behind her as shown in Figure 3. It is then impossible for the hen to get out of the nest till the attendant lifts door and treadle and resets it. It will be seen that the nest is extremely simple. It has no locks or triggers to get out of order. Yet by proper balancing of door and treadle it can be so delicately adjusted that a weight of less than 1-2 pound on the treadle will spring the trap. All bearing surfaces are made of beech because of the well known property of this wood to take on a highly polished surface with wear. The nests in use at the Maine Station have the doors

of hard wood in order to get greater durability. Where trap nests are constantly in use flimsy construction is not economical in the long run. For temporary use the nest door could be constructed of soft wood.

The trap nests are not made with covers because they are used in tiers and slide in and out like drawers. They can be carried away for cleaning when necessary. Ten nests in a pen accommodate 50 hens, by the attendant going through the pens once an hour during that part of the day when the hens are busiest. Earlier and later in the day his visits are not so frequent. Considerable experience is needed in trap-nesting before one learns how best to manage the hens at different seasons of the year with reference to this matter of time of removal of the birds from the nests. The tendency with one beginning trap-nesting is to visit the nests too frequently, not allowing a sufficient time between visits. The frequent handling upsets the hens and increases the number of "floor eggs" (i. e., eggs laid outside the trap nests.) The aim should be to provide enough nests so that visits to them need not be made oftener than once an hour, even during periods of heaviest laying. There is need for exact observations to determine what is the average time spent by a "non-broody" hen on the nest.

To remove a hen the nest is pulled part way out, and, as it has no cover, she is readily caught, the number on her leg band is noted, and the proper entry is made on the record sheet. After having been taken off a few times the hens do not object to being handled; most of them remaining quiet, apparently expecting to be picked up.

Egg Distributing and Turning Table.

As has been pointed out above (p. 240) it is desirable in poultry breeding work to have some arrangement such that the eggs laid by a particular bird may be kept together pending incubation, and at the same time be turned from day to day without too great an expenditure of labor. To attain these ends an egg distributing and turning table has been devised. A description follows of the table in use at the Station. It is, of course, possible to vary the dimensions at will from those given to meet special needs while retaining the general plan of the table.

FIG. 4. Egg distributing and turning table.

The table is tipped slightly from the horizontal point to give a view of the top. Note the 4 covers on the upper side with pin locks; the heavy braced base portion, and the light braces extending the length of the table above and below. The covers when raised are fastened to these longitudinal braces with wire hooks.

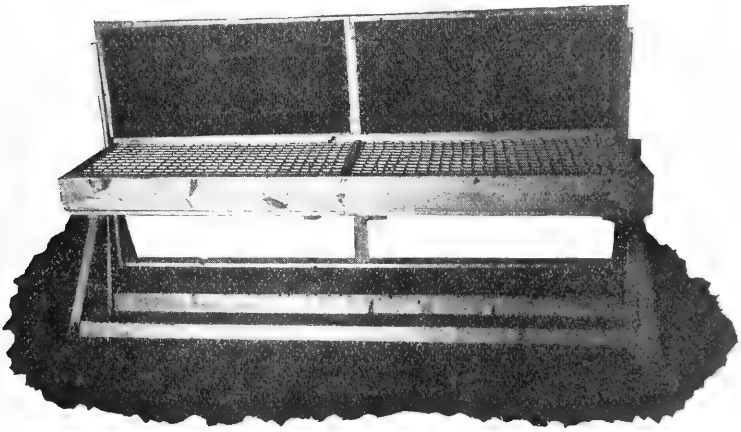


FIG. 5. Same view of the table as in Figure 4, but with the two covers on the side towards the observer raised. Note the compartments for the eggs (each vertical column of compartments—11 compartments in a column—receives the eggs from one hen whose band number is placed on the edge of the table at the end of the column); the lining of the covers; the small iron uprights which project through the covers when they are closed, and receive the locking pins.

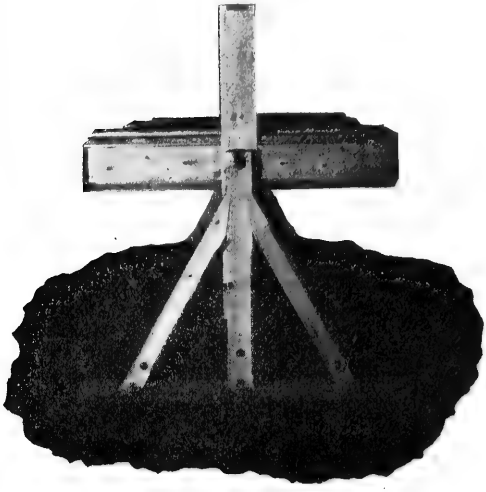


FIG. 6. End view of table. Note heavy construction of base; central point on which the whole egg containing portion of the table turns.

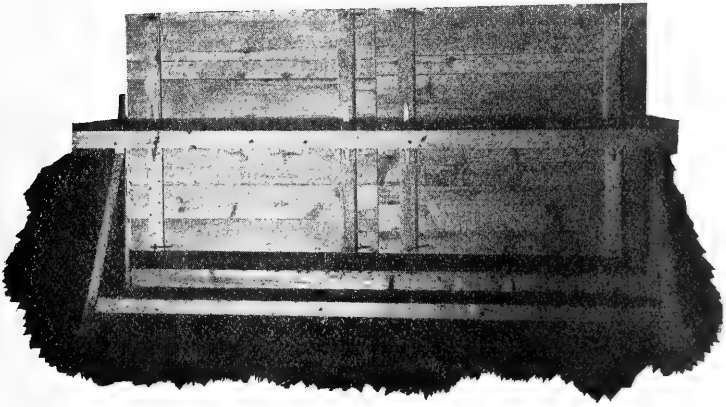


FIG. 7. Showing the table locked in the vertical position 90° (approximately) from that shown in Figure 1.

It will be seen from the figures that the essential plan of the table is a very simple one. It consists merely in suspending an egg distributing tray on a pivotal axis so that it may be turned as a whole. It was desirable in the breeding work here to have an egg distributing table of as great capacity as possible, hence, it was made of large size and the egg trays were made double. In place of having the whole top of the table form one single compartment it was deemed desirable on account of the large size of the table to break it up into 4 parts each having a separate cover (cf., Figs. 4, 5, and 7). Each of these parts is of approximately the same depth as the length of an egg. In order to make compartments within the trays to hold the eggs from each individual breeding hen resort was had to the device of putting the ordinary pasteboard fillers from an egg shipping crate into the trays. These fillers were joined together in sufficient number with strong glue. Each cross row of compartments formed by these fillers may then be devoted to the eggs from a single bird and the number of that bird placed at the end of the row (cf., Fig. 5). In order to prevent the eggs from being broken when the table top was turned the trays were lined below and their covers above with extra thick deadening felt. This felt may be obtained from any dealer in builders supplies. In the table in use here each side is divided into 4 trays. The dimensions of these 4 trays are such that each will hold eggs from 25 breeding hens. Consequently, the whole of the top of the table contains eggs from 100 hens. The width of the table is such that there are 11 compartments for each hen so that 11 eggs from that hen may be stored before incubation.

As has been said the table top is made double. That is, the construction is the same as if two egg distributing trays such as those just described were placed back to back and fastened together. Thus, for example, in Figure 5 the table is shown with two of the trays on one side (say "side I") open. With the table in this position the covers of the trays of the other side ("side II") form in effect the bottoms of those trays. By making the distributing trays in this way the capacity of the table is doubled.

It naturally results that so large a table top when full of eggs is very heavy. Consequently it is necessary that the construction of the base on which this top rests and turns should be substantial. In the case of the machine here in use the base is constructed of 2 x 4 timbers thoroughly braced as shown in the figures and held together by bolts and draw plates. The heavy construction of the base is apparent from the figures. The axle or pivot at each end of the table top on which it actually turns is a short piece of 1″ iron pipe set in a broad flange which is fastened to the center of the end of the table with screws. The pipe sets in a deep rounded slot in the upright of the base (cf., Fig. 6).

It will be noted from the figures that there are light longitudinal braces on either side of the egg distributing portions of the table. These braces serve two purposes: One, to furnish a support for the covers when they are lifted; the other to brace the upright pieces at the ends of the machine placed at right angles to the table top proper. At one end of the table these upright pieces and the boards forming the ends of the trays each have a 1-2″ hole bored through them. When in the proper position these holes receive a locking pin working in the base frame at the same end of the table.

The manner in which the machine is used is as follows: The eggs when brought from the breeding pens are sorted into the machine according to the numbers of the hens at the ends of the columns of compartments. These hen numbers are arranged on the trays to correspond with the order of the breeding pens in the poultry houses. After the eggs from the hens belonging on one side of the machine have been distributed the covers of that side are closed down and locked with the pin locks shown in the figures and the whole table top is turned on its longitudinal axis until the other side is brought uppermost. Then the eggs are sorted into that side. Usually at one other time during the day the whole table top is given either a half turn or a quarter turn from its previous position and locked in place. The appearance of the machine when it is given a quarter turn from its usual position is shown in Figure 7.

It will be seen that this table meets the requirements stated at the beginning. It enables one to distribute the eggs with ease

and at the same time to turn all the eggs waiting incubation at one operation instead of having to handle each of them separately. The table has been found to be very satisfactory in actual practice. The dimensions of the table in use here are given in the following table.

TABLE OF MEASUREMENTS OF EGG DISTRIBUTING TABLE.

Length of egg containing portion	8 ft.	1 inch
Breadth of egg containing portion	3 "	$9\frac{3}{4}$ "
Height of table top above floor	3 "	2 "
Thickness of whole egg containing portion		$7\frac{3}{4}$ "
Depth of each tray (inside)		$2\frac{3}{4}$ "
Length of covers	3 "	$11\frac{1}{2}$ "
Breadth of covers	1 "	$10\frac{1}{2}$ "

Capacity 2200 eggs and 200 "mother" hens.

Pedigree Incubator Baskets.

It is necessary in pedigree poultry breeding work that the eggs from a given hen should be kept together, at least during the last days of incubation, and in such way that the chickens which hatch from these eggs cannot be separated and mixed with others after hatching. This end is usually attained by the use either of so-called pedigree trays which may be substituted for the ordinary egg trays of the incubator, or of small wire baskets placed on the ordinary egg trays of the machine. The objection to the use of the so-called pedigree trays made by the incubator manufacturers is that they allow but few different pedigrees to be carried in the same incubator at the same time. It is difficult with these trays to incubate economically. The wire basket scheme has in consequence been adopted in the breeding work here.

The baskets which are used and which have been found to be very convenient are illustrated in Figure 8.

These baskets are made of 3-8″ mesh galvanized wire and have the following dimensions: Length 7 3-4″; breadth 5 1-4″; depth 2 3-4″. This size makes it possible to put 12 of the baskets in each tray of a No. 3 Cyphers Incubator (360 egg size) which is the incubator used at the Station. Furthermore the size of the baskets is so calculated that a tray may be drawn out and put back into the machine without having the baskets

hit the thermostat. Around the top of the basket is put a strip of galvanized iron folded down over the edge as shown in the figure. This galvanized strip is soldered at the corners. The purpose of the strip, which is an important feature, is to give the whole basket stiffness and maintain its shape under the rough handling which such baskets must receive when used in breeding operations on a large scale.

One of these baskets of the dimensions given will hold 11 eggs without undue crowding. When it is desirable, as is often the case in hybridizing work, to incubate a smaller number of eggs from a given female than 11, it is convenient to subdivide the baskets. This is done by the insertion of a removable wire partition such as is shown in the right hand basket in the figure. This partition is cut the right size to fit easily into the basket and is held in place by three twisted wires; one on each side and one on the bottom.

There is attached to each basket, or, in the case of the subdivided baskets to each end, a wired tag on which is placed the band number of the hen whose eggs go into the basket.

At the time when the eggs are turned for the last time before hatching covers are placed over the baskets. One of these covers is shown in Figure 8. It is a very simple affair consisting of a piece of galvanized wire screening bent over a form of suitable size. These covers may be made to fit so tightly that they will not be pushed off by the chickens as they hatch. In the case of an especially crowded basket, however, it is sometimes desirable to wire the cover on in order to prevent the escape of any of the chickens as they hatch.

Chick Leg Band Bender.

As the chicks are hatched there is immediately attached to each one a numbered leg band. In the work here the ordinary type of flat aluminum composition metal chick band is used. These bands come from the manufacturer as a flat strip of metal with a number on one end. Before these can be put on the chicks they must be bent into a circular form. This bending is usually done by hand with a considerable expenditure of time; particularly when, as is frequently the case, the composition metal of which the bands are made is unduly hard and stiff. Furthermore in bending these chick bands by hand it is difficult

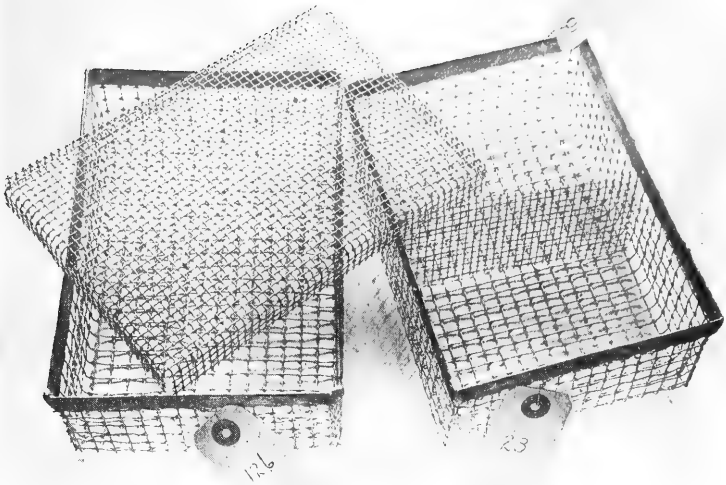


Fig. 8. Pedigree incubator baskets.

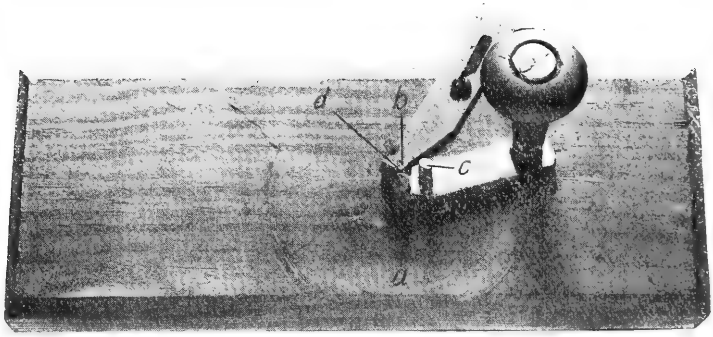


Fig. 9 Chick leg band bender.

to get a uniform bend on each one. In consequence a good deal of time is often lost in putting them on the legs of the chicks. It seemed desirable to have some sort of mechanism which should bend these bands more rapidly and uniformly than could be done by hand. A device to accomplish this purpose was invented by Mr. F. D. Sterry, Laboratory Assistant, and is shown in Figure 9.

FIG. 10. Chick leg bands. A. As the band comes from the manufacturer. B. Band bent at one end. C. Band bent at both ends as recommended.

The construction of this device will be plain from the figure and an account of its operation. The leg band which is to be bent is inserted between the two fixed posts *a* and *b* with its end against the adjustable stop *d*. The post *c* on the movable bar to which the operating handle is attached then engages the outside of the band. By rotating this arm about the axis on which it is pivoted, the leg band is rolled around the post *a* and given the desired bend at one end (Figure 10B). This post *a* is filed to exactly the size which has been found by experience to be best for the bend in the band. Having bent one end of the band by simply reversing it and going through the same operation a similar bend may be put in the opposite end, giving the band finally the appearance shown in Figure 10C.

It has been found desirable to have these chick bands bent at both ends because they can then be put on the leg of the chick with much greater speed and uniformity of fit. To put one of these bands bent at both ends on the leg one simply takes it with the thumb and forefinger bearing on the two bent ends and slips the chick's leg into the band on one end and then by compressing the thumb and finger the band rolls around and

makes a neat joint. Actual experience has shown that chicks can be banded much more rapidly with the bands bent in this way than if they are bent only at one end. The apparatus for bending can be very easily constructed by any mechanic.

A System of Keeping Pedigree Records.

There are probably as many systems of keeping pedigree records as there are breeders who are interested in such records. Each breeder's particular interests or needs lead to the adaptation of records to meet these needs. There is reason to believe, however, that not a few breeders keep their pedigree records in so *unsystematic* a manner that, on the one hand, a great deal of time and labor is lost in tracing pedigrees and in entering new, and, on the other hand, there is great likelihood of error occurring in the records themselves because of the unwieldy character of the method according to which they are kept. All will agree that the thing to be desired in such a system of records is that any given pedigree or step in a pedigree may be looked out or entered with the least possible expenditure of time and labor and the greatest possible accuracy. The system of record keeping in use in the breeding work here is thought to realize this ideal very well. It has been tested under conditions calculated to put any record system under the severest kind of strain and has stood the test satisfactorily. Its simplicity is its great recommendation.

It should be said that for suggestions regarding the keeping of pedigree records some of which are embodied in the system to be described the authors are indebted to Dr. Leon J. Cole, Instructor in Zoology at Yale University, formerly Chief of the Division of Animal Breeding and Pathology in the Rhode Island Experiment Station. In particular Dr. Cole brought to our attention the usefulness of the "mating number" idea (cf., p. 264) which is the fundamental starting point in the system of record keeping here described. For the sake of historical accuracy it should be stated that this idea of using "mating numbers" is essentially that proposed some years ago by Galton * for keeping human pedigree records.

---

* Galton, F. Pedigrees. Nature, Vol. 67, pp. 586-587, 1903.

GENERAL POINTS REGARDING PEDIGREE RECORDS.

For keeping the pedigree records in the breeding work of the Station the loose leaf system has been adopted. All records are kept on sheets of uniform size (5 x 8 inches) which are readily removed or inserted in a patent type of binder which is used. After examining into the relative merits of loose leaf and card systems and seeing both in operation in the keeping of laboratory records it was decided that the loose leaf system possesses distinct advantages over the card system for the keeping of pedigree records. Some of these points of advantage may be enumerated. Perhaps most important of all is the greater compactness and portability of records kept on a loose leaf system. A record book 5 x 8 inches in size is much more easily carried about from incubator cellar to breeding pens or laboratory than is a tray containing index cards. Furthermore the thin paper of the loose leaf sheets keeps down the bulk of the records to a minimum as they accumulate. The supposed inferiority of the loose leaf system as compared with the card system in the matter of inserting or removing sheets has been found in actual experience to be imaginary rather than real. The sheets can be inserted or removed from a loose leaf binder just as quickly as cards can be taken from a drawer in which they are locked.

In keeping the records sheets of different colors are used for different specific classes of data. For example, the mating sheets (cf., p. 264 below) are printed on orange paper; incubator records on pink paper; autopsy records on blue paper, and so on. This point of using different colored sheets for different parts of the records is a valuable aid in quickness of reference.

It will be noted in the account of the system of record keeping which follows that an effort is made at every possible point to make the numerical features of the records run in continuous series. This is a very important matter, although it might not be so considered by one who had not had experience in this particular kind of work. If any system of keeping pedigree records is used which involves giving the chicks when they are hatched band numbers which do not run in consecutive series it will be necessary to stamp with a die the leg band for each

individual chick. Leg bands consecutively numbered from one to any number desired may be purchased for a very slight advance over the price of blank leg bands. When one hatches several thousand chickens the labor which would be involved in numbering these bands individually by hand would be very great. But the matter of the total amount of labor involved is not the only one to be considered. There is also the time factor which must be taken into account. This will be plain if it be considered that one may have say 500 or 600 chickens hatching on the same day. It would be practically impossible under ordinary conditions to stamp a distinctive leg band for each one of these individual chicks as they were hatching and keep the book records of the pedigree straight at the same time. These considerations make it necessary to use for chick leg bands consecutively numbered bands which can be bought already numbered and have merely to be put on and recorded in the book at the time of hatching.

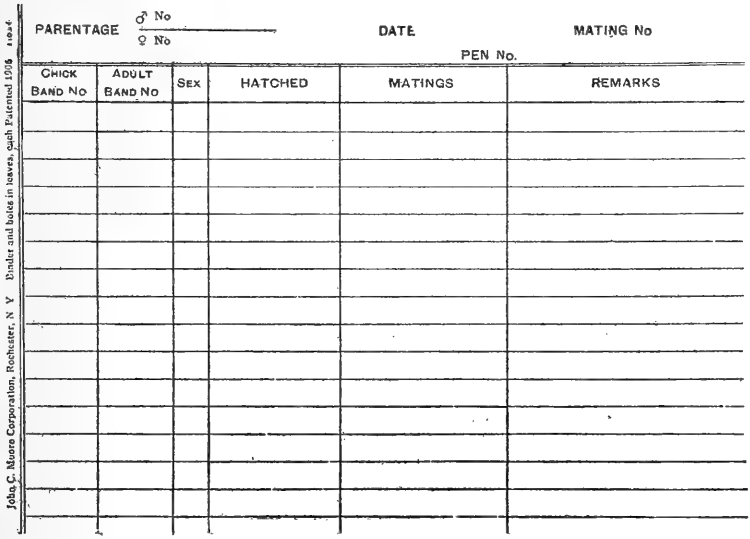
Similar considerations apply to the leg bands of adult birds. In the work of the Station a great deal of attention is being paid to the subject of egg production and its improvement by breeding. From 500 to 800 laying hens are tested in trap nests each year. The keeping of these egg records with accuracy involves careful attention as to method. A prime requisite both for accuracy and economy (in the matter of labor) is that the leg band numbers of these birds in the laying tests shall run consecutively, through the whole flock and in each separate pen. This means of course that a bird's adult band number will not be the same as its chick band number except by the rarest of accidents.

In connection with the matter of consecutive numbers it may be said that in keeping the breeding and egg records in the work here, an automatic numbering machine has been found to be an extremely valuable mechanical aid.

THE MATING SHEET.

The fundamental starting point of the present system of records, as has been implied above (p. 262), is the use of what will be spoken of throughout as "mating numbers." The idea is this: When a particular hen and cockerel are put together

in a mating pen there is given to the mating so formed an arbitrary number called the mating number. While these mating numbers are perfectly arbitrary they are taken consecutively for reasons of convenience referred to in the preceding section. The mating number itself gives no statement of the pedigree but it forms one element of an index wherewith the pedigree can be very quickly and easily looked out. At the time when the mating is made up and the mating number is assigned, there is prepared a mating sheet so-called, which is shown in Figure 11 somewhat reduced. *The purpose of this mating sheet is to show in one place the individuals which comprise a given mating and all the progeny which arise from that mating:* The mating sheet might with equal propriety be called a "family sheet" since it would include in human pedigree records a given pair of parents and all their children. Similarly the mating number might be called the "family number." It corresponds to the family name in a human family for a *single generation.* It differs from a family name in that it is not transmitted either through male or female lines. Instead every new mating receives a new mating number.


John C. Moore Corporation, Rochester, N. Y. Binder and holes in leaves, each Patented 1906 1024

PARENTAGE ♂ No ♀ No DATE MATING No PEN No.

Chick Band No	Adult Band No	Sex	Hatched	Matings	Remarks

FIG. 11. Facsimile of mating sheet, reduced one-half.

With the general idea of the purpose of mating numbers in mind the significance of the arrangement of the mating sheet as

shown in Figure 11 is plain. At the top of the sheet there is placed the "Parentage;" that is, the designating band numbers of the two individuals that compose the mating which is characterized in the records by the mating number at the upper right hand corner of the sheet. For convenience an arbitrary rule is made to put the band number of the male bird above that of the female. The date at the top of the sheet is the date at which the mating was made; that is, it is the date on which the two mated birds were put together in the mating pen. There is also placed at the top of the sheet the number of the pen in which these mated birds were kept. Below the horizontal double line on the mating sheet the space is devoted to the progeny which arise from the mating. In the first column is put the chick band number of each chick hatching from this mating. As has been said the chick leg bands are numbered consecutively. They come from the manufacturer in bundles of 25. No attempt is made in banding the chicks to sort these so that on any given mating sheet the numbers shall run consecutively. They are simply taken within the bundle of 25 at random. The second column provides space for the insertion of the adult band numbers for such of the chicks coming from the mating as are kept over as adult birds, either for egg record tests or, in the case of cockerels, for breeding purposes. In the third column is recorded the sex of each chick as soon as it can be determined. In the fourth column is placed the date of hatching of each chick. This column is of the proper width to take the ordinary band dating stamp.

The fifth column which is headed "Matings" on the sheet is intended to contain a very important part of the pedigree records. *In this column are inserted the mating numbers of those matings into which each individual may in its adult life enter.* Through the mating numbers in this column the connection is made between the parent individuals at the top of the page and all their grandchildren and progeny farther removed. An example will illustrate how this is done: Suppose that an individual having an adult band number 244 has the number 622 in the column headed "Matings." This will signify that to look up the records of the offspring of bird No. 244 one must turn to mating number 622. On that mating sheet will be found a record of all the immediate offspring of this bird arising

from the particular mating 622. But the parents of bird 244 are given on the sheet where 244 itself appears as a chick and as an adult. Hence, there is formed a direct connection in the records between all the individuals in a line of descent. All ramifications of a pedigree may be followed with ease, and very quickly. The mating numbers inserted in the column headed "Matings" are inclosed in brackets.

In the last column headed "Remarks" are put brief notes of a miscellaneous character, such as references to autopsy records and the like.

In addition to the mating sheet just described it is often desirable to make out also for each mating on an ordinary horizontal ruled sheet of the same size punched to go into the same note books a general account of the mating with a statement of the specific purpose for which this mating was made. This record should include all pertinent data regarding the mating. The sheet on which this record is made should have the mating number placed in the upper right hand corner.

DESCRIPTIVE CATALOGUE OF BREEDING STOCK.

For each individual used in breeding there is made out a record sheet which sets forth the data regarding this individual which are regarded as of importance in the breeding work. These sheets, which are of uniform size with all the other record sheets, bear in the upper right hand the band number of the individual. They are filed consecutively in the order of these numbers. On the sheet for a particular bird are recorded, besides it band number, the following data.

1. The mating number of the mating from which the bird to which the sheet pertains *originated*.

2. All mating numbers of matings into which this bird as an adult *enters*.

3. The chick band number of the bird.

4. A description of the bird. This will vary in extent and in character with the purpose for which the bird is used as a breeder.

These records are kept on ordinary sheets with horizontal rulings. No specially ruled blank form is necessary.

INDICES.

Besides the two kinds of record sheets already described—the mating sheet and descriptive catalogue sheets—there is necessary in the system of pedigree records here described only one other type of record. It is necessary for the most convenient operation of the system (though not for its completeness or accuracy) that there be prepared certain indices. The underlying reason which makes these indices necessary is that it is most simple and convenient to find any desired point in a set of figures if those figures are arranged in consecutive order. It is therefore desirable, or indeed necessary, that a person approaching these pedigree records from any point—whether chick, adult bird or mating—should find the numerical designations of the individuals in the class with which he starts arranged in consecutive order, with proper cross references to the other classes. To attain this result it is necessary to have the following indices.

1. *The "mother-mating" index.* On this index which occupies a single foolscap sheet and is fastened to a board to facilitate handling in the incubator cellar, the band numbers of all the hens in the breeding pens (potential "mother" hens) are arranged in columns in consecutive order. In parallel columns there is set down over against each hen's number the number of the mating to which she is a party. This index is used when the pedigreed chickens are leg banded after hatching. Each egg from the breeding pens is marked when gathered with the number of the hen which laid it. When the eggs from any given hen are set in the incubator the tag on the end of the pedigree basket (cf., p. 258) is marked with the hen's (i. e., the mother's) number. After hatching when a basket containing chickens is taken from the incubator for the banding this mother's number is looked out on the index at a glance, and the corresponding mating number tells at once where to open the book containing the mating sheets in order to enter the band numbers of the chickens. With the aid of this index sheet one person can enter chick records approximately as fast as two persons can band the chickens.

2. *The "chick-adult-mating" index.* In this index all chick band numbers are arranged in columns in consecutive order, on

sheets of foolscap size. In parallel columns there is space provided in which to set over against each chick band number (a) the adult band number of the same individual and (b) the mating number of the mating from which that individual originated. The need for this index is as follows: Suppose one picks up a chick on the range with a particular band number and desires to know its pedigree. The question which immediately presents itself is: "What was the mating number of the mating from which this chick arose?" It obviously would be a great task to hunt through all the mating sheets until one came upon this chick band number. But if there is arranged an index in which the chick band numbers are arranged in consecutive order, and having in parallel columns the mating number of the mating from which each chick arose it will clearly be possible to turn very quickly to the mating sheet corresponding to any individual chick number. Having the proper mating sheet in hand it is the simplest of matters, as has been shown above, to trace the entire pedigree. The mating number in this index are most conveniently entered at the time of hatching. The adult numbers are entered when the bands are changed.

3. *The "adult-mating" index.* In this index the adult band numbers of all birds are arranged in columns in consecutive order. In parallel columns is put the mating number from which each bird arose. This index is only useful for special purposes. Ordinarily its purpose will be served by the descriptive catalogue sheets.

It will be seen that, with these indices and the mating sheets described above, from whatever standpoint one approaches the records with the desire of looking out the pedigree of any bird the task will be found easy. If one starts with the chick to look out the pedigree the point of departure is the "chick-adult-mating" index. This index refers to the proper mating sheet. If one starts from an adult bird either the "adult-mating" index or the descriptive catalogue refers again to the proper mating number. The mating sheets themselves are arranged in the book in consecutive order so that to turn to a given mating sheet is no more trouble than to turn to any given page of a book.

HATCHING RECORDS.

For each mating number there is made out as a part of the records a sheet on which is entered all the data regarding the actual breeding performance of the individuals so far as that particular mating is concerned. The sheets on which these records are kept are ruled as shown in Figure 12.

MAINE AGRIC. EXPT. STAT. HATCHING RECORD

EGG COLOR								MATING NO		
EGG LENGTH			EGG WEIGHT							
EGG BREADTH			EGG INDEX							
DATE	Eggs Set	Infertile	Per Cent. Infertile	Died in Shell	Hatched	Per Cent. Hatched	Died in 3 Weeks	Incubator	Brooder	REMARKS

FIG. 12. Hatching record sheet. In facsimile, reduced one-half

At the upper right hand corner of this sheet is placed the mating number which serves to connect the sheet with the other records. There are also placed at the top of the sheet data regarding the color, length, breadth, weight and length-breadth index (100x breadth ÷ length) of the eggs laid by the hen in the particular mating to which the sheet belongs. Below the double horizontal line are placed the detailed data regarding the hatching of this hen's eggs. In the first column of the sheet is put the date when a given batch of eggs are hatched. In the next column is given a record of the number of eggs in that batch; that is, the number of eggs set which were hatched at the date given in the first column. In the third column is recorded the absolute number of infertile eggs in this batch. The following column gives the percentage of infertile eggs. In the fifth

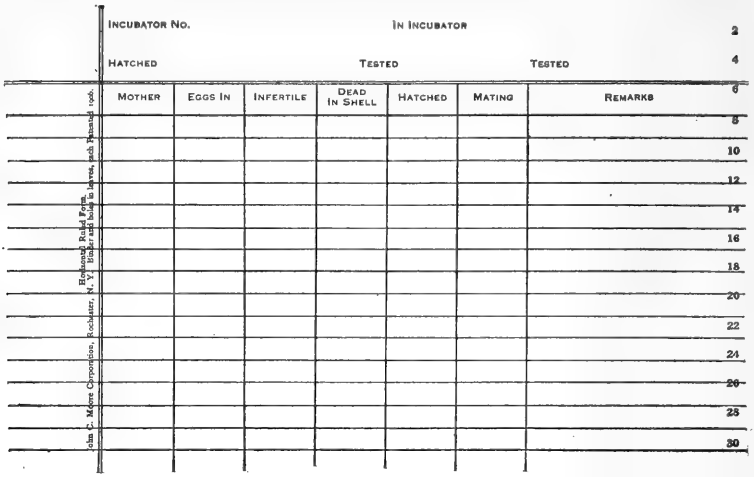
column is recorded the absolute number of embryos which "died in the shell;" i. e., sometime during incubation. These are, in other words, the fertile eggs which fail to hatch. In the sixth column is recorded the absolute number of chicks which hatch in a given batch, and the following column gives the percentage of the fertile eggs which hatch. The following column headed "Died in three weeks" records the number of chicks arising from the original batch of eggs which hatched out but died sometime within three weeks after hatching. The two following columns give respectively the number of the incubator and the brooder in which this given batch of eggs and the chicks arising from it were handled. At the right hand edge of the sheet is left a space for any notes regarding particular lots of eggs which it may be desirable to record.

It may perhaps be well to point out that this hatching record forms no absolutely necessary part of the pedigree records. It does, however, include data of the sort which every practical breeder must have. The great practical value of the data which come out of hatching records kept in this way in their bearing on the general problem of building up the utility characteristics of the flock by breeding will be discussed in another place.

It will be noted that this sheet is well adapted to keeping the history of individual eggs when for any reason it is desired to do this in an experiment. When used in this way a single line will of course be devoted to a single egg instead of to a "clutch" of eggs as described above. When used in this way the percentage columns would naturally be used as "summation" columns for entering totals and sub-totals.

INCUBATOR RECORDS.

When pedigreed eggs are set in incubators it is necessary that a record regarding the eggs put in should be kept. These records are made on sheets of the sort shown in Figure 13.



Incubator No.			In Incubator				2
Hatched			Tested		Tested		4
Mother	Eggs In	Infertile	Dead In Shell	Hatched	Mating	Remarks	6
							8
							10
							12
							14
							16
							18
							20
							22
							24
							26
							28
							30

Fig. 13. Incubator record sheets. In facsimile, reduced one-half.

At the top of these incubator records are placed the following data: The number of the incubator; the date on which the eggs were put in; the date on which they hatched, and the date or dates when they were tested. Below the double horizontal line one horizontal line is given to the eggs from each breeding hen whose eggs go into that particular incubator. In the first column is recorded the mother's band number; in the next column the number of eggs from that hen which go into the incubator. In the next two columns are recorded the number of eggs from that hen which prove to be infertile or, being fertile, produce embryoes which die before hatching. In the next column is given the number of chicks which hatch from the given lot of eggs. Finally, in the column headed "Mating" is recorded the mother's mating number. It will be seen that this at once connects the incubation records with the rest of the pedigree record system. In the final column is left a space for notes of a character not otherwise provided for on the sheet.

It will of course be apparent that the incubator records here discussed are quite distinct from those which have to do with the performance of the incubator in regard to temperature, humidity and the like. Such records are not peculiar to pedigree breeding work and consequently will not be discussed in this paper.

PEN RECORDS.

For some purposes it is desirable in breeding work to have records which will enable one to tell at once just what birds are in a given mating pen. In the work here such records have been kept on ordinary horizontally ruled loose leaf sheets of the same size as the other record sheets. It may be said in this connection that separate pen records of this kind are of relatively little use in such a system of keeping breeding records as that here outlined. In making out one's mating numbers at the beginning of the breeding season it is not only easy but it is the natural thing to have the mating numbers within a given pen run consecutively. The result of this is that by going through the book containing the mating sheets one gets with great ease the pen records directly from the mating sheets. For the matter of completeness, however, it is probably desirable in all cases to have separate pen records.

ADVANTAGES OF THE MATING NUMBER SYSTEM OF PEDIGREE RECORDS.

In closing some of the more important advantages of the mating number system of keeping pedigree records may be summarized as follows:

1. The parents and all offspring related to any given mating are all brought together in the record books. Brothers and sisters appear on the same sheet and with their parents.

2. Starting at any point it is equally easy to go forward or backward on a pedigree or to go into collateral branches. This facility depends on two fundamental facts; viz., (a) that the individual *mating* is the natural unit in breeding operations, and (b) that on the same sheet on which the record of any individual appears there appears also the number of the mating from which this individual originated on the one hand, and the numbers of the matings in which it takes part on the other hand. In other words, whether on mating sheet or in the descriptive catalogue, the connection of the individual both with what is behind and what is beyond in the pedigree is always maintained.

3. Owing to the fact that designating numbers of individuals do not in this system attempt to carry the pedigree within them-

selves, there is no tendency for these numbers to become complex. Complexity in designating numerals, and accuracy in entering and extracting pedigree records are very difficult things to have in common.

4. The system of pedigree records described is in effect a double entry one. This feature makes for accuracy because it makes it possible to detect errors which may get into the records.

5. The system is a very elastic one. By making very slight changes in matters of detail it can be adapted to keeping pedigree records in any kind of breeding work with either plants or animals, or as has been pointed out by Galton (loc. cit.) to keeping human family records.

6. Most important of all is the simplicity of the system. It is so simple and straightforward that once its essential features are grasped it is only by gross carelessness that an error in the records can be made.

BULLETIN No. 160.

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 (pages 280 to 296) the analyses of the samples of commercial fertilizers collected in the open market in the spring of 1908 by the Station representative are given.

R. T. PRENTISS COMPANY'S AROOSTOOK COMPLETE FERTILIZER.

The fertilizer supplied by this company in 1907 ran quite uneven, which led to an investigation on the part of the Station after the regular samples for 1907 had been collected, analyzed and the results published. The results of the analyses of the samples collected late in the fall of 1907 are given on page 103 of bulletin 153. This brand of fertilizers for 1908 was practically all manufactured before this investigation took place and in consequence the Company arranged for the Experiment Station, at the Company's expense, to sample and analyze each car coming into the State, the Company agreeing to sell by the analysis. The goods were thus sampled and 43 samples were analyzed with the following results:

Nitrogen, lowest 2.37 per cent; highest 3.74; average 3.19; guaranty 3.29. Available phosphoric acid, lowest 4.79; highest 8.49; average 5.82; guaranty 6.00 per cent. Potash, lowest 7.21; highest 11.78; average 9.44; guaranty 10.00 per cent.

TWO VIOLATIONS OF THE LAW.

There are two matters concerning the labeling or marking of fertilizer packages to which especial attention is called. The first is apparently a matter of carelessnesss which might cause confusion and possibly injustice; the second seems to be a matter of attempting to avoid payment of analysis fees by means of a cleverly devised system of tags. While the company concerned may be within the letter of the law it seems to be entirely fair to both dealers and consumers to call attention to the case.

The first matter was brought forcibly to our attention the past season by the unusually large number of cases where the guarantied percentages of fertilizer constituents named in the certificates sent to this office by the manufacturers did not agree with the guarantees marked on the bags of fertilizer which the inspector found in the open market. Such discrepencies are sometimes caused by changing the guaranty on a certain brand of fertilizer and then using up bags which are marked with the old guaranties. It would probably be much better to license a new brand than to change the guaranties on an old one long established. It would seem that a name once used in connection with a certain fertilizer made up according to a certain formula should stand for that same kind of goods with that same formula as long as the name is used in connection with any brand of fertilizer. Such changes in formula, however, do not cover the differences found in guaranties for the present season and probably office mistakes are accountable for a greater part.

The table on page 277 gives the more important differences observed concerning the samples collected the present season. Many of these differences it will be noted are on the total phosphoric acid which is, of course, not as important from the standpoint of the consumer as is the available, but the fact that the guarantees differ on the certificates and bags is as much a violation of both the spirit and the letter of the fertilizer law in one case as the other. In some cases bags were found properly marked in one locality, while at another place the same brand was found on which the marks differed from the certificates.

Table showing differences in guaranties upon packages and the certified analysis.

Brand of Fertilizer.	Constituent which differs.	Guaranty on Certificate.	Mark on Package.
Crocker's Ammoniated Corn Phosphate	*Total	9.00	10.00
" New Rival Ammoniated Superphosphate	"	9.00	10.00
" " " " "	Nitrogen	1.03	1.00
" " " " "	"	1.03	1.03
" " " " "	"	1.03	1.06
" Potato, Hop and Tobacco	*Total	9.00	10.00
Great Eastern General	"	9.00	10.00
" " Northern Corn Special	"	9.00	10.00
" " Potato Manure	"	9.00	10.00
Lazaretto Aroostook Potato Guano	"	9.00	10.00
" Corn Guano	"	9.00	10.00
" Propeller Potato Guano	"	9.00	10.00
Packer's Union Animal Corn Fertilizer	"	10.00	11.00
" " " " " "	Nitrogen	2.47	2.50
" " Gardner's Complete Manure	"	2.47	2.40
" " " " "	*Total	8.00	7.00
" " Potato Manure	"	9.00	10.00
" " Universal Fertilizer	"	9.00	10.00
" " " "	Nitrogen	0.82	1.00
" " " "	"	0.82	0.82
Armour's Complete Potato	Total	7.00	8.00
" Bone, Blood and Potash	"	9.00	10.00
" Fruit and Root Crop Special (1907 Goods)	"	9.00	10.00
" Grain Grower (1907 Goods)	"	9.00	10.00
" High Grade Potato	"	9.00	10.00
" Wheat, Corn and Oats Special (1907 Goods)	"	8.00	9.00
Bowker's Bone, Blood and Potash	"	9.00	8.00
" Potash Bone	"	8.00	7.00
" Potato and Vegetable Fertilizer	"	9.00	10.00
" " " " "	"	9.00	9.00
" Potato and Vegetable Phosphate	"	9.00	10.00
E. Frank Coe's Famous Prize Brand Grass and Grain Fertilizer	*Available	10.00	10.50
" " " High Grade Potato	Potash	6.00	8.00
" " " " " "	*Total	10.00	9.50
" " " Red Brand Excelsior Guano	*Available	9.00	8.00
" " " " " " "	"	9.00	9.00
Lister's High Grade Special	*Total	10.00	9.00
" " " "	"	10.00	10.00
New England High Grade Special	Nitrogen	3.69	3.50
Sagadahoc Acid Phosphate	*Available	14.00	15.00
Dirigo Fertilizer	"	4.00	6.00
" "	*Total	6.00	9.00
" "	Nitrogen	2.00	2.50
Sagadahoc High Grade Superphosphate	"	1.85	1.50
" Special Potato Fertilizer	*Available	7.00	6.00
" " " " "	*Total	8.00	7.00
" 3-6-10 Fertilizer	Nitrogen	2.47	2.35
" 4-6-10 "	"	3.29	3.25
Swift's Lowell Acid Phosphate	*Available	12.00	14.00
" " " "	*Total	13.00	15.00
" " Animal Brand	"	9.00	10.00
Tuscarora Aroostook Special	"	8.00	9.00
" Complete Potato	"	7.00	8.00
" Trucker	"	9.00	10.00

* "Total" and "Available" in this column means total phosphoric acid and available phosphoric acid respectively.

The Bowker Fertilizer Company licensed for the present year, among other brands of fertilizer, five different brands of Stockbridge Manures, as follows: Stockbridge Manure A for Potatoes, etc., Formula 5-7-10. Stockbridge Special Complete Manure for Seeding Down, Permanent Dressing and Legumes, Formula 3-6-10. Stockbridge Special Complete Manure for Quick Growth and for Forcing, Formula 6-4-6. Stockbridge Special Complete Manure for Corn and all Grain Crops, etc., Formula 4-10-7. Stockbridge Special Complete Manure for Potatoes and Vegetables, etc., Formula 4-6-10.

By means of cleverly devised tags some of these brands, if not all, are sold for a variety of crops, and by means of this scheme the company is not only avoiding the payment of several analysis fees but also apparently is using these few brands to compete with two or three times that number of brands put out by other companies. For example, tags which are labeled "Stockbridge Special Complete Manure for Seeding Down, Permanent Dressing and Legumes" according to the brand given on the license certificate; but across the end of some of the tags, in the most prominent position and in larger type, are the words "Fruit and Shade Trees," followed by "Hardy Shrubs, etc.," in smaller letters, and preceded by the words "Directions for" in letters even smaller. In a similar manner there are other tags for this same brand which read "Directions for Strawberries & Small Fruits; Blackberries, Currents, etc.," as well as still other tags reading "Directions for Seeding Down." In the same way for the brand licensed as "Stockbridge Special Complete Manure for Quick Growth and for Forcing" there are at least three kinds of tags reading "Directions for Celery and Lettuce," "Directions for Cabbage and Cauliflower, etc.," and "Directions for Top Dressing Grass, etc."

These different tags would give almost any buyer the impression that he was getting a fertilizer designed especially for fruit and shade trees, or small fruits, or seeding down, or for cabbages, etc., and this impression would be all the more likely because of the fact that the formula is printed in small, inconspicuous type in connection with reading matter.

Below is a photographic reproduction of the printed matter on one of these tags.

It will be noted that this tag does not give the "number of net pounds in the package," "the name of the manufacturer or shipper," "the place of manufacture," or "the place of business" as required by law.

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 page 280 and following of this bulletin, show how the samples collected by the Station inspector in 1908 compare with the guarantees. The tables beginning on page 297 give the analyses, so far as total nitrogen, available phosphoric acid and potash are concerned, for the years 1906, 1907 and 1908. 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 constituents.

[Trade Mark Secured.] [Patented January 25, 1876.]

STOCKBRIDGE SPECIAL COMPLETE MANURE

For Quick Growth and for Forcing

This manure is particularly adapted for top dressing grass, also for ensilage corn, lettuce, asparagus, onions, also strawberries, etc.,—in short, for all juicy, succulent growth, and for forcing purposes in market gardens and elsewhere.

CELERY AND LETTUCE. There is no question that the application of commercial fertilizers can improve the quality of celery. Celery which grows slowly is tough, rusty, and strong in flavor. To be tender, crisp and nutty in flavor, and to bleach well, it should grow vigorously from beginning to end. If celery starts off well, but is allowed to hang back, it will then grow stringy and tough. The most tender and succulent growths are those which are most rapid. The Stockbridge Manure used for celery is prepared from chemicals, free from weed seeds and germs of disease or blight, and will produce a large crop of excellent quality, which will BLEACH WELL AND KEEP WELL.

It should be applied in three applications. 400 to 600 lbs. per acre to the seed bed when the seed is sown. Then apply 1000 to 1500 lbs. when the plants are transplanted or pricked out, sown broadcast along the trenches or furrows, before the plants are set out, and worked into the soil. Then, just before the celery is banked up, apply 500 to 1000 lbs., so that it will be worked into the soil which is brought about the plants. If the bed where the seed is sown is rich from previous application of manure or fertilizer, then none need be applied at this time, but the object of making three applications is to feed the plant from start to finish.

FOR GLASS CULTURE. Apply from 1 to 2 pounds to each thirty square feet or two hot-bed sash, or from 3 to 6 pounds to each one hundred square feet, sown broadcast and worked into soil just before or just after the last transplanting, care being taken not to get it upon the roots or leaves of the plant.

FOR FIELD CULTURE. Apply just before the plants are transplanted, at the rate of 1500 to 2000 pounds per acre, sown broadcast, and worked into the soil.

ANALYSIS: 4.93 to 5.76% Nitrogen; Equal 6 to 7% Ammonia; 2 to 3% Soluble Phosphoric Acid, 2 to 3% Reverted Phosphoric Acid; 4 to 6% Available Phosphoric Acid; 2 to 3% Insoluble Phosphoric Acid; 6 to 9 %Total Phosphoric Acid; 6 to 7% Potash. (K20.)

CAUTION. Never drop it clear in contact with the seed, young roots or green leaves.

Tag Form 11.

DIRECTIONS FOR

CELERY AND LETTUCE

Descriptive List of Station Samples, 1908.

Station number.	Manufacturer, place of business and brand.
	AMERICAN AGRICULTURAL CHEMICAL COMPANY, NEW YORK.
1143	Aroostook Complete Manure
1188	Aroostook Complete Manure
1382	Aroostook Complete Manure
1503	Aroostook Complete Manure
1458	Aroostook High Grade
1461	Aroostook High Grade
1378	Northern Maine Potato Special
1438	Northern Maine Potato Special
1446	Northern Maine Potato Special
1479	Complete Manure with 10% Potash
1480	Grass and Lawn Top Dressing
1250	High Grade Fertilizer with 10% Potash
1390	High Grade Fertilizer with 10% Potash
1102	Bradley's Alkaline Bone with Potash
1189	Bradley's Alkaline Bone with Potash
1057	Bradley's Complete Manure for Potatoes and Vegetables
1249	Bradley's Complete Manure for Potatoes and Vegetables
1395	Bradley's Complete Manure for Potatoes and Vegetables
1055	Bradley's Complete Manure with 10% Potash
1380	Bradley's Complete Manure with 10% Potash
1101	Bradley's Corn Phosphate
1381	Bradley's Corn Phosphate
1098	Bradley's Eureka Fertilizer
1350	Bradley's Eureka Fertilizer
1085	Bradley's Niagara Phosphate
1320	Bradley's Niagara Phosphate
1103	Bradley's Potato Fertilizer
1383	Bradley's Potato Fertilizer
1106	Bradley's Potato Manure
1386	Bradley's Potato Manure
1071	Bradley's XL Superphosphate of Lime
1242	Bradley's XL Superphosphate of Lime
1081	Clark's Cove Bay State Fertilizer
1498	Clark's Cove Bay State Fertilizer
1202	Clark's Cove Bay State Fertilizer GG
1323	Clark's Cove Bay State Fertilizer GG
1219	Clark's Cove Bay State Fertilizer for Seeding Down
1234	Clark's Cove Defiance Complete Manure
1410	Clark's Cove Defiance Complete Manure
1125	Clark's Cove Great Planet Manure A. A. for Potatoes, etc
1366	Clark's Cove Great Planet Manure A. A. for Potatoes, etc
1090	Clark's Cove King Phillip Alkaline Guano for all Crops
1198	Clark's Cove King Phillip Alkaline Guano for all Crops
1084	Clark's Cove Potato Fertilizer
1218	Clark's Cove Potato Fertilizer
1080	Clark's Cove Potato Manure
1223	Clark's Cove Potato Manure

Analysis of Station Samples, 1908.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
			Total.					Available.		Total.			
	As Ammonia.	As Nitrates	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
1143	0.08	1.44	3.22	2.47	3.41	2.21	2.79	5.62	6.00	8.40	7.00	9.15	10.00
1188	0.13	0.31	2.74	2.47	4.32	2.13	2.84	6.44	6.00	9.28	7.00	9.29	10.00
1382	0.12	0.56	2.64	2.74	4.29	2.86	2.33	7.15	6.00	9.48	7.00	9.09	10.00
1503	0.18	0.50	2.82	2.47	4.11	3.49	1.68	7.60	6.00	9.28	7.00	9.40	10.00
1458	0.36	1.78	4.24	4.12	4.61	2.20	2.18	6.81	7.00	8.99	8.00	6.81	7.00
1461	0.36	1.74	4.04	4.12	5.01	1.75	2.45	6.76	7.00	9.21	8.00	6.80	7.00
1378	0.06	1.76	3.94	3.70	4.59	3.66	1.30	8.25	7.00	9.55	9.00	10.51	10.00
1438	0.06	1.46	3.88	3.70	4.48	2.29	2.49	6.77	7.00	9.26	9.00	9.79	10.00
1446	0.06	1.50	3.90	3.70	4.56	2.21	2.86	6.77	7.00	9.63	9.00	9.15	10.00
1479	0.04	1.46	3.40	3.30	5.47	1.84	1.58	7.31	6.00	8.89	7.00	10.14	10.00
1430	.....	4.28	5.64	3.91	1.05	4.96	1.45	6.01	5.00	7.46	6.00	4.26	2.00
1250	0.14	0.76	2.38	2.40	3.95	2.22	2.55	6.17	6.00	8.72	7.00	11.46	10.00
1390	0.06	1.24	2.46	2.40	5.05	2.19	1.56	7.24	6.00	8.80	7.00	9.58	10.00
1102	.....	.....	.....	.....	5.34	4.20	4.13	9.54	11.00	13.67	12.00	1.91	2.00
1189	.....	.....	.....	.....	4.61	4.89	3.54	9.50	11.00	13.04	12.00	1.76	2.00
1057	1.27	.....	3.38	3.30	5.44	2.19	2.07	7.63	8.00	9.70	9.00	6.38	7.00
1249	0.74	0.44	3.36	3.30	5.72	2.42	2.08	8.14	8.00	10.22	9.00	7.44	7.00
1395	0.68	0.92	3.49	3.30	6.07	2.29	2.21	8.36	8.00	10.57	9.00	6.65	7.00
1055	.....	1.56	3.45	3.30	4.80	1.67	2.03	6.47	6.00	8.50	7.00	9.81	10.00
1380	0.06	1.08	3.58	3.30	1.74	3.32	4.25	5.06	6.00	9.31	7.00	9.72	10.00
1101	0.14	0.96	2.16	2.06	4.26	3.53	3.45	7.79	8.00	11.24	10.00	1.99	1.50
1381	0.12	0.70	2.22	2.06	5.02	2.89	2.50	7.91	8.00	10.41	10.00	1.74	1.50
1098	.....	.....	1.07	1.03	4.93	3.48	3.66	8.41	8.00	12.07	10.00	2.22	2.00
1350	.....	.....	1.01	1.03	4.99	4.61	2.88	9.60	8.00	12.48	10.00	1.89	2.00
1085	.....	.....	1.10	0.82	4.75	1.95	3.88	6.70	7.00	10.58	8.00	2.16	1.00
1320	.....	.....	1.18	0.82	4.58	3.54	3.70	3.12	7.00	11.82	8.00	2.20	1.00
1103	0.14	0.88	2.30	2.06	1.21	6.00	4.03	7.21	8.00	11.24	10.00	2.81	3.00
1383	0.06	0.90	2.06	2.06	5.02	2.55	2.97	7.57	8.00	10.54	10.00	3.25	3.00
1106	0.38	1.10	2.80	2.50	4.22	2.56	2.27	6.78	6.00	9.05	8.00	5.29	5.00
1386	0.10	0.90	2.90	2.50	2.87	3.44	3.27	6.31	6.00	9.58	8.00	6.00	5.00
1071	0.16	0.63	2.58	2.50	5.23	3.49	2.52	8.72	9.00	11.24	11.00	2.17	2.00
1242	0.08	1.06	2.82	2.50	5.83	2.57	3.25	8.40	9.00	11.65	11.00	2.27	2.00
1081	.....	1.02	2.93	2.50	5.85	2.15	2.89	8.00	9.00	10.89	11.00	2.07	2.00
1498	0.10	0.96	2.86	2.50	6.82	3.09	2.49	9.91	9.00	12.40	11.00	2.05	2.00
1202	0.06	0.47	1.93	2.06	6.20	2.27	2.08	8.47	8.00	10.55	10.00	1.71	1.50
1323	0.06	0.93	2.10	2.06	3.73	3.65	4.10	7.38	8.00	11.48	10.00	1.87	1.50
1219	.....	.....	1.30	1.03	5.20	3.33	2.37	8.53	8.00	10.90	10.00	1.91	2.00
1234	.....	.....	1.18	0.82	3.25	4.40	3.28	7.65	7.00	10.93	8.00	0.97	1.00
1410	.....	.....	1.12	0.82	4.83	3.38	3.71	8.21	7.00	11.92	8.00	1.96	1.00
1125	0.64	1.02	3.48	3.30	5.90	1.66	2.94	7.66	8.00	10.60	9.00	6.86	7.00
1366	0.68	1.18	3.30	3.30	5.20	1.92	2.64	7.12	8.00	9.76	9.00	7.15	7.00
1090	.....	.....	1.10	1.03	4.75	3.45	3.95	8.20	8.00	12.15	10.00	2.17	2.00
1198	0.12	.....	1.22	1.03	5.36	4.74	2.26	8.10	8.00	10.36	10.00	2.21	2.00
1084	0.04	1.00	2.19	2.06	3.43	5.43	3.80	8.86	8.00	12.66	10.00	3.20	3.00
1218	0.09	0.77	2.11	2.05	5.26	2.71	2.55	7.97	8.00	10.52	10.00	3.24	3.00
1080	0.08	1.32	3.04	2.50	3.40	3.01	3.65	6.41	6.00	10.06	8.00	5.14	5.00
1223	0.08	0.98	2.76	2.50	5.36	2.10	1.93	7.46	6.00	9.39	8.00	5.26	5.00

Descriptive List of Station Samples, 1908.

Station number.	Manufacturer, place of business and brand.
1120	Cleveland Fertilizer for all Crops
1222	Cleveland Fertilizer for all Crops
1121	Cleveland High Grade Complete Manure
1367	Cleveland High Grade Complete Manure
1123	Cleveland Potato Phosphate
1228	Cleveland Potato Phosphate
1486	Cleveland Seeding Down Fertilizer
1221	Cleveland Superphosphate
1322	Cleveland Superphosphate
1301	Crocker's Ammoniated Corn Phosphate
1341	Crocker's Ammoniated Corn Phosphate
1088	Crocker's Aroostook Potato Special
1239	Crocker's Aroostook Potato Special
1104	Crocker's Grass and Oats Fertilizer
1197	Crocker's Grass and Oats Fertilizer
1227	Crocker's High Grade
1097	Crocker's New Rival Ammoniated Superphosphate
1237	Crocker's New Rival Ammoniated Superphosphate
1086	Crocker's Potato, Hops & Tobacco Phosphate
1339	Crocker's Potato, Hops & Tobacco Phosphate
1112	Crocker's Special Potato Manure
1241	Crocker's Special Potato Manure
1342	Crocker's Special Potato Manure
1124	Cumberland Potato Fertilizer
1206	Cumberland Potato Fertilizer
1478	Cumberland Seeding Down Manure
1110	Cumberland Superphosphate
1205	Cumberland Superphosphate
1056	Darling's Blood, Bone and Potash
1156	Great Eastern General Fertilizer
1230	Great Eastern General Fertilizer
1140	Great Eastern Grass and Oats Fertilizer
1235	Great Eastern Grass and Oats Fertilizer
1347	Great Eastern Grass and Oats Fertilizer
1141	Great Eastern High Grade Potato Manure
1225	Great Eastern High Grade Potato Manure
1138	Great Eastern Northern Corn Special
1212	Great Eastern Northern Corn Special
1139	Great Eastern Potato Manure
1385	Great Eastern Potato Manure
1433	Great Eastern Potato Special
1155	Lazaretto Aroostook Potato Guano
1358	Lazaretto Aroostook Potato Guano
1359	Lazaretto Corn Guano
1154	Lazaretto High Grade Potato Guano
1448	Lazaretto High Grade Potato Guano
1094	Lazaretto Propeller Potato Guano
1364	Lazaretto Propeller Potato Guano

Analysis of Station Samples, 1908.

Station number.	Nitrogen				Phosphoric Acid.							Potash.	
			Total.					Available.		Total.			
	As Ammonia.	As Nitrates.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble	Found.	Guaranteed.	Found	Guaranteed.	Found.	Guaranteed.
1120	0.11	0.45	1.58	1.03	5.10	2.69	2.63	7.79	8.00	10.42	10.00	2.22	2.00
1222	0.08	0.31	1.28	1.03	4.89	3.65	2.12	8.54	8.00	10.66	10.00	2.07	2.00
1121	1.30	0.36	3.58	3.30	6.55	1.34	2.23	7.89	8.00	10.12	9.00	6.40	7 00
1367	0.86	1.06	3.06	3.30	4.85	2.44	2.83	7.39	8.00	10.22	9.00	7.13	7.00
1123	0.10	0.92	2.28	2.06	5.07	2.29	2.23	7.36	8.00	9.59	10.00	3.29	3.00
1228	0.14	0.65	2.16	2.06	5.16	3.03	2.65	8.19	8.00	10.84	10.00	3.45	3.00
1486	0.13	.....	1.66	1.03	5.29	3.05	2.36	8.34	8.00	10.70	10.00	1.94	2.00
1221	0.06	0.58	2.09	2.06	3.98	4.46	3.24	8.44	8.00	11.68	10.00	2.13	1.50
1322	0.06	1.00	2.12	2.06	4.10	3.44	4.07	7.54	8.00	11.61	10.00	1.49	1.50
1301	0.06	0.56	2.02	2.06	6.46	2.24	1.96	8.70	8.00	10.66	9.00	1.73	1.50
1341	0.10	0.72	2.24	2.06	5.05	2.46	2.80	7.51	8.00	10.31	9.00	1.79	1.50
1088	0.08	0.86	2.07	2.06	5.13	1.82	2.32	7.05	8.00	9.37	10.00	6.16	6.00
1239	0.10	0.58	1.98	2.06	4.54	3.75	1.80	8.29	8.00	10.09	10.00	6.11	6.00
1104	.....	.....	.....	.....	4.06	5.27	4.67	9.33	11.00	14.00	12.00	2.07	2.00
1197	.....	.....	.....	.....	3.97	6.26	2.23	10.23	11.00	12.46	12.00	2.14	2.00
1227	0.82	0.88	3.27	3.30	5.61	2.67	2.19	8.28	8.00	10.47	9.00	6.89	7.00
1097	.....	.....	1.12	1.03	5.15	3.40	3.85	8.55	8.00	12.40	9.00	2.07	2.00
1237	0.06	0.40	1.28	1.03	3.09	3.66	2.41	8.75	8.00	11.16	9.00	2.00	2.00
1086	0.04	0.84	2.12	2.06	4.73	2.83	2.63	7.56	8.00	10.19	9.00	3.23	3.00
1339	0.10	0.85	2.23	2.06	5.28	2.79	2.35	8.07	8.00	10.42	9.00	3.07	3.00
1112	0.06	1.72	3.76	3.30	4.48	0.95	3.51	5.43	6.00	8.94	7.00	9.03	10.00
1241	0.76	0.86	3.26	3.30	5.71	0.94	2.77	6.65	6.00	9.42	7.00	9.25	10.00
1342	0.06	0.92	3.30	3.30	2.38	3.32	3.21	5.70	6.00	8.91	7.00	9.78	10.00
1124	0.16	0.88	2.15	2.06	5.42	2.16	2.69	7.58	8.00	10.27	10.00	3.27	3.00
1206	0.10	0.66	2.08	2 06	5.98	1.78	2.27	7.76	8.00	10.03	10.00	3.19	3.00
1478	0.09	.....	1.61	1.03	5.47	3.13	2.26	8.60	8.00	10.86	10.00	1.99	2.00
1110	0.14	0.68	2.18	2.06	4.69	3.02	2.19	7.71	8.00	9.90	10.00	1.60	1.50
1205	0.06	0.48	1.90	2.06	6.33	2.00	2.01	8.33	8.00	10.34	10.00	1.72	1.50
1056	0.42	1.44	4.20	4.10	5.26	1.47	2.69	6.73	7.00	9.42	8.00	7.17	7.00
1156	0.10	.....	1.04	0.82	3.94	3.59	2.11	7.53	8.00	9.64	9.00	3.60	4.00
1230	0.08	.....	1.44	0.82	3.78	3.14	2.98	6.92	8.00	9.90	9.00	5.43	4.00
1140	.....	.....	.....	.....	5.47	4.05	4.00	9.52	11.00	13.52	12.00	1.84	2.00
1235	.....	.....	.....	.....	4.97	4.52	3.28	9.49	11.00	12.77	12.00	1.43	2.00
1347	.....	.....	.....	.....	3.89	5.42	4.40	9.31	11.00	13.71	12.00	2.12	2.00
1141	0.08	0.94	3.26	3.30	1.80	3.79	4.17	5.59	6.00	9.76	7.00	9.84	10.00
1225	0.16	1.17	3.41	3.30	5.04	2.01	2.12	7.05	6.00	9.17	7.00	11.60	10.00
1138	0.12	0.74	2.14	2.06	4.48	3.03	2.93	7.51	8.00	10.44	9.00	1.85	1.50
1212	0.05	0.52	1.94	2.06	6.07	2.14	2.26	8.21	8.00	10.47	9.00	1.69	1.50
1139	0.14	0.88	2.13	2.06	4.99	2.60	2.64	7.59	8.00	10.25	9.00	3.24	3.00
1385	0.03	0.90	2.08	2.06	4.77	2.63	3.38	7.40	8.00	10.78	9.00	3.25	3.00
1433	1.10	0.10	3.32	3.30	4.81	2.82	1.93	7.63	8.00	9.56	9.00	7.24	7.00
1155	0.09	.....	1.04	0.82	3.81	3.52	2.22	7.33	8.00	9.55	9.00	3.66	4.00
1358	0.06	0.32	1.52	0.82	3.92	3.21	2.88	7.13	8.00	10.01	9.00	4.81	4.00
1359	0.14	0.48	1.88	1.65	4.38	2.62	2.66	7.00	8.00	9.66	9.00	2.19	2.00
1154	0.06	1.28	3.32	3.30	2.89	2.79	2.91	5.68	6.00	8.59	7.00	9.80	10.00
1448	0.08	1.60	3.46	3.30	4.42	1.79	2.22	6.21	6.00	8.43	7.00	9.69	10.00
1094	0.10	0.86	2.16	2.06	4.59	4.13	2.50	8.72	8.00	11.22	9.00	5.91	6.00
1364	0.02	1.14	2.69	2.06	6.15	1.91	2.35	8.06	8.00	10.41	9.00	5.72	6.00

Descriptive List of Station Samples, 1908.

Station number.	Manufacturer, place of business and brand.
1467	Muriate of Potash
1465	Nitrate of Soda
1488	Otis Potato Fertilizer
1487	Otis Superphosphate
1115	Pacific Dissolved Bone and Potash
1353	Pacific Dissolved Bone and Potash
1117	Pacific Grass and Grain Fertilizer
1199	Pacific Grass and Grain Fertilizer
1109	Pacific High Grade General Fertilizer
1114	Pacific Nobsque Guano for all Crops
1338	Pacific Nobsque Guano for all Crops
1126	Pacific Potato Special
1324	Pacific Potato Special
1082	Packer's Union Animal Corn Fertilizer
1200	Packer's Union Animal Corn Fertilizer
1394	Packer's Union Economical Vegetable Guano
1083	Packer's Union Gardeners Complete Manure
1226	Packer's Union Gardeners Complete Manure
1379	Packer's Union Gardeners Complete Manure
1462	Packer's Union High Grade
1463	Packer's Union High Grade
1093	Packer's Union Potato Manure
1229	Packer's Union Potato Manure
1105	Packer's Union Universal Fertilizer
1220	Packer's Union Universal Fertilizer
1116	Packer's Union Wheat, Oats and Clover Fertilizer
1346	Packer's Union Wheat, Oats and Clover Fertilizer
1466	Plain Superphosphate
1411	Quinnipiac Climax Phosphate for all Crops
1190	Quinnipiac Corn Manure
1363	Quinnipiac Corn Manure
1252	Quinnipiac Market Garden Manure
1360	Quinnipiac Market Garden Manure
1193	Quinnipiac Mohawk Fertilizer
1253	Quinnipiac Potato Manure
1214	Quinnipiac Potato Phosphate
1318	Quinnipiac Potato Phosphate
1079	Read's Farmers Friend Superphosphate
1232	Read's Farmers Friend Superphosphate
1178	Read's High Grade Farmers Friend Superphosphate
1231	Read's High Grade Farmers Friend Superphosphate
1100	Read's Potato Manure
1396	Read's Potato Manure
1091	Read's Practical Potato Special Fertilizer
1204	Read's Practical Potato Special Fertilizer
1128	Read's Standard Superphosphate
1203	Read's Standard Superphosphate
1321	Read's Standard Superphosphate

Analysis of Station Samples, 1908.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
			Total.					Available.		Total.			
	As Ammonia.	As Nitrates.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
1467	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	49.60	50.00
1465	.....	.....	15.64	15.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
1488	0.11	0.85	1.99	2.06	5.55	2.79	2.08	8.34	8.00	10.42	10.00	3.13	3.00
1487	0.16	0.94	2.34	2.06	4.86	2.72	2.61	7.58	8.00	10.19	10.00	1.74	1.50
1115	.....	.....	.....	.....	6.61	3.03	2.52	9.64	10.00	12.16	11.00	1.83	2.00
1353	.....	.....	.....	.....	3.84	6.37	3.67	10.21	10.00	13.88	11.00	2.09	2.00
1117	0.14	0.64	1.55	0.82	4.96	2.42	2.65	7.38	7.00	10.03	8.00	2.30	1.00
1199	.05	.....	1.22	0.82	4.43	3.35	3.28	7.78	7.00	11 06	8.00	1.12	1.00
1109	0.66	0.95	3.41	3.30	5.90	2.15	2.60	8.05	8.00	10.65	9.00	7.20	7.00
1114	0.14	0.58	1.64	1.03	5.10	3.89	1.64	8.99	8.00	10.63	10.00	2.12	2.00
1338	0.08	0.42	1.32	1.03	5.44	2.92	2.03	8.36	8.00	10.39	10.00	2.00	2.00
1126	0.10	0.92	2.21	2.06	5.61	2.50	2.01	8.11	8.00	10.12	10.00	3.21	3.00
1324	0.04	0.88	2.12	2.06	5.39	4.50	1.98	7.89	8.00	9.87	10.00	3.17	3.00
1082	0.06	0.92	2.92	2.47	5.20	2.99	2.65	8.19	9.00	10.84	10.00	2.07	2.00
1200	0.14	0.68	2.58	2.47	7.52	1.03	2.77	8.55	9.00	11.32	10.00	2.53	2.00
1394	0.09	0.31	2.14	1.25	5.82	1.99	2.49	7.81	6.00	10.30	7.00	4.15	3.00
1083	0.04	1.30	2.76	2.47	4.86	1.88	1.98	6.74	6.00	8.72	8.00	9.58	10.00
1226	0.16	0.70	2.69	2.47	4.42	2.34	2.80	6.76	6.00	9.56	8.00	9.32	10.00
1379	0.12	0.56	2.50	2.47	3.95	2.17	2 91	6.12	6.00	9.03	8.00	9.58	10.00
1462	0.13	1.59	3.45	3.30	6.04	1.88	1.80	7.92	8.00	9.72	9.00	6.40	7.00
1463	0.12	1.44	3.43	3.30	6.41	1.85	1.67	8.26	8.00	9.93	9.00	6.23	7.00
1093	0.10	0.88	2.56	2.06	4.02	2.98	2.44	7.00	8.00	9.44	9.00	6.23	6.00
1229	0.06	0.58	2.01	2.06	4.49	3.01	2.56	7.50	8.00	10.06	9.00	6.30	6.00
1105	.06	.....	1.01	0.82	3.44	3.12	3.63	6.56	8.00	10.19	9.00	3.40	4.00
1220	0.13	.....	1.50	0.82	3.97	2.74	3.25	6.71	8.00	9.96	9.00	5.41	4.00
1116	.....	.....	.....	.....	4.30	5.11	4.04	9.41	11.00	13.45	12.00	1.95	2.00
1346	.....	.....	.....	.....	6.53	3.40	2.50	9.93	11.00	12.43	12.00	1.79	2.00
1466	.....	.....	.....	.....	11.16	3.56	1.62	14.72	14.00	16.34	.....	.....	.....
1411	.....	.....	1.10	1.03	4.93	3.14	3.79	8.07	8.00	11.86	10.00	2.09	2.00
1190	0.10	0.72	2.34	2.06	3.55	4.11	3.26	7.66	8.00	10.92	10.00	1.92	1.50
1363	0.05	1.05	2.06	2.06	3.91	3.55	3.79	7.56	8.00	11.35	10.00	2.23	1.50
1252	0.48	0.98	3.33	3.30	5.69	2.24	2.11	7.93	8.00	10.04	9.00	7.24	7.00
1360	0.88	1.00	3.16	3.30	5.20	2.38	2.75	7.58	8.00	10.33	9.00	7.01	7.00
1193	.....	.....	1.16	0.82	2.81	4.73	3.28	7.54	7.00	10.82	8.00	1.12	1.00
1253	0.78	0.52	2.66	2.50	5.58	2.47	2.49	8.05	6.00	10.54	8.00	5.34	5.00
1214	0.12	0.58	2.10	2.06	4.49	3.34	2.87	7.83	8.00	10.70	10.00	3.22	3.00
1318	0.10	0.91	2.28	2.06	5.42	2.60	1.93	8.02	8.00	9.95	10.00	3.41	3.00
1079	0.08	0.98	2.22	2.06	3.51	4.00	3.76	7.51	8.00	11.27	10.00	3.06	3.00
1232	0.08	0.74	2.02	2.06	5.52	2.30	2.37	7.83	8.00	10.19	10.00	3.12	3.00
1178	0.06	0.62	3.28	3.30	4.53	1.88	2.04	6.41	6.00	8.45	7.00	8.42	10.00
1231	0.08	1.46	3.46	3.30	4.05	3.08	2.35	7.13	6.00	9.48	7.00	8.83	10.00
1100	0.16	1.24	2.62	2.40	4.93	2.67	1.82	6.60	6.00	8.42	7.00	9.59	10.00
1396	0.12	0.61	2.50	2.40	3.92	2.57	2.72	6.49	6.00	9.21	7.00	9.32	10.00
1091	0.07	.....	1.03	0.82	3.91	3.05	2.24	6.96	4.00	9.20	5.00	8.46	8.00
1204	0.06	.....	1.32	0.82	5.10	1.95	2.58	7.05	4.00	9.63	5.00	8.11	8.00
1128	0.34	.....	0.95	0.82	3.97	3.16	2.64	7.13	8.00	9.77	10.00	3.37	4.00
1203	0.06	.....	1.35	0.82	4.53	2.81	2.91	7.34	8.00	10.25	10.00	5.21	4.00
1321	0.04	.....	1.36	0.82	3.57	4.33	2.72	7.90	8.00	10.62	10.00	4.00	4.00

Descriptive List of Station Samples, 1908.

Station number.	Manufacturer, place of business and brand.
1089	Read's Sure Catch Fertilizer
1196	Read's Sure Catch Fertilizer
1092	Read's Vegetable & Vine Fertilizer
1384	Read's Vegetable & Vine Fertilizer
1113	Soluble Pacific Guano
1325	Soluble Pacific Guano
1127	Standard A Brand
1357	Standard A Brand
1119	Standard Bone and Potash
1187	Standard Bone and Potash
1355	Standard Bone and Potash
1122	Standard Complete Manure
1377	Standard Complete Manure
1107	Standard Fertilizer
1209	Standard Fertilizer
1216	Standard Guano for all Crops
1319	Standard Guano for all Crops
1118	Standard Special for Potatoes
1211	Standard Special for Potatoes
1246	Williams & Clark's Americus Ammoniated Bone Superphosphate
1243	Williams & Clark's Americus Corn Phosphate
1491	Williams & Clark's Americus Corn Phosphate
1247	Williams & Clark's High Grade Special for Potatoes, etc
1244	Williams & Clark's Americus Potato Manure
1194	Williams & Clark's Royal Bone Phosphate for all Crops
	ARMOUR FERTILIZER WORKS, BALTIMORE, MARYLAND.
1288	Armour's Fertilizer All Soluble
1050	Armour's Complete Potato
1286	Armour's Complete Potato
1051	Blood, Bone and Potash
1460	Blood, Bone and Potash
1285	Armour's Fruit & Root Crop Special
1489	Armour's Grain Grower
1049	Armour's High Grade Potato
1289	Armour's High Grade Potato
1287	Wheat, Corn & Oats Special
	BOWKER FERTILIZER CO., BOSTON, MASS.
1073	Bowker's Bone, Blood and Potash
1409	Bowker's Bone, Blood and Potash
1074	Bowker's Square Brand Bone and Potash
1261	Bowker's Square Brand Bone and Potash
1061	Bowker's Complete Manure for Potatoes
1456	Bowker's Complete Manure for Potatoes
1133	Bowker's Corn Phosphate
1267	Bowker's Corn Phosphate
1135	Bowker's Early Potato Manure
1400	Bowker's Early Potato Manure
1455	Bowker's Early Potato Manure

Analysis of Station Samples, 1908.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
			Total.					Available.		Total.			
	As Ammonia.	As Nitrates.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
1089	.....	.....	.....	.....	5.13	4.37	4.00	9.50	10.00	13.50	11.00	1.82	2.00
1196	.....	.....	.....	.....	3.51	6.58	2.49	10.09	10.00	12.58	11.00	1.85	2.00
1092	0.04	1.00	2.14	2.06	3.68	3.55	3.47	7.23	8.00	10.70	10.00	5.16	6.00
1384	0.04	0.66	2.06	2.06	5.66	2.02	8.32	7.68	8.00	10.00	10.00	5.06	6.00
1113	0.16	0.68	2.28	2.06	4.96	2.45	2.52	7.41	8.00	9.93	10.00	1.88	1.50
1325	0.06	0.97	2.15	2.06	3.94	3.36	4.10	7.30	8.00	11.40	10.00	2.02	1.50
1127	0.14	0.46	1.66	0.82	4.77	3.25	3.10	8.02	7.00	11.12	8.00	1.92	1.00
1357	.06	.....	1.16	0.82	4.24	4.17	3.45	8.41	7.00	11.36	8.00	1.98	1.00
1119	.....	.....	.....	.....	6.68	2.82	2.47	9.50	10.00	11.97	11.00	1.81	2.00
1187	.....	.....	.....	.....	2.98	7.20	2.49	10.18	10.00	12.67	11.00	2.07	2.00
1355	.....	.....	.....	.....	3.95	5.67	4.58	9.62	10.00	14.20	11.00	2.29	2.00
1122	1.24	0.62	3.64	3.30	6.23	1.86	2.22	8.09	8.00	10.31	9.00	7.05	7.00
1377	0.51	0.93	3.37	3.30	5.63	2.48	2.38	8.11	8.00	10.49	9.00	6.85	7.00
1107	0.20	0.64	2.30	2.06	5.58	2.43	2.27	8.01	8.00	10.28	10.00	1.93	1.50
1209	0.08	0.48	1.91	2.06	4.67	3.86	1.99	8.53	8.00	10.52	10.00	1.73	1.50
1216	0.12	.....	1.28	1.03	5.01	3.22	2.36	8.24	8.00	10.60	10.00	1.96	2.00
1319	0.05	.....	1.18	1.03	4.61	3.45	3.57	8.06	8.00	11.63	10.00	2.02	2.00
1118	0.16	0.86	2.18	2.06	5.31	2.44	2.47	7.75	8.00	10.22	10.00	3.28	3.00
1211	0.10	0.68	1.99	2.06	5.75	2.04	2.36	7.79	8.00	10.15	10.00	3.13	3.00
1246	0.10	1.06	2.84	2.50	5.55	2.68	3.33	8.24	9.00	11.57	11.00	2.18	2.00
1243	0.10	0.69	2.16	2.06	3.67	4.27	3.15	7.94	8.00	11.09	10.00	2.15	1.50
1491	0.10	0.51	1.85	2.06	6.31	2.61	2.22	8.92	8.00	11.14	10.00	2.57	1.50
1247	0.71	0.95	3.38	3.30	5.99	2.30	2.58	8.29	8.00	10.87	9.00	7.43	7.00
1244	0.10	0.58	2.14	2.06	4.72	3.37	2.80	8.09	8.00	10.89	10.00	3.34	3.00
1194	0.08	0.40	1.33	1.03	4.89	3.34	2.56	8.23	8.00	10.79	10.00	2.00	2.00
1288	0.04	1.90	3.02	2.89	7.00	1.61	0.33	8.61	8.00	8.94	9.00	4.15	4.00
1050	.....	1.86	3.56	3.30	4.69	2.05	0.57	6.74	6.00	7.31	7.00	10.14	10.00
1286	0.06	1.90	3.35	3.30	4.14	2.49	0.70	6.63	6.00	7.33	7.00	9.94	10.00
1051	0.06	1.92	4.18	4.11	5.20	3.45	0.98	8.65	8.00	9.63	9.00	9.19	7.00
1460	0.04	3.44	5.02	4.11	7.01	0.79	0.54	7.30	8.00	8.34	9.00	7.13	7.00
1285	0.04	0.68	2.29	1.65	7.36	1.87	0.41	9.23	8.00	9.64	9.00	5.08	5.00
1489	0.04	1.28	2.09	1.65	6.39	2.43	0.60	8.82	8.00	9.42	9.00	3.69	2.00
1049	.....	0.62	2.08	1.65	5.04	2.28	0.98	7.32	8.00	8.30	9.00	10.88	10.00
1289	0.02	0.50	1.90	1.65	3.57	3.48	1.28	6.99	8.00	8.27	9.00	11.84	10.00
1287	.....	.....	0.88	0.82	5.04	2.43	1.33	7.47	7.00	8.80	8.00	1.94	1.00
1073	0.76	1.04	3.66	4.10	3.01	3.64	3.19	6.65	7.00	9.64	9.00	7.04	7.00
1409	1.10	0.46	4.50	4.10	5.47	1.51	1.99	6.98	7.00	8.97	9.00	6.96	7.00
1074	0.04	0.90	1.98	1.65	4.85	0.89	5.37	5.74	6.00	11.11	7.00	2.12	2.00
1261	0.06	0.67	1.84	1.65	1.13	4.64	4.08	5.77	6.00	9.85	7.00	2.02	2.00
1061	0.06	1.72	3.45	3.29	4.40	1.27	2.46	5.67	6.00	8.13	7.00	10.41	10.00
1456	1.65	.....	3.78	3.29	4.77	1.90	2.00	6.67	6.00	8.67	7.00	9.22	10.00
1133	0.16	0.50	1.94	1.65	4.56	2.31	2.65	6.87	8.00	9.52	9.00	2.21	2.00
1267	0.12	0.44	1.84	1.65	4.11	2.63	2.49	6.74	8.00	9.23	9.00	2.04	2.00
1135	1.28	0.40	3.61	3.30	6.33	1.65	2.38	7.98	8.00	10.36	9.00	6.61	7.00
1400	1.24	0.42	3.41	3.29	5.74	2.09	2.32	7.83	8.00	10.15	9.00	6.41	7.00
1455	1.16	0.34	3.43	3.29	5.07	2.81	2.07	7.88	8.00	9.95	9.00	6.55	7.00

Descriptive List of Station Samples, 1908.

Station number.	Manufacturer, place of business and brand.
1077	Bowker's Farm and Garden Phosphate
1263	Bowker's Farm & Garden Phosphate
1259	Bowker's Fresh Ground Bone
1254	Bowker's Hill and Drill Phosphate
1405	Bowker's Hill and Drill Phosphate
1054	Bowker's Market Garden
1069	Bowker's Market Garden Fertilizer
1401	Bowker's Market Garden Fertilizer
1108	Bowker's Potash Bone
1403	Bowker's Potash Bone
1137	Bowker's Potash or Staple Phosphate
1258	Bowker's Potash or Staple Phosphate
1052	Bowker's Potato and Vegetable Fertilizer
1264	Bowker's Potato and Vegetable Fertilizer
1398	Bowker's Potato and Vegetable Fertilizer
1134	Bowker's Potato and Vegetable Phosphate
1266	Bowker's Potato and Vegetable Phosphate
1158	Bowker's 6% Potato Fertilizer
1179	Bowker's Superphosphate of Potash
1497	Bowker's Superphosphate of Potash
1136	Bowker's Sure Crop Bone Phosphate
1402	Bowker's Sure Crop Bone Phosphate
1181	Bowker's Ten Per Cent Manure
1422	Bowker's Ten Per Cent Manure
1421	Monticello Grange Chemicals
1180	Stockbridge's A Special Manure for Potatoes, etc
1457	Stockbridge's A Special Manure for Potatoes, etc
1063	Stockbridge's Special Complete Manure for Corn and all Grain Crops
1265	Stockbridge's Special Complete Manure for Corn and all Grain Crops
1062	Stockbridge's Special Complete Manure for Potatoes, Vegetables, etc
1262	Stockbridge's Special Complete Manure for Potatoes, Vegetables, etc
1397	Stockbridge's Special Complete Manure for Potatoes, Vegetables, etc
1256	Stockbridge's Special Complete Manure for Quick Growth and Forcing
1145	Stockbridge's Special Complete Manure for Permanent Dressing, Seeding Down, etc
1257	Stockbridge's Special Complete Manure for Permanent Dressing, Seeding Down, etc.
	COE-MORTIMER CO., NEW YORK.
1148	E. Frank Coe's Celebrated Special Potato Fertilizer
1269	E. Frank Coe's Celebrated Special Potato Fertilizer
1147	E. Frank Coe's Columbian Corn Fertilizer
1273	E. Frank Coe's Columbian Corn Fertilizer
1368	E. Frank Coe's Columbian Corn Fertilizer
1146	E. Frank Coe's Columbian Potato Fertilizer
1371	E. Frank Coe's Columbian Potato Fertilizer
1067	E. Frank Coe's Double Strength Potato Manure
1317	E. Frank Coe's Double Strength Potato Manure
1076	E. Frank Coe's Excelsior Potato Fertilizer
1272	E. Frank Coe's Excelsior Potato Fertilizer
1370	E. Frank Coe's Excelsior Potato Fertilizer

Analysis of Station Samples, 1908.

Station number.	Nitrogen.				Phosphoric Acid.							Potashi	
			Total.					Available.		Total.			
	As Ammonia.	As Nitrates.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
1077	0.14	0.56	1.96	1.65	4.32	2.91	2.68	7.23	8.00	9.91	9.00	2.30	2.00
1263	0.12	0.34	1.97	1.65	5.02	2.28	2.63	7.30	8.00	9.93	9.00	2.07	2.00
1259	.....	.....	2.82	2.47	.....	.....	.....	.....	.....	22.60	22.80	.....	.....
1254	0.08	1.04	2.76	2.47	6.25	2.43	3.00	8.68	9.00	11.68	10.00	2.38	2.00
1405	0.08	0.78	2.79	2.47	6.14	2.12	2.66	8.26	9.00	10.92	10.00	2.12	2.00
1054	0.02	0.86	2.50	2.47	1.66	4.17	2.11	5.83	6.00	7.94	7.00	10.56	10.00
1069	0.08	1.26	2.68	2.47	4.91	2.23	1.66	7.14	6.00	8.80	7.00	9.64	10.00
1401	0.12	0.90	2.44	2.47	5.04	2.25	1.48	7.29	6.00	8.77	7.00	9.25	10.00
1108	0.14	0.32	1.54	0.82	4.27	2.89	2.93	7.16	6.00	10.09	8.00	2.00	2.00
1403	.05	.....	0.96	0.82	5.01	3.49	3.79	8.50	6.00	12.29	8.00	2.13	2.00
1137	0.12	0.26	1.41	0.82	4.77	2.81	3.79	7.58	8.00	11.37	9.00	3.19	3.00
1258	0.12	.....	1.17	0.82	5.01	3.19	2.38	8.20	8.00	10.58	9.00	3.14	3.00
1052	0.12	0.50	2.98	2.47	3.98	2.91	3.23	6.89	8.00	10.15	9.00	4.48	4.00
1264	0.12	0.89	2.62	2.47	5.96	2.16	2.83	8.12	8.00	10.95	9.00	4.83	4.00
1398	0.04	0.88	2.82	2.47	5.79	3.22	2.56	9.01	8.00	11.57	9.00	3.81	4.00
1134	0.12	0.56	1.76	1.65	4.61	2.21	2.55	6.82	8.00	9.47	9.00	2.10	2.00
1266	0.08	0.56	1.91	1.65	4.57	2.67	2.93	7.34	8.00	10.17	9.00	2.10	2.00
1158	0.08	0.32	1.31	0.82	2.50	4.21	2.98	6.71	6.00	9.69	7.00	6.73	6.00
1179	.....	.....	.....	.....	4.06	6.55	2.36	10.61	10.00	12.97	11.00	1.98	2.00
1497	.....	.....	.....	.....	3.08	7.06	2.72	10.14	10.00	12.86	11.00	1.96	2.00
1136	0.23	.....	1.18	0.82	4.81	2.63	2.41	7.44	8.00	9.85	9.00	1.87	2.00
1402	0.04	.....	1.04	0.82	4.69	3.77	3.81	8.46	8.00	12.27	9.00	2.18	2.00
1181	0.08	0.38	1.45	0.82	2.65	3.36	3.58	6.01	5.00	9.59	6.00	10.18	10.00
1422	0 06	0.18	1.38	0.82	2.23	3.65	2.47	5.88	5.00	8.35	6.00	9.72	10.00
1421	0.15	.....	2.84	2.47	2.53	5.22	2.74	7.75	8.00	10.49	9.00	3.97	4.00
1180	0.04	1.90	4.12	4.11	4.86	2.14	1.48	7.00	7.00	8.48	8.00	10.18	10.00
1457	1.52	.....	4.44	4.11	5.02	1.91	1.49	6.93	7.00	8.42	8.00	9.68	10.00
1063	0.10	1.96	4.08	3.29	4.42	5.03	0.31	9.45	10.00	9.76	11.00	7.76	7.00
1265	0.06	1.40	3.48	3.29	7.17	2.17	0.99	9.34	10.00	10.33	11.00	7.14	7.00
1062	0.18	1.26	3.20	3.29	1.87	5.24	1.66	7.11	6 00	8.77	7.00	9.17	10.00
1262	0.08	0.94	3.30	3.29	5.37	1.63	1.91	7.00	6.00	8.91	7.00	8.96	10.00
1397	0.08	0.90	3.42	3.29	1.80	4.08	3.38	5.88	6.00	9.26	7.00	10.39	10.00
1256	0.76	1.58	4.68	4.93	2.90	2.28	2.61	5.18	4.00	7.79	6.00	6.97	6.00
1145	0.12	1.08	2.55	2.47	4.65	1.71	1.94	6.36	6.00	8.30	9.00	9.55	10.00
1257	0.16	0.46	2.74	2.47	4.30	2.12	2.78	6.42	6.00	9.20	9.00	9.54	10.00
1148	0.63	.....	1.72	1.65	3.59	4.47	1.82	8.06	8.00	9.88	10.00	3.66	4.00
1269	0.16	.....	1.95	1.65	3.28	4.55	2.72	7.83	8.00	10.55	10.00	4.35	4.00
1147	0.37	.....	1 52	1.23	2.26	5.02	2.33	7.28	8.50	9.61	10.50	2.38	2.50
1273	0.12	.....	1.66	1.23	4.48	5.20	1.99	9.68	8.50	11.67	10.50	2.05	2.50
1368	0.13	.....	1.54	1.23	4.38	4.96	2.07	9.34	8.50	11.41	10.50	2.50	2.50
1146	0.35	.....	1.86	1.23	2.53	4.91	2.09	7.44	8.50	9.53	10.50	2.61	2.50
1371	.35	.....	1.52	1.23	3.03	5.25	1.76	8.38	8.50	10.14	10.50	2.61	2.50
1067	2.21	.....	3.52	3.70	2.97	5.08	1.78	8.05	7.00	9.83	8.50	11.36	10.00
1317	1.14	.....	3.90	3.70	4.47	3.74	0.85	8.21	7.00	9.06	8.50	10.84	10.00
1076	0.53	.....	2.34	2.47	5.72	2.60	1.82	8.32	7.00	10.14	9.00	7.06	8.00
1272	0.15	.....	2.48	2.47	4.02	4.02	1.38	8.14	7.00	9.52	9.00	6.20	8.00
1370	0.91	.....	2.84	2.47	3.49	4.40	1.91	7.89	7.00	9.80	9.00	7.02	8.00

Descriptive List of Station Samples, 1908.

Station number.	Manufacturer, place of business and brand.
1144	E. Frank Coe's Famous Prize Brand Grain and Grass Fertilizer
1376	E. Frank Coe's Famous Prize Brand Grass and Grain Fertilizer
1064	E. Frank Coe's High Grade Ammoniated Bone Superphosphate for all Crops
1270	E. Frank Coe's High Grade Ammoniated Bone Superphosphate for all Crops
1065	E. Frank Coe's High Grade Potato Fertilizer
1269	E. Frank Coe's High Grade Potato Fertilizer
1369	E. Frank Coe's High Grade Potato Fertilizer
1068	E. Frank Coe's New Englander Corn and Potato Fertilizer
1274	E. Frank Coe's New Englander Corn and Potato Fertilizer
1066	E. Frank Coe's Red Brand Excelsior Guan for Market Gardening
1271	E. Frank Coe's Red Brand Excelsior Guano for Market Gardening
1316	E. Frank Coe's Red Brand Excelsior Guano for Market Gardening
1142	E. Frank Coe's Special Grass and Grain Fertilizer
1275	E. Frank Coe's Special Grass and Grain Fertilizer
	ESSEX FERTILIZER CO., BOSTON, MASS.
1177	Essex Complete Manure for Potatoes, Roots and Vegetables
1449	Essex Complete Manure for Potatoes, Roots and Vegetables
1502	Essex Market Garden and Potato Manure
1508	Essex Market Garden and Potato Manure
1439	Essex Potato Grower
1451	Essex Potato Grower
1450	Essex Special Potato Phosphate for Potatoes and Roots
1490	Essex XXX Fish and Potash for all Crops
1507	Essex XXX Fish and Potash for all Crops
	FARRAR & MORRISON, BANGOR, MAINE.
1499	Acid Phosphate
1500	Muriate of Potash
1501	Nitrate of Soda
	HUBBARD FERTILIZER CO., BALTIMORE, MD.
1260	Hubbard's Bone, Blood and Potash for Potatoes and all other Crops
1280	Hubbard's Bone, Blood and Potash for Potatoes and all other Crops
1281	Hubbard's Farmers IXL Superphosphate
1485	Hubbard's Farmers IXL Superphosphate
1484	Hubbard's Royal Ensign for Early Market Vegetables
1279	Hubbard's Soluble Bone and Potash
1444	Hubbard's Special Potato Compound
	LISTER'S AGRICULTURAL CHEMICAL WORKS, NEWARK, N. J.
1150	Lister's Animal Bone and Potash
1182	Lister's Animal Bone and Potash
1131	Lister's High Grade Special for Spring Crops
1215	Lister's High Grade Special for Spring Crops
1149	Lister's Oneida Special Fertilizer
1213	Lister's Oneida Special Fertilizer
1130	Lister's Potato Manure
1208	Lister's Potato Manure
1157	Lister's Bone Meal
1217	Lister's Pure Raw Bone Meal
1151	Lister's Special Corn Fertilizer
1185	Lister's Special Corn Fertilizer

Analysis of Station Samples, 1908.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	As Ammonia.	As Nitrates.	Total.		Soluble.	Reverted.	Insoluble.	Available.		Total.		Found.	Guaranteed.
			Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.		
1144	.....	.....	.....	.....	4.65	5.27	3.28	9.92	10.00	13.20	12.00	2.17	2.00
1376	.....	.....	.....	.....	4.69	5.99	3.25	10.68	10.00	13.93	12.00	2.01	2.00
1064	.05	.....	1.96	1.85	6.28	3.80	3.26	10.08	9.00	13.34	11.00	1.69	2.20
1270	0.67	.....	2.21	1.85	4.16	4.94	1.29	9.10	9.00	10.39	11.00	2.30	2.25
1065	0.73	.....	2.45	2.40	5.31	4.22	2.52	9.53	8.00	12.05	10.00	5.23	6.00
1268	0.67	.....	2.78	2.40	4.86	4.64	2.21	9.50	8.00	11.71	10.00	5.45	6.00
1369	0.88	.....	2.88	2.40	4.81	5.27	2.08	10.08	8.00	12.16	10.00	4.32	6.00
1068	0.17	.....	0.98	0.80	5.04	3.21	1.66	8.25	7.50	9.91	9.00	3.06	3.00
1274	0.06	0.40	1.23	0.80	5.21	3.08	1.59	8.29	7.50	9.88	9.00	3.10	3.00
1066	1.43	.....	2.96	3.30	4.78	4.86	2.82	9.64	9.00	12.46	10.00	5.07	6.00
1271	1.33	.....	3.22	3.30	4.69	4.89	2.31	9.58	9.00	11.89	10.00	4.35	6.00
1316	0.11	.....	3.94	3.30	5.88	4.91	1.31	10.79	9.00	12.10	10.00	5.56	6.00
1142	0.11	.....	0.92	0.80	3.17	5.15	2.65	8.32	8.50	10.97	10.00	1.75	1.50
1275	0.52	.....	1.30	0.80	4.45	6.06	1.52	10.51	8.50	12.03	10.00	2.27	1.50
1177	0.16	0.79	3.34	3.25	1.02	4.00	5.47	5.02	6.00	10.49	7.00	10.19	10.00
1449	0.72	0.36	3.36	3.25	2.15	3.53	4.65	5.68	6.00	10.33	7.00	9.97	10.00
1502	0.03	.....	2.20	2.00	1.94	4.83	6.57	6.77	8.00	13.34	9.00	4.78	5.00
1508	0.02	.....	2.12	2.00	2.53	4.80	5.33	7.33	8.00	12.66	9.00	5.18	5.00
1439	.03	.....	2.44	2.46	3.49	2.63	1.56	6.12	6.00	7.68	7.00	10.23	10.00
1451	0.05	.....	2.62	2.46	3.36	2.57	2.42	5.93	6.00	8.35	7.00	10.09	10.00
1450	0.10	.....	2.59	2.46	5.57	4.60	1.91	9.17	8.00	11.08	9.00	6.01	6.00
1490	0.04	0.26	2.12	2.00	2.89	4.59	4.36	7.48	8.00	11.84	9.00	2.84	3.00
1507	.02	.....	2.06	2.00	2.58	4.18	3.97	6.76	8.00	10.73	9.00	3.67	3.00
1499	.....	.....	.....	.....	10.42	4.38	1.17	14.80	15.44	15.97	15.95	.....	.....
1500	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	53.96	50.00
1501	.....	15.66	15.66	15.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
1260	0.83	1.45	3.62	3.29	6.68	1.72	0.64	8.40	8.00	9.04	9.00	9.56	7.00
1280	0.98	0.68	3.28	3.33	6.98	2.29	1.01	9.27	8.00	10.28	9.00	5.94	7.00
1281	0.62	0.14	1.70	1.65	2.25	5.99	2.28	3.24	8.00	10.52	9.00	9.72	2.00
1485	0.70	.....	2.15	1.65	5.66	2.95	1.67	8.61	8.00	10.28	9.00	2.82	2.00
1484	1.37	.....	2.64	2.47	5.37	2.84	1.62	8.21	8.00	9.83	9.00	4.68	4.00
1279	.....	.....	.....	.....	5.12	5.83	1.42	10.95	10.00	12.37	.....	2.62	2.00
1444	0.04	0.52	2.78	3.30	5.98	1.38	0.83	7.36	6.00	8.19	7.00	10.92	10.00
1150	.....	.....	.....	.....	4.42	4.48	2.08	8.90	10.00	10.98	11.00	1.98	2.00
1182	.....	.....	.....	.....	5.09	3.56	4.21	8.65	10.00	12.86	11.00	1.92	2.00
1131	0.19	.....	1.86	1.65	5.09	3.37	1.84	8.46	8.00	10.30	10.00	9.91	10.00
1215	0.10	0.80	1.99	1.65	5.15	2.58	2.23	7.73	8.00	9.96	10.00	10.04	10.00
1149	0.08	.....	1.03	0.83	3.86	3.04	1.87	6.90	7.00	8.77	8.00	1.25	1.00
1213	0.06	0.32	1.22	0.83	2.65	5.51	3.17	8.16	7.00	11.33	8.00	1.28	1.00
1130	1.89	.....	3.32	3.30	5.52	2.61	1.63	8.16	8.00	9.79	9.00	6.95	7.00
1208	1.34	0.40	3.30	3.30	6.25	1.82	2.37	8.07	8.00	10.44	9.00	6.67	7.00
1157	.....	.....	4.36	2.68	.....	.....	.....	.....	.....	22.49	23.00	.....	.....
1217	.....	.....	2.90	2.68	.....	.....	.....	.....	.....	24.67	23.00	.....	.....
1151	0.10	0.36	2.16	1.65	5.42	2.57	2.89	7.09	8.00	9.98	9.00	3.32	3.00
1185	.....	0.95	2.15	1.65	5.16	2.34	2.35	7.50	8.00	9.85	9.00	3.54	3.00

Descriptive List of Station Samples, 1908.

Station number.	Manufacturer, place of business and brand.
1152	Lister's Special Potato Fertilizer
1186	Lister's Special Potato Fertilizer
1132	Lister's 10% Potato Grower
1184	Lister's 10% Potato Grower
1153	Lister's Success Fertilizer
1183	Lister's Success Fertilizer
	NATIONAL FERTILIZER CO. BOSTON, MASS.
1428	Chittenden's Aroostook Special Fertilizer
1434	Chittenden's Aroostook Special Fertilizer
1441	Chittenden's Complete Root Fertilizer
1447	Chittenden's Eureka Potato Fertilizer
1420	Chittenden's Excelsior Potato Fertilizer
1429	Chittenden's Excelsior Potato Fertilizer
1435	Chittenden's Excelsior Potato Fertilizer
1431	Chittenden's Market Garden Fertilizer
	NEW ENGLAND FERTILIZER CO., BOSTON, MASS
1171	New England Compl te Manure
1334	New England Complete Manure
1174	New England Corn and Grain Fertilizer
1311	New England Corn and Grain Fertilizer
1165	New England Corn Phosphate
1310	New England Corn Phosphate
1168	New England High Grade Potato Fertilizer
1326	New England High Grade Special with 10% Potash
1452	New England High Grade Special with 10% Potash
1504	New England High Grade Special
1509	New England High Grade Special
1427	New England Market Garden Fertilizer
1169	New England Potato Fertilizer
1312	New England Potato Fertilizer
1175	New England Potato Grower
1314	New England Potato Grower
1163	New England Superphosphate
1315	New England Superphosphate
	PARMENTER & POLSEY FERTILIZER CO., BOSTON, MASS.
1176	A A. Brand
1464	A. A. Brand
1308	Aroostook Special
1164	Maine Potato Fertilizer
1307	Maine Potato Fertilizer
1167	Plymouth Rock Brand Fertilizer
1306	Parmenter & Polsey Potato Grower with 10% Potash
1303	Special Potato Fertilizer
1483	Special Potato Fertilizer
	PORTLAND RENDERING COMPANY, PORTLAND, MAINE.
1276	Portland Rendering Company Bone Dust Tankage
	R. T. PRENTISS FERTILIZER CO., HOULTON, ME.
——	Prentiss Aroostook Complete
	PROVINCIAL CHEMICAL FERTILIZER CO., ST. JOHN, N. B.
1440	10% Complete Potato

Analysis of Station Samples, 1908.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
			Total.					Available.		Potash.			
	As Ammonia.	As Nitrates	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
1152	0.08	0.98	2.20	1.65	4.72	2.60	2.63	7.32	8.00	9.95	9.00	3.25	3.00
1186	0.10	0.58	1.76	1.65	4.81	2.31	2.91	7.12	8.00	10.03	9.00	3.22	3.00
1132	1.11	.....	3.26	3.30	4.22	2.36	2.11	6.58	6.00	8.69	9.00	10.02	10.00
1184	0.08	1.06	3.26	3.30	5.61	1.34	1.63	6.95	6.00	8.58	9.00	8.76	10.00
1153	0.08	0.36	1.69	1.24	4.49	3.21	2.49	7.70	9.00	10.19	11.00	2.14	2.00
1183	0.10	0.38	1.59	1.24	5.21	2.67	2.80	7.88	9.00	10.68	11.00	2.01	2.00
1428	0.90	1.02	4.18	4.11	5.58	2.41	1.24	7.99	7.00	9.23	8.00	7.96	7.00
1434	0.08	1.35	4.28	4.11	4.38	2.37	2.08	6.75	7.00	8.78	8.00	7.12	7.00
1441	0.24	1.18	3.26	3.30	5.55	2.08	2.24	7.63	8.00	9.87	10.00	5.63	6.00
1447	0.39	1.11	2.77	2.40	4.54	2.89	2.09	7.43	6.00	9.52	8.00	9.24	10.00
1420	0.28	1.20	3.30	3.30	4.45	2.03	2.19	6.48	6.00	8.67	8.00	9.21	10.00
1429	0.22	0.80	3.36	3.30	4.34	1.96	2.21	6.30	6.00	8.51	8.00	9.94	10.00
1435	0.18	0.74	3.59	3.30	3.21	2.65	2.44	5.86	6.00	8.30	8.00	9.48	10.00
1431	0.20	0.79	2.92	2.40	5.52	2.29	2.17	7.81	6.00	9.98	8.00	4.90	5.00
1171	0.04	0.82	3.16	3.28	3.91	2.25	1.28	6.16	6.00	7.44	7.00	9.95	10.00
1334	0.06	0.94	3.13	3.28	4.94	1.61	1.84	6.55	6.00	8.49	7.00	9.37	10.00
1174	.....	.....	1.44	1.22	4.85	1.79	1.30	6.64	7.00	7.94	8.00	2.09	2.00
1311	.....	.....	1.62	1.22	4.82	2.27	1.16	7.09	7.00	8.25	8.00	2.18	2.00
1165	.....	.....	1.90	1.64	5.56	2.02	1.35	7.58	8.00	8.91	9.00	3.04	3.00
1310	.....	.....	1.62	1.64	5.45	1.73	1.55	7.18	8.00	8.51	9.00	3.07	3.00
1168	.....	.....	2.52	2.46	4.75	2.42	2.17	7.17	8.00	9.34	9.00	5.96	6.00
1326	0.04	0.92	3.60	3.69	4.19	2.93	1.65	7.12	7.00	8.77	8.00	9.79	10.00
1452	0.72	.....	3.89	3.69	5.47	2.27	1.66	7.74	7.00	9.37	8.00	9.81	10.00
1504	0.40	0.40	3.66	3.69	4.29	2.71	2.31	7.00	7.00	9.31	8.00	10.72	10.00
1509	0.68	0.20	3.47	3.69	5.10	2.09	1.48	7.19	7.00	8.67	8.00	9.86	10.00
1427	0.83	.....	4.04	4.10	4.46	3.19	1.80	7.69	7.00	9.45	8.00	7.57	7.00
1169	0.04	.....	1.65	1.64	4.43	2.28	1.91	6.71	7.00	8.62	8.00	4.11	4.00
1312	0.03	.....	1.84	1.64	4.72	2.14	1.42	6.86	7.00	8.28	8.00	4.19	4.00
1175	0.08	0.72	2.26	2.46	4.19	2.10	1.39	6.29	6.00	7.68	7.00	10.10	10.00
1314	0.06	0.94	2.64	2.46	4.71	1.99	1.11	6.70	6.00	7.81	7.00	9.91	10.00
1163	.....	.....	2.48	2.46	6.39	1.69	0.91	8.08	8.00	8.99	10.00	3.97	4.00
1315	.....	.....	2.52	2.46	6.99	1.23	1.00	8.22	8.00	9.22	10.00	3.89	4.00
1176	0.78	.....	3.98	4.10	5.50	2.90	2.69	8.40	7.00	11.09	8.00	8.99	8.00
1464	0.80	.....	3.88	4.10	5.24	3.17	2.51	8.41	7.00	10.92	8.00	8.23	8.00
1308	0.36	0.30	3.84	3.69	3.84	3.11	1.74	6.95	7.00	8.69	8.00	9.21	10.00
1164	0.92	0.34	3.56	3.28	3.59	2.62	1.71	6.21	6.00	7.92	8.00	9.17	10.00
1307	0.84	0.34	3.52	3.28	3.62	3.05	1.30	6.67	6.00	7.97	8.00	9.32	10.00
1167	0.07	.....	2.72	2.46	1.56	6.09	1.93	7.65	8.00	9.58	9.00	4.03	4.00
1306	0.76	.....	2.50	2.46	4.29	2.17	0.71	6.46	6.00	7.17	7.00	9.00	10.00
1303	0.06	0.98	2.96	3.28	4.70	2.85	1.56	7.65	8.00	9.21	9.00	6.93	7.00
1483	0.08	0.72	3.39	3.28	5.21	3.03	1.66	8.24	8.00	9.90	9.00	6.49	7.00
1276	.....	.....	6.05	5.75	.....	.....	.....	.....	.....	14.39	14.50	.....	.....
.....	*	*	*	2.57	*	*	*	*	6.00	*	9.00	*	10.00
1440	.....	.....	2.44	3.29	5.67	1.85	1.82	7.52	8.00	9.34	.....	8.78	10.00

* For analysis see page 275.

Descriptive List of Station Samples, 1908.

Station number.	Manufacturer, place of business and brand.
	P H. REED, FT. FAIRFIELD, MAINE.
1426	Reed's Potato Grower
	SAGADAHOC FERTILIZER CO., BOWDOINHAM, MAINE.
1291	Dry Acid Phosphate
1297	Aroostook Potato Manure
1299	Dirigo Grass and Grain Fertilizer
1300	Muriate of Potash
1293	Nitrate of Soda
1292	Sagadahoc High Grade Superphosphate
1295	Sagadahoc Special Potato Fertilizer
1298	XX Chemical Fertilizer for Grain and Top Dressing
1296	Yankee Fertilizer
1290	3–6–10% Potash Fertilizer for Potatoes
1468	3–6–and 10 Fertilizer for Potatoes
1294	4–6–and 10 Fertilizer for Potatoes
1430	4–6–and 10 Per cent Potash Fertilizer
	SWIFT'S LOWELL FERTILIZER CO., BOSTON, MASS.
1474	Swift's Lowell Acid Phosphate
1309	Muriate of Potash
1477	Muriate of Potash
1475	Nitrate of Soda
1304	Swift's Lowell Animal Brand for All Crops
1333	Swift's Lowell Animal Brand for all Crops
1161	Swift's Lowell Bone Fertilizer for Corn and Grain
1330	Swift's Lowell Bone Fertilizer for Corn and Grain
1160	Swift's Lowell Cereal Brand
1327	Swift's Lowell Cereal Brand
1302	Swift's Lowell Dissolved Bone and Potash
1328	Swift's Lowell Dissolved Bone and Potash
1284	Swift's Lowell Empress Brand for Corn and Potatoes
1162	Swift's Lowell Potato Manure
1332	Swift's Lowell Potato Manure
1159	Swift's Lowell Potato Phosphate
1335	Swift's Lowell Potato Phosphate
1172	Swift's Lowell Potato Grower
1445	Swift's Lowell Potato Grower
1170	Swift's Special Potato Fertilizer
1305	Swift's Special Potato Fertilizer
1506	Swift's Lowell Special Vegetable Manure
1173	Swift's Lowell Superior Fertilizer with 10% Potash
1337	Swift's Lowell Superior Fertilizer with 10% Potash
	TUSCARORA FERTILIZER CO., BALTIMORE, MARYLAND.
1425	Aroostook Special
1436	Aroostook Special
1437	Complete Potato
1505	Tuscarora Fruit and Potato
1424	Trucker's Special

Analysis of Station Samples, 1908.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
			Total.					Available.		Total.			
	As Ammonia.	As Nitrates.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
1426	0.16	1.00	2.70	3.30	5.56	1.41	0.94	6.97	7.00	7.91	9.00	7.92	8.00
1291	.....	.....	.....	.....	11.06	3.86	1.28	14.92	14.00	16.20	.....	.....	.....
1297	0.20	0.34	1.24	1.00	2.76	2.57	1.20	5.33	6.00	6.53	7.00	5.65	4.00
1299	0.10	.....	1.77	1.00	2.73	2.44	1.81	5.17	4.00	6.98	6.00	5.24	2.00
1300	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	50.88	50.00
1293	.....	.....	15.52	14.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
1292	0.08	.....	1.82	1.85	8.67	2.81	1.08	11.48	6.00	12.56	8.00	3.03	3.00
1295	0.10	1.10	2.00	2.00	4.43	2.70	1.14	7.13	7.00	8.27	8.00	8.30	8.00
1298	0.04	4.46	7.01	7.00	1.53	5.15	2.53	6.68	2.00	9.21	7.00	10.18	8.00
1296	0.02	0.26	0.64	0.40	3.92	2.54	1.00	6.46	7.00	7.46	8.00	3.01	2.00
1290	0.04	1.20	2.74	2.47	3.32	2.43	1.29	5.75	6.00	7.04	7.00	11.69	10.00
1468	0.06	0.98	2.79	2.47	3.67	2.33	1.31	6.00	6.00	7.31	7.00	9.41	10.00
1294	0.66	1.68	3.50	3.29	3.87	2.00	0.98	5.87	6.00	6.85	7.00	12.23	10.00
1430	0.80	1.06	3.12	3.29	3.92	2.86	1.52	6.78	6.00	8.30	7.00	9.23	10.00
1474	.....	.....	.....	.....	9.91	4.50	2.52	14.41	12 00	16.93	13.00	.....	.....
1309	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	48.04	50.00
1477	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	49.20	50.00
1475	.....	.....	15.74	15.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
1304	0.09	.....	2.86	2.46	4.45	3.22	2.95	7.67	8.00	10.62	9.00	4.21	4.00
1333	.....	.....	2.67	2.46	6.97	1.14	0.87	8.11	8.00	8.98	9.00	4.30	4.00
1161	.....	.....	1.64	1.64	5.63	1.98	1.54	7.61	8.00	9.15	9.00	3.40	3.00
1330	.....	.....	1.72	1.64	4.47	2.98	1.77	7.45	8.00	9.22	9.00	2.94	3.00
1160	0.32	.....	0.90	0.82	5.05	2.18	0.77	7.23	7.00	8.00	8.00	1.18	1.00
1327	.....	.....	1.06	0.82	5.81	1.50	0.92	7.31	7.00	8.23	8.00	2.19	1.00
1302	.....	.....	1.81	1.64	5.80	2.50	1.93	8.30	9.00	10.23	10.00	2.38	2.00
1328	.....	.....	1.88	1.64	6.65	1.63	1.50	8.28	9.00	9.78	10.00	2.17	2.00
1284	.....	.....	1.27	1.25	4.99	2.54	1.21	7.53	7.00	8.74	8.00	2.08	2.00
1162	.....	.....	1.82	1.64	4.57	1.80	1.34	6.37	7.00	7.71	8.00	3.97	4.00
1332	.....	.....	1.70	1.64	5.69	1.15	1.28	6.84	7.00	8.12	8.00	4.29	4.00
1159	.....	.....	2.24	2.46	4.85	2.54	2.09	7.39	8.00	9.48	9.00	6.66	6.00
1335	.....	.....	2.64	2.46	6.12	1.65	1.59	7.77	8.00	9.36	9.00	5.84	6.00
1172	0.04	0.92	3.12	3.28	3.92	2.33	1.22	6.45	6.00	7.67	7.00	10.06	10.00
1445	0.78	.....	3.28	3.28	2.09	3.78	5.16	5.87	6.00	11.03	7.00	9.69	10.00
1170	0.08	0.89	2.47	2.46	4.32	2.28	1.29	6.60	6.00	7.89	7.00	10.06	10.00
1305	0.72	.....	2.64	2.46	4.32	1.72	0.88	6.04	6.00	6.92	7.00	9.64	10.00
1506	0.12	0.82	3.11	3.28	4.88	3.04	1.63	7.92	8.00	9.55	9.00	7.10	7.00
1173	0.08	0.94	3.62	3.69	3.95	2.95	1.64	7.90	7.00	8.54	8.00	10.12	10.00
1337	0.04	0.90	3.60	3.69	4.38	2.53	2.05	6.91	7.00	8.96	8.00	9.93	10.00
1425	0.19	1.27	2.42	2.47	6.04	1.21	0.56	7.25	7.00	7.81	8.00	7.74	8.00
1436	0.16	1.06	2.52	2.47	5.64	1.16	1.17	6.80	7.00	7.97	8.00	8.08	8.00
1437	0.20	1.26	3.28	3.29	5.61	1.29	0.37	6.90	6.00	7.27	7.00	9.32	10.00
1505	0.12	0.42	1.82	1.65	6.74	1.93	1.01	8.67	8.00	9.68	9.00	10.35	10.00
1424	0.02	1.54	4.28	4.11	7.33	0.82	0.62	8.15	8.00	8.77	9.00	7.50	7.00

Descriptive List of Station Samples, 1908.

Station number	Manufacturer, place of business and brand.
	WHITMAN & PRATT RENDERING CO., LOWELL, MASS.
1493	Whitman & Pratt's All Crop
1494	Whitman & Pratt's All Crop
1495	Whitman & Pratt's Corn Success
1496	Whitman & Pratt's Corn Success
1412	Whitman & Pratt's Potash Special
1470	Whitman & Pratt's Potato Special
1471	Whitman & Pratt's Potato Special
1492	Whitman & Pratt's Potato Manure
1473	Whitman & Pratt's Potato Plowman
1469	Whitman & Pratt's Vegetable Grower
1472	Whitman & Pratt's Vegetable Grower
	WILCOX FERTILIZER COMPANY, MYSTIC, CONN.
1481	Wilcox Complete Bone Superphosphate
1432	Premium Potato Fertilizer
1482	Wilcox Premium Potato Fertilizer

Analysis of Station Samples, 1908.

Station number.	Nitrogeen.				Phosphoric Acid.							Potash.	
			Total.					Available.		Total.			
	As Ammonia.	As Nitrates.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
1493	0.07	.....	2.80	2.46	3.43	4.74	3.21	8.17	9.00	11.38	11.00	7.10	4.00
1494	0.14	.....	2.56	2.46	3.84	4.79	4.27	8.63	9.00	12.30	11.00	3.97	4.00
1495	0.06	.....	2.01	1.64	4.27	4.07	5.69	8.34	8.00	14.03	.....	3.05	3.00
1496	1.04	.....	1.94	1.64	4.18	4.01	5.64	8.19	8.00	13.83	.....	3.66	3.00
1412	0.11	1.03	2.83	2.88	2.97	3.41	3.31	6.38	6.00	9.69	.....	10.84	10.00
1470	1.28	0.20	3.30	2.88	2.87	3.79	3.61	6.66	6.00	10.27	.....	10.00	10.00
1471	0.08	1.06	2.94	2.88	3.35	3.71	3.24	7.06	6.00	10.30	.....	10.42	10.00
1492	.....	.....	2.86	2.46	2.61	4.45	3.28	7.06	7.00	10.34	.....	7.40	5.00
1473	0.53	.....	3.45	3.29	3.76	3.28	3.85	7.04	8.00	10.89	10.00	6.62	7.00
1469	0.67	.....	3.73	3.29	3.89	4.17	4.91	8.05	8.00	12.97	.....	7.65	7.00
1472	0.08	1.32	3.10	3.29	4.99	3.51	2.83	8.50	8.00	11.33	.....	7.68	7.00
1481	0.62	0.26	2.32	2.05	1.05	5.04	7.27	6.09	8.00	13.36	9.00	3.81	3.00
1432	0.58	0.70	3.82	3.70	4.22	3.15	2.45	7.37	7.00	9.82	8.00	10.00	10.00
1482	0.56	0.96	3.78	3.70	3.81	3.19	2.76	7.00	7.00	9.76	8.00	9.84	10.00

Summary of results of analyses of Station samples for the years 1906, 1907 and 1908.

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
	1908	2.85	6.70	9.23
A. A. C. Co. Aroostook High Grade	1906	4.35	8.15	6.31
	1907	4.36	7.05	6.63
	1908	4.14	6.78	6.80
Bradley's Alkaline Bone with Potash	1906	.....	11.19	2.10
	1907	.....	10.09	2.09
	1908	.....	9.52	1.83
Bradley's Comp. Manure for potatoes and vegetables	1906	3.27	8.69	6.79
	1907	3.32	8.06	6.68
	1908	3.41	8.04	6.82
Bradley's Complete Manure with 10% Potash	1906	3 36	7.03	9.79
	1907	3.30	6.39	9.76
	1908	3.52	5.76	9.76
Bradley's Corn Phosphate	1906	2.18	8.51	2.06
	1907	2.14	7.69	1.63
	1908	2.19	7.85	1.86
Bradley's Eureka Fertilizer	1906	1.19	8.55	2.14
	1907	1.23	9.09	2.19
	1908	1.04	9.00	2.05
Bradley's Niagara Phosphate	1906	1.19	9.14	1.97
	1907	1.29	8.91	2.26
	1908	1.14	7.41	2.19
Bradley's Potato Fertilizer	1906	2.10	9.46	3.04
	1907	2.25	7.52	3.22
	1908	2.18	7.39	3.03
Bradley's Potato Manure	1906	2.60	6.76	5.01
	1907	2.71	7.20	5.93
	1908	2.85	6.54	5.64
Bradley's X. L. Superphosphate of Lime	1906	2.55	9.26	2.40
	1907	2.72	9.04	2.26
	1908	2.70	8.56	2.22
Clark's Cove Bay State Fertilizer	1906	2.58	8.95	2.57
	1907	2.66	9.07	2.34
	1908	2.89	8.95	2.06
Clark's Cove Bay State Fertilizer G. G	1906	2.09	7.94	1.95
	1907	2.14	7.88	1.59
	1908	2.01	7.92	1.79
Clark's Cove Bay State Fertilizer for Seeding Down	1906	1.13	8.42	2.04
	1908	1.30	8.53	1.91
Clark's Cove Defiance Complete Manure	1906	1.39	8.04	2.29
	1907	1.22	7.25	1.62
	1908	1.15	7.93	1.46
Clark's Cove Great Planet Manure A. A	1906	3.39	8.01	7.60
	1907	3.40	8.46	7.02
	1908	3.39	7.39	7.00

Summary of results of analyses of Station samples for the years 1906, 1907 and 1908.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Clark's Cove King Philip Alkaline Guano	1906	1.10	8.48	2.09
	1907	1.21	7.44	1.99
	1908	1.16	8.15	2.19
Clark's Cove Potato Fertilizer	1906	2.05	8.26	3.36
	1907	2.18	7.67	3.35
	1908	2.15	8.41	3.22
Clark's Cove Potato Manure	1906	2.61	7.07	5.48
	1907	2.64	7.21	5.44
	1908	2.90	6.93	5.20
Cleveland Fertilizer for all Crops	1906	1.38	8.21	2.43
	1907	1.44	7.67	2.09
	1908	1.43	8.16	2.14
Cleveland High Grade Complete Manure	1906	2.95	8.16	7.91
	1907	3.40	7.88	6.75
	1908	3.32	7.64	6.76
Cleveland Potato Phosphate	1906	2.14	8.08	3.13
	1907	2.25	7.67	3.47
	1908	2.22	7.77	3.37
Cleveland Seeding Down Fertilizer	1906	1.11	8.31	2.10
	1908	1.66	8.34	1.94
Cleveland Superphosphate	1906	2.14	7.57	1.84
	1907	2.06	7.91	1.75
	1908	2.11	7.99	2.06
Complete Manure with 10% Potash	1906	3.17	6.42	9.85
	1908	3.40	7.31	10.14
Crocker's Ammoniated Corn Phosphate	1906	2.19	8.03	1.87
	1907	2.30	8.12	1.55
	1908	2.13	8.10	1.76
Crocker's Aroostook Potato Special	1906	2.00	8.69	5.90
	1907	2.20	7.99	7.09
	1908	2.02	7.67	6.13
Crocker's Grass and Oats Fertilizer	1906	.....	10.58	2.14
	1907	.....	10.10	2.06
	1908	.....	9.78	2.10
Crocker's High Grade	1906	3.23	8.15	6.58
	1908	3.27	8.28	6.89
Crocker's New Rival Ammoniated Superphosphate	1906	1.31	8.28	2.30
	1907	1.27	7.96	2.44
	1908	1.20	8.65	2.03
Crocker's Potato, Hop and Tobacco	1906	2.04	7.99	3.10
	1907	2.28	8.08	3.39
	1908	2.20	7.81	3.14
Crocker's Special Potato Manure	1906	3.33	6.73	10.91
	1907	3.34	6.65	9.76
	1908	3.44	5.92	9.35
Cumberland Guano for all Crops	1906	1.04	8.79	2.29

Summary of results of analyses of Station samples for the years 1906, 1907 and 1908.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Cumberland Potato Fertilizer	1906	2.21	8.51	3.34
	1907	2.32	7.97	3.26
	1908	2.11	7.67	3.23
Cumberland Seeding Down Manure	1906	1.14	9.09	2.24
	1907	1.22	7.88	1.88
	1908	1.61	8.60	1.99
Cumberland Superphosphate	1906	2.12	7.87	2.43
	1907	1.92	7.65	1.80
	1908	2.04	8.02	1.66
Darling's Blood, Bone and Potash	1906	4.32	6.69	8.09
	1907	4.20	7.22	8.76
	1908	4.20	6.73	7.17
A. A. C. Co. Fine Ground Bone	1907	2.52	.....	22.92
Grass and Lawn Top Dressing	1906	4.93	5.84	2.62
	1908	5.64	6.01	4.36
Great Eastern General Fertilizer	1906	0.99	7.55	3.87
	1907	1.06	7.75	4.21
	1908	1.24	7.22	4.51
Great Eastern Grass and Oats Fertilizer	1906	.....	10.61	2.06
	1907	.....	10.43	2.38
	1908	.....	9.44	1.79
Great Eastern High Grade Potato Manure	1906	3.48	7.38	10.13
	1907	3.44	5.60	9.63
	1908	3.33	6.32	10.72
Great Eastern Northern Corn Special	1906	2.39	8.80	2.06
	1907	2.16	8.00	1.92
	1908	2.04	7.86	1.77
Great Eastern Potato Manure	1906	2.10	8.30	3.32
	1907	2.04	8.34	3.24
	1908	2.10	7.48	3.25
Great Eastern Potato Special	1906	3.35	8.45	7.32
	1908	3.32	7.63	7.24
High Grade Fertilizer with 10% Potash	1906	2.61	6.48	10.26
	1907	2.83	5.93	9.52
	1908	2.42	6.70	10.52
Lazaretto Aroostook Potato Guano	1906	0.98	8.30	4.06
	1908	1.28	7.23	4.23
Lazaretto Corn Guano	1906	2.16	7.42	2.37
	1907	1.88	8.24	2.26
	1908	1.88	7.00	2.19
Lazaretto High Grade Potato Manure	1906	3.38	6.10	10.58
	1907	3.42	6.65	9.84
	1908	3.39	5.95	9.74
Lazaretto Propeller Potato Guano	1906	2.05	8.16	5.62
	1907	2.30	7.30	6.40
	1908	2.42	8.39	5.81

Summary of results of analyses of Station samples for the years 1906, 1907 and 1908.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
A. A. C. Co. Muriate of Potash	1908	.....	.....	49.60
A. A. C. Co. Nitrate of Soda	1907	14.92	.....	.....
	1908	15.64	.....	.....
Northern Maine Potato Special	1907	3.82	7.05	9.12
	1908	3.90	7.26	9.81
Otis' Potato Fertilizer	1906	2.03	8.46	3.11
	1908	1.99	8.34	3.13
Otis' Seeding Down Fertilizer	1906	1.17	8.54	2.22
Otis' Superphosphate	1906	2.23	9.19	1.96
	1908	2.34	7.58	1.74
Pacific Dissolved Bone and Potash	1906	.....	10.29	2.08
	1907	.....	10.52	2.12
	1908	.....	9.92	1.96
Pacific Grass and Grain Fertilizer	1906	1.16	8.96	1.51
	1907	1.37	6.75	1.99
	1908	1.38	7.58	1.71
Pacific High Grade General Fertilizer	1906	3.17	8.34	7.07
	1907	3.50	8.31	6.78
	1908	3.41	8.05	7.20
Pacific Nobsque Guano	1906	1.12	8.50	2.29
	1907	1.30	7.40	2.13
	1908	1.48	8.67	2.06
Pacific Potato Special	1906	2.07	7.55	3.42
	1907	2.21	7.61	3.28
	1908	2.16	8.00	3.19
Packer's Union Animal Corn Fertilizer	1906	2.50	9.26	2.38
	1907	2.60	8.70	2.37
	1908	2.75	8.37	2.30
Packer's Union Economical Vegetable Guano	1906	1.37	6.66	4.49
	1907	1.52	8.09	3.90
	1908	2.14	7.81	4.15
Packer's Union Gardeners' Complete Manure	1906	2.47	6.67	10.26
	1907	2.64	6.21	9.53
	1908	2.65	6.54	9.49
Packer's Union High Grade	1906	3.25	8.48	7.27
	1908	3.46	8.09	6.31
Packer's Union Potato Manure	1906	2.21	9.12	6.40
	1907	2.29	7.68	6.47
	1908	2.28	7.25	6.26
Packer's Union Universal Fertilizer	1906	1.24	8.25	4.18
	1907	1.10	8.05	4.11
	1908	1.25	6.63	4.40
Packer's Union Wheat, Oats and Clover Fertilizer	1906	.....	11.16	2.45
	1907	.....	10.91	2.10
	1908	.....	9.67	1.87

Summary of results of analyses of Station samples for the years 1906, 1907 and 1908.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Plain Superphosphate	1908	.....	14.72	.....
Quinnipiac Climax Phosphate for all Crops	1906	1.18	8.60	2.05
	1907	1.16	8.05	1.82
	1908	1.10	8.07	2.09
Quinnipiac Corn Manure	1906	2.13	8.63	2.23
	1907	2.21	7.85	1.85
	1908	2.20	7.61	2.07
Quinnipiac Market Garden Manure	1906	3.33	8.16	7.28
	1907	3.22	8.00	6.62
	1908	3.24	7.75	7.12
Quinnipiac Mohawk Fertilizer	1906	1.22	8.39	2.29
	1907	1.22	7.10	1.57
	1908	1.16	7.54	1.12
Quinnipiac Potato Manure	1906	2.59	7.54	5.05
	1907	2.71	6.97	6.19
	1908	2.66	8.05	5.34
Quinnipiac Potato Phosphate	1906	2.08	8.84	3.35
	1907	2.29	7.66	3.17
	1908	2.19	7.91	3.30
Read's Farmer's Friend Superphosphate	1906	2.03	8.42	3.76
	1907	2.28	7.80	3.40
	1908	2.12	7.66	3.09
Read's High Grade Farmers' Friend	1906	3.31	6.55	7.38
	1907	3.26	6.38	10.04
	1908	3.37	6.77	8.62
Read's Potato Manure	1906	2.59	6.10	9.76
	1907	2.53	6.58	9.67
	1908	2.56	6.54	9.45
Read's Practical Potato Special	1906	1.05	5.87	6.65
	1907	1.10	7.03	7.86
	1908	1.17	7.00	8.28
Read's Standard Superphosphate	1906	1.00	7.92	3.95
	1907	0.93	8.01	3.87
	1908	1 22	7.45	4.18
Read's Sure Catch Fertilizer	1906	.....	9.69	2.06
	1907	.....	10.44	2.19
	1908	.....	9.79	1.84
Read's Vegetable and Vine Fertilizer	1906	2.12	8.34	5.16
	1907	2.18	8.71	5.51
	1908	2.10	7.45	5.11
Soluble Pacific Guano	1906	2.10	8.25	1.99
	1907	1.89	8.12	1.60
	1908	2.21	7.35	1.95
Standard A. Brand	1906	1.19	8.03	1.67
	1907	1.19	7.38	2.01
	1908	1.41	8.21	1.95
Standard Bone and Potash	1906	.....	10.79	2.03
	1907	.....	10.40	2.05
	1908	.....	9.76	2.05

Summary of results of analyses of Station samples for the years 1906, 1907 and 1908.

Name of Fertilizer.	Year.	Total nitrogen	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Standard Complete Manure	1906	3.38	8.19	7.38
	1907	3.32	8.03	7.03
	1908	3.50	8.10	6.95
Standard Fertilizer	1906	2.24	7.97	1.86
	1907	2.12	8.25	1.68
	1908	2.10	8.27	1.83
Standard Guano for all Crops	1906	1.22	8.18	2.14
	1907	1.18	7.68	2.08
	1908	1.23	8.15	1.99
Standard Special for Potatoes	1906	2.14	8.22	3.07
	1907	2.24	7.87	3.22
	1908	2.08	7.77	3.20
Williams & Clark's Americus Ammoniated Bone Superphosphate	1906	2.43	9.29	2.25
	1907	2.52	8.89	2.10
	1908	2.84	8.24	2.18
Williams & Clark's Americus Corn Phosphate	1906	2.18	8.14	1.97
	1907	2.16	7.76	1.56
	1908	2.00	8.43	2.36
Williams & Clark's Americus High Grade Special	1906	3.30	8.55	7.15
	1907	3.38	7.85	6.91
	1908	3.38	8.29	7.43
Williams & Clark's Americus Potato Manure	1906	2.05	8.11	3.24
	1907	2.24	7.91	3.05
	1908	2.14	8.09	3.34
Williams & Clark's Royal Bone Phosphate for all Crops	1906	1.16	7.93	2.18
	1907	1.14	7.77	1.91
	1908	1.33	8.23	2.00
Armour's All Soluble	1906	2.71	9.44	4.02
	1907	3.61	8.37	3.65
	1908	3.02	*8.61	4.15
Armour's Bone, Blood and Potash	1906	3.90	7.94	8.39
	1907	4.27	8.47	7.90
	1908	4.60	*8.22	8.16
Armour's Complete Potato Fertilizer	1907	3.23	6.36	10.69
	1908	3.45	*6.68	10.04
Armour's Fruit and Root Crop Special	1906	1.83	8.34	5.77
	1907	1.96	9.00	4.31
	1908	2.29	*9.23	5.08
Armour's Grain Grower	1906	1.67	8.46	2.05
	1907	1.74	8.15	3.83
	1908	2.09	*8.82	3.69
Armour's High Grade Potato Fertilizer	1906	1.61	8.42	9.86
	1907	1.58	8.86	10.89
	1908	1.99	*7.15	11.36
Armour's Wheat, Corn and Oats Special Fertilizer	1906	0.92	8.10	1.03
	1907	0.65	9.02	1.07
	1908	0.88	*7.47	1.94
Bowker's Bone, Blood and Potash	1906	4.02	7.60	7.01
	1907	4.59	6.84	7.34
	1908	4.08	6.81	7.00

* Guarantee changed in 1908.

Summary of results of analyses of Station samples for the years 1906, 1907 and 1908.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Bowker's Bone and Potash Square Brand	1906	2.04	7.85	2.29
	1907	1.69	6.19	1.88
	1908	1.91	5.75	2.07
Bowker's Complete Manure for Potatoes and Vegetables	1907	3.45	6.61	10.32
	1908	3.61	6.17	9.81
Bowker's Corn Phosphate	1906	2.01	7.78	2.45
	1907	1.92	8.56	2.05
	1908	1.89	6.80	2.12
Bowker's Early Potato Manure	1906	3.36	7.66	7.56
	1907	3.32	8.26	6.47
	1908	3.48	7.89	6.52
Bowker's Farm and Garden Phosphate	1906	1.88	8.04	2.27
	1907	2.06	7.27	2.24
	1908	1.96	7.26	2.18
Bowker's Fresh Ground Bone	1907	2.58	.....	.....
	1908	2.82	.....	.....
Bowker's Hill and Drill Phosphate	1906	2.44	9.28	2.33
	1907	2.67	8.69	2.31
	1908	2.77	8.47	2.25
Bowker's Market Garden Fertilizer	1906	2.77	6.61	9.90
	1907	2.56	6.55	9.41
	1908	2.54	6.75	9.81
Bowker's Potash Bone	1906	1.16	8.81	2.11
	1907	1.39	7.56	2.03
	1908	1.25	7.83	2.06
Bowker's Potash or Staple Phosphate	1906	1.19	8.28	3.34
	1907	1.08	7.37	3.03
	1908	1.29	7.89	3.16
Bowker's Potato and Vegetable Fertilizer	1906	2.58	8.76	4.35
	1907	2.53	8.50	4.57
	1908	2.80	8.01	4.37
Bowker's Potato and Vegetable Phosphate	1906	1.71	8.77	2.16
	1907	2.04	8.34	2.00
	1908	1.83	7.03	2.10
Bowker's Six Per Cent Potato Fertilizer	1906	1.29	7.62	6.34
	1907	1.18	6.41	6.66
	1908	1.31	6.71	6.73
Bowker's Superphosphate of Potash for Grass and Grain	1906	.....	10.40	1.89
	1907	.....	11.31	2.02
	1908	.....	10.37	1.97
Bowker's Sure Crop Phosphate	1906	1.34	8.57	2.15
	1907	1.22	7.57	1.95
	1908	1.11	7.95	2.02
Bowker's Ten Per Cent Manure	1906	1.03	6.95	7.80
	1908	1.41	5.94	9.95

Summary of results of analyses of Station samples for the years 1906, 1907 and 1908.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Monticello Grange Chemicals	1906	2.52	8.22	4.01
	1907	2.68	8.05	4.40
	1908	*2.84	7.75	3.97
Special Potato Manure for the Grange	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
	1908	4.28	6.96	9.93
Stockbridge's Special Manure for Corn (Class D 107)	1906	3.55	9.02	†6.12
	1907	3.48	9.99	7.28
	1908	3.78	9.39	7.46
Stockbridge's Special Manure for the Grass (Class F 56)	1906	4.91	6.02	6.20
	1907	5.04	5.61	6.37
	1908	4.68	5.18	6.97
Stockbridge's Special Manure for Potatoes (Class D 610)	1906	3.11	6.15	9.74
	1907	3.34	9.54	9.73
	1908	3.30	6.66	9.50
Stockbridge's Special Manure for Seeding Down (Class C 610)	1906	2.45	7.01	10.40
	1907	2.70	6.58	9.62
	1908	2.64	6.39	9.55
E. Frank Coe's Celebrated Special Potato Fertilizer	1906	1.72	8.22	3.92
	1907	1.69	8.10	3.72
	1908	1.83	7.94	4.00
E. Frank Coe's Columbian Corn Fertilizer	1906	1.57	8.16	2.78
	1907	1.36	9.31	2.32
	1908	1.57	8.76	2.31
E. Frank Coe's Columbian Potato Fertilizer	1906	1.42	8.68	2.73
	1907	1.35	9.02	2.34
	1908	1.69	7.91	2.61
E. Frank Coe's Double Strength Potato Manure	1907	3.60	7.28	8.59
	1908	3.71	8.13	11.10
E. Frank Coe's Excelsior Potato Fertilizer	1906	2.59	7.30	8.38
	1907	2.47	7.41	6.94
	1908	2.55	8.11	6.76
E. Frank Coe's Grass and Grain Special Fertilizer	1906	1.09	9.01	1.66
	1907	1.09	9.58	1.87
	1908	1.11	9.41	2.01
E. Frank Coe's High Grade Ammoniated Bone Superphosphate	1906	2.18	9.11	2.77
	1907	1.74	9.20	2.22
	1908	2.08	9.59	1.99
E. Frank Coe's High Grade Potato Fertilizer	1906	2.61	8.34	5.68
	1907	2.43	7.80	5.17
	1908	2.70	9.70	5.00
E. Frank Coe's New Englander Corn Fertilizer	1906	1.49	8.27	4.02

* Guarantee changed in 1908. † Guarantee changed in 1906.

Summary of results of analyses of Station samples for the years 1906, 1907 and 1908.

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
	1908	1.10	8.27	3.08
E. Frank Coe's New Englander Potato Fertilizer	1906	1.30	7.39	3.27
E. Frank Coe's Prize Brand Grain and Grass	1906	.....	11.05	1.87
	1907	.....	9.96	1.66
	1908	.....	10.30	2.09
E. Frank Coe's Red Brand Excelsior Guano	1906	3.24	8.80	6.45
	1907	3.03	8.79	5.20
	1908	3.37	10.01	4.99
E. Frank Coe's Standard Grade Ammoniated Bone Superphosphate	1906	1.49	9.26	2.37
Dexter Special Potato Manure	1906	3.47	7.35	9.87
Farrar & Morrison Acid Phosphate	1908	.....	14.80	.....
Farrar & Morrison Muriate of Potash	1908	.....	.....	53.96
Farrar & Morrison Nitrate of Soda	1908	15.66	.....	.....
Hubbard's Bone, Blood and Potash	1906	3.41	7.89	7.34
	1907	3.22	7.73	7.41
	1908	3.45	8.83	6.25
Hubbard's Farmers' I. X. L. Superphosphate	1906	2.17	8.07	2.18
	1907	1.87	8.41	2.50
	1908	1.92	8.42	2.77
Hubbard's Royal Ensign	1906	2.41	7.04	4.02
	1907	2.30	8.59	4.57
	1908	2.64	8.21	4.68
Hubbard's Soluble Bone and Potash	1907	.....	9.48	1.84
	1908	.....	10.95	2.62
Hubbard's Trucker's 5%	1907	3.61	7.83	4.97
Hubbard's Special Potato Compound	1908	2.78	7.36	10.92
Watson's Improved High Grade Potato Manure	1906	3.17	7.24	5.24
	1907	3.10	6.04	5.02
Lister's Animal Bone and Potash	1906	.....	10.50	2.06
	1907	.....	10.04	2.09
	*1908	.....	8.77	1.95
Lister's High Grade Special for Spring Crops	1906	1.81	8.20	8.81
	1907	1.73	8.38	9.73
	1908	1.92	8.09	9.97
Lister's Oneida Special	1906	1.33	7.99	1.73
	1907	1.24	7.93	1.50
	1908	1.12	7.53	1.26
Lister's Potato Manure	1906	3.21	8.38	6.47
	1907	3.38	7.78	7.16
	1908	3.31	8.11	6.81

* Guarantee changed in 1908.

Summary of results of analyses of Station samples for the years 1906, 1907 and 1908.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Lister's Pure Raw Bone Meal	1907	2.58	.....	.....
	1908	3.63	.....	.....
Lister's Special Corn Fertilizer	1906	1.99	7.91	3.20
	1907	2.05	7.21	3.11
	1908	2.15	7.29	3.43
Lister's Special Potato Fertilizer	1906	1.90	7.85	2.95
	1907	2.11	6.76	3.16
	1908	1.98	7.22	3.23
Lister's Success Fertilizer	1906	1.39	9.42	2.47
	1907	1.39	9.26	2.12
	1908	1.64	7.79	2.07
Lister's 10% Potato Grower	1906	3.18	6.62	10.38
	1907	3.33	5.60	10.12
	1908	3.26	6.76	9.39
Chittenden's Aroostook Special	1908	4.23	7.37	7.54
Chittenden's Complete Root Fertilizer	1906	3.14	8.12	7.67
	1907	3.38	7.79	7.77
	1908	3.26	7.63	5.63
Chittenden's Eureka Potato Fertilizer	1906	3.19	6.77	10.37
	1908	2.77	7.43	9.24
Chittenden's Excelsior Potato Fertilizer	1906	3.48	5.25	10.44
	1907	3.36	6.66	10.29
	1908	3.41	6.21	9.54
Chittenden's Market Garden Fertilizer	1906	2.30	6.62	5.11
	1907	2.49	6.67	5.87
	1908	2.92	7.81	4.90
New England Complete Manure	1906	3.31	7.16	8.30
	1907	3.19	6.66	9.60
	1908	3.15	6.35	9.66
New England Corn and Grain Fertilizer	1906	1.29	7.21	2.17
	1907	1.20	7.00	1.94
	1908	1.53	6.86	2.13
New England Corn Phosphate	1906	1.75	8.35	3.10
	1907	1.72	8.09	3.01
	1908	1.76	7.38	3.05
New England High Grade Potato Fertilizer	1906	†2.41	8.41	6.44
	1907	2.22	8.00	5.95
	1908	2.52	7.17	5.96
New England High Grade Special	1908	3.56	7.09	10.29
New England High Grade Special with 10% Potash	1906	3.38	8.19	9.78
	1907	3.90	6.58	9.90
	1908	3.74	7.43	9.80
New England Market Garden Manure	1906	4.16	9.16	5.39
	1907	4.04	6.21	5.93
	1908	4.04	7.65	7.57

† Guarantee changed in 1906.

Summary of results of analyses of Station samples for the years 1906, 1907 and 1908.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
New England Potato Fertilizer	1906	1.92	8.06	4.23
	1907	1.59	6.87	4.05
	1908	1.73	6.78	4.15
New England Potato Grower	1906	2.28	7.18	9.74
	1907	2.36	5.71	9.89
	1908	2.45	6.49	10.00
New England Superphosphate	1906	2.42	9.87	3.93
	1907	2.35	9.99	4.22
	1908	2.50	8.15	3.93
Excelsior Potato Fertilizer	1906	3.41	6.37	9.73
P. & P. ** A. A. Brand	1906	3.98	8.23	8.24
	1907	3.93	7.14	8.43
	1908	3.93	8.40	8.61
P. & P. Aroostook Special	1906	†3.53	8.27	9.67
	1907	3.64	6.72	10.07
	1908	3.84	6.95	9.21
P. & P. Grain Grower	1906	1.01	7.48	2.30
P. & P. Maine Potato Fertilizer	1907	2.91	6.25	9.58
	1908	3.54	6.44	9.24
P. & P. Potato Fertilizer	1906	1.66	6.83	4.90
Plymouth Rock Brand Fertilizer	1906	2.37	8.69	4.08
	1907	2.55	7.82	3.95
	1908	2.72	7.65	4.03
P. & P. Special Potato Fertilizer	1906	3.07	9.03	7.34
	1907	2.96	7.89	7.18
	1908	3.17	7.94	6.71
Star Brand Superphosphate	1906	1.52	7.53	2.62
P. & P. Potato Grower with 10% Potash	1908	2.50	6.46	9.00
Bone Dust Tankage	1907	6.07	.....	.....
	1908	*6.05	.....	.....
Prentiss Aroostook Complete Fertilizer	1906	3.20	6.78	9.97
	1907	2.39	5.00	8.83
	1908	3.19	5.82	9.44
Prentiss 10% Complete Potato	1908	2.44	7.52	8.78
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
	1908	1.82	8.67	10.35
Tuscarora Aroostook Special	1907	2.52	7.02	8.79
	1908	2.47	7.02	7.91
Tuscarora Complete Potato	1907	3.25	6.36	9.25
	1908	3.28	6.90	9.32

* Guarantee changed in 1908. ‡ Guarantee changed in 1907. ** Parmenter & Polsey.

Summary of results of analyses of Station samples for the years 1906, 1907 and 1908.

Name of Fertilizer.	Year.	Total nitrogen.	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Tuscarora Trucker's Special	1907	3.85	8.42	6.93
	1908	4.28	8.15	7.30
Provincial Ten Per Cent Aroostook Complete Potato	1906	3.10	7.27	9.62
	1907	3.40	7.41	9.51
	1908	2.44	7.52	8.78
Provincial Special Potato Phosphate	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
	1908	2.70	6.97	7.92
Essex A. 1 Superphosphate	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
Essex Complete Manure for Potatoes, Roots and Vegetables	1908	3.35	5.34	10.08
Essex Potato Grower	1908	2.53	6.02	10.16
Essex Special Potato Phosphate for Potatoes and Roots	1908	2.59	9.17	6.01
Essex Market Garden and Potato Manure	1906	1.89	7.42	5.95
	1907	2.08	7.09	5.47
	1908	2.16	7.05	4.98
Essex XXX Fish and Potash	1906	2.28	6.81	2.57
	1907	2.44	6.97	2.64
	*1908	2.09	7.12	3.25
Sagadahoc Co. Acid Phosphate	1907	.....	16.95	.....
	1908	.....	14.92	.....
Sagadahoc Aroostook Potato Manure	1906	1.29	6.96	3.39
	1907	1.50	6.08	4.01
	1908	1.24	5.33	5.65
Dirigo Grass and Grain Fertilizer	1906	0.87	6.96	5.18
	1907	1.20	6.86	3.33
	*1908	1.77	5.17	5.24
Sagadahoc Co. Muriate of Potash	1907	.....	.....	49.20
	1908	.....	.....	50.88
Sagadahoc Co. Nitrate of Soda	1907	14.32	.....	.....
	1908	*15.52	.....	.....
Sagadahoc High Grade Superphosphate	1906	1.62	8.94	3.52
	1907	1.44	7.18	3.25
	1908	1.82	*11.48	3.03
Sagadahoc Special Potato Fertilizer	1906	1.83	8.91	7.52
	1907	2.04	6.73	7.77
	1908	2.00	7.13	8.30
Sagadahoc XX Chemical Fertilizer	1906	†8.02	7.79	8.07
	1907	7.18	4.42	8.52
	1908	7.01	*6.68	10.18

† Guaranteed change in 1906. * Guarantee changed in 1908.

Summary of results of analyses of Station samples for the years 1906, 1907 and 1908.

Name of Fertilizer.	Year.	Total nitrogen	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Yankee Fertilizer	1906	0.74	9.37	2.38
	1907	0.72	7.45	2.41
	1908	0.64	6.46	3.01
Sagadahoc Co. 3-6-10 Fertilizer	1906	2.11	8.38	9.34
	1907	2.24	6.99	9.12
	1908	*2.76	*5.87	10.55
Sagadahoc Co. 4-6-10 Fertilizer	1907	3.12	6.50	10.02
	1908	3.31	*6.32	10.73
Sanborn's Special Potato Fertilizer	1906	3.19	9.19	10.51
Scientific Potato and Vegetable Fertilizer	1906	3.87	7.22	7.43
Acid Phosphate	1908	.....	14.41	.....
Muriate of Potash	1908	.....	.....	48.62
Nitrate of Soda	1908	15.74	.....	.....
Swift's Lowell Animal Brand	1906	2.37	10.66	4.22
	1907	2.41	9.76	3.92
	1908	2.76	7.89	4.25
Swift's Lowell Bone Fertilizer	1906	1.78	9.24	3.22
	1907	1.67	7.63	2.83
	1908	1.68	7.53	3.17
Swift's Lowell Cereal Fertilizer	1906	0.86	7.21	1.19
	1907	0.88	6.84	1.29
	1908	0.98	7.27	1.68
Swift's Lowell Dissolved Bone and Potash	1906	1.61	10.42	2.10
	1907	1.43	8.03	4.23
	1908	1.84	8.29	2.27
Swift's Lowell Empress Brand	1906	1.32	7.50	2.15
	1907	1.32	7.81	2.03
	1908	1.27	7.53	2.08
Swift's Lowell Potato Grower	1906	3.11	7.29	10.55
	1907	3.19	6.00	10.30
	1908	3.20	6.16	9.87
Swift's Lowell Potato Manure	1906	1.72	8.61	4.65
	1907	1.68	6.70	4.13
	1908	1.76	6.60	4.13
Swift's Lowell Potato Phosphate	1906	2.40	8.19	6.13
	1907	2.22	7.91	6.06
	1908	2.44	7.58	6.25
Swift's Special Potato Fertilizer	1908	2.55	6.32	9.85
Swift's Special Vegetable Manure	1908	3.11	7.92	7.10
Swift's Lowell Superior Fertilizer with 10% Potash	1906	3.30	8.85	10.04
	1907	4.04	6.29	9.67
	1908	3.61	6.90	10.02

Summary of results of analyses of Station samples for the years 1906, 1907 and 1908.

Name of Fertilizer.	Year.	Total nitrogen	Available phosphoric acid.	Potash.
		Per ct.	Per ct.	Per ct.
Whitman and Pratt's All Crop	1908	2.68	8.40	5.53
Whitman and Pratt's Potato Plowman	1908	3.45	7.04	6.62
Whitman and Pratt's Vegetable Grower	1906	3.53	9.21	6.56
	1907	2.52	7.86	7.26
	1908	3.41	8.28	7.67
Whitman and Pratt's Potash Special	1906	2.38	9.23	10.49
	1907	2.85	5.57	9.25
	1908	3.03	6.70	10.42
Whitman and Pratt's Potato Manure	1907	1.98	7.59	4.18
	1908	2.86	7.06	7.40
Whitman and Pratt's Corn Success	1907	1.82	8.29	3.10
	1908	1.97	8.26	3.35
Wilcox Complete Bone Superphosphate	1908	2.32	6.09	3.81
Premium Potato Fertilizer	1908	3.80	7.18	9.92

BULLETIN No. 161.

THE SADDLED PROMINENT,

Heterocampa guttivitta (Walker).*

EDITH M. PATCH.

The present bulletin deals with a caterpillar outbreak so remarkable that the writer from sheer interest in it put aside other work so far as possible in order to keep in touch with the situation. Although a native insect the species under consideration has but occasionally been met with in the State, and prior to 1907 in numbers so slight that it had not seemed worth any special attention. The specimens of these caterpillars in the Station collection had not been determined except as to genus, never more than 3 or 4 inquiries had come concerning it during any one season and then it was reported only as scattered individuals found on apple trees.

ACKNOWLEDGMENTS.

During 1907 and 1908 numerous items have been sent in from people all through the infested areas which has added to the interest of the investigation. Some of the aid which has been given in this matter is herewith acknowledged in appreciation by the Station. Mr. Allen H. Jordan of Upper Gloucester has furnished pupæ for much of the parasite breeding and has for two seasons acted as guide into infested forest growth with which he is familiar. Mr. Fred R. Jones of Mercer aided materially with the investigation in that part of the State. To Mr. Dayton Edwards is due most of the molting records and the information concerning the conditions at Upper Gloucester, Sebago Lake and North Fryeburg, July 11-July 17. The bird observations were made by Mr. William C. Woods who also aided in the collection of parasites. Mr. Perley Skofield's assistance made much of the insectary work possible.

---

* Papers from the Maine Agricultural Experiment Station: Entomology No. 31.

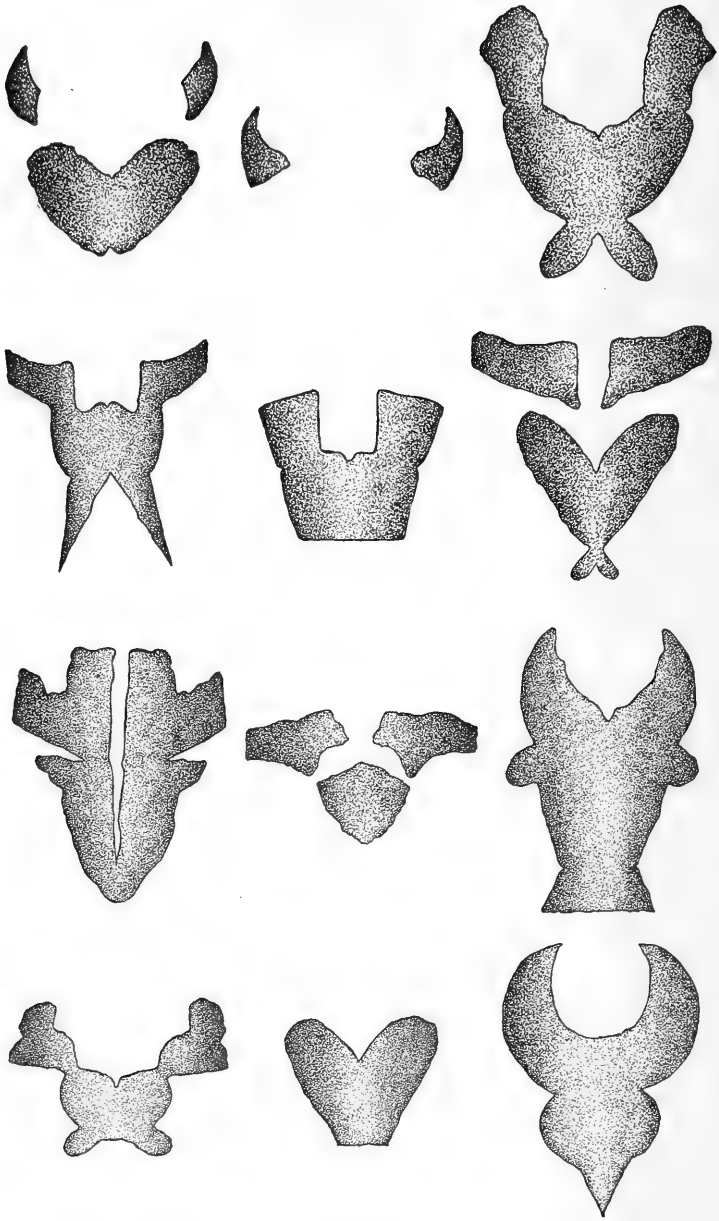


FIG. 14 Saddle marks of saddled prominents in third, fourth and fifth instars, showing a few of the innumerable patterns of this dorsal design. Drawn by Mr. R. L. Hammond.

Discussion of Name "Saddled Prominent."

Since Walker named the species in 1855, *Heterocampa guttivitta* has not attracted enough attention to have been given a common name. It has not, to be sure, lacked variety in classical designations, having been discussed under at least five generic and seven (partly by error) specific names.*

The thoroughgoing attack which it has made on hardwood forests from New York to Maine the past two seasons, however, brings it conspicuously before the public and the lack of a common name is an inconvenience. This inconvenience was met tentatively this season both by the Maine Experiment Station and the Maine Department of Agriculture by the designation "beech prominent," a name very naturally suggested by the noticeable preference of this insect for the beech for the past two seasons in Maine. There is, however, an obvious objection to dubbing a more or less general feeder with the name of its favorite plant, and "beech prominent" did not for this reason seem desirable.

"Antlered maple caterpillar" ** has been suggested, but for

---

* *Heterocampa guttivitta* (Walker).

Cecrita guittivitta Walk., Cat. Lep. Het. Brit. Mus., v. p. 992, 1855. *Drymonia mucorea* Herr.-Schaeffer. Samml. aussereur. Schmett., fig. 514, 1856. *Lochmæus cinereus* Pack., Proc. Ent. Soc. Phil., iii, p. 372, 1864. *Misogada sobria* Walk., Cat. Lep. Br. Mus., xxxii, p. 450, 1865. *Heterocampa doubledayi* Scudder, in Harris Ent. Corresp., p. 134, 1867. French, Can. Ent., xii, p. 83, 1880. Sixth Ann. Rep. S. Ill. Normal Univ., p. 651, 1880. Packard, Bull 7, U. S. Ent. Comm. Ins. Inj. Forest Trees, p. 46, 1881 (Quotes French's description). *H. guttivitta* Grote, New Check List N. Amer. Moths, p. 19, 1882. *H. pulverea* Pack., Fifth Rep. U. S. Ent. Comm., p. 159, p. 397, 1890. *Lochmaeus olivatus* Pack., Fifth Rep. U. S. Ent. Comm., p. 39, 1890. *H. pulverea,* Proc. Bost. Soc. Nat. Hist., xxiv, p. 548, 1890 (*H. pulverea by error*). *H. guittivitta* Dyar, Psyche, vi, p. 178, 1891. (Fourth and last larval stages; cocoon and pupa). *H. guttivitta* Smith, List. Lep. Bor. Amer., p. 31, 1891. Kirby, Syn. Cat. Lep. Het., i, p. 564, 1892. *Cecrita guttivitta* Neum. and Dyar, Trans. Amer. Ent. Soc., xxi, p. 207, 1894; Journ. N. Y. Ent. Soc., ii, p. 117, Sept., 1894. *H. guttivitta* Packard. Mem. Nat. Acad. Sci., VII, pp. 230-235. Plates. 1896. *H. guttivitta* Beutenmüller, Bombycine Moths of Vicinity of New York City. Bul. Amer. Mus. Nat. Hist., X, p. 425, 1898. *H. guttivitta Lugger,* Univ. of Minn. Agric. Exp. Sta. Bul. 61. p. 171 (quotes Beutenmüller's description) 1898.

** Dr. E. P. Felt, Journal of Economic Entomology, Vol. 1, No. 2, p. 150. (Also N. Y. State Ent. 23 Rep't pp 21-23 which appeared while this present bulletin was in press).

this outbreak in Maine, at least, the species has shown a decided preference for beech. The antlers (See Figure 16) are lost after the first few day of its life when it is very tiny so that this would not seem a fortunate popular name for a caterpillar which comparatively few people would even see until the antlers had been shed. Then too, other closely allied species bear antlers as young larvæ, and *Heterocampa biundata,* which retains them through three stages, feeds also upon maple.*

The "purple marked forest caterpillar" ** would seem more descriptive of the older caterpillars, though the dark markings on this species in Maine while exceedingly variable were more uniformly reddish brown than purple. The careful larval descriptions of Doctor Packard * and Doctor Dyar *** indicate that purple marked caterpillars were also the exception among those examined by them, the former not mentioning purple and the latter describing it in that color for "a peculiar variety of guttivitta." It is very difficult, however, to strike upon a stable name for a variable species and except for the length of "the purple marked forest caterpillar" this name might be a convenient designation.

The family *Notodontidae* to which the species in question belongs has been popularly named "The Prominents."

"In some species the front wing has a prominence or backward projecting lobe on the inner margin, which has suggested the common name of Prominents for these insects. The name is more generally appropriate, however, for the larvæ, as a much larger proportion of them than of the adults bear striking prominences." ****

We have among related species popular names based upon larval characteristics as "unicorn prominent," "long-horned prominent;" and "saddled prominent," seeming appropriate and convenient enough a name, has been settled upon mutually by the Maine Experiment Station and by the Maine Department of Agriculture, in order that it may bear but one popular appellation in this State.

---

* Packard. Bombycine Moths.

** E. D. Sanderson, Newspaper circular. August 1908.

*** Psyche VI, p. 178, 1891.

**** J. H. Comstock, Manual for the Study of Insects, p. 263.

The term "saddled" is suggested by the position of the most conspicuous of the dorsal markings. In different designs this saddle mark appears near the end of the second larval stage and persists through the third, fourth, and fifth stages, that is, it is present from the time the caterpillars are 8 or 9 days old until they are full fed. The saddle mark occurs on the mid dorsal portion of the third abdominal segment, and extends in most cases over the fourth and on to the fifth. Like all the markings in this species the saddle mark is subject to great variation and is sometimes exceedingly faintly traced or absent in the fifth instar. The saddle designs which accompany this discussion are drawn from specimens in the third, fourth, and fifth instars and represent only a few of the countless variations.

We have among the slug caterpillars the "saddle-back caterpillar," *Sibine stimulea* Clem., but with the family name *Prominent* retained there is certainly no danger of a confusion between the names of these two exceedingly dissimilar species.

The Present Outbreak.

About the middle of August, 1907, the Station mail was flooded with complaints of this caterpillar which had made startling inroads in certain localities.* Two of these localities were visited immediately,—a large maple grove at South Leeds and approximately 100 acres of beech growth at Upper Gloucester being found at that time defoliated. The full fed caterpillars were observed to be vigorous and forming apparently healthy pupæ, so that a more serious attack was feared for the present season. With this in view the last of May, 1908, the writer made an initial trip into regions known to be infested the previous August, and frequent trips for observation were taken to certain of these localities from southwestern part of Oxford county to the southern part of Piscataquis county, during the entire caterpillar season. Insectary observations have also been made on this species through the entire life cycle.

While for the most part only enough attention could be paid to this species to accumulate a miscellany of observations, the work has resulted in some definite data not previously known for this species. The fact that for Maine only one brood occurs, the unbroken series of molting records for the same lot of cater-

* Me. Agr. Exp. Sta. Bul. No. 148. Insect Notes for 1907.

pillars, and the notes on parasites, the description of the egg, and several other observations in regard to the life cycle, seasonal history, and habits have not been previously published. In fact from an economic standpoint this species has never demanded consideration * before this present outbreak and except for careful descriptions very little attention has been given it. It is included in Packard's Forest Insects in two places (in both incorrectly determined). This season, however, the attack has occurred seriously in Vermont, New Hampshire, and New York, at least, besides this State; and doubtless much data of interest will come to light over so extended an area.

Description of the Saddled Prominent.

The descriptions which follow are made entirely from specimens bred in Maine during this present outbreak. They are, however, written with reference to the descriptions of Doctor Packard whose diction is used wherever convenient.

Moth, female. Ground color olive-greenish ashen with cream white patches and black markings. Fore wings with a marginal black line broken at the veins by a pale dot. The marginal fringe is ashen with darker lines extending from the region of the veins giving the wings a border of shallow scallops. There is a submarginal series of 6 to 8 dark spots. Discal mark a curved dark line inclosed in a lunate pale space. In some specimens this pale space extends beyond the median dark zigzag line far enough to enclose the row of submarginal dots. The body is 20 mm. long and the wings expand 40-52 mm. Figure 24 gives the female actual size and presents a better general idea of the markings than a detailed description.

Moth, male. Ground color of both wings darker than with the female, and the markings are less distinctive. Figure 23 was photographed from a particularly dark individual. The body is 20 mm. long and the wings expand 40-45 mm.

Both sexes are variable in markings.

---

* *H. guttivitta* was included in a list of 356 apple insects by Lintner (N. Y. State Ent. 11th Rep't, p 265) and an interesting portion of his introductory statement seems, in light of this present outbreak, to sound a note of prophecy:—"It is hardly necessary to state that not all the species herein recorded are to be regarded as specially injurious to the apple tree and its fruit but as each one is known to make it, at times, its food plant from choice (many others will feed upon it in confinement) the least harmful among them may at any time, through such sudden and inexplicable multiplication as is often witnessed in the insect world, become a serious pest."

Fig. 15. The Saddled Prominent.

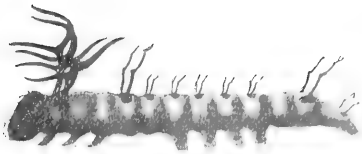


Fig. 16. First Instar.

Fig. 17. Second Instar.

Fig. 18. End of Second Instar.

Fig. 19. Third Instar.

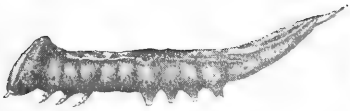


Fig. 20. Fourth Instar.

Fig. 21. End of Fourth Instar.

Fig. 22. Fifth Instar.

Larval stages of saddled prominent. After Bridgham. From Plate XXXI Bombycine Moths A. S. Packard. Memoirs of the National Academy of Sciences. Actual size indicated by lines under figures.

Egg. Pale pellucid green, the color of the ribs of the beech leaf. It is circular in outline with a diameter of 1.19 mm. The surface which is applied to the leaf is flat and the exposed surface is an unsculptured convex. The eggs are deposited singly and adhere firmly to the leaf.

Larva. In this stage the insect defies description particularly in the last instars as the dorsal pattern is exceedingly variable. In the first instar the species is characterized by 9 pairs of horns. In the latter instars the caterpillars may be in general described as green with dorsal longitudinal lines of various colors variously interspaced with designs of various shapes and colors. Such a description would at least convey an idea of the most striking characteristic of these larvae,—their high degree of variation as to markings. The most nearly constant of these is a reddish brown spot on the back of the caterpillar. This, the writer has designated as the saddle mark from its position and in some cases its form. The saddle designs figured in the bulletin were drawn from the specimens reared or collected during the summer of 1908, and give a suggestion of the variation of this mark no one of which seems to be exactly like any other. Those caterpillars which cannot find an original design for their saddle evade the responsibility by appearing with no saddle at all. Following is a description which will perhaps serve the present purpose. The form is illustrated by the accompanying figures and the size indicated by the hair line under them.

Larva. First Instar. Figure 16. Body and abdominal legs dull dark red,—head darker red. True legs black. 9 pairs of black horns occur along the mid dorsal line, each situated on a black enameled spot. The first pair just back of the head are much the largest and branched so that they have the appearance of antlers. There are no horns on the second and third thoracic segments or the seventh abdominal segment. The caudal end of the abdomen is held in an elevated position.

Larva. Second Instar. Figures 17 and 18. Body and head dark rose pink. The dorsal horns of the first instar have disappeared and are represented merely by two straight pointed projections on the first thoracic segment and by a pair of very minute points on the first, second, third, fourth, fifth, sixth and eighth abdominal segments. These minute points are black and are situated on a greenish brown mid dorsal spot.

Larva. Third Instar. Figure 19. Body green marked with bright reddish brown, except for slight tubercles representing the prothoracic horns. The body is smooth. The head is conspicuously large at the beginning of the instar with a broad pale reddish band on each side.

Larva. Fourth Instar. Figures 20 and 21. Body green with dorsal reddish brown markings varied. Head large with broad lateral band composed of 4 stripes colored black, white, pink, and yellow.

Larva. Fifth and last Instar. Figure 22. Body usually beech leaf green with a bluish cast though some are brownish and some vary from straw to almost lemon yellow and others from lavendar to deeper purple. (These were insectary caterpillars which had not been exposed to the direct rays of the sun.) The dorsal pattern was not exactly alike in any two of the caterpillars bred, varying from a pale design in whitish yellow

in some individuals to a heavy marking in reddish brown or purple in other individuals of the same age. Usually the third thoracic segment bears a dark oblique lateral mark with the ventral end slanting cephalad and the sixth abdominal segment bears a similar mark with a ventral slant caudad. Both these marks are sometimes missing and very often other similar marks are present on other segments.

This species would be a fascinating subject for a study in variation but nothing could really be done with it without the constant service of both a photographer and an artist to reproduce the intricate designs in color as no description could serve to fix them adequately.

Cocoon. Figure 26. The cocoon is formed by a very thin layer of silk usually lining a place hollowed in the leaf mold at the base of the infested tree. Sometimes the cocoon is firm enough so that it can be removed with the particles of earth attached as with the specimen photographed.

Pupa. Figure 25. Within the cocoon is a dark glistening brown pupa about 19 mm. long. Just caudad of the mesoscutum is a curve of 8 dull unpolished tubercles the two at the ends being triangular, and the other six being nearly square. The terminal spines of the cremaster are somewhat boot shaped,—the toe being turned laterad and the heel mesad.

Seasonal History.

Packard records the following dates for this species.*

"The eggs were found at Brunswick, Maine, as early as July 3, and it hatched July 11 or 12. Other larvæ, as observed in Maine, hatched about the 8th to 10th of July, feeding on the under side of the leaf, at first eating away a little irregular patch. Stage I lasts 9 days, Stage II probably 4 or 5 days. The last stage is reached a month later, August 9-10; one belated individual occurred on the oak at Providence as late as September 20 to 24.

Riley notes larvæ as occurring in July, and captures of the moths in May, June, July and August."

Doctor Dyar gives the species as "occasionally double brooded" ** and Mr. Beutenmüller says the species "is not common and possibly double brooded." ***

In view of these records the calendar for *H. guttivitta* during the past season's outbreak in Maine is of particular interest.

May 27, 1908, the writer visited a beech growth at North Fryeburg, Maine, which had been stripped by *H. guttivitta* the

---

* Bombycine Moths, page 234.

** Psyche VI, p. 179, 1891.

*** Bombycine Moths of Vicinity of New York, p. 426.

Male. Female.

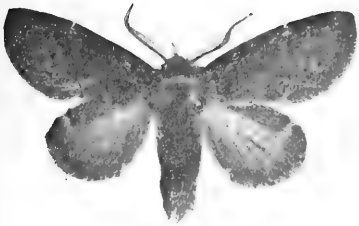


FIG. 23. Male. FIG. 24. Female.

Moths of saddled prominent which emerged May 29, 1908. See page 325.

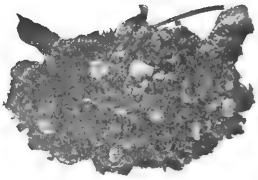


FIG. 25. Pupa. FIG. 26. Cocoon.

See page 322.

FIG. 27. Characteristic posture of larva resting on molting mat on beech leaf. The head molt has already taken place. Change from fourth to fifth instar. See page 328.

previous season to secure pupæ and was surprised to find the moths already emerging in great numbers in the woods. Several hours were spent collecting pupæ, an easy matter in this thickly infested region. Many moths emerged on the way to Orono but enough pupæ were secured for ample material for the life history cycle.

May 29. Moths deposited eggs upon the beech leaves with which their cages were supplied.

June 7. First instar. Larvæ began hatching and in great numbers.

June 11-12. Beginning of second instar. The larvæ spinning their molting mats on the cage and leaves June 11 and molting during the night.

June 16-17. Beginning of third instar. The mats being formed June 16, and the molt occurring during the night and June 17.

June 23-24. Beginning of fourth instar.

June 30-July 2. Beginning of fifth instar. Last stage.

July 13. The first larvæ observed to be forming pupal cells in the earth provided for them. These pupated promptly.

October 7 the date on which this bulletin goes to press, no moths have emerged from these pupæ though the pupæ are alive as evidenced by their vigorous movements on being disturbed. The pupæ were kept in the insectary under leaf mold where the temperature does not vary appreciably from that out of doors.

This record should settle the question of a double brood for Maine. If moths emerging so early as May with the succeeding larvæ full fed in mid July do not give two generations (and the summer was particularly warm and dry) there would seem to be no possible chance for two broods in this latitude.

That this species is very susceptible to temperature control is evidenced by the fact last winter that from pupæ which were wet and warmed in the laboratory moths emerged December 3, 1907.*

Individuals hibernating in a place which did not warm up early in the spring might easily be a month or so later in emerging which would give late larvæ and conversely exceedingly early individuals to emerge in the spring might perhaps make

* Me. Agr. Exp. Sta. Bul. No. 148, 1907.

possible the cycle to the moth stage the same season. Thus farther south two broods may occur.

Weather conditions may account in part for the fact that in 1908 this species was pupating about the time of month that Packard records newly hatching caterpillars,—mid July; or for the larvæ of the first instar at Upper Gloucester this season on July 11.

The insectary observations were made with ample material. There were 175 female moths which emerged in captivity. A very conservative estimate of caterpillars hatching from the eggs these deposited would be 8,000 or 9,000. (See page 331) No count of the caterpillars in the first instar was made and most of them were destroyed at that time after retaining several hundred for the breeding observations. They were healthy in captivity and an easy species to rear. They were fed entirely upon beech. The foregoing record is for the earliest of the larvæ, a group of about 50 of the first hatching being caged together for detailed data as to molting. For the later larvæ, molting records were not kept.

Pupæ collected at Upper Gloucester, June 1, 1908, and sent promptly to the Station, emerged to a great extent on the way. The last of May to early June seemed a fairly uniform date for the greatest number of emerging moths this season.

As a check upon the insectary data a tour of largely infested areas was made as follows:

July 11 at Upper Gloucester specimens from the first to the fourth instar were found but the majority of them were in the third. They appeared in general smaller than were those reared in the insectary at the same stages,—a fact possibly explained by the food supply which was abundantly furnished to the captive caterpillars while those at liberty at Upper Gloucester had comparatively stripped the beech over 100 acres or more and were in many cases starving to death.

July 15. A devastated area of approximately 150 acres of maple and beech was visited at North Fryeburg where the caterpillars were observed to be a little older than at Upper Gloucester.

July 23. Upper Gloucester was visited again. Where caterpillars had been thick 12 days before very few were now to be seen. In some places they were traveling up and down the trunks

of stripped trees and it was in such places that the predaceous Podisus (see Fig. 37) was seen to be busy stabbing the larvæ and the pile of dead and half sucked caterpillars at the bases of trees where these bugs were at work gave good evidence of their appetites. Some larvæ were dying evidently from exhaustion and starvation after traveling up and down many trees and finding no food. Nearer the outskirts of the devastated area the caterpillars were faring better as they got off into fresh growth and were feeding vigorously. Those which were observed were in their fifth (last) instar.

July 24. Sebago Lake, Cape Raymond. The caterpillars were in their fifth instar, healthy and feeding.

July 27. Norridgewock. Caterpillars in the fifth instar, some feeding and some pupating, for the most part healthy.

July 28. Mercer. Pupated in some localities. In others caterpillars in the fifth instar feeding, a few beginning to die. (See a contagious fungus disease p. 344).

July 31-August 1. Norridgewock. Some healthy caterpillars feeding; many sick and dying.

August 3-4. Mercer. Dead caterpillars present by thousands and only a few live ones seen in two days.

Aug. 5-7. Norridgewock. Collection of pupæ which were in certain localities numerous.

August 8. Sebago Lake. *Heterocampa guttivitta* had already pupated in apparently healthy shape. Other species of larvæ which were about at the time were fungus attacked.

August 10. East Sangerville. Caterpillars still feeding, though many were full fed in this locality July 26.

August 14. Buckfield. Larvæ still feeding.

SEASONAL HISTORY SUMMARY.

For Maine the saddled prominent has but one brood. The moths in 1908 emerged in greatest numbers late in May and early in June. Oviposition begins soon after mating which occurs the first night after emergence.—The eggs hatch in about 9 days and the larvæ become full grown in 5 weeks (or more according to weather conditions and food supply). During this time they molt four times. The full grown larvæ enter the ground for pupation. In Maine this season pupation took place from mid July to late August, the majority of larvæ burying

late in July. They pass the winter in the pupal stage, under the leaf mold and the moths emerge in the spring.

Habits.

The eggs are deposited singly by the female which in captivity applied the eggs to both sides of the leaf. From the reason that during both years over the whole range of the infestation the *tops* of the trees were stripped first and then the lower branches it is to be concluded that the moths by preference deposit the eggs upon the upper leaves. Perhaps the same tendency to fly high may account in part for the fact that the hillside forests were in general more largely attacked than the lowlands, which was noticeable throughout the infested districts.

An interesting feature was noticed in the feeding habits of the larvæ. The young caterpillars just hatched fed, as do the young of many species, from the surface of the leaf skeletonizing it in spots by nibbling out the parenchyma and leaving even the finest veins untouched. (See Figure 28). This habit was continued through the first instar but after the first molt the caterpillars migrated to the margin of the leaf and the meals during the second instar were obtained by eating down between the veins as indicated by Figure 29. In the third instar the feeding habits of the caterpillars is represented by Figure 30. After that Figures 31 and 32 are significant illustrations.

The saddled prominents do not cling tightly to the leaf or branch. Even in the first instar the caudal portion of the body is elevated,—the species from the first observing that characteristic family trait. A slight jar will dislodge the caterpillars from their hold and bring them rattling to the ground. (See also Combatative Measures page 349). They then climb the trunk and go to work again.

Before each of the four molts they carefully spin a thin, broad resting mat where they cling during the molt. At such times the larva usually waits with the head curved to one side as shown in Figure 27 where it will be noticed that the head molt has just occurred.

The full grown larva drops or climbs to the ground and constructs a cell in the earth or under the leaves at a distance of one to 3 inches below the surface. This cell is oval and is lined

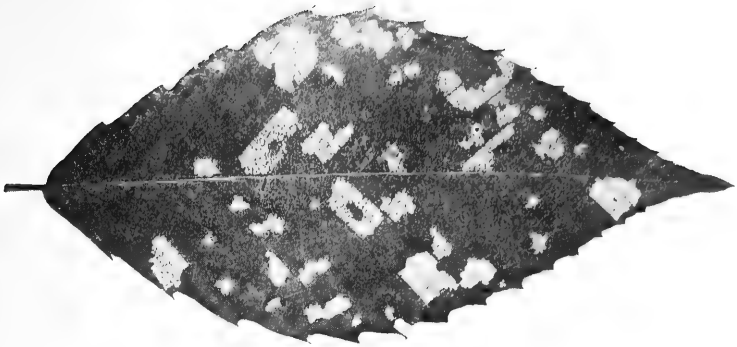


Fig. 28.

Fig. 29.

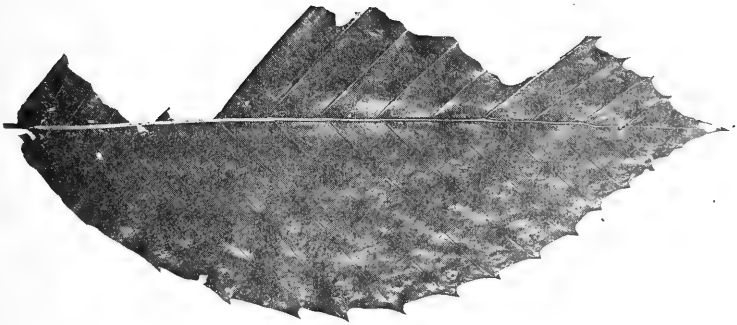


Fig. 30.

Beach leaves showing work of saddled prominent in first, second and third instar respectively. Reduced. See page 328.

by a thin spinning of silk. The structure is hardly worthy the name cocoon as it is easily broken in throwing back the leaves and the loose pupæ exposed. Sometimes, however, a fairly stable cocoon is constructed and such a one to which particles of earth have adhered is shown in Figure 26.

The insect after remaining in the pupal stage all winter emerges with the warm spring days. On May 27 the writer observed great numbers of these moths breaking through the leaf mold during the warm afternoon and creeping up some convenient object while their wings expanded.

During captivity the moths mated the first night and began laying eggs soon afterward. The length of life of an individual moth could not be estimated as the captive moths break their wings and otherwise disable themselves usually before all their eggs are deposited. As to the number of eggs laid by a single moth the following record is of interest. June 3, 1908, one female freshly emerged was dissected and the eggs in the ovarian tubes were counted. They varied from 55 to 75 in the different tubes of which there are 8, and the total number for this one moth was approximately 500 eggs. Later 12 females that had died in the cage were dissected and the unlaid eggs remaining in the egg strings were counted. The total number of unlaid eggs was 629 giving an average of 52+ of unlaid eggs to each moth. In some individuals only 5 or 6 eggs remained. In 3 individuals the number of unlaid eggs was between 125-150, however, a condition doubtless due to the moths beating themselves to death before they finish depositing eggs, in their attempts to get out of the cage.

Food Plants.

Beech leaves have been unquestionably the favorite food of this species during the two years attack in Maine. Over about 800 acres on Frye's Island, Sebago Lake, and about 800 acres on Cape Raymond, the beech was completely stripped, the birch being taken later. At Upper Gloucester the beeches were taken first these trees being defoliated over 100 acres by July 11. At this time maple and oak had been in some cases stripped but the white birch was at that time practically untouched. By July 23, however, the birch had succumbed also.

Isolated maple groves as well as maples present with beech in forest growths were stripped often by the saddled prominent

alone and sometimes helped out by the green striped maple caterpillar, *Anisota rubicunda,** which has been for two years very numerous. Similarly the attack by the saddled prominent on the oaks was reinforced by the rosy-striped oak-worm, *Anisota virginiensis.**

As to what happened to apple orchards in the infested districts Figure 32 is sufficient explanation.

Yellow birch seemed avoided at first and several reports came in "everything stripped but yellow birch" but larvæ of this species were seen actively feeding upon the yellow birch at East Sangerville and elsewhere later in the season.

Sumac was in several instances reported stripped but in every case investigated by the writer this was due to an undetermined small green caterpillar which made a general raid of the sumacs this season.

Saddled prominents were observed to be feeding also upon witch hazel, poplar, blackberry, mountain maple, spirea, cherry, and undoubtedly a full list of food plants would be very long.

The order in which various species of trees were taken seemed to vary in different localities but everywhere the beech was given preference.

The following extracts from letters give the food plants most attacked and are indicative of the extent and time of most conspicuous infestations. In each case the inquiry was accompanied by specimens of the saddled prominent.

July 18, 1908. Douglas Hill, Cumberland County, Maine. "Sunday they stripped fully 50 acres of forest trees here and are still at work very rapidly. They are also on apple trees."

July 28. Dover, Piscataquis County. "I am sending several worms taken from maple trees. They are eating the leaves from the tops or seem to work more in the top. May work downward later as I have just discovered them."

July 14. Bridgton, Cumberland County. "Some green worms are covering our apple trees in large numbers and are doing great damage."

July 16. Naples, Cumberland County. "What species of worm are these on nearly all hardwood and fruit trees? Beeches seem to be the ones they prefer."

---

* See Maine Agric. Experiment Station Bulletin No. 162 Insect Notes for 1908.

Fig. 31. Work of the saddled prominent in beech growth. Photograph taken at Upper Gloucester, Me., July 23, 1908.

FIG. 32. Orchard stripped by the saddled prominent, on the estate of J. H. Jones & Sons, Hampshire Hill, Mercer, Me., July 20, 1908. Photograph loaned by Mr. Fred R. Jones.

July 16. Lovell, Oxford County. "The green worms have stripped whole orchards of leaves."

July 19. Sebago Lake, Cumberland County. "I first saw these worms in this section last spring when they began attacking the beech, birch and maple on several hundred acres. This year they have become much worse."

July 20. New Sharon, Franklin County. "These caterpillars have eaten off all the foliage from many of the trees, both apple and hardwood. They are especially prevalent on beeches."

July 20. Stark, Somerset County. "These caterpillars are stripping the hardwood trees in this part of the town."

July 20. N. Waterford, Oxford County. "Some green worms are eating *all* the leaves on the apple trees and take the maple and beech."

July 20. Shapleigh, York County. "They have stripped the leaves from 100 acres of forest, and are also working on fruit trees."

July 20. Livermore Falls, Androscoggin County. "I send specimens of green worms which are devouring both shade and fruit trees."

July 21. Lovell, Oxford County. "Am sending a box of *Heterocampa guttivitta*. They have proved very destructive in this vicinity. Several hundred acres having been traversed by them and are almost devoid of leaves. Our orchard is practically ruined for this year at least. Our shade trees are bare as winter except elm and oak."

July 21. Livermore Falls, Androscoggin County. "Several hundred acres have been so defoliated that they present a brown appearance like that of bare trees in winter. The caterpillars seem to prefer the beech and birches, but are also very numerous on maples and oaks and may be found on other trees."

July 22. Madison, Somerset County. "The worms are doing considerable damage, working chiefly in the top branches."

July 22. Norridgewock, Somerset County. "They are partial to beech and yellow birch."

July 22. Harrison, Cumberland County. "The forests in the south part of Harrison and the adjoining town of Naples are in an alarming condition. The beeches are as bare as in December. White birches, oaks and maples are suffering

severely. Apple trees are in a leafless state also. The same condition prevails across the lake in Bridgton."

July 23. N. Waterford, Oxford County. "I am sending you worms that belong to an army which are destroying all the hardwood save the poplars within about seven miles of here. Last year they started to eat in the town of Sweden cleaning up the woods so that with the exception of the poplars and evergreens they looked as bare as in late fall. This year they ate everything that leaved out in the old neighborhood and began to move toward us through the woods in great quantities. They are moving half a mile a day. They seem to crowd along the ground in swarms as soon as they strip one section of woods."

July 23. Bethel, Oxford County. "The worms have eaten the leaves all off about 500 cords of wood and they are so thick they can be gathered by the bushel."

July 23. Hiram, Oxford County. "I send you specimen of a worm that is eating the hardwood growth, stripping the trees over thousands of acres in a place."

July 24. N. Leeds, Androscoggin County. "Forests look as though a fire had swept through."

July 24. Freeport, Cumberland County. "Beech trees seem to fare the worst."

July 24. Shapleigh, York County. "A caterpillar that is destroying acres of woodland and apple trees."

July 27. Wiscasset, Lincoln County. "I am sending you green worms which have stripped the beeches and yellow birches completely and have nearly stripped the white birch and are now beginning on the maple."

July 28. Sebago Lake, Cumberland County. "They are eating beeches, oaks and birches. White maple and sugar maple have escaped so far. They begin at the top of the tree and work down until there isn't a leaf left upon the tree, they then drop to the ground with a thud and crawl to some other tree. The woods are full of them on the ground and they are traveling at a fearful rate."

July 29. Ross Corner, York County. "The Prominent (*H. guttivitta*) is doing the most damage, the one I send you on oak (*Anisota virginiensis*) comes next and the maple leaf caterpillar (*A. rubicunda*) last. Probably 100 acres of trees are all bare."

July 31. So. Paris, Oxford County. "They seem to prefer

beech, birch and maple. They strip a tree clean of leaves and take tree after tree."

August 1. Fryeburg, Oxford County. "The wretched infestation of these worms make life in the country difficult and destroy the pleasure of my hitherto beautiful summer home."

August 1. Gardiner, Kennebec County. "Worms that are destroying the foliage of beech, maple and birch in the forests."

August 5. Sebago Lake, Cumberland County. "I was in the woods yesterday and there are scarcely any of the Prominents to be found in the trees now."

Degree of Injury Due to the Saddled Prominent.

The question uppermost in the minds of owners of infested woodland is whether the stripped trees will die. While it is not possible definitely to predict the degree of injury caused by such an attack, the following statements are of interest in this regard. Weather is one controlling factor, hard winters, excessive drought, or other unfavorable climatic conditions occurring at the time of such a severe stripping of trees increase the danger of fatal results. Under ordinary conditions some species of deciduous trees will stand being stripped for 2 consecutive years, and recover from the shock. If other conditions are particularly favorable a 3 years seige may not prove fatal. Some species of trees will stand what others cannot. The beech growth at Upper Gloucester and North Fryeburg which the writer had under observation was thoroughly stripped in 1907 and leaved out heavily and well the following spring. At South Leeds, Mr. John O. Bates, at whose place a large maple grove was completely stripped by the saddled prominent both in 1907 and 1908 wrote on September 16, 1908: "The old growth maple all leaved out in good shape last spring. The leaves on the young maple tops were a pale yellow. This year the grove was stripped as bare as winter about the first of August. Last year the trees did not leave out again after being stripped. This year the maples have all leaved out and some of the limbs of the beeches have leaved out."

Other reports that the trees, particularly the maple, were releaving came from various parts of Maine during late August this year.

The fact that in general the infested districts were stripped about 2 weeks earlier this year than last seems to be due to the greater number of caterpillars this season, many growths being devastated before the caterpillars were nearly grown. This was an unfortunate thing for the caterpillars as, except for such as could reach fresh growth, there was nothing for them to do but "drop out of the trees and keep going up until they died" as one observer put it.

Natural Enemies of the Saddled Prominent.

Prophecy as to the condition of the caterpillars another season is as difficult as predictions concerning the state of the trees. There are, however, more definite statements to be made in this case.

INSECT ENEMIES.

Last year over widely separated regions the saddled prominent pupated in an apparently perfectly healthy condition. Predaceous bugs and beetles were numerous and fed upon the caterpillars to a considerable extent. Two counts were made for the proportion of parasites from pupæ collected this spring. From 255 pupæ collected at Upper Gloucester June 1, 1908, 190 moths emerged, and 15 parasites, the cause of death of the other 50 pupæ was perhaps largely due to injury in transmission or handling in laboratory. From 176 pupæ collected May 29 at North Fryeburg, 153 moths emerged and 5 parasites, the remaining 18 died probably from injury in transmission. In 1908 particularly about August 1, hymenopterous parasites were very abundant in the woods infested by the saddled prominent. Concerning about 40 species there is so far only such circumstantial evidence that they were present in regions infested by the saddled prominent and further observations will be made for these another season. *Pimpla pedalis* which passed the winter in the pupa of its host was bred by the writer from pupæ of *Heterocampa guttivitta* collected last spring and *Ichneumon sublatus* * similarly bred was present this season in great numbers from North Fryeburg to Norridgewock, and was without question the most beneficial of the hymenopterous parasites.

* Determined by Mr. Crawford through the courtesy of the U. S. Bureau of Entomology.

FIG. 33. Male. FIG. 34. Male. FIG. 35. Female. FIG. 36. Female.

Ichneumon sublatus. The most beneficial parasite of the saddled prominent. See pages 340 and 343.

FIG. 37. *Podisus modestus.* Predaceous bug stabbing the saddled prominent. See page 343.

FIG. 38. Adult.

FIG. 39. Larva.

Calosoma. Predaceous beetle feeding upon saddled prominents.

Both sexes of this species are given as Figures 33, 34, 35, and 36. *Ichneumon sublatus* also emerged the middle of September from pupæ collected at Norridgewock the first of August. How many generations a year there are for *sublatus* in connection with the saddled prominent was not ascertained. The only seasonal data which can be given is that it passed the winter in the pupa of its victim and emerged early in June, that it was on the wing in great numbers (evidently freshly emerged individuals) the first of August in the infested regions and that the species also emerged in mid-September from pupæ of the saddled prominent. Of the various predaceous wasps, apparently attracted by the saddled prominent, species of Ammophilas were particularly abundant.

The larvæ and adults of *Calosoma* were numerous in the infested woodlands at North Fryeburg, Upper Gloucester, Norridgewock and Mercer during the season. Both the beetles and larvæ carried on an active warfare against the caterpillars and were found climbing the tree trunks for their prey though their supply of food was largely taken from the ground or a foot or two up the trunk. One of these beetles was, however, found on the branches of a small tree. Figures 38 and 39 illustrate two stages of this species.

The larvæ of *Calosoma* are also active in feeding upon the buried pupæ of the saddled prominent and were particularly fond of the fresh pupæ the contents of which they were frequently found to be devouring early in August.

Pterostichus lucublandus was especially abundant last spring under beech trees where the pupæ were hibernating. These and other common ground beetles unquestionably take their part in feeding upon these caterpillars.

Of the predaceous bugs which were numerous, *Podisus modestus* was most active in feeding upon the caterpillars of the saddled prominent. Figure 37 gives this species in a fairly characteristic position with its beak plunged into the caterpillar (this species it usually attacks a little behind the head) and braced back while it drains the caterpillar fluids. Tree trunks where these bugs were working were decorated with dead caterpillars half sucked and hanging limp like an inverted U, and little heaps of dead caterpillars at the base of the trees testified to the ability of these blood thirsty bugs.

Some undetermined species of predaceous bugs were found near the saddled prominents but none were so numerous as *Podisus modestus*. As this bug also feeds upon the caterpillars of the brown-tail moth * it should be recognized as a benefactor of considerable significance.

No effort was made to secure evidence in regard to the host of insect eating animals. Mr. Curtis A. Perry, Bridgton, reports a pair of pet skunks as being very fond of the saddled prominents, eating them voraciously.

STARVATION.

Before the middle of July at Upper Gloucester and other badly infested places large areas had been already stripped. This happened in many cases before the caterpillars were ready to pupate and though the caterpillars sought new feeding ground, as was evidenced by stripped orchards (see Fig. 32), hordes of the caterpillars never reached suitable food and died of starvation. These starving caterpillars would drop from one defoliated tree and climb others only to find that no food awaited them. Many climbed trees they could not eat when nothing remained for them but to drop or climb down and try another. Figure 40 shows a mass of such caterpillars that had congregated about the base of a hemlock tree the foliage of which they could not eat.

CONTAGIOUS DISEASE.

Where excessive numbers of caterpillars are present in one place, favorable conditions arise for the spread of disease. Late in July and in early August various species of caterpillars were attacked by a disease and in some instances practically the whole infestation of saddled prominents was wiped out. At Mercer and elsewhere countless thousands of these caterpillars died within a few days. They lay in heaps about the bases of trees, in masses about stones, and hung limp where they had fallen across the branches. Specimens of these caterpillars were examined by Doctor Lewis, Associate Plant Pathologist of this Station, who found that the disease was due to a fungus parasite but that bacteria set in among the sick caterpillars and hastened their decay. The destruction of the bodies

---

* See Me. Agr. Exp. Sta. Bul. No. 162 Insect Notes for 1908.

FIG. 49. Starving saddled prominents congregated about base of Hemlock tree, the foliage of which they could not eat. Photograph taken in stripped beech growth upper Gloucester, Me., July 23, 1908. See page 344.

was thus so rapid that after a few days of heavy stench, nothing remained of the plague-stricken caterpillars.

In localities where the caterpillars died this season in this wholesale manner, it would seem that little need be feared from caterpillar attacks for the coming year.

In what manner the fungus disease started is not known. Possibly it found entrance among the wounded caterpillars that predaceous bugs had stabbed. In one or two localities there seemed to be some indication that such was the case. Once well started it would not be difficult for the disease to spread rapidly for the fungus penetrates throughout the body of the caterpillar, and the spores are thrown to considerable distance in all directions so that they light upon caterpillars below, or upon parts of the tree over which healthy caterpillars would travel. *Podisus modestus* was observed repeatedly in close proximity to diseased caterpillars, and it is not unlikely that such bugs would transfer fungus spores from sick caterpillars to healthy ones.

It is worth recording in this respect that this fungus outbreak came in a dry season. At Hampshire Hill, Mercer, for instance, it had rained but twice in the month (July 17 and July 27) previous to the height of the fungus disease which occurred July 28 to August 1. This severe fungus attack at Mercer occurred over an area the altitude of which was from 680 to 1020 feet, reaching the summit of the hill. Although it was a particularly dry season, various species of caterpillars were attacked by fungus all over the State about this time, though in many localities the saddled prominents had become full fed and safely pupated before the fungus developed.

BIRD ENEMIES.

As a rule soft bodied caterpillars are soon checked by birds. In order to form some estimation of the role birds were taking in the present outbreak, observations of badly infested areas were planned for this year. This could not be carried out until late July and early August, and it chanced that each place selected for the desired data was experiencing a wholesale fungus attack which naturally interfered with bird diet.

The following list of Maine birds, however, gives species which are undoubtedly beneficial. Of these 45 are reported as

observed eating hairy caterpillars * in Massachusetts and the remaining 8 related more northern species would without doubt have the same habit. Any bird that will eat a hairy caterpillar will take a naked caterpillar like the saddled prominent with relish.

Yellow Billed Cuckoo, Black Billed Cuckoo, Hairy Woodpecker,** Downy Woodpecker,** Yellow Billed Sapsucker, Northern Flicker,** Kingbird,** Crested Flycatcher, Least Flycatcher, Phoebe, Wood Pewee, Blue Jay, American Crow,** Red Winged Blackbird, Baltimore Oriole, Bronzed Grackle, White Throat Sparrow, Chipping Sparrow,*** Song Sparrow,** Field Sparrow, Junco,** Towhee, Rose Breasted Grosbeak, Indigo Bunting, Scarlet Tanager, Cedar Waxwing,** Red-Eye Vireo,*** Warbling Vireo, Solitary Vireo,*** Yellow Throat Vireo, Black and White Warbler,** Nashville Warbler, Northern Parula Warbler, Yellow Warbler,** Black Throated Green Warbler, Black Throated Blue Warbler, Myrtle Warbler, Magnolia Warbler, Chestnut Sided Warbler, Ovenbird, Northern Yellow Throat, Northern Water Thrush,** Redstart, Catbird, Brown Thrasher, Winter Wren, White Breasted Nuthatch, Red Breasted Nuthatch,** Chicadee,** Wilson's Thrush,** Hermit Thrush,** Robin,*** Bluebird.

In recording the efficiency of birds as natural enemies to the saddled prominent and other caterpillars, the domestic fowls should not be scorned. Turkeys and hens though not applicable to forest conditions are exceedingly helpful in the orchard or about shade trees. By way of example may be cited a hen of Buckfield which ate without much pause 60 of the caterpillars which dropped from a tree that was given a sharp rap. A case to the point also is recorded by State Entomologist E. F. Hitchings * concerning a chicken weighing when dressed 1 3-4 pounds. The crop of the little fowl was so distended that its contents were examined curiously and were found to consist of 75 full grown caterpillars compactly disposed.

---

* Forbush, E. H. Useful Birds and Their Protection.

** Seen in stripped woodlands in Maine.

*** Actually observed feeding on saddled prominent.

* Maine Dept. of Agric., Augusta. Circular of Information on Forest Insects, 1908.

Combatative Measures.

ORCHARD AND SHADE TREES.

For the orchard or shade trees there are several practical measures which have proven successful the past season in preventing serious injury from the saddled prominent.

Spraying. This species is susceptible to arsenical poisons and the caterpillars readily died on apple trees which were thoroughly sprayed. Arsenate of lead or Paris green will kill these caterpillars and should be applied as soon as they begin appreciable work. Applications from the middle to the last of June would probably get all these caterpillars which hatched upon the trees. In case a migration to an orchard from an infested forest growth is feared, the orchard should be sprayed as soon as the caterpillars begin to travel in search of fresh food. If trees not already attacked are banded with a sticky substance, the ascent of caterpillars up the trunk will effectually be prevented.

Jarring and banding. The saddled prominents are readily shaken from the branches. The writer repeatedly has seen trees effectually cleared in this way for the past two seasons. Small trees can be shaken from the ground. With larger ones a boy can be sent among the branches to shake or give them a sudden jar, a proceeding which should begin with the top, of course. The cool of the morning is the most propitious time for jarring.

The caterpillars once dislodged, their reclimbing can be prevented by banding. The trunks of the trees are protected with a sticky band. A band of tarred paper thickly smeared with equal parts of lard and sulphur has proven helpful in such cases. This mixture should not be applied directly to the bark of the tree as there is danger of injury, but with the tarred paper it is safe and effectual. Tar hardens so quickly that it has not proven satisfactory in several cases where it has been tried this season.

A material useful in certain phases of the gypsy caterpillar campaign and sold under the name of Tree Tanglefoot has been recommended by this Station during the present seige of saddled prominents. "This substance consists principally of resin softened by the admixture of suitable oils. It is quite similar to that used in the manufacture of adhesive fly-paper, seems to

possess the merit of not injuring the trunks of trees, and is very effective in checking the ascent of caterpillars thereon." * Where the number of caterpillars jarred from the trees is excessive it is expedient to kill them. A hand spray charged with kerosene or gasoline is a useful means to this end.

Fowls and Pigs. Hens will devour these caterpillars greedily (see page 348) and if given the range of an orchard will eat great numbers of the caterpillars which drop to the ground or descend to pupate. Of course, where such an excessive infestation occurs as during the present season, it would not do to depend upon hens entirely but they would prevent great numbers from entering the ground to develop into next season's moths. A flock of turkeys would display even more commendable ability in this respect.

Pigs pastured in an orchard will, by rooting up and eating the pupæ, prevent great numbers of saddled prominents and other moths from emerging and depositing eggs for the following season.

FOREST TREES.

For such phenomenal outbreaks as the present no artificial measures are practical in forest growths. If the saddled prominents were likely to appear in excessive numbers year after year, wholesale spraying or other combatative measures might be advisably applied as with the gypsy caterpillars. But the saddled prominent, like other native species, is ordinarily held in check by birds, insect enemies, field mice and other animals which feed upon it in its various stages, by fungus diseases or by weather conditions. A moth ordinarily so guarded has never been known to remain uncontrolled by natural agents for more than a few years in succession, and in extensive woodland growths there is in this case apparently nothing to be done except to wait for natural conditions to readjust themselves.

---

* A. H. Kirkland. Second Annual Report of the Superintendent for Suppressing the Gypsy and Brown-tail Moths, page 150.

BULLETIN No. 162.

INSECT NOTES FOR 1908.*

EDITH M. PATCH.

The present bulletin, like others of the series, is concerned with certain insects of Maine which have come especially to the notice of the Station during the current season. In some cases the records are merely statements of insect situations which it may never be desirable to spend more time upon; in other instances the records serve as a preliminary note of species to be dealt with more fully at some future time. The summer of 1908 has been one of tremendous insect interest; the devastation of thousands of acres of hard wood forests by the saddled prominent; the prevalence of almost innumerable other species of caterpillars; the conspicuous appearance of pine insects, many of them usually rare, at a time when the pines are weakened from other causes; the noticeable great numbers and extent of aphid infestations; the continuation of grasshopper depredations; may be mentioned among the insect disasters of the season. Over against this we have as a bit of encouragement, the noticeable increase of predaceous and parasitic insects all over the State and late in July and in August a pretty general occurrence of a contagious fungus disease which struck various species of caterpillars like a plague, killing them by wholesale and thereby diminishing in many localities the danger of the succeeding generation.

For many items of interest the Station is indebted to people from different parts of the State who have kindly submitted important material. Such aid, although considerable, is too miscellaneous and disconnected to acknowledge separately and it is hoped that Insect Notes for 1908 will be accepted as a statement of appreciation of whatever suggestions or aid have been given the Station this year.

---

* Papers from the Maine Agricultural Experiment Station; Entomology No. 32.

So far as practicable "remedial measures" are not discussed here for the reason that descriptive circulars dealing with the standard injurious insects of the State are always on file to be mailed to persons requiring such information.

Station notes were recorded this season for something over 300 lots of insects, selections from which are contained in this bulletin. The Lot numbers here given are merely reference to Station records for the species in question and have no significance beyond permanently linking the published account to the Station collection and notes which is in some cases desirable.

The Gypsy and Brown-tail Moths.

As dangerous insects in this State, these moths are of first rank. Little need be recorded of them in this present bulletin as they are discussed adequately in so much constantly available literature. Descriptive circulars are sent out both by this Station and the Maine Department of Agriculture and the United States Department of Agriculture in reply to inquiries. For information concerning their present status and the work in progress against them for this State the reader is referred to the annual reports of the State Entomologist. The annual report of the Superintendent for Suppressing the Gypsy and Brown-tail moths in Massachusetts, are of no less interest to the neighboring states, as the gigantic experiments with introduced parasitic and predaceous enemies of these moths concern not the one state alone but the country at large which will benefit from the successful work carried on there. The value of such work cannot be over estimated either from the standpoint of scientific or practical demonstration.

While the owners of infested trees are for the most part alive to their responsibility as individuals, now and then careless owners of neglected trees still harbor the winter nests of the brown-tail moth evidently trusting to the fates or the State to prevent the consequences. The latter is proving itself willing to help most materially and that the fates are also propitious is indicated by specimens of a predaceous bug (nymphs of probably *Podisus modestus*) received with a nest of brown-tail moths from Stroudwater, Maine, September 4, 1908, together with the comment that there were "one or more in each of the 5 nests examined, feeding upon the young caterpillars."

The Saddled Prominent, *Heterocampa guttivitta* Walk.

By far the greatest amount of damage caused by any single species this season was due to the saddled prominent caterpillar. So enormous was the work of this insect that it seemed expedient to discuss it in a bulletin * by itself and it is mentioned here merely to include it among the insects of the year. A newspaper circular from this station was sent into the districts most infested about the middle of July, with a description of the pest and such remedies as were applicable to shade and orchard trees.

Associated with the saddled prominent the two species next to be mentioned were present in greatest numbers.

The Rosy-Striped Oak-Worm, *Anisota virginiensis* (*pellucida*). Lot 309.

Found feeding upon several trees but everywhere especially upon the oak which they completely strip, is a darker relative of the green-striped maple worm. In many localities the work of the saddled prominent was greatly augmented by these two caterpillars. This oak worm is variable as to color but in general it may be described as a dark grey or greenish larva with dull brownish yellow or often brick red lateral stripes, and the skin is dotted with small white warts. A row of short black spines occurs on each segment and there are two long spines on the second thoracic segment. The winter is passed in the pupa similar to that of the maple-worm and in the same situation,—among fallen leaves beneath the trees the caterpillars have stripped.

The moth emerges early in June. Professor Comstock's description is quoted:

"The wings of the female are purplish red, blended with ochre-yellow; they are very thinly scaled, and consequently almost transparent; and are not speckled with small dark spots. The wings of the male are purplish brown, with a large transparent space on the middle." The male is considerably smaller than the female.

Figures 41, 42 and 43 represent the caterpillar and the moth of this species.

---

* Maine Agricultural Experiment Station Bulletin No. 161.

The Green-Striped Maple-Worm, *Anisota* (*Dryocampa*) *rubicunda*. Lot 325.

So numerous upon the maple have been these caterpillars for two seasons, in many cases entirely defoliating the trees, that the following description and accompanying illustrations are given. "The larva measures when full grown about one and one-half inches. It is pale yellowish green, striped above with 8 very light, yellowish-green lines, alternating with 7 of a dark green, to black. There are two prominent spines on the second thoracic segment, and two rows of spines on each side of the body, one above and one below the spiracles, and on the 8th and 9th abdominal segments there are four prominent dorsal spines." *

The species passes the winter in the pupa state and pupæ were commonly found in the same situations as those of the saddled prominent under the fallen leaves in the infested maple growths. The moth which emerges in the spring (for Maine about the first of June) is an exquisitely beautiful moth with wings of pale yellow banded with rose pink.

Symmerista (*Edema*) *albifrons*.

The White Tipped Moth. Lot 386. Among the forest caterpillars this season, the larva of this moth was very common. This caterpillar was taken on oak, birch and other trees. "It is smooth and shining, with no hairs. Along each side of the back there is a yellow stripe, and between these, on the back, fine black lines on a pale lilac ground; on each side below the yellow stripes there are three black lines, the lowest one just above the spiracles. The head is orange-red; and there is an orange-red hump on the eighth abdominal segment." (Professor J. H. Comstock-Manual). The conspicuous orange-red at each end of the caterpillar together with its rather peculiar shape make it a little puzzling to tell whether one of these caterpillars is traveling backward or forward.

---

* Professor J. H. Comstock. Manual p. 349.

A New Spruce Tortrix, *Argyroploce abietana* Fernald. Lot 237.

Spruce twigs with the needles dead and webbed together in a silken mass were received from South Paris, May 20, 1908, with the complaint that two small spruces were much injured in that way. See Fig. 44. The inside of the leaves had been eaten out by the larvæ which entered by a hole made near the base of the leaf. The webbed mass contained small felty cocoons with greenish pupæ inside. Upon request a considerable mass of the webbed twigs was sent from the same place and over 40 of the numerous moths which emerged were mounted. These were not previously in the Station collection and were submitted to Doctor C. H. Fernald who kindly named and described * them. The females differ in no conspicuous marking from the males described by Doctor Fernald. The wing expansion, however, should read 11-13 mm. instead of 21-23 mm. as appearing by mistake in the original description. The accompanying photographs Figures 45 and 46, will give a general idea of the color pattern of this species. The fore wings might be briefly and graphically described as being composed of alternate irregular transverse bands of brown and bluish or silvery white. Accompanying the description of the male moth Doctor Fernald quotes Miss Rose L. Davis concerning the larvæ as follows: "The larvæ, when full grown, are about 7 mm. in length, cylindrical in form, with the head of medium size, of a shining yellowish-brown colour, and with a few fine hairs scattered over the surface. The rest of the body is of a light greenish-brown colour, semi-transparent. The thoracic and anal shields are of a pale greenish colour, with the usual fine hairs on these and over the surface of the body. When disturbed they quickly let themselves down by a silken thread."

The cocoon is a firm gray structure about 7 mm. in length and covered with pellets of frass.

The moths began to emerge May 29, so that it would seem probable that there are two broods a season. Since the cocoons are made among the webbed twigs the most practical remedy would seem to cut and burn such branches before the last of May. This would be applicable to shade and ornamental spruces and would prevent or greatly reduce the succeeding generation.

---

* The Canadian Entomologist, Oct. 1908, p. 349.

A NEW NOCTUID FOR THE APPLE, *Crocigrapha normani* Grote. Lot 40.

During the season of 1907 larvæ of an undetermined species were bred upon apple in the insectary. These pupated about mid-July and in the spring a single moth emerged in the laboratory. This was identified by Doctor Harrison G. Dyar as *Crocigrapha normani* Grote, who stated that nothing was recorded of the life history of this species. Some descriptive notes in regard to the earlier stages which had been made by the writer have been published elsewhere,* and need not be further recorded here.

Acrobasis (Phycis) rubrifasciella. Lot 264.

About the midle of June most of the sweet fern in the vicinity of Orono and also at Lewiston was found to be attacked by these caterpillars which constructed trumpet shaped tubes. These tubes were composed of silk into which were woven more or less regular circles of dark frass pellets. The more perfectly formed trumpets were beautiful structures. Later the open mouths of the trumpets were closed before the larvæ pupated so that the cases were then rather oval in structure. Several masses of these were gathered and July 11, 1908, the moths began to emerge. The wings expand about 3-4 inch. When the moths are at rest they hold their wings curled about the body and the antennæ are stretched back straight against the mid-dorsal line.

On June 29 apparently the same sort of cases were received from Dexter, Maine, where they were taken from white birch.

Deilephila galli.

Sphinx caterpillars on *Galium verum.* Lot 298. One of the most curious of the season's collections was made July 16 when a bunch of yellow or ladies bed-straw was brought into the Station with about 20 young sphinx caterpillars upon it. This introduced plant was in full blossom and growing in profusion over a limited area. The caterpillars upon it were about 1 1-2 inch long with head and body bright green. See Fig 47. There was a mid dorsal yellowish white unbroken line, and a similar yellowish line just ventrad the spiracles. Midway between

* Entomological News. July 1908, pp. 321, 322. Plate XIII.

these two lines was another yellow line of the same width broken by 9 reddish spots edged with a curve of black along the sides, the posterior pair of red spots forming a Y with the caudal spine for the stem. These larvæ were unknown to the writer in this stage as was the plant upon which they were found, and it was after a half day's search that either was placed when, curiously enough, both were located on colored Table 7 of *Die Raupen der Schmetterlinge Europas* by Hofmann-Spuler.

The fact that this sphinx had discovered, in a Maine meadow, the first bit of this European plant known to appear in this locality and one of its favorite food plants in Europe seemed particularly interesting. Within a few days the caterpillars molted and were then the characteristic color of full fed *D. galli* (*chamoenerii*) larvæ which the writer had taken on fire weed (*Erechtites hieracifolia*), strawberry leaves and other plants previous years. That the *Galium verum* was a favorite diet is evidenced by the difficulty with which these caterpillars were induced to feed upon other plants when the supply of "bed straw" gave out. Several plants reported for this sphinx were tried but the caterpillars, after reveling in the sweet scented yellow blossoms of the *Galium,* sturdily declined leaves of any sort and were tempted only by the blossoms of fireweed, on which they fed until they pupated. Figs. 48, 49, and 50 picture moth, pupa, and full fed caterpillar of this species.

Datana major. Lot 394.

Several of these handsome caterpillars were received from Harrison, Maine, August 27, 1908, where they have been numerous upon "Deerberry," (*Vaccinium stamineum*) for two seasons. They fed in the insectary upon common low blueberry. The writer is not aware that this species has been previously reported from Maine. The specimens received were black bodied with 4 heavy longitudinal lines of pure white, broken into subquadrate spots. Head and cervical shield deep rich red, anal plate and prolegs red, the thoracic legs red at the base but the distal portion black. The body was thinly covered with short black hairs and longer whitish ones. The caterpillars assumed the characteristic Datana attitude, resting with both extremities raised, sometimes slightly, sometimes nearly meeting over the body.

Ogdoconta cinereola.

Bean Worm. Lot 231. This is a slender naked green caterpillar, pale with darker longitudinal stripes, measuring when full fed a little more than an inch in length. It was troublesome over the greater part of the State on beans this year, in many cases stripping the vines bare of foliage and pods. At the slightest touch they give a series of violent jerks landing on the ground. Their contortions are laughable even when their depredations are serious. Their habit of jerking off from the plant would seem to make killing them upon the ground practical, or in gardens to which hens have access merely shaking the infested vines for the benefit of the hens might prove a sufficient remedy. With shell-beans arsenical sprays would be practicable.

Alcothoe caudata.

Clear winged moths (Lot 322) were common flying about blossoms of Virgin's Bower (*Clematis virginiana*), August 3, 1908, at Mercer, Maine. The moths were mating at that date. The larvæ of this species bore in the stems of clematis.

Estigmene acraea and *Diacrisia* (*Spilosoma*) *virginica.*

The hairy "yellow bear" caterpillar of these two species were overwhelmingly troublesome in vegetable and flower gardens all through the State this year.

Basilona imperialis.

The Imperial Moth. Lots 329 and 379. Two full fed larvæ of this moth were received this season on white pine, the one from Naples, Maine, August 11, being the bright yellowish green variety, and the one from North Berwick, August 15, being dark brown. See Figure 51.

Lapara bombycoides.

Pine Hawk Moth. Lot 315. Several larvæ of this moth were received on white pine. This striking caterpillar is particularly inconspicuous in its natural habitat, as when it lies longitudinally along the pine needles—its normal attitude—the green stripes have so much the appearance of the needles that the insect is not noticeable. See Figure 52.

Dibolia borealis Chev.

Plantain Flea Beetles. Lot 279. Every season the bronze green flea beetles of the plantain, *Plantago major,* are found feeding upon the leaves of this plant early in the season and again later in the summer. This year they were found very plentiful near Portland mating May 25. At Lewiston, July 3, plantain leaves thoroughly mined, (See Figure 53) were found over an area of several square rods. The leaf miners in the trails were at that time full fed. A collection of leaves was made and the larvæ deserted the trails and buried themselves in the earth furnished them for pupation. On July 27 several of the fully developed beetles had emerged from the soil and proved to be *Dibolia borealis* Cherv. (=*aerea* Melsch). This beetle passes both the larval and adult life on the plantain. Whether there is a second brood for Maine has not been ascertained.

Oberea bimaculata.

The Raspberry Cane Borer. Lot 261. For the past two seasons this insect which had been very little in evidence for some time came to the front again. The writer is informed that about 12 years ago the injury by this borer to blackberry canes in this State was quite extensive, and it is blackberries that have been most attacked for the past two seasons although both at Orono and elsewhere the raspberries have been taken also. One man explained: "The tops of my blackberries kept lopping down and I thought at first the children were doing the injury in thoughtless sport. But I sat where I could watch the vines one day and saw several tops go down without apparent cause. When I looked at these lopping canes I found two magic rings upon them. The thing is pure witchcraft," the owner of the canes added with a puzzled laugh.

Two "magic" rings (See Figure 54) are indeed at the base of the drooping portion of all canes affected in this manner. They are about one-half inch apart and are the two rows of punctures made by the adult beetle with her jaws. Between them the beetle makes a small hole through which she deposits her egg.

Were the drooping tops the end of the injury usually not much damage would be done but the grubs which hatch from

the egg bore down the cane. Professor Slingerland's excellent account * of the work of this boring is as follows:

"They are cylindrical, footless, yellowish grubs, measuring about three-fifths of an inch in length. When first observed in the latter part of July they had made in each case a burrow less than two inches in length; but after that date the burrows were rapidly extended downward so that they became in many cases two feet or more in length and reached the base of the canes. The burrows are about one-eighth of an inch in diameter; they wind from side to side of the pith, and at frequent intervals penetrate the woody part of the cane. In some of the cases where the woody part of the cane is penetrated an opening is made through the bark. These openings occur at intervals of a few inches throughout the length of the tunnelled portion of the cane; they are small, being about one-third of the diameter of the burrow; and their object is to enable the larva to deposit its excrement outside of the burrow. It is evident that the larva puts the caudal end of the body at this opening and forces the excrement directly into the open air, for it was found in long strings, some of them a half inch in length, on the sand below the openings; and the burrows were always free from it."

The remedy is obviously simple. As soon as the tops begin to wilt the affected cane should be cut off below the lower ring and destroyed. If this is consistently attended to in the spring the insect will be killed in the egg before any real injury by boring is done. When the trouble is not noticed until later in the season all affected canes should be pruned to the ground and burned.

On June 29, 1908, some canes in the University garden showed evidence of the work of this insect and July 3 the beetle was observed at work. July 8, raspberry canes that grew close by the blackberry bushes showed the girdlings by the beetle.

From Bridgton, Maine, September 28, 1908, came the following communication: "I am about to send you red raspberry tops in which are some small whitish grubs. The first signs of these grubs are noticed about the middle of July. A couple of rings of holes appear near the tops of some of the new canes. The tops wither and the grubs bore down the inside toward the

* 1890. Bul. Agric. Exp. Sta. Cornell University. Entomological Division XXIII.

earth. I have found them when they have bored nearly the whole length of the cane."

The beetles pass the pupal stage at the roots of the cane and emerge in the spring. The beetle has a narrow black body about long, the thorax is yellow, with 2 small black spots sometimes absent, while in some specimens there is an additional black spot at the posterior margin of the prothorax.

Among the accounts of this insect might be mentioned that of F. M. Webster * who observed it boring in apple and in witchhazel and that of O. Lugger.**

Osmoderma scabra Beauv.

The Rough Flower Beetle. Lot 399. In an old orchard where the apple trees were being cut a considerable number of the white grubs of this beetle were found. About 10 of these were kept the winter of 1907-08 in the laboratory living in a section of decaying apple trunk to which no other attention was given than soaking it up now and then. Two of the beetles emerged during the winter and to the others were added about 20 more grubs of various sizes during the summer of 1908. These lived in confinement with very little care and were kept until the edible portion of the trunk had been disposed of.

Although these grubs do not occur in healthy trees, they sometimes cause considerable injury by consuming the wood of old trees and inducing more rapid decay.

Figure 56 pictures the cell which this grub constructs by cementing together "sawdust" inside which cocoon it passes its pupal stage and from which it emerges in the winged or beetle stage.

Figures 55 and 57 give the grub and beetle.

Dermestes vulpinus Fab. Lots 227 and 400.

Two infestations of this Dermestid were reported. They were breeding in "tankage," that is refuse from a rendering place, to be used as a fertilizer. They were also at work in curd from dried buttermilk. The buttermilk is evaporated, the curd pressed, dried, ground, and put into two bushel sacks to be used for sizing paper. It was in these sacks that the beetles

---

* 1898. Bulletin No. 96. Ohio Agricl. Exp. Station.

** 1899. Fifth Annual Report of the Entomologist of the Experiment Station of the Univ. of Minn.

were breeding enough to be troublesome. The species was determined by Mr. Schwarz through the courtesy of the United States Bureau of Entomology.

Corticaria ferruginea Gyllenhal Lot 291.

Dense swarms of these minute beetles occurred at Orono in the early evening of July 13, 1908. At that time a forest fire was raging west of Orono and the wind was from the west at the time the beetles were taken. Whether the beetles were escaping from the burning district or whether this circumstance was merely a coincident was not ascertained.

Brachys aerosa.

These Buprestid beetles (Lot 249) were common upon oak the leaves of which they were eating in the vicinity of Portland May 25, 1908. The larvæ are leaf miners. The beetles were by no means so numerous as last season in the same localities, as recorded on p. 270 of Bulletin No. 148 of this Station.

Dendroctonus terebrans.

The Turpentine Bark Beetle, Lots 244 and 300, were abundant at North Fryeburg, May 29, about windows and were reported in numbers from East Denmark, July 14.

Monohammus titillator * Lot 302. Sub. 1.

Monohammus scutellatus Lot 302.

Two of these pine borers were received from Ross Corner, July 17, with the comment "They had about stripped one side of the tree" (a small white pine). Being in doubt as to whether the stripped pine was the work of these beetles, as sawflies were pretty generally numerous, the writer placed the beetles in a jar with fresh pine twigs and they very soon began to chew along and through the needles, strewing the bottom of the jar with the needles which they had nipped through.

---

* Determined by Mr. Schwarz through the courtesy of the United States Bureau of Entomology.

Cryptorhynchus lapathi.

The Poplar and Willow Borer. Lot 327. This insect which has been a serious pest in other states was observed on the campus for the first time in 1907, a single specimen being taken from a willow hedge, June 7. This season from the same hedge these beetles were taken in several collections. On August 10 the females were observed chiefly upon new growth and some were found with beaks buried in the bark. At this date also they were mating.

Conotrachelus nenuphar.

Plum Curculio as an Apple Pest. One of the most serious apple pests in the State is the plum curculio. Besides the young apples which fall in quantities and in which the weevils develop, the fruit remaining upon the trees is so often and so generally deformed that it is seriously injured. As is the custom of the Station in regard to orchard pests, a circular of information concerning the work and remedies for this insect is used for full reply to questions about injuries due to the curculio.

Aphrophora parallella.

The Parallel Spittle-Insect, Lots 319 and 326. In June, deposits of white froth were observed generally upon the white pines of the State and the young insects found in the froth were frequently received with the question "are these the cause of the 'pine blight?'" The full grown insects were abundant on the white pine in the vicinity of Sebago Lake late in July, and the specimens were determined by Mr. Heidemann through the courtesy of the Bureau of Entomology, Washington, D. C.

Eriopeltis festucae.

The Cottony grass-scale was present as usual which means parasited as usual. It could be found in localities where it has been observed previous seasons but there were no complaints of serious injury to meadows.

Leptoterna dolobrata.

This meadow insect could be swept up by hundreds in the net about June 30 in the Orono grass lands. They exhibited great variation both in color and in length of wing covers.

Canthophorus cinctus Lot 392.

August 26, great masses of the red and black nymphs, in several stages and the black and white adults of these bugs were found congregated under chips and bits of rubbish. This seems to be the hibernating habit of this species as such masses are frequently met with late in the fall.

Anasa tristis.

Squash bug. Strangely enough, the specimens sent from Gorham, Maine, July 14, 1908, were the only specimens of these squash bugs received by this Station in 5 years.

Lygus pratensis.

The tarnished plant bug, Lot 308, was present among blackening and withering tips of potato vines at Waldoboro, July 20 where it was reported to be "working quite extensively in potato fields."

Podisus modestus.

Surely this species of soldier bug deserves honorable mention as it was busily engaged in stabbing destructive caterpillars during the entire season, over all parts of the State.

Aphididae.

The plant louse collections have been more than 100 this summer and the material has been of considerable interest including some new species as well as unrecorded forms of named species. The dry warm season has proven a favorable condition for aphid life and the weather was particularly good late in September and October when the true sexes are to be found. As is to be expected, parasitic and predaceous enemies of the aphids were abundant and many infestations were controlled by such natural enemies.

Nematus erichsonii and Other Sawflies.

Larvæ of the Larch Sawfly, Lot 383, were taken at West Houlton, July 7, 1908. Sawflies of many species seemed especially common upon the wing this season, and a considerable number of undetermined species were collected.

Lophyrus abietis.

Spruce Sawfly. Lot 323. "All the fir trees in this vicinity are dying" was the complaint which accompanied large sendings of cocoons of the spruce sawfly from Orrs Island and some other localities this season. The sawflies emerged about September 9, 1908. This is a well nigh impossible pest to fight in the woodland and the very serious trouble of this season added to last season's attack by the same species is rendered a little more hopeful by the fact that parasites emerged this spring from cocoons which were received from Seeket last year. The attack seems to have been more general upon the fir than the spruce.

Hymenopterous parasites.

Tiphia inornata, Lot 228, parasitic upon the white grub, were very numerous. Cocoons of these beneficial insects were received from South Thomaston, April 30, with the statement "I am planting new ground to potatoes and find an unusual quantity of the enclosed."

Chelonus sp. were bred from the tiny spruce tortrix, *Argyroploce abietana* Fernald. *Ichneumon sublatus* bred from the saddled prominent, was noticeable in woodlands all over the State. At Norridgewock as many as 10 or 12 were frequently to be found resting upon a single plant, about the first of August. At Mercer, August 3, one of these parasites was observed to be sipping honey-dew globules from a poplar leaf when an ant about one-third its size rushed at it and the Ichneumon took to its wings in haste. This comedy was repeated several times, as the Ichneumon would return to the feast of the honey-dew.

Pimpla pedalis also emerged from pupæ of the saddled prominent this spring.

As for parasites in general they were so abundant this season as to seem a prediction of fewer caterpillars another year.

Grasshoppers.

As was the case last year grasshoppers have been seriously troublesome this season. The red-legged locust, *Melanophus femur-rubrum* and *M. bivittatus* were guilty of most of the mischief, though the grasshopper kind in general were numerous and industrious. Among the other grasshoppers collected

this season as determined by Mr. Caudell through the courtesy of the U. S. Bureau of Entomology, are the following species *Nomotettix cristatus* Scudd. *Tettigidea lateralis polymorpha* Burm. *Camnula pellucida* Scudd. *Encoptolophus sordidus* Burm. *Stenobothrus curtipennis* Harr. *Stenobothrus curtipennis longipennis* Scudd. *Melanoplus collinus* Scudd. *Xiphidium fasciatum* De Geer.

At Mercer not far from the center of "the grasshopper region" the predaceous beetles, *Amara obesa,* was observed. As the larva of the beetle is credited with "devouring great numbers of locust eggs" its presence is one hopeful sign.

The grasshopper mites, *Trombidium locustarum,* bright red mites were present upon the grasshoppers of this locality being crowded particularly thicker about the regions of the wings.

Possibly correlated to the grasshopper scourge is the increase of the blister beetles, *Macrobasis unicolor* and *Epicauta pennsylvanica,* both species troublesome to potatoes and other crops but probably paying for such damage by the good which their larvæ do in eating such dangerous material as the eggs of locusts.

Fungus disease disposed of large numbers this season as last in spite of the dry weather.

Fungus Disease of Insects.

Late in July and early August it was observed over a region extending at least from Franklin to York counties that the caterpillars then feeding were overtaken by a contagious fungus disease. An account of such an attack of the saddled prominent is cited elsewhere.*

"White Pine Blight."

On account of the precarious condition of white pine in certain parts of the State considerable alarm has been aroused by various insects found upon the pine this season and indeed it has seemed as though an unusual number of species had taken advantage of the pines this year.

Besides the standard borers to be continually reckoned with, the pine sawflies and pine leaf eating caterpillars have made

* Me. Agric. Exp. Station Bulletin No. 161.

noticeable inroads, while spittle insects and plant lice (*Lachmus strobi* and *Chermes pinicorticis*) have been unusually prevalent.

None of these insects, however, have been the cause of the "white pine blight," * though several of them *Chermes pinicorticis* and the spittle insects, *Aphrophora parallela*, for instance, have been in some cases conspicuously associated with the ailing trees.

Eriophyes fraxiniphila Hodgkiss
and
Eriophyes fraxini (Karp.) Nal.
Ash Clusters and Gall Mites. Lot 429.

In the vicinity of Orono the red ash is commonly covered with distorted growth somewhat of the appearance of "witches' broom." Figure 58. In some cases these clusters hang from every branch and give the tree a strange appearance after the leaves have fallen. Examination of one such cluster taken October 10, 1908, revealed thousands of microscopic mites, some transparent and some pinkish, moving over the irregular surface. Similar galls are recorded by Murray as the so-called clusters of ash,† caused by an unnamed mite.

The mites that cause the physiological disturbance in the plant tissue which results in this erineum or gall are so small as to be almost invisible to the unaided eye. Examination of the gall under a Zeiss binocular gives a very interesting glimpse of these minute creatures on the gall and reveals the characteristic movements of the mites as well as their color and a general idea of their form. An oil emulsion, however, is necessary to give any definite details.

---

* A discussion of the "white pine blight" is given by W. J. Morse in a forthcoming bulletin of the Maine Agricultural Experiment Station, and by the same authority under the title "The White Pine Blight in Maine" in the Report of the State Forest Commissioner of Maine, 1908.

† "They are the monstrous deformed styles of the flower, which gather into a ball, brownish green at the beginning, later on a dark brown, causing rough masses on the upper part, which have on the outside a great similarity to fragments of the upper part of a cauliflower. Its upper side is clothed, as it were, with colourless hair cloth, from which come stick like hairs. They are solid, without any hollow space, and, in a dry state so hard that they can be sawn and cut like wood." Economic Entomology, Aptera, p. 364.

No observations were made in regard to natural enemies except that a white mite resembling somewhat the figure of "an enemy of the blister mite" * was found October 13 upon one of the galls. A sufficient remedy would apparently be found in cutting off and burning the galls before the first of October.

As there seemed to be no record for America for the species of mites causing these galls, material was sent to Mr. P. J. Parrott through whose courtesy the following statements are made possible.

An examination of the material sent Mr. Parrott November 4 showed that the mites had left the flower galls but large numbers of Eriophyids were taken from the buds, in which the species responsible for the flower galls appear to hibernate. One of the two species present is *Eriophyes fraxini* (Karp.) Nal. which is said to cause flower galls on the European and the green ash in Europe. The other is a new species. This has been described by Mr. Hodgkiss and has been designated by him in his manuscript as *Eriophyes fraxiniphila.*

The brief description used here with the kind permission of Mr. Hodgkiss gives the following characters by which this mite may be recognized:

"Body long and narrow. Thoracic shield small. The dorsal setæ are of medium length and are widely separated. The legs are stout and the feathered hair has four rays. The thoracic setæ are present. The striæ on the dorsum and ventrum of the abdomen are narrow, closely punctured and number about seventy. Abdominal setæ are present. The third pair of thoracic setæ and the first and second pairs of ventral setæ are long. The females measure about 220 microns in length and about 40 microns in width, while the males average about 190 microns in length and 46 microns in width. The color of the mites varies from white with pinkish reflections to a deep salmon color in the hibernating forms."

---

* *Seius pomi* Parrott. N. Y. Agric. Exp. Sta., Bul. 283, plate IV.

FIG 41.

FIG. 42.

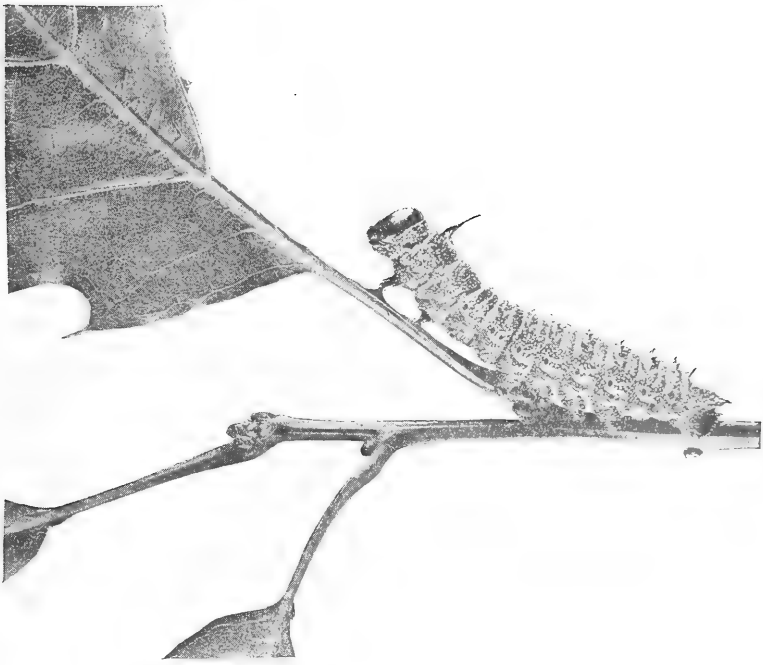
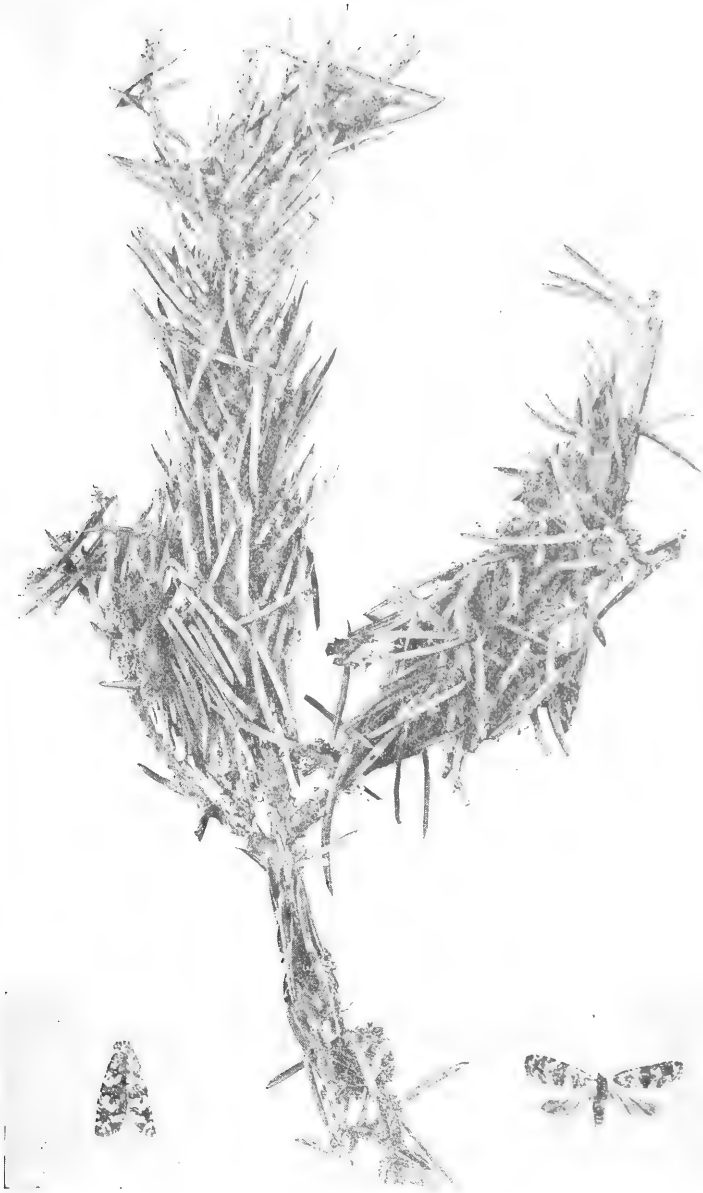


FIG. 43.

The Rosy-striped Oak-worm, Anisota virginiensis Fig. 41 male moth, Fig. 42 female moth, Fig. 43 full fed larva. See page 353.



FIGS. 44, 45 and 46.

Argyroploce abietana Fernald. A new spruce Tortrix and work of larvæ on spruce. See page 355.

Fig. 47.

Deilephila galli. Young sphinx as taken on introduced European plant, Galium verum, in Maine meadow. See page 356.

Fig. 48.

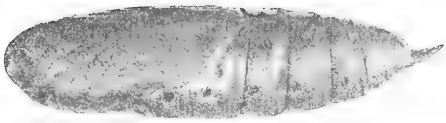


Fig. 49.

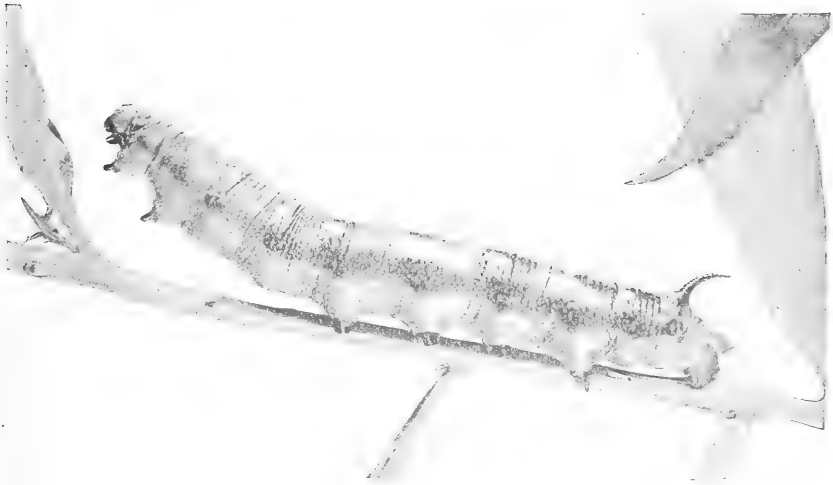


Fig. 50.

Deilephila galli, Sphinx. Fig. 48 moth, Fig. 49 pupa, Fig 50 full fed larva on fire weed. See page 356.

Fig. 51.

Basilona imperialis. Larva of Imperial Moth. See page 358.

FIG. 52.

Lapara bombycoides. Larva of pine hawk-moth. See page 358.

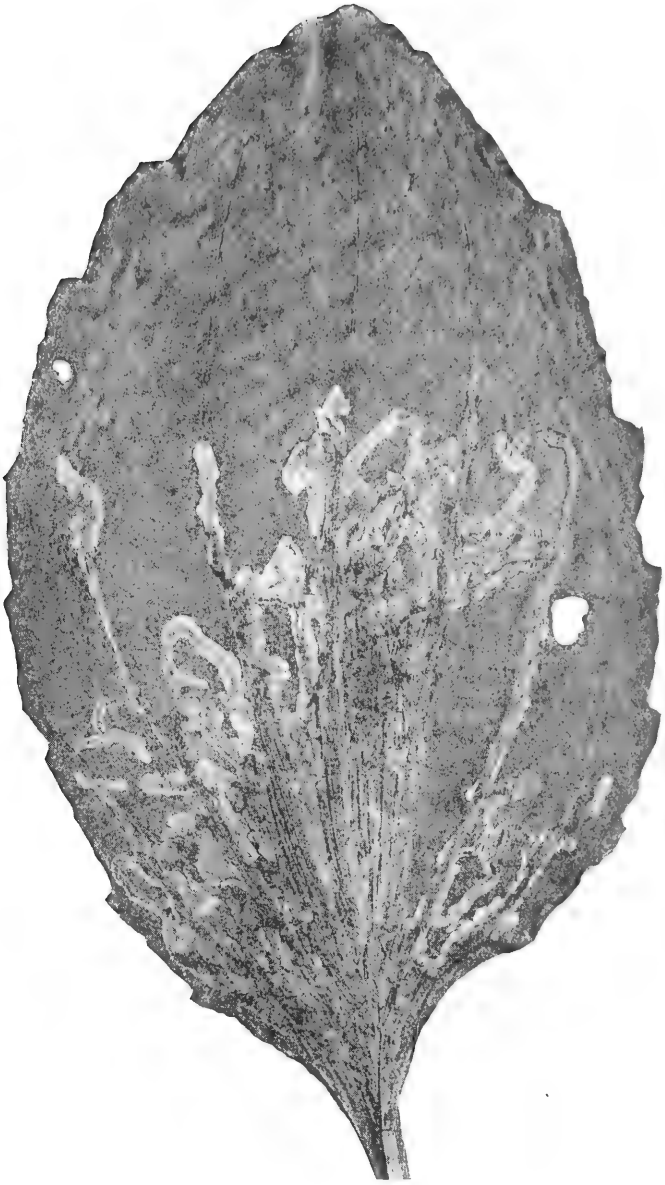


FIG. 53.

Dibolia borealis. Trails of leaf mining larvæ in leaf. See page 359.

FIG. 54.

Oberea bimaculata. Work of adult beetle on blackberry cane. Enlarged. Orono, July 8, 1908. See page 359.

FIG. 55.

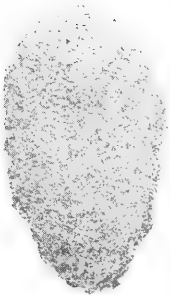


FIG. 56.

FIG. 57.

Osmoderma scabra. Fig 55 grub bred in decaying apple trunk. Fig. 56 cocoon. Fig 57 adult. See page 361.

Fig. 58.

Ash clusters caused by gall mites. *Eriophyes* sp. See page 367.

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-guage; self-recording anemometer, vane, and barometer. The observations at Orono now form an almost unbroken record of forty years.

The year 1908 differed from the average year in several very important respects. Every month but three was warmer than the average. January was especially warm, the mean temperature for the month being 6.4° higher than the average for the past 40 years. The highest temperature reached was 97° on July 7; and the lowest -24° on February 5. May and October were warm months, and but for the prolonged droughts of June and September the growing season would have been exceptionally long.

The precipitation for the year was light, over six inches below the average. During the period of 47 days, from June 1 to July 17 inclusive, only 2.10 inches of rain fell; and from August 18 to October 1 inclusive, 48 days, the total precipitation was .99 inch.

METEOROLOGICAL SUMMARY FOR 1908.

Observations Made at the Maine Experiment Station.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Mean.	Total.
Highest barometer	30.26	30.59	30.30	30.28	30.35	30.20	30.23	30.19	30.29	30.40	30.31	30.50	30.32	
Lowest barometer	28.96	29.14	29.28	29.02	29.17	29.56	29.51	29.50	29.56	29.26	29.12	29.06	29.26	
Mean barometer	29.76	29.86	29.91	29.69	29.81	29.84	29.88	29.89	29.93	29.97	29.78	29.84	29.85	
Highest temperature	52°.0	49°.0	55°.0	79°.0	82°.0	88°.0	97°.0	90°.0	88°.0	82°.0	56°.0	59°.0		
Lowest temperature	-12°.0	-24°.0	- 5°.0	9°.0	30°.0	36°.0	42°.0	37°.0	29°.0	20°.0	12°.0	-18°.0		
Mean temperature	22°.5	17°.4	29°.6	40°.0	55°.1	65°.1	71°.2	65°.6	62°.5	51°.0	35°.6	20°.3	44°.66	
Mean temperature for 40 years	16°.1	18°.8	28°.0	40°.6	52°.5	61°.9	67°.1	65°.0	57°.5	45°.1	34°.2	20°.5	42°.27	
Total precipitation in inches	3.36	4.23	2.90	2.37	4.59	1.35	2.85	4.69	.81	6.03	1.39	2.94	.....	37.51
Mean precipitation for 40 years	4.24	3.82	4.25	2.88	3.52	3.51	3.27	3.47	3.36	3.84	3.67	3.75	.....	43.58
No. of days with precip. of .01 in. or more	12	10	7	10	13	3	11	10	4	5	9	14	.....	108
Snow fall in inches	10.7	21.2	18.0	6.3	.....	.....	.....	.....	.....	.....	2.0	15.0	.....	73.2
Average snow fall for 40 years	22.6	21.3	16.0	5.6	0.2	.....	.....	.....	.....	0.8	8.0	16.9	.....	91.4
Number of clear days	16	13	6	10	9	17	15	12	22	17	8	11	.....	156
Number of fair days	2	5	11	9	5	9	10	9	3	4	7	9	.....	83
Number of cloudy days	13	11	14	11	17	4	6	10	5	10	15	11	.....	127
Total movement of wind in miles	6452	5215	6411	7854	5634	5030	4290	4759	3744	3999	5687	4793		

Monthly and Annual Precipitation (as rain) for the Year 1908.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Bar Harbor	4.89	5.88	3.40	3.25	3.75	1.65	3.50	2.23	2.25	5.63	1.69	5.95	44.07
Cornish	2.85	4.67	1.90	2.95	5.47	0.65	2.66	2.62	1.54	3.41	1.47	3.63	33.82
Eastport	4.17	3.71	3.96	2.64	2.58	1.01	1.95	3.32	1.60	4.09	1.52	5.01	35.56
Fairfield	1.61	3.68	1.77	1.93	4.52	2.17	2.41	3.05	0.56	3.64	.....	2.07	
Farmington	.....	4.44	2.82	2.38	5.88	2.05	2.82	4.87	1.48	2.59	1.63	3.10	
Gardiner	2.65	4.58	2.17	2.20	4.29	1.03	4.38	2.36	0.92	4.16	1.40	3.28	33.42
Greenville	2.63	4.93	2.95	2.14	5.50	2.83	5.18	7.75	1.90	2.08	1.94	2.59	42.42
Houlton	1.89	4.75	2.51	2.25	2.20	2.00	1.30	3.57	0.49	1.35	1.07	1.50	24.88
Lewiston	2.82	4.68	2.18	2.64	4.94	0.90	3.66	2.73	0.80	5.01	1.61	4.16	36.13
Madison	2.75	4.52	2.48	2.56	6.59	1.63	3.91	5.18	1.40	3.51	1.53	2.47	38.53
Millinocket	2.52	3.82	2.65	1.93	5.16	2.10	2.35	5.01	2.46	.....	1.88	3.32	
North Bridgton	2.43	3.65	2.20	2.58	4.51	1.00	5.34	3.55	0.81	2.40	1.46	3.27	33.20
Orono	3.36	4.23	2.90	2.37	4.59	1.35	2.85	4.69	.81	6.03	1.39	2.94	37.51
Patten	.....	.....	.....	.....	.....	.....	1.51	5.00	0.30				
Portland	.....	3.72	2.26	2.14	4.76	0.53	2.58	3.73	0.69	3.65	1.34	2.92	
Rumford Falls	2.84	4.08	1.95	1.73	5.90	1.42	2.30	3.62	1.26	1.96	1.48	2.38	30.92
Van Buren	2.55	4.90	2.10	2.00	5.10	2.80	2.10	3.45	0.75	3.60	1.55		
Winslow	2.07	3.10	1.78	2.07	5.00	2.82	2.73	.....	0.93	3.08	.....	2.57	

With the exception of readings from the Orono station, the above table is compiled from the monthly bulletins of the U. S. Weather Bureau.

REPORT OF TREASURER FOR FISCAL YEAR ENDING JUNE 30, 1908.

Receipts.	Hatch Fund.	Adams Fund.	Gen'l Acct.
Balance July 1, 1907			$3,583 96
Treasurer of United States	$15,000 00	$9,000 00	
Inspection, sales, etc.			10,238 70
Disbursements	$15,000 00	$9,000 00	$13,822 66
Salaries	$7,683 40	$6,406 24	$7,914 29
Labor	756 55	7 50	
Publications	259 65		17 00
Postage and stationery	485 65	26 40	293 43
Freight and express	320 58	30 58	67 89
Heat, light and power	548 67	30 50	97 57
Chemical supplies	142 76	15 05	312 15
Seeds, plants and sundry supplies	380 75	1,036 62	34 68
Feeding stuffs	1,576 87		597 95
Library	467 94	388 99	73 27
Tools, implements and machinery	110 86	12 10	14 10
Furniture and fixtures	569 89		
Scientific apparatus	341 07	206 79	
Live stock	96 92	67 00	2 00
Traveling expenses	481 63	401 75	1,396 66
Contingent expenses	28 50		
Buildings	748 31	370 48	1,171 26
Balance June 30, 1908			1,830 41
Total	$15,000 00	$9,000 00	$13,822 66

INDEX.

APPENDIX

Official Inspections.

1 to 6

CONTENTS.