State of Connecticut

PUBLIC DOCUMENT No. 24

Fortieth Annual Report

OF

The Connecticut Agricultural Experiment Station

Being the annual report for the year ended October 31

1916

PRINTED BY ORDER OF THE LEGISLATURE

NEW HAVEN
PUBLISHED BY THE STATE
1917

PUBLICATION

APPROVED BY

THE BOARD OF CONTROL

THE TUTTLE, MOREHOUSE & TAYLOR PRESS

CONNECTICUT AGRICULTURAL EXPERIMENT STATION.

OFFICERS AND STAFF.

SEPTEMBER 30, 1916.

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Plant Breeding.
DONALD F. JONES, M.S., *Plant Breeder.*
C. D. HUBBELL, *Assistant.*

Vegetable Growing.

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REPORT OF THE BOARD OF CONTROL

OF

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION.

To His Excellency, Marcus H. Holcomb, Governor of Connecticut:

As required by law, the Board of Control of The Connecticut Agricultural Experiment Station herewith respectfully makes its annual report for the year ending October 31, 1916.

A full discussion of the Station work and its results is presented year by year in printed reports and bulletins. It is therefore only necessary here to give a general sketch of the Station's activities, sufficient in detail to show what it does and whether the service rendered pays for its cost to the State. This cost to the State for the year has been approximately $38,750.

This includes the State Forester's expenses, except for land purchase, and those of the State Entomologist and of the gipsy and brown-tail moth work in his charge.

This is equivalent to an expense per capita of the entire population of the State of about 3.5 cents.

We wish here to show in brief outline what service the Station has rendered in return. It will be seen, in the sketch which follows, that this service is not in the interest of farmers alone but that in several directions it has a distinct bearing on the public welfare, as in the protection from insect pests, the examination of foods and drugs, etc.

The object of the Station, as set forth in its act of incorporation, is to promote agriculture by scientific investigation and experiment.

Nevertheless, the one project which was most prominently in the mind and speech of those who urged its establishment was the control of the quality of commercial fertilizers, because this seemed to them their greatest need at the time.

Since then other forms of inspection and control work have been by statute delegated to this Station. Some of them have

a not very obvious connection with agricultural investigation, but the reasons for placing them under the management of this Station and of leaving them there are nevertheless very clear and convincing.

This is the only State institution which owns its laboratories, library, collections and grounds, with ample room for further expansion and equipped for investigation in the various departments required for control work.

Its entire staff give their whole time and attention to the Station work, its personnel is not affected by the vicissitudes of politics, and for forty years it has commanded the confidence of the public.

The Botanical Department.

Dr. Clinton in Charge.

The work of this department in finding and destroying the pine blister rust will be referred to with the work of the Forestry Department.

The experimental work has been in the study of plant diseases and the means for their prevention and control. Many of these experiments have to be continued from year to year until sufficient data have been secured for a comprehensive discussion of them. Thus, Dr. Clinton's last report gives the conclusions of fourteen years' study of means of preventing potato blight. The results of this work are now being tested and demonstrated by the county agents, a part of them in coöperation with Dr. Clinton.

A continued study of the channels of infection and method of spread of peach yellows, both on a commercial orchard of 900 trees and also in a small experimental orchard at our experiment field, promises helpful results.

The studies of fungicides and of the nature of various plant diseases need not be catalogued here.

The management and records of the Station experimental orchards are also largely in the botanist's care, as well as the tests of vitality and purity of agricultural seeds.

Considerable time and attention are given by the department to the identification of fungous diseases, weeds, cultivated and wild plants, varieties of fruits, etc., which are sent in from all parts of the State. Advice is given concerning the control of

diseases, and personal inspections of fruit, garden and greenhouse crops are frequently made for this purpose.

Particular attention is given to various troubles as they become especially prominent, as blast of onions, root-rot of tobacco, apple spot, etc. Purely scientific studies are made of certain fungi or groups of fungi.

Effort is made to gather in the herbarium specimens and notes on every disease, whether fungous or physiological, found on cultivated plants within the State.

The aim of the department is to combine research work with practical help in the control of plant diseases.

The Chemical Department.

Mr. Street in Charge.

Seven hundred and thirteen samples of fertilizing materials have been examined and the results published, calling attention to inferior or worthless articles.

The value of this work may be illustrated by the cottonseed meal situation. Very large amounts of this meal are used as a fertilizer, though it also finds use as a feed. Not less than $180,000 yearly are paid for meal used as a fertilizer.

Most of the car-lots brought into the State are analyzed at this Station, and if a shipment is not as guaranteed the buyer receives a rebate from the agent or shipper and a loss to the farmer is thus prevented.

Two hundred and seventy-three samples of feeds have likewise been examined. As a result of these yearly tests, many feeds of inferior value have been kept out of the State and the composition of the valuable feeds has been more correctly stated in their guaranties.

The number of food products and drugs tested has been 2,220. These include the samples referred to us by the State Dairy and Food Commissioner, who depends on the Station for the chemical evidence necessary in prosecution. In fifteen cases expert evidence was required in court.

Aside from the work done for the Dairy and Food Commissioner, the examination of foods for the general information of the public has been very extensive. Thus, in the last twenty years over 28,000 samples have been tested, various frauds

detected, in many cases the nutritive value determined, untruthful claims exposed, and the results given to the public so far as our publishing facilities permitted.

This educational work we believe has benefited the producer as well as the consumer both within and without the State and has resulted in a great improvement in the quality of food and also in the truthfulness of the labels under which it is sold. As an example may be cited a summary of purity tests gathered from two inspections.

	Per cent. of Samples Found Pure	
	1896-8	1914-6
Ground coffee	9	100
Honey	22	96
Molasses	68	93
Spices	65	90
Lard	54	90
Olive Oil	68	86
Average of 20 foods	59	90

The work which the Station began in 1906 on the examination of foods for diabetic patients and which has been carried on ever since has met with remarkable popularity and success. It has exposed the fraudulent and misleading claims of certain manufacturers who recommended their special foods, which in fact were dangerous or deadly for this class of patients, and has given, chiefly for the guidance of physicians, the essential chemical data on every brand of diabetic food which has been found in the American market. The results of the work are naturally in great demand, for an authority on the subject* states that it is probably an underestimate to consider that one per cent of all individuals in the country have or may have diabetes.

The accuracy and value of the Station work on foods and medicines have been widely recognized. As one evidence of this appreciation it may be noted that the chief chemist of the Station is one of the Federal Committee on Food Definitions and Standards, which determines these important matters for the guidance of the United States and state officials. He is also a member of the Committee on Revision of Analytical Methods, which are the standards for the American agricultural stations

* Joslin: Treatment of Diabetes Mellitus, p. 22.

and for analysts generally, and is referee on diabetic foods for the Council of the American Medical Association.

The laboratory has also done an important work in the exposure of the fallacious, misleading and dangerous claims made by manufacturers of many of the proprietary medicines widely advertised in this State. During the last four years 280 of these remedies have been analyzed and the analyses published in the annual reports. The economic loss arising from the use of these medicines is large, and the danger in their unrestricted and unintelligent use is a menace to the public health.

Twelve hundred and fifty-two pieces of Babcock glassware used in the State for determining the quality or market price of milk and cream have been tested and certified since our last report on this work.

These inspections, all required by law, have been made by this department.

Other work of the department has been as follows:

Chemical examinations for the Police Department and State Board of Pharmacy in efforts to abate the illegal traffic in narcotic drugs; many analyses for the departments of botany and agronomy; examination of many soil samples for farmers to determine their lime requirement; and study of methods of determining the availability of nitrogen in fertilizers, and of various other methods for the Association of Official Agricultural Chemists.

The Entomological Department.

Dr. Britton in Charge.

The work of this department has included a determination of the life history and habits of a destructive imported pine sawfly and a study of its parasites.

Methods of combating the striped beetle, the squash borer and the pine weevil have been studied with success.

Too little time has been left for such studies because both time and funds have of necessity been spent in the various kinds of inspection and control work required by law and made necessary by the invasions of dangerous insects pests. A brief outline of this work follows:

The eighty-eight nurseries in the State have been examined, and insects and fungous pests destroyed in the few cases where they were found.

More arduous has been the inspection of 291 shipments containing 2,102 parcels of imported nursery stock. Nearly a third of the shipments were infested with insects or fungi, some of which are dangerous and these were destroyed.

Four hundred and sixty-seven apiaries with 3,698 colonies were inspected, and about twenty per cent of the apiaries were found infected with foul brood.

The most important and expensive work has been directed to the detection and suppression of the gipsy moth, which is now present in twenty-one towns on our eastern border, having apparently been blown into the State almost at the same time by an easterly storm soon after the caterpillars hatched in 1913.

A gang of scouts under the direct supervision of Mr. Davis has searched the four worst infested towns, federal scouts working in the other towns. The number of infestations in the four towns this year was 169 as against 252 in 1915. Four other towns infested last year were found free in 1916, and in general most of the towns this year showed fewer infestations than last. This indicates that the work is really reducing the extent of the plague.

The work of the year may be indicated by these figures:

Number of infestations	210
Egg clusters destroyed	3,135
Trees banded and examined	13,165
Areas sprayed	60
Larvae destroyed	31,671
Fruit trees examined by scouts	205,579
Shade trees* examined by scouts	42,272

The fact that by the prompt and vigorous action of the State Entomologist two previous invasions of gipsy moth have been entirely blotted out gives ground for hope that the present much more extensive invasion may be kept from devastating woodland and finally be destroyed.

It should be stated that the Bureau of Entomology of the United States Department of Agriculture has most efficiently

* Only trees within 100 feet of a building.

coöperated with the State Entomologist during the past year and has spent nearly $15,000 in the work in this State.

Some scouting for brown-tail moths was done by our men at a cost of $186.61, and the towns of Putnam, Thomaston, Pomfret, and Woodstock were asked to cut and burn the winter nests. This was done, as provided by law, at an expense of $457, one-half of which was paid out of the appropriation for this work by the State.

Under the law passed by the last General Assembly a large mosquito ditching contract involving 2,668 acres, lying between the Branford and Hammonasset Rivers, has been executed, and according to universal testimony the mosquito plague has been very largely reduced.

The Forestry Department.

Mr. Filley in Charge.

The work required by law of the State Forester, Mr. Filley, who is also the Station forester, is the care of the State Forests and the management of the State Forest Fire Service.

There are four State Forests:

1. The Union forest of about 287 acres, which is in the heart of a rather extensive white pine region, where the only work done has been the removal of weeviled pine tops from plantations of previous years.

2. The Simsbury plantation of 130 acres, where 27,000 trees of four different species of pine have been set out and necessary renewal of fire lines done.

3. The Cornwall forest of 1,100 acres, on which no work has been done.

4. The Portland forest of about 1,200 acres. Here considerable work is done in improving the present stands, replanting land with various species, partly for experimental purposes and for making observations on the rate of tree growth. This is both the largest and the oldest of the State Forests, and here permanent plots have been established for studying forest growth.

All work in the State Forests has been greatly hindered this year by the impossibility of getting necessary labor.

No serious fires have occurred on the State land.

The Forest Fire Control is gradually increasing in efficiency. In the last year there has been less destruction than in other recent years. This is of course largely explained by weather conditions. Until the public realizes the danger in the careless setting and watching of fires great damage will be done in the critical periods of fall and spring—however efficient the fire service is—if rain or snow does not add its protection.

There were 327 forest fires last spring (46 per cent of them caused by the railroads), which burned over 17,000 acres, with estimated damage of over $68,800, as compared with 1,325 fires covering an estimated area of 100,000 acres, and damage of $291,000, in the spring of 1915.

Unquestionably the loss would have been much larger if there were not in every town a forest fire warden to call help and direct the work of fire-fighting intelligently.

The experimental forestry work is largely carried on in the Station's experimental forest of 150 acres at Rainbow and at the smaller white-pine field of 5 acres in Enfield.

But little work of this kind could be done this year because of the emergency caused by the white-pine blister rust, an imported disease, which destroys the young trees on which it fastens. It had been found some years ago by the entomologist's department on imported stock and destroyed. But its appearance in Massachusetts and the public apprehension of the destruction of our extensive white-pine plantations made necessary a careful scouting of this State.

This was done by the coöperation of this Station through the botanical department (Dr. Clinton), the forestry department (Mr. Filley), and the entomological department (Dr. Britton), with the Bureau of Plant Industry of the United States Department of Agriculture. The Bureau met nearly one-half of the expense.

Eighty plantations were inspected, and infected trees found and destroyed in ten of them and in one nursery.

The fungus has two hosts. Part of its life cycle is passed on the five-leaved pines; the rest of it is passed on currant or gooseberry leaves. It cannot spread directly from pine to pine, but its course must be: pine to currant, currant to pine.

The disease on pine is therefore self-limiting unless currants or gooseberries are in the neighborhood.

A very serious situation was found in Norfolk and vicinity, where the disease was found in an imported pine plantation set in 1909 and where wild and native currants and gooseberries were very abundant and abundantly infected. A camp was established with a crew of six men, directed by Messrs. Moss and Stoddard, and two months were spent in destroying all wild currants near the roadsides for several miles around. The infected area was found to cover about forty square miles. Later a hurried scouting showed the disease on currants to be very prevalent east of the Connecticut River, but on the west side it appears to be sporadic rather than general.

The Department of Vegetable Growing.

Mr. Huber in Charge.

This department has carried through its first year elaborate tests of the time and methods of seeding, greenhouse management and field culture of tomatoes in their effect on earliness and amount of crop.

A second test of Southport White Globe onion seed grown in different parts of the country has been made.

A hybrid sweet corn, a cross between Golden Bantam and Stowell's Evergreen, has been further selected and established and, in the opinion of market gardeners who have tested it, is a promising extra early white sweet corn.

Studies on methods of growing and storing potatoes to preserve vigor and productive capacity are also in progress, and a comparative test of twenty varieties of lettuce for summer growing, besides less extensive tests of other vegetables.

Complete data have been gathered on cost and income from a half-acre vegetable garden under average conditions.

Research Work Supported by the Adams Fund.

It remains to briefly allude to two departments of Station work supported by the Adams Fund, which is received from the federal government and which the law requires to be spent in scientific investigation on subjects approved by the Office of Experiment Stations and preferably on projects requiring continuation through a term of years.

One of these Adams projects is: studies in inheritance in plants, in charge of Mr. Jones. In some parts of this work

he has had the coöperation of Dr. E. M. East of the Bussey Institution of Harvard University, and of the Bureau of Plant Industry of the United States Department of Agriculture.

The studies have been chiefly on inheritance in corn and tobacco. Less elaborate studies of tomatoes and selection experiments with rye have also been made.

The discussion of the results in relation to the laws of heredity are published mainly in scientific journals. Their bearing on practical problems of improving yield and quality of the crops mentioned is discussed in our reports.

To know what can and what cannot be done by crossing strains or varieties and how it may be possible to fix any apparently improved qualities in a cross requires patient investigation and must be preliminary to any successful practical undertaking.

In this connection and in coöperation with the Storrs Station, but not on the Adams Fund, a corn survey of the whole State has been carried out, and the most promising varieties are being grown for three years both at the Storrs Station and on our own field to test their vigor and yield, with the object of finding the best and in the end encouraging the using of home-grown seed instead of depending on seed brought from outside.

The other department of distinctive research work is that under Dr. Osborne's direction, on the constitution of the protein bodies and their relative value in nutrition. This work, begun with very limited support about twenty-six years ago, has become recognized here and abroad as epoch making. It has helped to revolutionize our conception of nutrition and the problems of cattle feeding and has furnished a starting point for other investigators and practical experimenters.

The work now receives substantial support from the Carnegie Institution.

From this brief and incomplete summary of the Station work one may get a general idea of its scope. Some further idea of its amount may be gained from the following additional statistics:

Number of letters written	11,956
Public addresses	97
Papers in scientific journals	23
Specimens of insects and fungi determined for inquirers	524
Specimens added to herbarium	1,677
Samples of seed tested	335

During the year a small insectary has been built for the entomological department.

A section of the greenhouse which had become useless was taken down and a new one built in its place wholly by the workmen on the place under Mr. Veitch's direction. They have also built a garage for the Station motors.

The annual field meeting at the Mount Carmel Farm on August 16th brought together about 400 farmers and their wives, who lunched together, listened to short talks and discussions on the Station work, and inspected the various field experiments which were in progress.

This experiment field, most efficiently managed by Mr. Hubbell, has been a great help in the experiment work of the Station. The results of laboratory work may here be tested under our control before they are passed on to the county agents for tests in all parts of the State. Every department of the Station is represented in these field tests at Mount Carmel.

Changes in the Station Staff.

Miss E. B. Whittlesey, who has served efficiently as herbarium assistant and stenographer for some years, resigned September 30, 1916.

In June, 1916, G. L. Davis terminated his work as assistant chemist.

Publications.

During the year the Station has issued its annual report containing 555 pages, 28 plates and 2 maps, and three bulletins aggregating 80 pages and 19 plates.

The Needs of the Station.

A larger appropriation for the support of the Station is urgently needed to permit its growth in response to the demands on it.

It is universally acknowledged that the work of the Stations is the basis for any sound advance in agriculture and in agricultural education.

The Extension Service, which has been so remarkably advanced of late, is designed wholly to carry to the individual

farms and farmers of the State a knowledge of what has been established by the work of the Stations. It may be likened to a means of transportation, absolutely necessary as a means, but absolutely dependent for its usefulness on abundant production. If crops fail, if manufacturing interests decline, the railroads must either lay off their cars or run them empty.

Efficient and well-supported Stations are the first need of the Extension Service. Otherwise, it must curtail its traffic or, what is worse, run empty.

All of which is respectfully submitted.

GEORGE A. HOPSON,
Secretary.

NEW HAVEN, CONN., October 31, 1916.

REPORT OF THE TREASURER, 1916

E. H. JENKINS, in account with THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION for the fiscal year ending September 30, 1916.

RECEIPTS.

Balance on hand, October 1, 1915 (Analysis Fees)		$ 1,476.18
State Appropriation, Agriculture	$17,500.00	
State Appropriation, Food	2,500.00	
State Appropriation, Insect Pest	3,750.00	
United States Appropriation, Hatch	7,500.00	
United States Appropriation, Adams	7,500.00	
Analysis Fees	8,135.00	
Sale of Station Produce	8.04	
Miscellaneous Receipts	1,037.34	
From Lockwood Trust Income (including sale of tree seedlings and Mt. Carmel Farm Produce)	9,609.68	
		57,540.06
		$59,016.24

DISBURSEMENTS

E. H. Jenkins, director, salary	$2,800.00
E. H. Jenkins, treasurer, "	400.00
V. E. Cole, salary	969.99
L. M. Brautlecht, "	870.00
J. P. Street, "	2,500.00
T. B. Osborne, "	2,400.00
E. M. Bailey, "	1,800.00
C. B. Morison, "	1,400.00
C. E. Shepard, "	1,025.00
G. L. Davis, "	666.66
W. E. Britton, "	2,500.00
G. P. Clinton, "	2,500.00
E. M. Stoddard, "	1,300.00
W. O. Filley, "	2,200.00
A. E. Moss, "	1,700.00
E. L. Ferry, "	1,320.00
H. F. Huber, "	1,291.67
D. F. Jones, "	1,500.00
H. Lange, "	925.00
V. L. Churchill, "	900.00
W. Veitch, "	700.00
E. L. Avery, "	480.00
E. B. Whittlesey, "	720.00
C. D. Hubbell, "	800.00
C. D. Hubbell	9.33
H. Kiley	748.00
W. Pokrob	231.00

G. Graham	$ 809.33
F. Sheldon	748.00
O. Welch	678.00
J. Leschke	530.00
Labor	4,369.91
Publications	953.58
Postage	274.53
Stationery	402.28
Telephone and Telegraph	187.88
Freight and Express	165.80
Gas, Kerosene and Electricity	791.97
Coal	1,704.60
Water	134.75
Chemicals and Laboratory Supplies	862.95
Agricultural and Horticultural Supplies	182.29
Miscellaneous Supplies	764.19
Fertilizers	674.01
Feeding Stuffs	310.78
Library and Periodicals	501.55
Tools, Machinery and Appliances	704.76
Furniture and Fixtures	680.84
Scientific Apparatus	65.46
Live Stock	2.10
Traveling by the Board	172.50
Traveling by the Staff	1,245.71
Gasoline for Automobiles	280.59
Traveling in connection with Adams Fund Investigations	126.93
Insurance	560.27
Insect Pest Appropriation to State Entomologist	3,750.00
Contingent	213.93
Lockwood Expense	400.00
New Buildings	533.19
Betterments	7.55
Repairs	370.09
Total Disbursements	$58,816.97
Balance on hand, Sept. 30, 1916 (Analysis Fees)	199.27
	$59,016.24

NEW HAVEN, CONN., Oct. 19, 1916.

THIS IS TO CERTIFY that we have audited the accounts of E. H. Jenkins, Treasurer of Connecticut Agricultural Experiment Station, for the fiscal year ending September 30, 1916, and have found them correct.

WILLIAM P. BAILEY,
JAMES P. TOBIN,
Auditors of Public Accounts.

PART I.

Report on Commercial Fertilizers, 1916.

BY E. H. JENKINS, *Director, and* JOHN PHILLIPS STREET,
Chemist in Charge of the Analytical Laboratory.

During 1916 forty-eight individuals and firms have entered for sale in this state 389 brands of fertilizers classified as follows:

Nitrogenous superphosphates with potash	181
Nitrogenous superphosphates without potash	125
Bone manures and tankage	33
Fish, blood, castor pomace and chemicals	50
Total	389

During the spring months V. L. Churchill, the sampling agent, visited 100 towns and villages of the state and gathered 537 samples of commercial fertilizers. These represented all the brands registered with the exception of the following:

American Agricultural Chemical Co.'s Dissolved Acid Phosphate, Dissolved Animal Bone, H. G. Ground Bone, H. G. Dried Blood, *Complete Tobacco Manure 1916, Bradley's Tobacco Manure 1916 (carbonate), East India Economizer Phosphate 1916, East India Roanoke Phosphate 1916, Williams and Clark's Royal Phosphate 1916, Williams and Clark's Matchless Fertilizer 1916, Williams and Clark's Utility Brand 1916; *Armour's* 4-8-1, Brewer's Special No. 2; *Coe-Mortimer's* 6-30 Tankage, Original Ammoniated Dissolved Phosphate 1916; *International* Buffalo Ammoniated Phosphate; †*James'* Ground Bone; *Lister's* Buyer's Choice Acid Phosphate, U. S. Superphosphate 1916, H. G. Special for Spring Crops 1916; *National* Nitrogen Phosphate Mixture No. 3; *Nitrate Agencies Co.'s* H. G. Acid Phosphate 14%, Dried Blood; *Olds and Whipple's* †Wood Ashes; *Royster's* Valley Tobacco Compound; *Spencer Bros.* †Castor Pomace; *Tennessee Coal*

*A purchaser's sample was analyzed.
†A manufacturer's sample was analyzed.

and Iron R. R.'s Duplex Basic Phosphate "AA"; *Worcester Rendering Co.'s* Royal Worcester Corn and Grain Fertilizer, Royal Worcester Potato and Vegetable Fertilizer; *Whitman and Pratt's* 2½-10, 3-8-1, 4-8-1, and 5-10. Of these it was therefore impossible to make analyses, except where the manufacturer had deposited a sample of the brand with the station, or where individuals sent samples of these brands. In such cases the Station assumes responsibility only for the correctness of the analysis and not for the sampling.

CLASSIFICATION OF FERTILIZERS ANALYZED.

1. Containing nitrogen as the chief active ingredient:	
Nitrate of soda	11
Dried blood	1
Horn and hoof wastes	3
Cotton seed meal	177
Castor pomace	19
2. Containing phosphoric acid as the chief active ingredient.	
Ground phosphate rock	4
Basic lime phosphate	2
Precipitated bone phosphate	14
Precipitated phosphate	1
Acid phosphate	18
3. Containing potash as the chief active ingredient:	
Muriate of potash	7
Sulphate of potash	1
Cotton hull ashes	2
Wood ash carbonate	1
4. Raw materials chiefly valuable for nitrogen and phosphoric acid:	
Fish manures	20
Tankage	16
Bone manures	29
5. Mixed fertilizers:	
Nitrogenous superphosphates with potash	202
Nitrogenous superphosphates without potash	128
Home-mixed fertilizers	2
6. Miscellaneous fertilizers and waste products:	
Sheep and goat manures	4
Wood ashes	29
Limestones and limes	13
Miscellaneous	42
Soils	82
Total	828

I. RAW MATERIALS CHIEFLY VALUABLE FOR NITROGEN.

NITRATE OF SODA, OR SODIUM NITRATE.

As offered in the Connecticut market this year, nitrate of soda has contained an average of 15.47 per cent of nitrogen, equivalent to 93.8 per cent of pure sodium nitrate.

The following eleven samples were analyzed:

7319. Sold by Sanderson Fertilizer and Chemical Co., New Haven. Sampled at factory.

7367. Sold by Apothecaries Hall Co., Waterbury. Stock of C. A. Templeton, Waterbury.

7876. Sold by Coe-Mortimer Co., New York. Stock of W. R. Markham, Middletown.

7371. Sold by Berkshire Fertilizer Co., Bridgeport. Stock of W. H. Burr, Westport.

7262. Sold by Nitrate Agencies Co., New York. Stock of C. R. Treat, Orange.

7292. Sold by Nitrate Agencies Co., New York. Stock of Spencer Bros., Suffield.

7375. Sold by Wilcox Fertilizer Co., Mystic. Stock of G. F. Stannard, Branford.

7287. Sold by American Agricultural Chemical Co., New York. Stock of Geo. S. Phelps and Co., Thompsonville.

7384. Sold by L. T. Frisbie Co., New Haven. Stock of Lightbourn and Pond Co., New Haven.

7267. Sold by L. T. Frisbie Co., New Haven. Sampled at Station Farm, Mt. Carmel.

7700. Old stock of Station.

ANALYSES OF NITRATE OF SODA.

Station No.	7319	7367	7876	7371	7262	7292
Per cent of						
Nitrogen guaranteed	15.00	15.00	15.00	14.80	15.00	15.00
Nitrogen found	15.64	15.28	15.64	15.52	15.40	15.44
Cost per ton	$72.50	72.00	75.00	75.00	75.00	79.00
Nitrogen costs cents per pound	**23.2**	**23.6**	**24.0**	**24.2**	**24.4**	**25.6**

Station No.	7375	7287	7384	7267	7700
Per cent of					
Nitrogen guaranteed	15.00	15.00	15.00	15.00	.....
Nitrogen found	15.04	15.52	15.52	15.68	15.52
Cost per ton	$78.00	85.00	90.00	.....	.....
Nitrogen costs cents per pound	**25.9**	**27.4**	**29.0**	.....	.....

The cost of nitrogen in nitrate of soda in small lots at retail has been about 24 1-2 cents per pound, 8 or 9 cents more than in the previous year. This is a rise of more than 50 per cent.

DRIED BLOOD.

Only one sample was analyzed.

7316. Sold by L. T. Frisbie Co., New Haven. Sampled at factory. Guaranteed 9.85, contained 9.78 per cent of nitrogen. It cost $60.00 per ton, the nitrogen costing 30.7 cents per pound.

HORN AND HOOF WASTES.

3000. Horn and Hoof Meal, sold by H. J. Baker and Bro., New York, contained 14.21 per cent of nitrogen.

7229. Horn Waste, sampled and sent by Mr. Warren, New Haven, contained 15.25 per cent of nitrogen.

7239. Horn Shavings, sold by Kane Button Co., Newtown, and sampled and sent by J. L. Mitchell, South Britain, contained 15.13 per cent of nitrogen.

Steamed Horn and Hoof Meal, like sample **3000**, is a fairly active form of nitrogen. The nitrogen in that sample is divided as follows:

As ammonia	0.41
Organic, water soluble	2.52
active insoluble	8.86
inactive insoluble	2.42
	14.21

The nitrogen of raw horn on the other hand is much less available.

COTTON SEED MEAL.

(*Analyses on pages 6 and 7.*)

One hundred and seventy-seven samples of this material, bought for use as a fertilizer, have been tested. Most of the samples represented car lots and in the aggregate indicate a cash outlay by Connecticut purchasers of about $170,000.

One hundred and four of the samples contained the full amount of nitrogen guaranteed and require no detailed report here. But seventy-three lots of meal, or 41 per cent of all the car lots brought into the state, of which we have record, did not contain as much nitrogen as was guaranteed.

The amount of deficiency was:

		Average Deficiency in Money Value per Ton.*
In 2 samples	One per cent or more	$4.59
" 5 "	0.75 to 1.00 per cent	3.44
" 17 "	0.50 " 0.75 "	2.30
" 30 "	0.25 " 0.50 "	1.44
" 18 "	0.10 " 0.25 "	0.62

In case the buyer, to whom the analyses are reported wherever this is possible, made a claim for rebate because the meal delivered was not what was guaranteed, an adjustment has not been refused to our knowledge and thus a good deal of money has been saved.

The following statement shows the number of samples failing to meet their guaranty which each of the firms named shipped into this state:

	Above Guaranty.	Below Guaranty.	Total.
Humphreys-Godwin Co.	51	28	79
Empire Cotton Oil Co.	15	8	23
Southern Cotton Oil Co.	5	5	10
Texas Cake and Linter Co.	11	10	21
F. M. Brode & Co.	0	12	12
Terrell Cotton Oil Co.	7	0	7

On the 89 samples which met their guaranty and of which the prices are given the average per cent of nitrogen is 6.65, ranging from 5.30, the only one below 6.07, to 7.11 and the average cost is $39.52.

Of the 62 samples which did not meet their guaranty and of which the prices are given the average per cent of nitrogen is 6.03, ranging from 4.97 to 7.30 and the average cost is $37.59.

Assuming 2.9 and 1.9 as the respective percentages of phosphoric acid and potash in cotton seed meal, if they are valued at 4 cents and 25 cents per pound respectively, the nitrogen of cotton seed meal would cost about 20.9 cents per pound.

* Reckoning nitrogen at 20.9 cents per pound.

COTTON SEED MEALS BELOW GUARANTY.

Station No.	Manufacturer or Jobber, Car No. or Marks.	Purchased, Sampled, or Sent by	Per cent. Nitrogen. Found.	Per cent. Nitrogen. Guaranteed.	Cost per ton.
	F. W. Brode & Co.				
7560	852	E. N. Austin	5.21	5.76	$34.00
7385		L. T. Frisbie Co.	6.12	6.50	.....
7575		C. K. Hale	5.74	6.50	38.00
7275		C. H. Hatheway	5.83	6.50	41.50
7442	No. 1	W. J. Hayes	5.74	6.17	37.00
7443	No. 2	" "	5.39	6.17	35.50
7006	38200	Holmes, Keeler & Kent Co.	6.11	6.50	.....
7597	93790	K. C. Kulle	6.57	7.00	33.00
7825	15994	" "	6.71	7.00	33.00
7826	24252	" "	6.84	7.00	33.00
7824	108894	" "	6.70	7.00	33.00
7574		W. J. Norton	5.68	6.50	37.50
	Empire Cotton Oil Co.				
6893	95519	American Sumatra Tobacco Co.	5.66	6.17	.....
6974	5946	" " " "	6.06	6.17	.....
6975	33193	" " " "	5.66	6.17	.....
6976	32674	" " " "	6.03	6.17	.....
6977	60477	" " " "	6.02	6.17	.....
7187	88884	" " " "	5.90	6.17	.....
7188	61786	" " " "	6.06	6.17	.....
7191	578560	" " " "	6.03	6.17	.....
	Humphreys-Godwin Co.				
7432		Berkshire Fertilizer Co.	4.97	6.50	36.00
7519	75184	A. W. Higgins	6.01	6.50	36.00
7572		S. H. Neelans	5.10	6.50	36.00
7311	65404	Geo. S. Phelps & Co.	5.56	6.50	39.50
7394	120570	" " "	5.55	6.50	38.00
7444	65404	" " "	5.49	6.50	39.50
7541	9355	E. S. Seymour	5.98	6.18	35.00
7399	48079	Spencer Bros.	5.26	6.50	38.00
7400	60167 x 11840	" "	5.96	6.18	37.75
7401	12856 x 14372	" "	5.95	6.18	37.75
7402	6868	" "	5.95	6.50	38.00
7404	19102 x 40429	" "	6.03	6.18	37.75
7406	142495	" "	5.95	6.18	37.75
7408	173444	" "	5.80	6.18	37.75
7411	132492	" "	5.15	6.50	36.00
7602	37132	" "	6.13	6.50	38.00
7608	145637	" "	5.78	6.18	35.00
7609	87212	" "	6.00	6.50	40.00
7610	108947	" "	5.84	6.18	35.00
7611	6896	" "	5.30	6.50	36.50
7613	120464	" "	6.05	6.18	37.75
7614	109947	" "	6.02	6.18	38.00
7615	96181	" "	6.14	6.50	38.00
7620	40218	" "	5.99	6.50	38.00
7621	22724	" "	5.80	6.18	35.00

COTTON SEED MEALS BELOW GUARANTY.—*Continued.*

Station No.	Manufacturer or Jobber, Car No. or Marks.	Purchased, Sampled, or Sent by	Per cent. Nitrogen. Found.	Per cent. Nitrogen. Guaranteed.	Cost per ton.
	Humphreys-Godwin Co. *(Continued.)*				
7622	118024	Spencer Bros.	6.14	6.50	$40.00
7699	533876	James Sullivan	5.95	6.18	37.25
7754	7798	Griffin-Neuberger Tob. Co.	6.80	7.00	36.00
	Lanier Bros.				
7573		J. N. Lasbury	5.70	6.00	35.75
	Meech & Stoddard.				
7459		E. H. Rollins	6.11	6.50	37.00
7461		J. S. Dewey	6.08	6.50	37.00
	C. L. Montgomery & Co.				
7524	31654 x 18551 x 27802 x 87008 x 102771	L. T. Frisbie Co.	5.68	6.50	40.00
	W. C. Northern.				
7431		M. E. Thompson	5.88	6.24	38.00
	Olds & Whipple.				
7213	17448	L. B. Haas & Co.	7.29	7.82	46.08
7252	13394	" " "	7.28	7.82	42.92
7253	24398	" " "	7.30	7.82	42.97
	W. Newton Smith.				
6971		E. N. Austin	5.88	6.50	35.00
	J. E. Soper Co.				
6980		J. M. Bahr	6.01	6.50	40.00
	Southern Cotton Oil Co.				
7589	72226	Conn. Tobacco Corp.	6.01	6.18	34.25
7591	3701	" " "	5.82	6.18	34.25
7593	29444	" " "	6.07	6.18	34.25
7544	37638,	" " "	5.94	6.18	34.25
7546	151151	" " "	6.01	6.18	34.25
	Texas Cake and Linter Co.				
7418	54518	A. W. Camp	5.93	6.50	38.50
7261	504533	Conn. Tobacco Corp.	6.26	7.00	41.00
7260	3491	" " "	6.34	7.00	41.00
7596	104652	" " "	6.82	7.00	41.00
7268	16311	Griffin-Neuberger Tob. Co.	6.59	7.00	41.00
7395	123310	" " "	6.87	7.00	41.00
7753	1206	" " "	6.68	7.00	41.00
7276	29232	Geo. S. Phelps & Co.	6.12	6.50	38.00
7439	54518	Geo. T. Soule	5.80	6.50	40.00
7440	60072	" " "	6.06	6.50	39.00

CASTOR POMACE.

This is a residue from the manufacture of castor oil and is used chiefly as a tobacco fertilizer. Experience indicates that it is a little slower in its action than cotton seed meal and that it gives a somewhat heavier quality to the tobacco leaf. Stock will eat it greedily if they have the chance, but it is extremely poisonous.

The following nineteen samples were analyzed:

7013, 7019, 7021, 7022, 7028, 7029 and **7194.** Sold by G. S. Alexander and Co., New York. Sampled and sent by Connecticut Tobacco Corporation, Tariffville and Silver Lane. The respective car numbers were 64298, 10002, 46176, 210368, 67663, 112275 and 8606.

7289, 7330 and **7366.** Sold by Apothecaries Hall Co., Waterbury. Stock of Patrick McCue, Windsor Locks, K. C. Kulle, Suffield, and J. A. Marston, Wallingford, respectively.

7370, 7580 and **7582.** Sold by Baker Castor Oil Co., New York. Stock of Fred Thrall, Windsor, American Sumatra Tobacco Co. (Tariffville plant), and American Sumatra Tobacco Co. (So. Windsor plant), respectively.

7465. Sold by Berkshire Fertilizer Co., Bridgeport. Stock of W. N. Pinney, Rockville.

7471. Sold by A. L. Koster, Suffield. Stock of S. B. Warner, Windsor.

7317 and **7579.** Sold by Olds and Whipple, Hartford. Sampled at factory and from stock of American Sumatra Tobacco Co. (Poquonock plant), respectively.

7243. English Castor Pomace. Sold, sampled and sent by Spencer Bros., Suffield.

7873. Sold by Wilcox Fertilizer Co., Mystic. Stock of C. B. Sikes, Jr., Ellington.

ANALYSES OF CASTOR POMACE.

Station No.	7013	7019	7021	7022	7028	7029	7194
Per cent of							
Nitrogen guaranteed	.....	.....	.....	.....	.....	.....	.....
Nitrogen found	6.62	6.01	6.55	6.14	6.42	6.00	5.87
Cost per ton	.....	.....	.....	.....	.....	.....	.....

Station No.	7289	7330	7366	7370	7580	7582	7465
Per cent of							
Nitrogen guaranteed	4.52	4.52	4.52	4.50	4.50	4.50	5.00
Nitrogen found	4.99	5.15	5.04	4.40	4.59	4.53	4.90
Cost per ton	$31.00	28.00	32.00	.....	26.00	26.00	30.00

Station No.	7471	7317	7579	7243	7873
Per cent of					
Nitrogen guaranteed	4.94	5.00	5.00	5.59	4.53
Nitrogen found	4.82	5.50	5.13	5.64	4.81
Cost per ton	$31.00	30.00	32.00	33.00	27.00

In sample **7370** one per cent of phosphoric acid and potash was also guaranteed; the sample contained 1.73 and 0.97 per cent, respectively.

There are two grades of castor pomace, one guaranteed 6.0 per cent, the other 4 1-2 per cent of nitrogen. If 4 cents per pound for phosphoric acid and 25 cents per pound for potash were assumed in valuation, the average cost of nitrogen in the higher grade pomace would be about 19.8 cents, in the lower grade 23.5 cents.

II. RAW MATERIALS CHIEFLY VALUABLE FOR PHOSPHORIC ACID.

GROUND PHOSPHATE ROCK.

For the mixed farming which is most common in this state and on light soils containing little humus which constitute the larger part of our agricultural land, experiments indicate that soluble forms of phosphoric acid, acid phosphate, basic phosphate, ground bone, etc., are much more profitable to use than the much less soluble and available raw phosphates. This has been quite definitely settled by careful and long continued tests.

Whether on such of our soils as are relatively deficient in phosphoric acid and with short rotations the abundant use of lime with stable manure and green manures, which greatly increase the vegetable matter in the land, may make raw phosphates more profitable than the soluble phosphates in supplementing the phosphoric acid in the manure, is still an open question and can only be definitely determined by well-planned and long continued tests. The Connecticut stations are engaged in this work.

Three samples of finely ground phosphate rock ("floats") have been analyzed:

7415. Stock of Thomas Holt, Southington. Cost $9.00 per ton. It contained 29.80 per cent of phosphoric acid.

7433. Sold by Federal Chemical Co., Columbia, Tenn. Stock of C. M. Griffin, East Granby. Cost $9.00 per ton. It was guaranteed 29.75 and contained 31.48 per cent of phosphoric acid.

7874. Sold by American Agricultural Chemical Co., New York. Stock of Thomas Martin, Bridgeport. Cost $12.00 per ton. It was guaranteed 31.12 and contained 30.50 per cent of phosphoric acid.

SPURIOUS PHOSPHATE ROCK.

6841. This sample of alleged phosphate rock was sent by C. A. Peabody, Vernon. It was agriculturally worthless material containing only 0.22 per cent of phosphoric acid and 94.75 per cent of matter insoluble in acid (sand).

BASIC LIME PHOSPHATE.

Shipments of basic phosphate from abroad have been almost cut off on account of the European war. As a substitute for basic phosphate a product called "basic lime phosphate" has been put on the market, of which we have analyzed two samples.

7880. Basic Lime Phosphate. Sold by American Agricultural Chemical Co., New York. Stock of C. R. Main, Norwich. Cost $17.50 per ton. Guaranteed 13 per cent of "available" phosphoric acid. It contained 14.32 per cent total and 10.94 per cent "available" phosphoric acid, the latter costing 8.0 cents per pound.

7883. Basic Fruit and Legume Phosphate. Sold by Coe-Mortimer Co., New York. Stock of August Preli, So. Glastonbury. Cost $18.25 per ton. Guaranteed 13 per cent of "available" phosphoric acid. It contained 15.10 per cent total and 13.05 per cent "available" phosphoric acid, the latter costing 7 cents per pound.

PRECIPITATED BONE PHOSPHATE.

This is a manufacturing by-product and consists of fine precipitated phosphate of lime, neutral in reaction, and contains no nitrogen. It is very readily soluble in ammonium citrate solution and is quickly available to crops. It is at present chiefly used as a tobacco fertilizer.

Fourteen samples were analyzed, all of which were sold by Olds and Whipple, Hartford, and all but one of which were sampled and sent by the above firm; **7374** was sampled by the station agent from the jobber's stock. The samples were uniformly guaranteed 36 per cent "available" phosphoric acid.

The respective car numbers were as follows: 254639, 213797, none, 75653, 7393, 92416, 73930, 53525, 26006, 65605, 112, 4513, 9672 and 7222.

ANALYSES OF PRECIPITATED BONE.

Station No.	7217	7312	7374	7416	7434	7538	7655
Per cent of							
Water-soluble phosphoric acid	1.44	1.30	1.25	1.01	1.01	1.18	1.32
Citrate-soluble phosphoric acid	28.67	27.71	31.26	29.37	33.05	29.53	32.09
Citrate-insoluble phosphoric acid	9.81	11.17	8.05	4.86	8.80	10.57	8.49
Total phosphoric acid	39.92	40.18	40.56	35.24	42.86	41.28	41.90
"Available" phosphoric acid	30.11	29.01	32.51	30.38	34.06	30.71	33.41

Station No.	7714	7715	7808	7867	8210	8232	8242
Per cent of							
Water-soluble phosphoric acid	0.76	1.23	1.30	1.08	1.03	0.87	0.87
Citrate-soluble phosphoric acid	28.30	31.48	30.71	28.72	28.60	28.94	29.34
Citrate-insoluble phosphoric acid	4.62	7.25	9.57	7.20	11.81	8.15	8.89
Total phosphoric acid	33.68	39.96	41.58	37.00	41.44	37.96	39.10
"Available" phosphoric acid	29.06	32.71	32.01	29.80	29.63	29.81	30.21

The above samples sold for a uniform price of $1.33 1-3 per unit of "available" phosphoric acid, or 6.7 cents per pound.

PRECIPITATED PHOSPHATE.

7463. Sold by Berkshire Fertilizer Co., Bridgeport. Stock of W. N. Pinney, Rockville. Cost $30.00 per ton. Guaranteed 22 per cent "available" phosphoric acid. It contained:

Water-soluble phosphoric acid	8.86
Citrate-soluble phosphoric acid	16.52
Citrate-insoluble phosphoric acid	0.72
Total phosphoric acid	26.10
"Available" phosphoric acid	25.38

Available phosphoric acid cost 5.9 cents per pound.

DISSOLVED ROCK PHOSPHATE OR ACID PHOSPHATE.

This material is made by treating mineral phosphates or phosphate rock with oil of vitriol (sulphuric acid), which converts

the larger part of the phosphoric acid into forms soluble in water, and at the same time changes into sulphate of lime a large part of the lime which was previously combined with phosphoric acid.

The guaranty usually gives the percentage of "available" phosphoric acid. This is only a trade name for the sum of the water-soluble and citrate-soluble phosphoric acid. Its amount gives no certain indication of the actual availability of this phosphoric acid to crops. In acid phosphate, however, well made from domestic rock, it is fair to assume that the larger part of the "available" is also agriculturally available.

The following eighteen samples were analyzed:

7263. Sold by Nitrate Agencies Co., New York. Stock of C. R. Treat, Orange.

7373. Sold by Nitrate Agencies Co., New York. Stock of S. R. Macdonald, Wallingford.

7562. Sold by American Agricultural Chemical Co., New York. Stock of C. W. Hudson, Warehouse Point.

7462. Sold by American Agricultural Chemical Co., New York. Stock of F. O. Burr, Branford.

7294. Sold by Nitrate Agencies Co., New York. Stock of Spencer Bros., Suffield.

7565. Sold by Sanderson Fertilizer and Chemical Co., New Haven. Sampled at factory.

7900. Sold by F. S. Royster Guano Co., Baltimore, Md. Stock of D. L. Clark and Sons, Milford.

7466. Soluble Phosphate. Sold by Bowker Fertilizer Co., New York. Stock of W. D. Grant, Willimantic.

7295. Sold by Nitrate Agencies Co., New York. Stock of The F. S. Platt Co., New Haven.

7467. High Grade Soluble Phosphate. Sold by Coe-Mortimer Co., New York. Stock of J. E. Stoddard, Abington.

7286. Sold by American Agricultural Chemical Co., New York. Stock of Blish Hardware Co., So. Manchester.

7266. Sold by L. T. Frisbie Co., New Haven. Stock of Station Farm, Mt. Carmel.

7288. Sold by Apothecaries Hall Co., Waterbury. Stock of Patrick McCue, Windsor Locks.

7318. Plain Superphosphate. Sold by Sanderson Fertilizer and Chemical Co., New Haven. Stock of H. O. Chatfield, Seymour.

7468. Sold by Coe-Mortimer Co., New York. Stock of J. E. Stoddard, Abington.

7561. Sold by American Agricultural Chemical Co., New York. Stock of Fred Thrall, Windsor.

7570. Sold by Wilcox Fertilizer Co., Mystic. Sampled at factory.

7879. Sold by American Agricultural Chemical Co., New York. Stock of D. A. Doolittle, Bethany.

ANALYSES OF ACID PHOSPHATE.

Station No.	Water-soluble phosphoric acid.	Citrate-soluble phosphoric acid.	Citrate-insoluble phosphoric acid.	Total phosphoric acid.	"Available" phosphoric acid found.	"Available" phosphoric acid guaranteed.	Cost per ton.	"Available" phosphoric acid costs cents per pound.
7263	13.92	2.04	0.65	16.61	15.96	16.00	$18.00	*5.6
7373	14.74	1.79	0.23	16.76	16.53	16.00	18.50	5.6
7562	11.90	4.38	1.09	17.37	16.28	16.00	21.25	6.5
7462	16.64	1.65	0.37	18.66	18.29	18.00	24.50	6.7
7294	13.92	3.02	0.27	17.21	16.94	16.00	23.00	6.8
7565	14.20	2.67	0.43	17.30	16.87	16.00	23.00	6.8
7900	13.22	3.04	1.06	17.32	16.26	16.00	22.50	6.9
7466	9.05	5.21	0.61	14.87	14.26	14.00	20.50	7.2
7295	13.68	3.03	0.37	17.08	16.71	16.00	25.00	7.5
7467	9.64	4.92	0.52	15.08	14.56	14.00	22.00	7.6
7286	11.71	4.82	1.06	17.59	16.53	16.00	25.50	7.7
7266	15.68	1.14	0.13	16.95	16.82	16.00	.....	..
7288	12.72	2.34	0.61	15.67	15.06	14.00	.....	..
7318	13.44	2.76	0.49	16.69	16.20	14.00	.....	..
7468	11.66	4.65	0.74	17.05	16.31	16.00	22.50	6.9
7561	9.53	4.66	1.19	15.38	14.19	14.00	.....	..
7570	12.33	3.97	1.87	18.17	16.30	16.00	.....	..
7879	12.02	4.26	1.07	17.35	16.28	16.00	27.50	8.4

One of the above samples was of the highest grade, 18 per cent "available," twelve were guaranteed 16 per cent and five 14 per cent.

The average cost of available phosphoric acid in the samples here reported was 6.94 cents per pound.

* Mixed car lot.

III. RAW MATERIALS OF HIGH GRADE CONTAINING POTASH.

Owing to the European war very little, if any, potash has been shipped to this country during the past two years. All but two of the eight samples of potash salts analyzed during the past season represented stock in the hands of certain farmers of the state, who were tempted by the abnormally high prices to dispose of their surplus stock.

MURIATE OF POTASH.

7377. Stock of R. E. Banks, Fairfield; contained 61.08 per cent of potash.

7196. Stock of A. N. Farnham, Westville; contained 53.36 per cent of potash.

6866. Stock of C. E. Billin, Southbury; contained 49.32 per cent of potash.

6794. Stock of E. J. Wallace, Wallingford; contained 43.88 per cent of potash.

6827, 6829 and **6831.** Stock of W. A. Henry and Son, Wallingford; contained 50.80, 51.76 and 52.68 per cent of potash, respectively.

SULPHATE OF POTASH.

6830. Stock of W. A. Henry and Son, Wallingford, contained 51.56 per cent of potash.

COTTON HULL ASHES.

6843. Sampled and sent by Griffin-Neuberger Tobacco Co., North Bloomfield; contained 14.48 per cent of water-soluble potash.

6840. Sampled and sent by Olds and Whipple, Hartford; contained 20.34 per cent of moisture and 10.08 per cent of water-soluble potash.

WOOD ASH CARBONATE.

7313. Sampled and sent by Olds and Whipple, Hartford. Stock of Nich. Schug, Burnside. This is apparently the evaporated leachings of wood ashes.

Water	15.85
Ash	78.39
Organic matter	5.76
	100.00
Nitrogen	0.29
Phosphoric acid	0.10
Potash, total	45.58
" as muriate	9.39
" as sulphate	18.34
" as carbonate	17.85
Sulphuric anhydrid	15.59
Chlorin	7.07
Lime	0.77
Insoluble in acid	0.34

Wood ashes, another source of potash and lime, are discussed later in this report.

SECURITY POTASH TREATER DUST.

A sample of this material, **8250,** was sent by the Security Cement and Lime Co., Hagerstown, Md.

It is stated to be a by-product in the manufacture of cement. It is a fine powder and contains 7.56 per cent of water-soluble potash.

IV. RAW MATERIALS CHIEFLY VALUABLE FOR NITROGEN AND PHOSPHORIC ACID.

FISH MANURES.

(*Analyses on pp. 16 and 17.*)

In the table are given analyses of twenty samples of this material. There are two quite distinct products: one, and the most common, is dry ground fish with a guarantee of 8.24 per cent nitrogen and of 5.50 to 6.00 per cent of phosphoric acid, the other with a guaranty of 7.4 and 14 per cent of nitrogen and phosphoric acid, respectively. The latter is made, in part at least, from the waste of factories where edible fish are prepared for market. Samples **7315, 7877** and **7563** are of this class.

Only two samples failed to meet their guaranty: **7563,** sold by Apothecaries Hall Co., and **7502,** sold by the E. D. Chittenden Co. **7502** and **7501** were both certified as drawn from stock of R. C. Lasbury, Broad Brook, by W. H. Cook. One was sent

ANALYSES OF

Station.	Manufacturer.	Dealer or Purchaser.
	Sampled by Station :	
7881	American Agr. Chem. Co.	H. S. Davis, New Haven.
7290	Apothecaries Hall Co.	P. McCue, Windsor Locks.
7563	Apothecaries Hall Co.	W. J. Norton, Broad Brook.
7291	Armour Fertilizer Works.	F. S. Bidwell & Co., Windsor Locks
7464	Berkshire Fertilizer Co.	W. N. Pinney, Rockville.
7875	E. D. Chittenden Co.	R. C. Lasbury, Broad Brook.
7564	E. D. Chittenden Co.	J. N. Lasbury, Broad Brook.
7315	L. T. Frisbie Co.	Factory
7469	A. L. Koster.	F. J. Hartz, Burnside.
7470	A. L. Koster.	S. B. Warner, Windsor.
7581	A. L. Koster.	Amer. Sum. Tob. Co., So. Windsor.
7877	Lowell Fertilizer Co.	T. J. Coleman, Warehouse Point.
7273	Olds & Whipple.	James Gamble, Thompsonville.
7296	Wilcox Fertilizer Co.	Spencer Bros., Suffield.
7567	Wilcox Fertilizer Co.	C. B. Sikes, Jr., Ellington.
7568	Wilcox Fertilizer Co.	C. K. Hale, Gildersleeve.
7569	Wilcox Fertilizer Co.	W. J. Norton, Broad Brook.
	Sampled by Purchaser :	
7502	E. D. Chittenden Co.	R. C. Lasbury, Broad Brook,
7501	E. D. Chittenden Co.	R. C. Lasbury, Broad Brook.
7331	Olds & Whipple.	K. C. Kulle, Suffield.

with a letter from E. P. Brewer, Silver Lane, and the other with a letter from R. C. Lasbury. Later two samples of the same brand, **7875** and **7564**, were drawn by the station agent, one from stock of R. C. Lasbury, the other from stock of J. N. Lasbury, both of which fully met the guaranty.

The average of all the analyses is 8.50 per cent of nitrogen and 8.24 per cent of phosphoric acid.

The average cost was $51.39 per ton. If the phosphoric acid were valued at 4 cents per pound, the nitrogen would cost 26.3 cents per pound.

If phosphoric acid were valued at 6 cents, the nitrogen would cost 24.4 cents.

TANKAGE.

(*Analyses on pp. 18 and 19.*)

This material, made from the waste of slaughter houses and meat markets, naturally shows considerable differences in composition, the nitrogen in the 16 samples here reported ranging from 2.68 to 7.46 per cent.

FISH MANURES.

Nitrogen.				Phosphoric Acid.			Total Phosphoric Acid.		Cost per ton.
As Ammonia.	As Organic.	Total found.	Total guaranteed.	Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Found.	Guaranteed.	
0.38	8.21	8.59	8.23	0.83	4.97	1.27	7.07	6.00	$55.31
0.20	9.40	9.60	8.20	0.58	6.10	1.28	7.96	5.50	52.00
0.15	7.47	7.62	8.20	0.53	7.57	3.66	11.76	5.50	52.00
0.35	8.05	8.40	8.22	0.29	6.19	2.60	9.08	6.87	49.00
0.22	8.03	8.25	8.23	0.45	5.13	1.01	6.59	6.00	52.00
0.24	8.06	8.30	8.23	0.58	3.52	1.25	5.35	6.00	50.00
0.28	8.04	8.32	8.23	0.51	3.82	1.00	5.33	6.00	50.00
0.14	7.56	7.70	7.41	0.48	9.91	4.32	14.71	14.00	50.00
0.31	8.28	8.59	8.23	0.44	7.83	0.24	8.51	6.00	52.00
0.32	8.23	8.55	8.23	0.23	7.92	0.29	8.44	6.00	54.00
0.34	8.23	8.57	8.23	1.11	6.86	0.59	8.56	6.00	50.00
0.16	7.36	7.52	7.41	0.66	8.53	5.23	14.42	14.00	54.00
0.15	8.48	8.63	7.40	0.48	5.13	1.55	7.16	5.50	52.00
0.22	8.84	9.06	8.24	0.58	5.61	1.61	7.80	6.00	52.00
0.21	8.88	9.09	8.24	2.34	3.96	1.70	8.00	6.00	50.50
0.22	9.03	9.25	8.24	0.82	5.61	1.27	7.70	6.00	50.00
0.22	8.64	8.86	8.24	0.77	6.46	1.39	8.62	6.00	52.00
0.54	6.76	7.30	8.23	0.48	2.96	0.95	4.39	6.00	50.00
0.14	8.95	9.09	8.23	0.48	4.03	1.77	6.28	6.00	50.00
...	...	9.36	7.40	0.72	4.89	1.55	7.16	5.50	51.00

Four samples fail to meet their nitrogen guaranty: **7365**, from American Agricultural Chemical Co., **7293** and **7372**, from Nitrate Agencies Co., and **7878**, from the F. S. Platt Co.

The Nitrate Agencies Co. made prompt reduction in the price, to cover the shortage in composition.

The average percentages of nitrogen and phosphoric acid in these samples were 5.38 and 12.92 respectively, and the average cost was $35.98.

Only four of these samples could be called fine, having 50 per cent or more of their weight in particles smaller than $\frac{1}{50}$ inch.

BONE MANURES.

(*Table of Analyses, pp. 20 and 21.*)

The analyses of twenty-nine samples of bone are given in the table, nineteen of them drawn by the station agent. "Bone,"

ANALYSES OF

Station No.	Manufacturer.	Dealer or Purchaser.
	Sampled by Station:	
7365	American Agr. Chem. Co. (6–30)	Jos. Adams, Westport
7882	American Agr. Chem. Co. (9–20)	H. S. Davis, New Haven
7368	Apothecaries Hall Co.	Factory
7314	Conn. Fat Rendering Co.	Factory
7265	L. T. Frisbie Co.	Station Farm at Mt. Carmel
7884	L. T. Frisbie Co.	Factory
7472	Lister's Agr. Chem. Works (Celebrated Ground Bone and Tankage).	Paul Lauz, Rockville
7264	Nitrate Agencies Co.	C. R. Treat, Orange
7293	Nitrate Agencies Co.	Spencer Bros., Suffield
7372	Nitrate Agencies Co.	S. R. Macdonald, Wallingford
7878	F. S. Platt Co.	Factory
7566	C. M. Shay Fertilizer Co.	Knowles Lombard Co., Guilford
7571	Wilcox Fertilizer Co.	Factory
	Sampled by Purchaser:	
7417	Apothecaries Hall Co.	A. I. Fonda, Kensington
7506	Apothecaries Hall Co.	Keiser & Boasberg Plant., E. Windsor Hill
6842		E. N. Austin, Suffield

like tankage, has a wide range of composition, some samples being from raw bone with or without much adhering meat and cartilage, others representing bone which has been cooked, grease and nitrogenous matter being partially removed.

The average per cent of nitrogen in these samples is 3.09 and of phosphoric acid 23.71.

All the samples taken by the Station meet their guaranties of nitrogen. Two are deficient in phosphoric acid but the deficiency is more than made good in money value by an overrun in nitrogen.

APPROXIMATE COST OF NITROGEN, PHOSPHORIC ACID AND POTASH, SPRING OF 1916.

A review of the preceding analyses of raw materials and fertilizer chemicals shows the following approximate costs of

TANKAGE.

Nitrogen.				Phosphoric Acid.		Mechanical Analyses.		
As Ammonia.	As Organic.	Total found.	Total guaranteed.	Found.	Guaranteed.	Finer than 1-50 inch.	Coarser than 1-50 inch.	Cost per ton.
0.47	3.67	4.14	4.94	18.36	13.73	50	50	$36.00
0.26	7.11	7.37	7.41	13.50	9.15	47	53	48.31
0.34	4.80	5.14	4.94	10.94	7.00	45	55	36.00
0.04	3.73	3.77	3.00	21.17	20.00	61	39	26.00
0.17	7.59	7.76	7.41	10.23	9.15	43	57	.....
0.28	4.70	4.98	4.94	16.09	15.00	24	76	40.00
0.22	2.46	2.68	2.67	14.14	12.00	49	51	32.50
0.15	5.57	5.72	5.75	9.68	6.86	32	68	35.00*
0.18	5.02	5.20	5.75	8.12	6.86	40	60	39.00
0.25	5.12	5.37	5.75	8.76	6.86	53	47	35.00
0.38	6.61	6.99	7.28	11.39	9.80	49	51	42.00
0.14	4.02	4.16	....	9.12	.....	47	53	38.00
0.08	6.26	6.34	6.00	16.52	15.00	75	25	.....
....	....	5.52	4.94	7.48	7.00	45	55	35.00
....	....	4.63	2.47	19.83	22.88	42	58	30.00
....	....	6.32	....	10.84	.....	30	70	26.00

* Mixed car lot.

nitrogen, phosphoric acid and potash during the season of 1916 when bought in ton lots or less:

		Cents per pound.
Nitrogen in	nitrate of soda	24.5
	cotton seed meal	20.9
	castor pomace, 6 per cent	19.8
	castor pomace, 4½ per cent	23.5
	fish manures	24.4–26.3
Phosphoric acid, total, in	"floats"	1.5
	available "basic lime phosphate"	7.5
	" precipitated bone	6.7
	" acid phosphate	6.9

Potash. No potash salts have been on the market at prices which admitted of profitable use on the farm. Potash in ashes and in mixed fertilizers has been sold at $5.00 per unit or 25 cents per pound, nearly six times the price which prevailed just before the European war.

ANALYSES OF

Station No.	Manufacturer and Brand.	Dealer or Purchaser.
	Sampled by Station:	
7885	American Agr. Chem. Co., Fine Ground Bone.	Holmes, Keeler & Kent Co....
7369	Apothecaries Hall Co., Bone Meal	J. A. Martin .....
7886	Armour Fertilizer Works, Bone Meal.....	Kennedy Corporation .....
7887	Bowker Fertilizer Co., Fresh Ground Bone	Chas. Greenbacker.....
7888	Coe-Mortimer Co., Fine Ground Bone.....	J. P. Barstow & Co.....
7889	John C. Dow & Co., Pure Ground Bone.....	Norwich Grain Co.....
7890	L. T. Frisbie Co., Fine Bone Meal	Hitchcock Hardware Co.....
7891	International Agr. Corp., Buffalo Bone Meal...	Ansonia Flour & Grain Co.....
7893	Lister's Agr. Chem. Works, Bone Meal	Paul Lanz.....
7894	Lowell Fertilizer Co., Ground Steamed Bone ..	Geo. S. Phelps & Co. .....
7895	Nitrate Agencies Co., Ground Bone.....	M. C. Griffin .....
7896	Rogers & Hubbard Co., Hubbard's Knuckle Bone Flour.....	Factory .....
7897	Rogers & Hubbard Co., Hubbard's Strictly Pure Fine Bone.....	R. H. Hall .....
7898	Rogers & Hubbard Co., Rogers' Pure Raw Knuckle Bone Flour.....	Cadwell & Jones.....
7899	Rogers & Hubbard Co., Rogers' Strictly Pure Fine Bone.....	Factory .....
7901	Sanderson Fert. & Chem. Co., Fine Ground Bone.....	G. W. Thorpe .....
7903	C. M. Shay Fertilizer Co., Pure Ground Bone..	Factory .....
7902	M. L. Shoemaker & Co., Swift-Sure Bone Meal	Spencer Bros. .....
7904	Van Iderstine Co., Pure Ground Bone.....	E. B. Clark Co.....
	Sampled by Purchaser:	
6809	Florence Bone Mills, Bone Dust.....	J. B. Stewart .....
7010	L. T. Frisbie Co., Ground Bone (Car 65178)....	Connecticut Tobacco Corp.....
7011	L. T. Frisbie Co., Ground Bone (Car 71516)....	Connecticut Tobacco Corp.....
7012	L. T. Frisbie Co., Ground Bone (Car 90520)....	Connecticut Tobacco Corp.....
7018	L. T. Frisbe Co., Ground Bone (Car 62241)....	Connecticut Tobacco Corp.....
7020	L. T. Frisbie Co., Ground Bone (Car 504363)...	Connecticut Tobacco Corp.....
7023	L. T. Frisbie Co., Ground Bone (Car 218164)...	Connecticut Tobacco Corp.....
7892	E. L. James, Ground Bone	Factory .....
7437	Rogers & Hubbard Co., Hubbard's Strictly Pure Fine Bone.....	John Gotta .....
7032	Rogers & Hubbard Co., Steamed Bone	Factory .....

V. MIXED FERTILIZERS.

NITROGENOUS SUPERPHOSPHATES.

(*Analyses on pages 30 to 49.*)

The analyses of these fertilizers have been tabulated in two classes: those in which potash has been guaranteed, 202 in number, Table I, and those in which potash has not been guaranteed, of which there are 128, Table II.

In a considerable number of cases two or more analyses of a single brand have been made. This was done where the first

BONE MANURES.

Nitrogen.		Phosphoric Acid.		Mechanical Analysis.		
Found.	Guaranteed.	Found.	Guaranteed.	Finer than 1-50 inch.	Coarser than 1-50 inch.	Cost per ton.
2.85	2.47	25.56	22.82	52	48	$41.00
2.73	2.26	21.36	22.88	64	36	32.00
3.02	2.47	22.69	22.00	56	44	38.00
3.14	2.47	19.29	22.88	54	46	.....
2.55	2.47	24.72	22.88	65	35	38.00
2.04	2.00	23.90	24.00	58	42	37.00
3.59	2.46	23.00	23.00	63	37	38.00
2.52	2.50	22.69	22.00	55	45	37.00
3.15	2.47	24.33	23.00	48	52	39.00
2.64	2.46	25.92	23.00	66	34	36.00
2.57	2.46	23.51	22.88	50	50	37.00
3.93	3.82	25.94	24.70	91	9	43.00
3.90	3.50	23.33	20.00	39	61	35.00
3.88	3.82	26.66	24.70	71	29	46.00
3.70	3.50	21.44	20.00	58	42	34.00
2.54	2.47	24.66	20.00	59	41	38.00
2.50	2.06	27.33	20.00	66	34	35.00
5.53	4.53	23.56	20.00	70	30	41.00
2.05	2.00	29.55	27.00	39	61	35.00
4.06	....	23.53	.....	78	22	35.00
3.39	....	24.82	.....	53	47	.....
3.06	....	26.22	.....	60	40	.....
3.48	....	24.82	.....	43	57	.....
3.09	....	25.48	.....	55	45	.....
3.55	....	23.82	.....	41	59	.....
3.38	....	24.36	.....	53	47	.....
3.96	3.00	20.39	20.00	4	96	37.00
3.88	3.50	22.77	20.00	52	48	34.00
*	....	†28.03	.....	..	..	.....

* Not determined.
† 15.76% citrate-insoluble phosphoric acid.

analysis failed to show the guaranteed composition and the manufacturer requested that another sample be drawn and examined.

In a good many cases the manufacturer has asked for a portion of our sample to check our results, but in no case has there been essential disagreement between our results and those obtained elsewhere on the same samples.

Regarding Guaranties.

Of the 121 samples of nitrogenous superphosphates without potash sampled by the Station, 30, or 25 per cent, failed to meet their minimum guaranty of nitrogen or phosphoric acid. Nine were deficient in nitrogen and 21 in phosphoric acid. We are advised that the failure of the Rogers & Hubbard goods to meet their available phosphoric acid guaranty was due to a miscalculation of the solubility of the bone which was used. Of the 186 samples of nitrogenous superphosphates with potash, 62, or 33 per cent, failed in some particular to meet the minimum guaranteed composition. Fifteen were deficient in nitrogen, 5 in phosphoric acid, 30 in potash and 12 in both nitrogen and potash. Potash seemed to offer the greatest difficulty, some manufacturers apparently guaranteeing more potash than they were able, or cared, to furnish. Of 186 brands guaranteeing potash, 42, or 23 per cent, were deficient.

The following summaries show the firms whose brands failed to meet their guaranties in the ingredients indicated, deficiencies of not more than 0.10 per cent nitrogen, 0.30 per cent phosphoric acid and 0.15 per cent potash being disregarded in this connection.

A slight deficiency in one ingredient, if compensated by an excess of another, is of no great significance to the purchaser, though a large deficiency in one element may disarrange a calculation of the plant food to be supplied to a crop, which is vexatious and may result in loss.

More important therefore is the question whether these mixed fertilizers which fail in one or more particulars to meet their guaranty, do nevertheless supply an excess of the other ingredients sufficient to balance this failure.

It is not possible, in this year of high and quickly shifting prices of raw materials, when the prices which prevailed at the

	Number of brands analyzed.	Possible deficiencies.	No. of brands deficient in: Nitrogen.	Phosphoric acid.	Potash.	Nitrogen and potash.
Nitrogenous superphosphates with potash.						
Amer. Agr. Chem. Co.	58	174	1	1	14	5
Apothecaries Hall Co.	5	15	1	..	..	..
Armour	6	18	2	1	..	1
Bowker	16	48	1	..	4	3
Chittenden	5	15	1	..	..	..
Clark	1	3	..	..	..	1
Coe-Mortimer	9	27	2	..	1	..
International Agr. Corp.	5	15	1	..	2	..
Kirke	1	3	..	..	1	..
Lister	8	24	..	1	1	..
Mapes	8	24	1	..	..	..
National	14	42	..	1	7	2
Rogers & Hubbard	4	12	1	..	..	..
Royster	8	24	4	..	..	..
Virginia-Carolina Chem. Co.	9	27	..	1	..	..
Woodruff	1	3	..	..	1	..
Other manufacturers	28	84	..	..	..	..
Totals	186	558	15	5	31	12
Nitrogenous superphosphates without potash.						
Atlantic Packing Co.	5	10	1	..	..	..
Bowker	7	14	1	1	..	..
Chittenden	2	4	..	1	..	..
Clark	2	4	..	1	..	..
Essex	4	8	2	..	..	..
Mapes	2	4	..	1	..	..
Parmenter & Polsey	5	10	..	1	..	..
Rogers & Hubbard*	12	23	..	8	..	..
Royster	6	12	2	1	..	..
Sanderson	3	6	1	1	..	..
Shay	3	6	..	3	..	..
Virginia-Carolina Chem. Co.	4	8	1	1	..	..
Wilcox	7	14	1	2	..	..
Other manufacturers	59	118	..	..	..	..
Totals	121	242	9	21	0	0
Totals for all nitrogenous superphosphates	307	800	24	26	31	12

* See notice on page 22.

time of manufacture may have been very different from those quoted at the time of sale to farmers, to establish any very accurate schedule of valuations.

We have assumed for the following comparison 25 cents per pound for both nitrogen and potash and 6 cents per pound for phosphoric acid.

The following statement includes those brands in which the deficiency of one or more ingredients was not made up in money value by an overrun of others.

NITROGENOUS SUPERPHOSPHATES CONTAINING POTASH IN WHICH A FAILURE TO MEET THE GUARANTY IN ONE INGREDIENT WAS NOT MADE GOOD BY AN OVERRUN IN OTHER INGREDIENTS.

No.	Brand.	Relation to Guaranty. Available Nitrogen.	Phos. Acid.	Potash.
	American Agr. Chem. Co.:			
*7346	Sure Growth Phosphate, 1916	—0.56	+1.74	—0.38
*7449	Top Dresser, 1916	—0.28	+1.10	—0.34
7760	East India Corn King, 1916	—0.11	+1.80	—0.65
*7761	" " Potato and Garden Manure	—0.91	+1.92	—0.87
*7457	Great Eastern Garden Special	—0.29	+0.86	—0.14
7827	" " Potato Manure	—0.04	+0.48	—0.15
7762	Packers' Union Potato Manure, 1916	—0.14	+0.95	—0.21
7771	Williams & Clark's Elk Brand	+0.08	+0.32	—0.22
	Armour Fertilizer Works:			
7780	Wheat, Corn and Oats Special	—0.12	—0.23	—0.20
7306	3-8-1	—0.15	—0.10	+0.02
	Bowker Fertilizer Co.:			
*7636	Complete Alkaline Tobacco Grower	—0.47	+1.46	—0.17
	E. B. Clark Seed Co.:			
7483	Special Mixture	—0.19	+0.39	—0.29
	The Coe-Mortimer Co.:			
*7790	Universal Fertilizer, 1916	—0.37	+1.52	—0.13
	International Agricultural Corporation:			
7830	Buffalo Economy	+0.16	—0.26	—0.76
8218	" "	+0.22	+0.90	—0.83
	National Fertilizer Co.:			
*7685	Complete Root and Grain Fertilizer, 1916	—0.75	+2.59	—0.22
*7686	Eureka Potato Fertilizer, 1916	—0.11	+0.93	—0.19

* A second analysis on stock from another place had no deficiency in money value.

No.	Brand.	Relation to Guaranty. Available Nitrogen.	Phos. Acid.	Potash.
	Royster Guano Co.:			
7720	Defender Fertilizer	—0.31	+0.32	+0.12
7721	Pipe of Peace Tobacco Fertilizer	—0.52	+0.22	+0.20

NITROGENOUS SUPERPHOSPHATES WITHOUT POTASH.

	Bowker Fertilizer Co.:			
7426	Superphosphate with 5% Ammonia	—0.31	+0.53	
	Rogers & Hubbard Co.:			
7656	Hubbard's Bone Base Corn and General Crops	+0.02	—0.62	
7659	Rogers H. G. Oats & Top Dressing	+0.02	—1.32	
7660	" " Corn and Onion	—0.07	—0.94	
7661	" " Soluble Tobacco	+0.24	—2.85	
	F. S. Royster Guano Co.:			
7664	Curfew Ammoniated Superphosphates	—0.31	+0.56	
7857	" " "	—0.15	+0.24	
	Virginia-Carolina Chemical Co.:			
8213	H. G. Corn and Vegetable Compound	—0.20	—0.04	

QUALITY OF THE PLANT FOOD IN NITROGENOUS SUPERPHOSPHATES.

The potash reported in the table of analyses is all water-soluble and doubtless readily available to crops.

The amounts of phosphoric acid soluble in water and in ammonium citrate solution, as well as the total amount present in each fertilizer, are given in the table. The water-soluble phosphoric acid speedily becomes insoluble in water after it goes into the soil, but it probably is distributed somewhat more widely in the soil than insoluble forms and is more readily available to crops. The sum of the "citrate-soluble" and the water-soluble phosphoric acid is called in the trade "available." It must be remembered, however, that "available" in the trade is not necessarily "available" on the land. Doubtless the water-soluble and citrate-soluble are in general much more quickly used by crops than the phosphoric acid which is insoluble in these media, but there are probably very considerable differences in the agricultural value of citrate-soluble phosphoric acid from various sources.

The same is true of the "insoluble" phosphoric acid. Where bone is used as the chief or only source of phosphoric acid, from 30 to 60 per cent of it may be classed as "insoluble," but experiments show that the phosphoric acid of bone is much more readily available to crops than that of phosphate rock. In buying mixed fertilizers, however, it is safest to give preference to those in which the amount of insoluble phosphoric acid is relatively small.

In 307 samples tested this year the average per cent of the total phosphoric acid which was insoluble was 14.6. In 24 cases more than 30 per cent was insoluble and in one or two cases 60 per cent. No evidence has been found of the presence of raw rock phosphate in significant amount.

Of more importance is the quality of the organic nitrogen. Its solubility has been tested and where it proved to be low by one method, a second method has been used to confirm the finding.

The detail and merits of the alkaline permanganate and neutral permanganate methods have been explained in previous reports. By the former, any form of organic nitrogen is considered inferior in which less than 50 per cent of the water-insoluble organic nitrogen is soluble in permanganate, by the latter any solubility less than 85 is suspicious.

This year only six fertilizers have been found in which a part of the organic nitrogen appears to be inferior. The detail of the nitrogen examination appears in the table on page 27.

In certain fertilizers peat or some other "conditioner" which contains inactive nitrogen is used to keep the mixture in soft, drillable condition and prevent caking in the bags. Such a practice is not objectionable if the *guaranteed* amount of nitrogen is present in available form; that is, without counting the inferior nitrogen of the "conditioner."

	Required.	Found.
In Armour's Wheat, Corn & Oats the corresponding figures are	0.74	0.37
" " 2-8-1 " " " "	1.47	0.94
" Mapes' Cereal Brand " " " "	0.45	0.43
" " General Crop " " " "	0.63	0.37
" " Corn Manure " " " "	0.80	0.60
" Woodruff's Home Mixture " " " "	1.90	1.53

The amounts of soluble nitrogen required to meet the guaranty and the amounts actually found in the samples are given below.

BRANDS IN WHICH INFERIOR ORGANIC NITROGEN IS INDICATED BY PERMANGANATE METHODS.

Station No.	Brand.	Organic Nitrogen.						
		Total.	Water-soluble.	Alkaline Method.			Neutral Method.		
				Active-insoluble.	Inactive-insoluble.	Per cent. active-insoluble.	Active-insoluble.	Inactive-insoluble.	Per cent. active-insoluble.
7779	Armour's 2-8-1	1.37	0.65	0.29	0.43	40.0	0.56	0.16	78.0
7780	Armour's Wheat, Corn and Oats Special	0.62	0.22	0.15	0.25	38.0	0.24	0.16	59.0
7512	Mapes' Cereal Brand	0.83	0.15	0.28	0.40	41.2	0.45	0.23	66.0
7513	Mapes' General Crop	0.79	0.09	0.28	0.42	40.4	0.45	0.25	64.0
7309	Mapes' Corn Manure	1.10	0.23	0.37	0.50	42.6	0.64	0.23	73.0
7849	Woodruff's Home Mixture	2.27	1.07	0.46	0.74	38.0	1.00	0.20	83.0

Samples Needing Special Notice.

Four samples were sent, labeled "Complete Tobacco Fertilizer," with no certificate as to where or how the samples were taken and how much stock was represented.

Through an oversight they were given to the chemist for analysis. The Station will not examine samples until it has assurance that they fairly represent the stock from which they are taken, and that in the public interest full information has been given regarding them. If the sender cannot trust the Station with these facts, which are necessary to make the analyses of any general interest and value, he certainly should not trust the accuracy of its analyses.

	8235	8236	8237	8238
Nitrogen	5.42	6.13	6.00	5.34
Phosphoric acid	5.50	1.56	1.51	5.51
Potash	0.70	1.22	1.24	0.62

Regarding Prices of Nitrogenous Superphosphates.

The prices given are those quoted by the retailer to the Station agent as the cash ton prices.

The manufacturer has little if any control over these prices. The retail dealer naturally fixes a price which he believes will yield him the largest profit on the season's sales. In a few cases less is charged than the manufacturer deems should be, but in many cases the price quoted to the Station is considerably higher than what the manufacturer thinks would yield a fair profit to the retail seller. The following table illustrates these differences in prices quoted for goods which have the same guaranty. The first figure in the guaranty is the per cent. of ammonia, the second available phosphoric acid and the third potash.

Guaranty	Average	Highest	Lowest
1 – 8–1	30.18	38	28
1 –10–1	32.00	36	30
2 – 9–1	31.90	35	29
2 –10–1	32.77	36	30
2½– 8–1	33.00	33	32
2½–10–1	34.93	37	32
3 – 8–1	36.33	39	34
3 – 9–1	35.91	39	32.50

Guaranty	Average	Highest	Lowest
4 – 9–1	37.50	42	37
5 – 4–1	38.53	41	35.50
5 – 8–1	41.42	50	37
5½– 3–1	38.20	41	36

In many cases the guaranties of a considerable number of brands differ only in the percentage of phosphoric acid or of potash. From these it is therefore possible to calculate the retail cost of a pound of potash or of available phosphoric acid.

A considerable number of such calculations show that *at the prices quoted by retailers of* fertilizers, a pound of available phosphoric acid has cost 4.75 cents on the average with extremes of 1.55 and 8.9 cents. The average cost of a pound of potash has been 27.7 cents and the extremes 16 and 51.5 cents.

HOME MIXTURES.

Only two samples of home mixed fertilizers were sent for analysis this year, as follows:

7332. Potato Fertilizer. Mixed, sampled and sent by Charles R. Treat, Orange. The formula called for 4 per cent ammonia, 10 per cent phosphoric acid and 4 per cent potash.

7364. Mixed by J. G. Schwink, Meriden. Sampled by station agent.

Station No.	7332	7364
Per cent of		
Nitrogen as nitrates	1.66	4.93
" as ammonia	0.06	0.17
" as organic	1.75	0.36
" total	3.47	5.46
Phosphoric acid, water-soluble	8.11	8.41
" " citrate-soluble	2.64	2.33
" " citrate-insoluble	0.96	0.33
" " total	11.71	11.07
Potash as muriate	4.89	.....

TABLE I.—NITROGENOUS SUPERPHOSPHATES WITH POTASH.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealer's cash price per ton.	Nitrogen. In Nitrates.	Nitrogen. In Ammonia.	Nitrogen. Organic, water-soluble.	Nitrogen. Organic, water-insoluble.	Nitrogen. Total. Found.	Nitrogen. Total. Guaranteed.	Phosphoric Acid. Water-soluble.	Phosphoric Acid. Citrate-soluble.	Phosphoric Acid. Citrate-insoluble.	Phosphoric Acid. Total. Found.	Phosphoric Acid. Total. Guaranteed.	Phosphoric Acid. So-called "Available." Found.	Phosphoric Acid. So-called "Available." Guaranteed.	Potash. Found. As Muriate.	Potash. Found. Total.	Potash. Guaranteed.	Station No.
	Sampled by Station Agent:																			
	American Agricultural Chemical Co., New York City.																			
7448	Complete Manure for Top Dressing 1916	Branford	$40.00	....	2.12	0.83	1.38	4.33	4.11	4.75	3.28	2.28	10.31	9.0	8.03	8.0	1.00	1.00	1.0	7448
7447	Odorless Grass and Lawn Top Dressing 1916	Norwalk	40.00	2.15	0.86	0.04	0.98	4.03	3.70	5.09	3.74	0.51	9.34	9.0	8.83	8.0	0.78	0.78	1.0	7447
7346	Sure Growth Phosphate 1916	Glastonbury	35.00	....	0.79	0.51	0.61	1.91	2.47	7.10	3.64	1.16	11.90	10.0	10.74	9.0	0.35	0.62	1.0	7346
7702	Sure Growth Phosphate 1916	Thompsonville	36.00	0.06	1.01	0.58	1.05	2.70	2.47	6.94	2.63	0.69	10.26	10.0	9.57	9.0	0.95	0.95	1.0	7702
7449	Top Dresser 1916	Stamford	42.00	2.01	1.00	0.04	0.78	3.83	4.11	3.98	5.12	0.69	9.79	9.0	9.10	8.0	0.35	0.66	1.0	7449
7810	Top Dresser 1916	Forestville	42.00	2.27	1.21	0.17	0.85	4.50	4.11	3.70	4.92	0.92	9.54	9.0	8.62	8.0	0.33	0.68	1.0	7810
7757	5½-3-1 for Tobacco	East Granby	40.75	0.60	0.16	0.51	3.44	4.71	4.53	1.71	2.52	0.64	4.87	4.0	4.23	3.0	0.31	0.99	1.0	7757
7816	Bradley's B. D. Sea Fowl Guano 1916	Avon	30.00	0.16	0.20	0.24	0.71	1.31	0.82	6.89	4.60	1.25	12.74	11.0	11.49	10.0	0.87	0.87	1.0	7816
7453	Bradley's Complete Manure for Potatoes and Vegetables 1916	Norwalk	40.00	0.13	1.49	0.85	0.95	3.42	3.29	6.62	2.95	0.79	10.36	10.0	9.57	9.0	0.96	0.96	1.0	7453
7454	Bradley's Complete Manure for Top Dressing, Grass and Grain 1916	Norwich	40.00	1.02	1.70	0.37	0.95	4.04	4.11	3.94	5.04	1.32	10.30	9.0	8.98	8.0	1.01	1.01	1.0	7454
7528	Bradley's Corn Phosphate 1916	Sterling	33.00	0.70	0.54	0.12	0.60	1.96	1.65	5.08	4.81	1.07	10.96	11.0	9.89	10.0	0.98	0.98	1.0	7528
7451	Bradley's Eclipse Phosphate 1916	Sterling	33.00	0.43	0.45	0.10	0.43	1.41	1.23	4.66	5.22	0.74	10.62	11.0	9.88	10.0	0.98	0.98	1.0	7451
7759	Bradley's Half Century Fertilizer 1916	Canaan	35.00	0.76	0.84	0.36	0.58	2.54	2.06	4.62	4.59	0.87	10.08	11.0	9.21	10.0	0.71	1.00	1.0	7759
8215	Bradley's Half Century Fertilizer 1916	East Granby	32.50	0.18	0.80	0.22	0.88	2.08	2.06	7.91	3.77	0.93	12.61	11.0	11.68	10.0	0.20	1.26	1.0	8215
7758	Bradley's New Method Fertilizer 1916	Wallingford	25.00	0.20	0.22	0.37	0.29	1.08	0.82	3.46	5.71	0.87	10.04	9.0	9.17	8.0	0.99	0.99	1.0	7758
7305	Bradley's Patent Superphosphate 1916	Thompsonville	34.00	....	0.61	0.59	0.91	2.11	2.06	6.10	3.03	1.23	10.36	9.0	9.13	8.0	0.56	0.89	1.0	7305
7452	Bradley's Potato Fertilizer 1916	South Coventry	33.00	0.77	0.61	0.33	0.57	2.28	2.06	4.27	4.34	0.79	9.40	9.0	8.61	8.0	1.09	1.09	1.0	7452
7348	Bradley's Potato Manure 1916	Suffield	36.00	0.60	0.24	1.08	0.70	2.62	2.47	5.90	4.27	0.90	11.07	10.0	10.17	9.0	0.87	0.87	1.0	7348
7450	Bradley's Special Niagara Phosphate	Danielson	31.00	0.21	0.26	0.41	0.25	1.13	0.82	3.55	5.85	0.96	10.36	9.0	9.40	8.0	0.85	0.85	1.0	7450
7347	Bradley's Unicorn 1916	Glastonbury	35.00	0.35	0.11	0.74	0.62	1.82	1.65	5.95	4.16	1.15	11.26	10.0	10.11	9.0	0.88	0.88	1.0	7347
7630	Bradley's Tobacco Manure 1916	Glastonbury	38.50	0.89	0.06	0.14	3.36	4.45	4.53	1.42	2.47	0.29	4.18	4.0	3.89	3.0	0.23	0.91	1.0	7630
7760	East India Corn King 1916	Burnside	32.50	0.13	1.07	0.40	0.76	2.36	2.47	7.47	3.33	1.11	11.91	10.0	10.80	9.0	0.05	0.35	1.0	7760
7455	East India Mayflower 1916	Burnside	30.50	0.40	0.11	0.70	0.58	1.79	1.65	6.00	3.90	1.04	10.94	10.0	9.90	9.0	0.85	0.85	1.0	7455
7868	East India Pilgrim Fertilizer 1916	Branford	30.00	0.08	0.04	0.46	0.40	0.98	0.82	7.49	3.60	1.47	12.56	11.0	11.09	10.0	0.16	0.64	1.0	7868
7761	East India Potato and Garden Manure	Burnside	37.50	....	1.04	0.53	0.81	2.38	3.29	7.63	3.29	1.09	12.01	10.0	10.92	9.0	0.13	0.13	1.0	7761
7869	East India Potato and Garden Manure	Ansonia	42.00	1.54	0.17	0.86	0.91	3.48	3.29	5.92	3.38	0.81	10.11	10.0	9.30	9.0	0.93	0.93	1.0	7869
7631	East India Tobacco Special 1916	Burnside	36.75	0.86	0.06	0.11	3.48	4.51	4.53	1.58	2.19	0.26	4.03	4.0	3.77	3.0	0.24	0.91	1.0	7631
7349	East India Unexcelled Fertilizer 1916	Southport	32.00	....	0.66	0.53	0.86	2.05	2.06	5.52	3.90	1.01	10.43	9.0	9.42	8.0	0.91	0.91	1.0	7349
7457	Great Eastern Garden Special 1916	Bloomfield	37.00	...	1.36	0.54	1.10	3.00	3.29	5.81	4.05	1.14	11.00	10.0	9.86	9.0	0.86	0.86	1.0	7457
7703	Great Eastern Garden Special 1916	Granby	38.00	0.18	1.64	0.37	1.16	3.35	3.29	5.87	3.86	1.16	10.89	10.0	9.73	9.0	0.95	0.95	1.0	7703
7456	Great Eastern General 1916	East Hampton	31.00	0.70	0.33	0.10	0.87	2.00	0.82	3.41	5.79	1.10	10.30	9.0	9.20	8.0	0.74	0.74	1.0	7456
7814	Great Eastern General 1916	Bloomfield	38.00	....	0.14	0.22	0.63	0.99	0.82	4.82	4.75	1.47	11.04	9.0	9.57	8.0	0.64	0.64	1.0	7814
7828	Great Eastern Northern Corn Special 1916	Hotchkissville	33.00	....	1.03	0.64	1.08	2.75	2.06	5.81	3.20	1.28	10.29	9.0	9.01	8.0	0.91	0.91	1.0	7828
7827	Great Eastern Potato Manure 1916	Hotchkissville	34.00	....	0.76	0.47	0.79	2.02	2.06	6.79	3.69	1.14	11.62	11.0	10.48	10.0	0.85	0.85	1.0	7827
7529	Packers' Union Animal Corn Fertilizer	Forestville	31.00	0.13	0.44	0.32	0.78	1.67	1.65	6.92	3.32	1.13	11.37	11.0	10.24	10.0	0.90	0.90	1.0	7529
7762	Packers' Union Potato Manure 1916	Forestville	32.00	0.62	0.15	0.47	0.68	1.92	2.06	7.68	3.27	1.56	12.51	11.0	10.95	10.0	0.16	0.79	1.0	7762
7530	Quinnipiac Ammoniated Dissolved Bone 1916	Branford	31.00	0.24	0.22	0.88	0.60	1.94	1.65	5.41	4.50	1.71	11.62	10.0	9.91	9.0	0.74	0.74	1.0	7530
7764	Quinnipiac "B" Fertilizer 1916	Terryville	33.00	....	0.76	0.37	0.83	1.96	1.23	6.96	3.73	0.87	11.56	11.0	10.69	10.0	0.78	0.78	1.0	7764
7763	Quinnipiac Climax Phosphate 1916	Milford	31.00	....	0.10	0.16	0.58	0.84	0.82	4.90	4.45	1.32	10.67	9.0	9.35	8.0	0.71	0.71	1.0	7763
8225	Quinnipiac Climax Phosphate 1916	Shelton	34.00	0.18	0.24	0.83		1.25	0.82	3.29	5.56	0.87	9.72	9.0	8.85	8.0	0.51	0.78	1.0	8225
7531	Quinnipiac Corn Manure 1916	New London	36.00	0.63	0.47	0.26	0.52	1.88	1.65	4.14	5.83	1.25	11.22	11.0	9.97	10.0	1.33	1.33	1.0	7531
7767	Quinnipiac Fish and Potash Mixture 1916	Hazardville	33.75	....	0.70	1.02	0.96	2.68	2.47	5.40	4.31	1.23	10.94	10.0	9.71	9.0	0.80	0.80	1.0	7767

TABLE I.—NITROGENOUS SUPERPHOSPHATES

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealer's cash price per ton.	Nitrogen. In Nitrates.	Nitrogen. In Ammonia.	Nitrogen. Organic, water-soluble.	Nitrogen. Organic, water-insoluble.	Nitrogen. Total. Found.	Nitrogen. Total. Guaranteed.	Phosphoric Acid. Water-soluble.	Phosphoric Acid. Citrate-soluble.	Phosphoric Acid. Citrate-insoluble.	Phosphoric Acid. Total. Found.	Phosphoric Acid. Total. Guaranteed.	Phosphoric Acid. So-called "Available." Found.	Phosphoric Acid. So-called "Available." Guaranteed.	Potash. Found. As Muriate.	Potash. Found. Total.	Potash. Guaranteed.	Station No.
	Sampled by Station Agent:																			
	American Agricultural Chemical Co., New York City. (*Continued.*)																			
7532	Quinnipiac Market Garden Manure 1916	North Stonington	$38.50	2.22	0.20	0.31	0.77	3.50	3.29	4.92	4.17	1.14	10.23	10.0	9.09	9.0	0.94	0.94	1.0	7532
7766	Quinnipiac Phosphate 1916	New London	39.00	0.82	0.76	0.27	0.77	2.62	2.47	4.39	4.97	1.27	10.63	10.0	9.36	9.0	1.03	1.03	1.0	7766
7765	Quinnipiac Potato Phosphate 1916	Branford	32.00	....	0.66	0.64	0.76	2.06	2.06	5.37	3.94	1.56	10.87	9.0	9.31	8.0	0.48	0.75	1.0	7765
8226	Quinnipiac Potato Phosphate 1916	Shelton	35.00	0.76	0.62	0.84		2.22	2.06	4.07	4.47	1.00	9.54	9.0	8.54	8.0	0.85	0.85	1.0	8226
7632	Quinnipiac Wrapper Leaf Brand Tobacco Manure 1916	Windsor	36.75	0.91	0.06	0.07	3.50	4.54	4.53	1.65	2.51	0.56	4.72	4.0	4.16	3.0	0.20	1.06	1.0	7632
7533	Wheeler's Corn Fertilizer 1916	Bloomfield	30.00	....	0.74	0.38	0.71	1.83	1.65	6.99	4.62	1.43	13.04	11.0	11.61	10.0	0.45	0.82	1.0	7533
7769	Wheeler's Corn Fertilizer 1916	Hartford	30.00	....	0.82	0.35	0.87	2.04	1.65	6.65	3.77	1.11	11.53	11.0	10.42	10.0	1.07	1.07	1.0	7769
7770	Wheeler's Cuban Tobacco Grower 1916	Hartford	37.00	1.15	0.09	0.35	3.37	4.96	4.53	1.24	2.66	0.41	4.31	4.0	3.90	3.0	0.31	1.22	1.0	7770
7768	Wheeler's Potato Manure 1916	Bloomfield	32.00	0.72	0.18	0.44	0.71	2.05	2.06	7.56	3.07	1.37	12.00	11.0	10.63	10.0	0.31	0.86	1.0	7768
7535	Williams and Clark's Americus Corn Phosphate 1916	Ellington	33.50	0.69	0.36	0.30	0.51	1.86	1.65	5.40	4.94	1.51	11.85	11.0	10.34	10.0	1.05	1.05	1.0	7535
7772	Williams and Clark's Americus H. G. Special for Potatoes and Root Crops 1916	Milford	40.00	....	1.36	1.04	1.18	3.58	3.29	6.70	2.70	1.10	10.50	10.0	9.40	9.0	1.00	1.00	1.0	7772
7536	Williams and Clark's Americus Potato Manure 1916.	Clark's Corner	.....	0.74	0.65	0.29	0.64	2.32	2.06	4.41	4.58	0.96	9.95	9.0	8.99	8.0	0.95	0.95	1.0	7536
7771	Williams and Clark's Elk Brand 1916	Waterbury	36.00	....	0.05	0.47	0.38	0.90	0.82	7.05	3.27	1.85	12.17	11.0	10.32	10.0	0.31	0.78	1.0	7771
7773	Williams and Clark's Meadow Queen Fertilizer 1916.	Milford	37.00	....	0.62	1.12	0.90	2.64	2.47	6.22	3.69	1.16	11.07	10.0	9.91	9.0	0.88	0.88	1.0	7773
7774	Williams and Clark's Seed Leaf Tobacco Manure 1916	South Manchester	39.00	0.86	0.06	0.03	3.83	4.78	4.53	1.59	2.66	0.55	4.80	4.0	4.25	3.0	0.16	1.09	1.0	7774
7534	Williams and Clark's Special Prolific Crop Producer	Milford	30.00	....	0.04	0.49	0.39	0.92	0.82	5.09	3.72	1.82	10.63	9.0	8.81	8.0	0.36	0.72	1.0	7534
	Apothecaries Hall Co., Waterbury, Conn.																			
7777	Victor Fish and Potash for Corn	Windsorville	34.00	0.05	0.27	0.19	1.15	1.66	1.65	6.60	2.81	1.20	10.61	9.0	9.41	8.0	0.35	1.05	1.0	7777
7633	Victor Potato and Vegetable Special, 1% Potash	Plantsville	36.00	0.75	0.10	0.45	1.32	2.62	2.47	5.21	3.76	1.64	10.61	9.0	8.97	8.0	0.27	1.11	1.0	7633
7775	Victor Potato and Vegetable Special, 2% Potash	Waterbury	38.00	0.90	0.12	0.43	1.12	2.57	2.47	4.73	4.70	1.02	10.45	9.0	9.43	8.0	0.71	2.10	2.0	7775
7634	Victor Tobacco Special	Windsorville	40.00	0.92	1.92	0.08	1.11	4.03	4.12	4.54	0.88	0.59	6.01	5.0	5.42	4.0	0.23	1.00	1.0	7634
7776	Victor Top Dresser for Grass and Grain	Waterbury	45.60	3.22	0.10	0.59	1.61	5.52	5.76	3.56	3.29	1.61	8.46	6.0	6.85	5.0	0.48	2.12	1.0	7776
	Armour Fertilizer Works, Baltimore, Md.																			
7307	Bidwell's 3-8-1	Windsor Locks	34.00	0.99	0.03	0.13	1.31	2.46	2.47	6.77	1.94	0.37	9.08	8.5	8.71	8.0	0.36	0.87	1.0	7307
7778	Fish and Potash No. 2	Danielson	33.00	0.19	0.65	0.17	1.07	2.08	2.06	6.16	1.96	0.81	8.93	8.5	8.12	8.0	1.01	1.01	1.0	7778
7635	Special Tobacco Grower No. 1	Hazardville	40.00	0.89	0.11	0.11	2.87	3.98	4.11	3.55	1.84	0.43	5.82	4.5	5.39	4.0	0.11	1.12	1.0	7635
7780	Wheat, Corn and Oats Special	Danielson	28.00	0.06	0.02	0.22	0.40	0.70	0.82	5.07	1.70	0.47	7.24	7.5	6.77	7.0	0.80	0.80	1.0	7780
7779	2-8-1	Hazardville	33.00	0.05	0.13	0.65	0.72	1.55	1.65	4.58	3.04	0.81	8.43	8.5	7.62	8.0	0.99	0.99	1.0	7779
7306	3-8-1	Thompsonville	35.00	....	1.05	0.27	1.00	2.32	2.47	4.99	2.91	0.54	8.44	8.5	7.90	8.0	1.02	1.02	1.0	7306
	Berkshire Fertilizer Co., Bridgeport, Conn.																			
7474	Complete Fertilizer	Granby	42.50	0.96	0.05	0.25	1.62	2.88	2.50	7.41	1.97	0.47	9.85	9.0	9.38	8.0	0.89	2.97	2.0	7474
7781	Tobacco Special	Suffield	50.00	1.16	0.02	1.47	2.53	5.18	4.50	0.69	3.11	0.29	4.09	4.0	3.80	3.0	0.40	2.06	2.0	7781
	Bowker Fertilizer Co., New York City.																			
7475	All Round Fertilizer 1916	Yalesville	37.00	1.11	0.13	0.27	0.59	2.10	2.06	7.08	3.36	0.87	11.31	11.0	10.44	10.0	0.88	0.88	1.0	7475
7782	Ammoniated Food for Flowers	Waterbury	.....	2.70	0.00	0.18	0.12	3.00	2.47	0.84	5.53	1.22	7.59	7.0	6.37	6.0	2.10	2.69	2.0	7782
7482	Brighton Phosphate	New Haven	29.00	....	0.11	0.18	0.50	0.79	0.82	5.77	3.38	1.39	10.54	9.0	9.15	8.0	0.78	0.78	1.0	7482
7636	Complete Alkaline Tobacco Grower 1916	Rockville	41.00	0.79	0.10	0.14	2.61	3.64	4.11	2.18	3.28	0.41	5.87	5.0	5.46	4.0	0.17	0.83	1.0	7636
7811	Complete Alkaline Tobacco Grower 1916	Suffield	38.75	0.96	0.14	0.05	2.67	3.82	4.11	1.99	3.01	0.56	5.56	5.0	5.00	4.0	0.20	1.03	1.0	7811
7478	Corn Phosphate 1916	Willimantic	31.00	0.63	0.35	0.29	0.50	1.77	1.65	5.13	5.47	1.14	11.74	11.0	10.60	10.0	1.14	1.14	1.0	7478

WITH POTASH—(*Continued*).

TABLE I.—NITROGENOUS SUPERPHOSPHATES

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealer's cash price per ton.	Nitrogen. In Nitrates.	Nitrogen. In Ammonia.	Nitrogen. Organic, water-soluble.	Nitrogen. Organic, water-insoluble.	Nitrogen. Total. Found.	Nitrogen. Total. Guaranteed.	Phosphoric Acid. Water-soluble.	Phosphoric Acid. Citrate-soluble.	Phosphoric Acid. Citrate-insoluble.	Phosphoric Acid. Total. Found.	Phosphoric Acid. Total. Guaranteed.	Phosphoric Acid. So-called "Available." Found.	Phosphoric Acid. So-called "Available." Guaranteed.	Potash. Found. As Muriate.	Potash. Found. Total.	Potash. Guaranteed.	Station No.
	Sampled by Station Agent:																			
	Bowker Fertilizer Co., New York City. (*Continued.*)																			
7308	Farm and Garden Phosphate 1916	New Haven	$33.00	....	0.36	0.40	0.92	1.68	1.65	7.25	3.78	0.74	11.77	11.0	11.03	10.0	0.87	0.87	1.0	7308
7481	High Nitrogen Mixture 1916	Bloomfield	56.00	3.68	3.32	0.20	1.46	8.66	8.23	3.75	1.91	0.56	6.22	6.0	5.66	5.0	0.88	0.88	1.0	7481
7476	Hill and Drill Phosphate 1916	Waterbury	37.00	....	1.01	0.48	1.08	2.57	2.47	0.43	3.70	0.81	10.94	10.0	10.13	9.0	0.70	0.70	1.0	7476
7813	Hill and Drill Phosphate 1916	New Canaan	37.00	....	1.04	0.41	1.15	2.60	2.47	6.39	3.49	0.88	10.76	10.0	9.88	9.0	0.62	0.62	1.0	7813
7458	Lawn and Garden Dressing 1916	New Haven	50.00	2.66	0.17	0.20	0.96	3.99	4.11	5.28	4.38	0.77	10.43	9.0	9.66	8.0	0.51	0.82	1.0	7458
7477	Potato Phosphate 1916	Rockville	34.00	0.60	0.50	0.30	0.39	1.79	1.65	5.80	4.81	0.83	11.44	11.0	10.61	10.0	0.94	0.94	1.0	7477
7480	Stockbridge Early Crop Manure 1916	Rockville	41.00	....	2.07	0.80	1.33	4.20	4.11	5.07	3.07	2.20	10.34	9.0	8.14	8.0	1.06	1.06	1.0	7480
7479	Stockbridge General Crop Manure 1916	Waterbury	40.00	0.14	1.41	0.47	1.05	3.07	3.29	7.77	2.90	0.82	11.49	10.0	10.67	9.0	0.83	0.83	1.0	7479
7812	Stockbridge General Crop Manure 1916	Yalesville	42.00	....	1.62	0.54	1.10	3.26	3.29	7.79	2.67	1.05	11.51	10.0	10.46	9.0	0.82	0.82	1.0	7812
7783	Sure Crop Phosphate 1916	Yalesville	32.00	0.15	0.08	0.21	0.66	1.10	0.82	7.95	3.04	1.36	12.35	11.0	10.99	10.0	0.91	0.91	1.0	7783
	E. D. Chittenden Co., Bridgeport, Conn.																			
7786	Complete Tobacco and Onion Grower, 1% Potash	Suffield	38.00	1.04	0.30	0.74	1.10	3.18	3.29	1.20	6.78	3.75	11.73	9.0	7.98	8.0	0.20	1.00	1.0	7786
7785	Complete Tobacco and Onion Grower, 2% Potash	Suffield	41.50	0.82	1.58	0.09	0.95	3.44	3.29	6.77	2.32	1.82	10.91	9.0	9.09	8.0	1.00	2.39	2.0	7785
7787	Connecticut Tobacco Grower, 2% Potash	Broad Brook	49.00	0.15	3.64	0.26	1.23	5.28	4.94	4.00	0.83	0.35	5.18	5.0	4.83	4.0	0.40	2.05	2.0	7787
7784	Tobacco Special with 1% Potash	Suffield	41.00	2.05	0.93	0.09	1.55	4.62	4.50	4.20	0.76	0.40	5.36	4.0	4.96	3.0	0.60	2.06	1.0	7784
7788	Tobacco Special with 2% Potash	Suffield	50.00	0.23	2.52	0.47	1.63	4.85	4.50	2.16	1.06	0.37	3.59	4.0	3.22	3.0	0.71	2.24	2.0	7788
	The Everett B. Clark Seed Co., Milford, Conn.																			
7483	Special Mixture	Milford	34.00	0.64	1.33	0 19	0.94	3.10	3.29	6.30	2.09	0.97	9.36	9.0	8.39	8.0	0.71	0.71	1.0	7483
	The Coe-Mortimer Co., New York City.																			
7792	Columbian Corn and Potato Fertilizer 1916	Brooklyn	33.00	0.69	0.43	0.28	0.42	1.82	1.23	5.52	5.29	0.92	11.73	11.0	10.81	10.0	0.96	0.96	1.0	7792
7484	Gold Brand Excelsior Guano 1916	Brooklyn	36.00	0.97	0.78	0.24	0.90	2.89	2.47	4.79	4.67	1.09	10.55	10.0	9.46	9.0	1.00	1.00	1.0	7484
7789	Ideal Tobacco Fertilizer 1916	Windsor	.....	0.95	0.06	0.05	3.28	4.34	4.53	1.53	2.49	0.46	4.48	4.0	4.02	3.0	0.20	1.01	1.0	7789
7818	Morco Top Dresser 1916	Poquonock	56.00	3.24	2.38	1.10	1.58	8.30	8.23	3.70	1.92	0.61	6.23	6.0	5.62	5.0	0.77	0.77	1.0	7818
7791	New Englander Special 1916	Abington	28.00	0.40	0.30	0.10	0.30	1.10	0.82	4.32	4.38	0.74	9.44	9.0	8.70	8.0	1.06	1.06	1.0	7791
7817	Red Brand Excelsior Guano 1916	Poquonock	43.00	0.21	1.95	0.67	1.39	4.22	4.11	5.16	2.93	2.34	10.43	9.0	8.09	8.0	1.02	1.02	1.0	7817
7485	Standard Potato Fertilizer 1916	Abington	39.00	1.33	1.19	0.31	0.70	3.53	3.29	5.01	4.29	1.09	10.39	10.0	9.30	9.0	0.99	0.99	1.0	7485
7790	Universal Fertilizer 1916	Killingly	34.00	0.36	0.26	0.46	0.20	1.28	1.65	7.06	3.46	1.65	12.17	10.0	10.52	9.0	0.11	0.87	1.0	7790
8231	Universal Fertilizer 1916	Winsted	34.00	0.12	0.12	1.54		1.78	1.65	5.47	4.73	1.38	11.58	10.0	10.20	9.0	0.63	0.63	1.0	8231
	T. H. Eldredge, Norwich, Conn.																			
7638	Fish and Potash	Norwich	30.00	1.00	0.18	0.18	2.08	3.44	2.40	5.83	2.38	0.72	8.93	9.0	8.21	8.0	0.20	0.49	0.25	7638
	Essex Fertilizer Co., Boston, Mass.																			
7820	High Grade Special	Warehouse Point	.....	0.28	1.52	0.88	1.41	4.09	3.69	5.97	4.12	1.64	11.73	10.0	10.09	9.0	1.28	1.28	1.0	7820
7819	New Tobacco Fertilizer	Glastonbury	39.00	0.60	0.08	1.11	2.60	4.39	4.10	3.17	3.80	1.47	8.44	6.0	6.97	5.0	0.31	1.15	1.0	7819
	The L. T. Frisbie Co., New Haven, Conn.																			
7829	Complete Manure for Roots, Fruits and Vines	New Haven	39.00	0.24	1.28	0.96	1.04	3.52	3.29	6.77	4.60	1.41	12.78	11.0	11.37	10.0	1.27	1.27	1.0	7829
	International Agricultural Corporation, Buffalo, N. Y.																			
7830	Buffalo Economy	Ansonia	35.00	....	0.41	0.52	0.83	1.76	1.60	4.51	5.23	2.30	12.04	11.0	9.74	10.0	0.24	0.24	1.0	7830
8218	Buffalo Economy	West Suffield	35.00	0.28	0.90	0.64		1.82	1.60	7.66	3.24	1.37	12.27	11.0	10.90	10.0	0.11	0.17	1.0	8218
7831	Buffalo General Favorite	West Suffield	31.00	....	0.42	0.18	0.39	0.99	0.80	5.33	3.46	0.70	9.49	9.0	8.79	8.0	0.20	0.99	1.0	7831
7832	Buffalo High Grade Manure	Watertown	39.50	0.45	0.81	0.58	1.59	3.43	3.30	5.85	2.29	0.38	8.52	9.0	8.14	8.0	1.02	1.02	1.0	7832
7905	Buffalo Tobacco Producer	West Suffield	37.50	....	0.96	0.36	2.50	3.82	4.10	1.62	2.44	1.30	5.36	5.0	4.06	4.0	0.00	1.43	1.0	7905

WITH POTASH—(*Continued*).

TABLE I.—NITROGENOUS SUPERPHOSPHATES

WITH POTASH—(*Continued*).

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealer's cash price per ton.	Nitrogen. In Nitrates.	Nitrogen. In Ammonia.	Nitrogen. Organic, water-soluble.	Nitrogen. Organic, water-insoluble.	Nitrogen. Total. Found.	Nitrogen. Total. Guaranteed.	Phosphoric Acid. Water-soluble.	Phosphoric Acid. Citrate-soluble.	Phosphoric Acid. Citrate-insoluble.	Phosphoric Acid. Total. Found.	Phosphoric Acid. Total. Guaranteed.	Phosphoric Acid. So-called "Available." Found.	Phosphoric Acid. So-called "Available." Guaranteed.	Potash. Found. As Muriate.	Potash. Found. Total.	Potash. Guaranteed.	Station No.
	Sampled by Station Agent:																			
	Kirke Chemical Co., Brooklyn, N. Y.																			
7833	Kirke Fertilizer	Hartford	.....	5.12	0.04	0.03		5.19	5.0	8.73	1.83	0.52	11.08	8.25	10.56	7.5	1.79	2.89	3.15	7833
	Lister's Agricultural Chemical Works, Newark, N. J.																			
7677	Ammoniated Dissolved Superphosphate 1916	North Branford	$32.00	0.84	0.81	0.22	0.35	2.22	2.06	4.48	3.71	1.34	9.53	9.0	8.19	8.0	0.91	0.91	1.0	7677
7680	Complete Tobacco Manure 1916	Burnside	39.00	2.03	0.15	0.24	1.60	4.02	4.11	1.92	2.94	1.68	6.54	5.0	4.86	4.0	0.40	0.97	1.0	7680
7676	Corn and Potato Fertilizer 1916	Stratford	.....	0.21	1.20	0.39	0.46	2.26	2.06	2.28	4.53	2.30	9.11	9.0	6.81	8.0	0.92	0.92	1.0	7676
7679	Potato Manure 1916	Warehouse Point	39.50	0.21	2.15	0.23	1.48	4.07	4.11	6.17	3.27	0.95	10.39	9.0	9.44	8.0	0.20	0.97	1.0	7679
7834	Special Tobacco Fertilizer 1916	Brookfield	36.00	1.11	0.08	0.49	0.47	2.15	2.06	6.92	3.51	1.80	12.23	11.0	10.43	10.0	0.20	0.97	1.0	7834
7678	Standard Pure Superphosphate of Lime 1916	Rockville	36.00	0.83	1.09	0.15	0.45	2.52	2.47	6.62	2.90	0.73	10.25	10.0	9.52	9.0	0.82	0.82	1.0	7678
7675	Success Fertilizer 1916	Warehouse Point	28.00	0.10	0.58	0.08	0.61	1.46	1.23	7.89	3.78	0.73	12.40	11.0	11.67	10.0	1.01	1.01	1.0	7675
7681	Valley Brand Fertilizer 1916	Hamden	.....	0.12	0.19	0.16	0.66	1.13	0.82	7.77	3.34	1.09	12.20	11.0	11.11	10.0	0.96	0.96	1.0	7681
	Lowell Fertilizer Co., Boston, Mass.																			
7836	Special Tobacco	Rockville	40.00	0.40	0.10	1.21	2.41	4.12	4.10	4.03	2.96	0.61	7.60	6.0	6.99	5.0	0.40	1.30	1.0	7836
7835	Superior Fertilizer	Derby	35.00	0.25	1.25	1.48	1.59	4.57	3.69	4.99	4.85	1.69	11.53	10.0	9.84	9.0	1.12	1.12	1.0	7835
	The Mapes Formula and Peruvian Guano Co., New York City.																			
7309	Corn Manure (War Brand)	Suffield	36.00	1.62	0.05	0.23	0.87	2.77	2.47	0.53	7.75	3.30	11.58	10.0	8.28	8.0	0.64	0.85	1.0	7309
7688	General Special (War Brand)	Southington	49.00	5.04	0.06	0.10	1.22	6.42	5.76	0.94	5.43	2.84	9.21	8.0	6.37	6.0	0.80	1.35	1.0	7688
7689	Potato Manure (War Brand)	Windsor Locks	41.00	2.92	0.10	0.07	0.96	4.05	3.71	0.77	7.61	2.28	10.66	8.0	8.38	8.0	0.54	1.06	1.0	7689
7639	Tobacco Manure (War Brand)	East Windsor Hill	.....	4.55	0.13	0.44	3.18	8.30	8.23	0.50	6.32	2.17	8.99	8.0	6.82	5.0	0.45	1.44	1.0	7639
7640	Tobacco Manure (War Brand)	East Windsor Hill	.....	3.79	0.09	0.45	3.48	7.81	8.23	0.36	7.19	2.39	9.94	8.0	7.55	5.0	0.52	1.20	1.0	7640
7690	Tobacco Starter Improved	Windsor Locks	41.00	2.26	0.10	0.34	1.95	4.65	4.12	0.44	5.67	3.47	9 58	8.0	6.11	6.0	0.54	1.07	1.0	7690
7691	Top Dresser Full Strength (War Brand)	Rockville	65.00	8.12	0.12	0.56	1.26	10.06	9.88	0.53	5.85	2.46	8.84	8.0	6.38	5.0	0.91	1.84	1.0	7691
7692	Top Dresser Half Strength (War Brand)	Hartford	41.00	4.24	0.08	0.35	0.46	5.13	4.94	1.57	2.24	0.91	4.72	4.0	3.81	2.5	0.40	0.59	0.5	7692
	National Fertilizer Co., New York City.																			
7694	Ammoniated Phosphate 1916	Wallingford	.....	....	0.40	0.42	0.82	1.64	1.65	7.12	3.73	0.95	11.80	11.0	10.85	10.0	0.87	0.87	1.0	7694
7685	Complete Root and Grain Fertilizer 1916	Meriden	.....	0.08	1.02	0.30	1.14	2.54	3.29	8.56	3.03	1.02	12.61	10.0	11.59	9.0	0.33	0.78	1.0	7685
7906	Complete Root and Grain Fertilizer 1916	Greenwich	40.00	0.28	1.22	1.03	1.00	3.53	3.29	6.48	3.50	1.38	11.36	10.0	9.98	9.0	0.97	0.97	1.0	7906
7686	Eureka Potato Fertilizer 1916	South Manchester	38.25	0.15	1.02	0.44	0.75	2.36	2.47	6.24	3.69	1.05	10.98	10.0	9.93	9.0	0.81	0.81	1.0	7686
7907	Eureka Potato Fertilizer 1916	Broad Brook	38.75	0.36	1.12	0.35	1.07	2.90	2.47	5.94	3.82	1.14	10.90	10.0	9.76	9.0	0.78	0.78	1.0	7907
7684	Extra High Grade Manure 1916	Greenwich	44.65	0.33	1.93	0.62	1.50	4.38	4.11	4.78	2.57	2.48	9.83	9.0	7.35	8.0	1.05	1.05	1.0	7684
7863	Extra High Grade Manure 1916	Warehouse Point	37.00	2.62	1.18	0.00	0.84	4.64	4.11	3.89	4.51	0.82	9.22	9.0	8.40	8.0	0.31	0.72	1.0	7863
7683	High Grade Top Dressing 1916	Granby	60.00	3.34	3.51	0.18	1.67	8.70	8.23	4.03	1.96	0.68	6.67	6.0	5.99	5.0	0.40	0.97	1.0	7683
7693	Potato Phosphate 1916	Meriden	.....	....	0.55	0.51	1.02	2.08	2.06	5.88	3.66	1.10	10.64	9.0	9.54	8.0	0.78	0.78	1.0	7693
7862	Potato Phosphate 1916	Wallingford	.....	....	0.55	0.53	0.92	2.00	2.06	5.77	3.84	1.10	10.71	9.0	9.61	8.0	0.80	0.80	1.0	7862
7682	Tobacco Special 1916	Warehouse Point	38.00	1.10	0.18	0.13	3.51	4.92	4.53	1.44	2.19	0.58	4.21	4.0	3.63	3.0	0.16	1.03	1.0	7682
7695	Universal Phosphate 1916	Wallingford	.....	....	0.12	0.27	0.65	1.04	0.82	6.75	4.64	1.43	12.82	11.0	11.39	10.0	0.70	0.70	1.0	7695
7861	Universal Phosphate 1916	South Manchester	32.00	....	0.13	0.30	0.59	1.02	0.82	6.34	4.47	1.48	12.29	11.0	10.81	10.0	0.82	0.82	1.0	7861
7310	XXX Fish and Potash 1916	South Manchester	36.50	....	0.52	0.38	1.08	1.98	2.06	7.20	3.77	0.93	11.90	11.0	10.97	10.0	0.82	0.82	1.0	7310
	Nitrate Agencies Co., New York City.																			
7696	H. G. Genuine Peruvian Guano	Middletown	75.00	0.27	3.47	0.71	6.20	10.65	10.69	2.38	8.62	1.45	12.45	11.0	11.00	10.0	2.45	2.64	2.5	7696
7837	Pescadores H. G. Genuine Peruvian Guano	Bridgeport	.....	0.14	4.26	0.00	7.42	11.82	11.51	3.03	8.80	0.84	12.67	13.0	11.83	10.0	2.19	2.74	2.5	7837

TABLE I.—NITROGENOUS SUPERPHOSPHATES WITH POTASH—(*Continued*).

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealer's cash price per ton.	Nitrogen. In Nitrates.	Nitrogen. In Ammonia.	Nitrogen. Organic, water-soluble.	Nitrogen. Organic, water-insoluble.	Nitrogen. Total. Found.	Nitrogen. Total. Guaranteed.	Phosphoric Acid. Water-soluble.	Phosphoric Acid. Citrate-soluble.	Phosphoric Acid. Citrate-insoluble.	Phosphoric Acid. Total. Found.	Phosphoric Acid. Total. Guaranteed.	Phosphoric Acid. So-called "Available." Found.	Phosphoric Acid. So-called "Available." Guaranteed.	Potash. Found. As Muriate.	Potash. Found. Total.	Potash. Guaranteed.	Station No.
	Sampled by Station Agent:																			
	Olds and Whipple, Hartford, Conn.																			
7697	Complete Corn, Potato and Onion Fertilizer	Silver Lane	$40.75	2.00	0.10	0.48	1.03	3.61	3.30	1.53	4.51	1.92	7.96	6.0	6.04	6.0	2.57	2.57	2.0	7697
7583	Complete Tobacco Fertilizer	Weatogue	48.00	1.09	0.02	0.80	3.05	4.96	4.50	0.53	2.95	1.22	4.70	3.0	3.48	3.0	0.71	2.46	2.0	7583
7584	Complete Tobacco Fertilizer	Windsor Locks	48.00	....	....	....	....	4.92	4.50	....	....	....	4.34	3.0	....	....	0.40	2.64	2.0	7584
7585	Complete Tobacco Fertilizer	Southwick, Mass.	48.00	....	....	....	....	4.88	4.50	....	....	....	4.40	3.0	....	....	0.20	2.28	2.0	7585
7698	Fish and Potash	Hartford	37.50	0.55	0.15	0.22	1.98	2.90	2.45	3.34	4.41	2.19	9.94	6.0	7.75	6.0	2.67	2.67	2.0	7698
	The Rogers and Hubbard Co., Middletown, Conn.																			
7852	Hubbard's Bone Base Soluble Potato Manure	Branford	49.00	2.02	0.31	0.68	1.45	4.46	4.25	0.70	10.68	5.97	17.35	16.0	11.38	10.0	1.00	1.00	1.0	7852
7843	Hubbard's Tobacco Special	Glastonbury	44.00	1.08	0.06	0.48	3.09	4.71	5.00	0.11	5.23	2.90	8.24	7.0	5.34	4.0	0.16	1.01	0.5	7843
7842	Rogers' H. G. Soluble Tobacco and Potato Manure	Somerville	49.00	2.02	0.28	0.59	1.42	4.31	4.25	0.94	10.16	6.46	17.56	16.0	11.10	10.0	1.00	1.00	1.0	7842
7838	Rogers' Tobacco Grower, Vegetable Formula	Suffield	43.50	0.69	0.21	0.68	3.68	5.26	5.00	0.32	6.01	1.00	7.33	7.0	6.33	4.0	0.40	0.78	0.5	7838
	F. S. Royster Guano Co., Baltimore, Md.																			
7722	Arrow Head Tobacco Fertilizer	Glastonbury	42.75	0.08	0.56	0.28	3.08	4.00	4.11	2.87	2.31	0.33	5.51	4.5	5.18	4.0	1.20	1.92	2.0	7722
7717	Cuckoo Crop Grower	Branford	30.00	....	0.40	0.19	0.43	1.02	0.82	4.11	4.93	0.82	9.86	8.5	9.04	8.0	1.03	1.03	1.0	7717
7720	Defender Fertilizer	Plainville	38.00	....	0.92	0.69	1.37	2.98	3.29	4.01	4.31	1.66	9.98	8.5	8.32	8.0	1.12	1.12	1.0	7720
7719	Drillwell Phosphate	Waterbury	39.00	....	0.54	0.62	1.00	2.16	2.47	4.11	4.14	1.37	9.62	8.5	8.25	8.0	1.30	1.30	1.0	7719
7844	Log Cabin Guano	Darien	39.75	....	2.00	0.87	1.51	4.38	4.11	4.08	4.24	1.94	10.26	8.5	8.32	8.0	1.03	1.03	1.0	7844
7718	Logical Compound	Plainville	35.00	....	0.21	0.77	0.98	1.96	1.65	3.24	5.18	0.96	9.38	8.5	8.42	8.0	0.88	0.88	1.0	7718
7721	Pipe of Peace Tobacco Fertilizer	Glastonbury	.....	0.18	0.72	0.21	2.48	3.59	4.11	1.89	1.33	0.20	3.42	3.5	3.22	3.0	0.20	1.20	1.0	7721
7723	Vim Top Dresser	Milford	38.75	1.23	2.62	0.00	0.23	4.08	4.11	7.18	0.95	0.03	8.16	6.5	8.13	6.0	0.11	1.06	1.0	7723
	Sanderson Fertilizer and Chemical Co., New Haven, Conn.																			
7726	Atlantic Coast Bone, Fish and Potash 1916	Guilford	29.00	....	0.12	1.12	0.71	1.95	1.65	1.76	7.73	1.56	11.05	10.0	9.49	9.0	1.26	1.26	1.0	7726
7846	Complete Tobacco Grower 1916	Glastonbury	.....	0.25	0.26	0.23	3.95	4.69	4.53	1.43	2.83	0.69	4.95	4.0	4.26	3.0	0.31	1.07	1.0	7846
7727	Corn Superphosphate 1916	Seymour	34.00	0.38	0.18	0.49	0.67	1.72	1.65	2.31	8.77	0.86	11.94	11.0	11.08	10.0	0.60	0.96	1.0	7727
7724	Formula A 1916	Shelton	37.50	0.71	0.71	0.72	1.22	3.36	3.29	3.22	6.46	1.68	11.36	10.0	9.68	9.0	1.41	1.41	1.0	7724
7815	Formula B 1916	Southport	37.00	1.20	0.56	0.34	1.41	3.51	3.29	4.52	5.43	4.67	14.62	10.0	9.95	9.0	0.50	1.16	1.0	7815
7847	Kelsey's Bone, Fish and Potash 1916	Branford	33.25	0.57	0.24	0.58	1.49	2.88	2.47	4.08	5.25	1.42	10.75	10.0	9.33	9.0	1.29	1.29	1.0	7847
7728	Potato Manure 1916	Shelton	33.00	....	0.34	0.93	1.23	2.50	2.06	1.15	7.51	2.78	11.44	9.0	8.66	8.0	0.80	1.12	1.0	7728
7845	Top Dressing for Grass and Grain 1916	East Hampton	42.00	1.68	0.10	1.02	1.48	4.28	4.11	2.96	5.68	1.85	10.49	9.0	8.64	8.0	1.01	1.01	1.0	7845
	Virginia-Carolina Chemical Co., New York City.																			
7737	H. G. Corn and Vegetable Compound	Glastonbury	.....	0.69	0.11	0.45	1.28	2.53	2.47	4.96	3.70	1.51	10.17	9.0	8.66	8.0	0.20	1 09	1.0	7737
7729	Indian Brand for Tobacco No. 1	Glastonbury	41.75	0.27	1.92	0.25	1.58	4.02	4.12	4.08	1.56	0.46	6.10	5.0	5.64	4.0	0.90	2.80	2.0	7729
7730	Indian Brand for Tobacco No. 2	Suffield	35.50	0.04	3.28	0.04	1.16	4.52	4.12	3.83	0.75	0.55	5.13	5.0	4.58	4.0	0.16	1.20	1.0	7730
7732	National Corn, Grain and Grass Top Dresser	Glastonbury	.....	0.04	2.38	0.31	0.55	3.28	3.29	6.84	1.75	1.77	10.36	9.0	8.59	8.0	0.51	1.14	1.0	7732
7735	Owl Brand Potato Fertilizer	Shelton	34.00	0.07	0.39	0.20	1.30	1.96	1.65	6.23	2.67	1.62	10.52	9.0	8.90	8.0	0.31	1.09	1.0	7735
7736	Star Brand Potato and Vegetable Compound	Jewett City	42.00	0.31	1.83	0.18	1.12	3.44	3.29	6.68	2.52	1.55	10.75	9.0	9.20	8.0	0.60	1.94	2.0	7736
7731	Tobacco and Onion Special	Glastonbury	35.50	0.64	0.36	0.83	1.47	3.30	3.29	1.05	5.50	4.08	10.63	9.0	6.55	8.0	0.31	0.95	1.0	7731
7734	20th Century Potato Manure with 1% Potash	Milford	38.00	2.02	0.32	0.62	1.23	4.19	4.12	3.63	4.76	2.38	10.77	9.0	8.39	8.0	0.31	1.34	1.0	7734
7733	XXX Fish and Potash Mixture	Glastonbury	30.00	0.34	0.84	0.63	0.44	2.25	1.65	7.08	2.00	1.51	10.59	9.0	9.08	8.0	0.25	0.93	1.0	7733
	Wilcox Fertilizer Co., Mystic, Conn.																			
7704	Fish and Potash	Meriden	26.50	0.14	0.16	0.35	2.20	2.85	2.40	6.36	2.27	0.49	9.12	9.0	8.63	8.0	0.15	0.52	0.5	7704
7738	High Grade Vegetable Fertilizer	Ellington	41.00	2.40	0.10	0.06	1.64	4.20	4.12	6.75	2.11	0.26	9.12	9.0	8.86	8.0	0.97	0.97	1.0	7738

TABLE I.—NITROGENOUS SUPERPHOSPHATES WITH POTASH—(*Concludea*).

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealer's cash price per ton.	Nitrogen. In Nitrates.	Nitrogen. In Ammonia.	Nitrogen. Organic, water-soluble.	Nitrogen. Organic, water-insoluble.	Nitrogen. Total. Found.	Nitrogen. Total. Guaranteed.	Phosphoric Acid. Water-soluble.	Phosphoric Acid. Citrate-soluble.	Phosphoric Acid. Citrate-insoluble.	Phosphoric Acid. Total. Found.	Phosphoric Acid. Total. Guaranteed.	Phosphoric Acid. So-called "Available." Found.	Phosphoric Acid. So-called "Available." Guaranteed.	Potash. Found. As Muriate.	Potash. Found. Total.	Potash. Guaranteed.	Station No.
	Sampled by Station Agent:																			
	Wilcox Fertilizer Co., Mystic, Conn. (*Continued.*)																			
7740	Potato Fertilizer	Suffield	$33.00	0.58	0.20	0.09	1.75	2.62	2.46	3.58	2.44	5.10	11.12	7.0	6.02	6.0	0.15	0.45	0.5	7740
7586	Potato, Onion and Vegetable Phosphate	Gildersleeve	34.00	0.95	0.05	0.21	2.79	4.00	3.72	6.17	2.99	1.50	10.66	9.0	9.16	8.0	0.24	0.49	0.5	7586
7739	Tobacco Special	Ellington	40.00	0.92	0.10	0.08	3.95	5.05	4.95	0.65	5.46	0.58	6.69	6.0	6.11	5.0	0.16	1.02	0.5	7739
	S. D. Woodruff and Sons, Orange, Conn.																			
7849	Home Mixture	Orange	36.00	1.30	0.10	1.07	1.20	3.67	3.30	0.51	6.34	1.71	8.56	8.0	6.85	....	0.62	0.62	1.0	7849
	Sampled by Purchasers and Others:																			
7223	A. A. C. Co.'s Complete Tobacco Manure 1916	*West Suffield:*—H. C. Nelson	38.75	1.07	0.04	3.55		4.66	4.53	1.60	2.29	0.24	4.13	4.0	3.89	3.0	0.25	0.97	1.0	7223
7224	A. A. C. Co.'s Complete Tobacco Manure 1916	*West Suffield:*—H. C. Nelson	38.75	1.07	0.03	3.63		4.73	4.53	1.52	2.37	0.19	4.08	4.0	3.89	3.0	0.18	0.93	1.0	7224
7230	A. A. C. Co.'s Complete Tobacco Manure 1916	*West Suffield:*—H. C. Nelson	38.75	....	....	....	....	4.73	4.53	1.44	2.14	0.18	3.76	4.0	3.58	3.0	....	0.92	1.0	7230
7809	Quinnipiac Complete Tobacco	*Suffield:*—G. H. Harmon	36.00	0.86	0.14	0.09	3.45	4.54	4.50	1.65	2.24	0.54	3.89	4.0	4.43	3.0	0.50	1.03	1.0	7809
7242	Quinnipiac Tobacco Fertilizer	*Suffield:*—H. F. Russell	38.75	....	....	....	....	4.51	4.50	.....	....	....	4.21	4.0	....	3.0	....	1.09	1.0	7242
7247	Quinnipiac Tobacco Manure	*West Suffield:*—W. H. Nelson	36.00	1.11	0.04	3.60		4.75	4.50	1.44	2.56	0.13	4.13	4.0	4.00	3.0	0.23	0.94	1.0	7247
8211	Bowker's Alkaline Tobacco Grower	*West Suffield:*—S. Viets	36.50	0.80	0.05	3.17		4.02	4.11	1.75	2.90	0.33	4.98	5.0	4.65	4.0	0.20	0.97	1.0	8211
7333	Chittenden's Connecticut Tobacco Grower	*Suffield:*—Bissell-Graves Co.	52.00	0.09	3.49	1.39		4.97	4.94	3.94	0.95	0.23	5.12	....	4.89	4.0	0.43	2.19	2.0	7333
7334	Chittenden's Connecticut Tobacco Grower	*Suffield:*—Bissell-Graves Co.	52.00	0.13	3.53	1.45		5.11	4.94	3.65	0.95	0.26	4.86	....	4.60	4.0	0.41	2.10	2.0	7334
6810	Clark's Special Mixture for General Use (1915 stock)	*Woodmont:*—R. M. Treat	.....	....	....	....	....	3.06	3.29	....	....	....	10.17	9.0	....	....	....	3.62	4.0	6810
8221	Lister's Complete Tobacco Fertilizer	*Tariffville:*—Ketchen Tob. Corp.	37.75	2.06	0.08	1.84		3.98	5.00	1.89	2.56	1.79	6.24	.....	4.45	4.0	0.40	0.86	1.0	8221
7212	Mapes' Tobacco Starter Improved	*Jewett City:*—A. A. Young	42.00	1.75	0.05	2.83		4.63	4.11	0.21	6.20	2.46	8.87	8.0	6.41	6.0	0.41	1.16	1.0	7212
6444	Rogers and Hubbard's Oats and Top Dressing (1915 stock)	*Middletown:*—Manufacturer.	....	....	....	....	....	7.86	8.50	.....	.....	.....	9.83	8.0	....	4.5	....	3.58	4.0	6444
7908	Royster's Pipe of Peace Tobacco Fertilizer	*Glastonbury:*—R. Kraiger	36.75	0.18	0.80	2.57		3.55	4.11	2.11	1.33	0.36	3.80	3.5	3.44	3.0	0.20	0.82	1.0	7908
8219	Royster's Pipe of Peace Tobacco Fertilizer	*Glastonbury:*—John Bantle	36.75	0.69	0.19	2.82		3.70	4.11	1.94	1.60	0.27	3.81	3.5	3.54	3.0	0.11	1.09	1.0	8219
7526	Sanderson's Kelsey's Bone, Fish and Potash	*Branford:*—A. E. Plant Sons Co.	33.25	0.58	0.22	1.93		2.73	2.47	4.46	5.20	1.60	11.26	10.0	9.66	9.0	1.30	1.30	1.0	7526

TABLE II.—NITROGENOUS SUPERPHOSPHATES WITHOUT POTASH.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealer's cash price per ton.	Nitrogen. In Nitrates.	Nitrogen. In Ammonia.	Nitrogen. Organic, water-soluble.	Nitrogen. Organic, water-insoluble.	Nitrogen. Total. Found.	Nitrogen. Total. Guaranteed.	Phosphoric Acid. Water-soluble.	Phosphoric Acid. Citrate-soluble.	Phosphoric Acid. Citrate-insoluble.	Phosphoric Acid. Total. Found.	Phosphoric Acid. Total. Guaranteed.	Phosphoric Acid. So-called "Available." Found.	Phosphoric Acid. So-called "Available." Guaranteed.	Station No.
	Sampled by Station Agent:																
	American Agricultural Chemical Co., New York City.																
7338	Ammoniated Fertilizer A	Southport	$23.50	....	0.06	0.26	0.50	0.82	0.82	6.91	3.48	0.93	11.32	11.0	10.39	10.0	7338
7419	Ammoniated Fertilizer AA	East Hampton	28.00	0.41	0.45	0.37	0.55	1.78	1.65	6.67	3.95	1.02	11.64	11.0	10.62	10.0	7419
7420	Ammoniated Fertilizer AAA	Southport	28.50	....	1.34	0.44	0.81	2.59	2.47	7.20	3.75	1.52	12.47	11.0	10.95	10.0	7420
7285	Ammoniated Fertilizer AAAA	New Haven	40.00	1.17	1.21	0.57	0.64	3.59	3.29	9.27	0.85	1.27	11.39	11.0	10.12	10.0	7285
7797	5½–3 for Tobacco	Avon	35.00	0.92	0.16	0.23	3.38	4.69	4.53	1.73	2.21	0.63	4.57	4.0	3.94	3.0	7797
7706	Bradley's Tobacco Manure without Potash	Burnside	.....	0.97	0.09	0.04	3.70	4.80	4.53	1.56	2.74	0.51	4.81	4.0	4.30	3.0	7706
	Armour Fertilizer Works, Baltimore, Md.																
7707	Special Tobacco Grower No. 2	East Hartford	34.75	0.02	0.18	1.09	2.72	4.01	4.11	3.19	1.74	0.49	5.42	4.5	4.93	4.0	7707
7641	2–11–0	Hazardville	30.00	0.18	0.86	0.20	0.54	1.78	1.65	7.49	3.49	0.73	11.71	11.5	10.98	11.0	7641
7798	4–10	East Granby	.....	0.13	1.54	0.30	1.42	3.39	3.29	7.70	2.34	1.33	11.37	10.5	10.04	10.0	7798
	Atlantic Packing Co., New Haven, Conn.																
7421	Atlantic Grain Fertilizer	Norwich	34.00	....	0.35	0.62	0.70	1.67	1.64	6.84	4.69	0.50	12.03	11.0	11.53	10.0	7421
7558	Atlantic Potato Phosphate	Norwich	37.00	0.33	0.50	0.70	0.77	2.30	2.46	7.12	4.13	0.63	11.88	11.0	11.25	10.0	7558
7547	Atlantic Special Vegetable	Norwich	39.00	....	1.26	1.04	1.20	3.50	3.29	7.51	4.01	0.99	12.51	11.0	11.52	10.0	7547
7799	Atlantic Tobacco Special (C. S. Meal)	Silver Lane	32.00	0.50	0.14	1.03	2.47	4.14	4.10	4.27	2.88	1.01	8.16	7.0	7.15	6.0	7799
7548	Atlantic Top Dresser for Grass and Market Gardens	Norwich	42.00	....	2.23	1.11	1.26	4.60	4.10	8.16	3.62	0.99	12.77	11.0	11.78	10.0	7548
	Berkshire Fertilizer Co., Bridgeport, Conn.																
7422	Ammoniated Bone Phosphate	Norwich Town	24.00	....	0.01	0.05	1.21	1.27	0.80	7.01	1.70	0.37	9.08	9.0	8.71	8.0	7422
7549	Economical Grass Fertilizer	Granby	54.00	6.10	0.21	1.20	0.36	7.87	7.40	0.60	8.21	0.52	9.33	8.0	8.81	4.0	7549
7550	Grass Special	Norwich Town	39.00	3.51	0.08	0.11	2.02	5.72	5.00	4.47	1.18	0.40	6.05	6.0	5.65	5.0	7550
7423	Market Garden Fertilizer	Plantsville	34.00	....	0.95	0.52	2.03	3.50	3.30	5.23	3.49	0.55	9.27	9.0	8.72	8.0	7423
7551	Potato and Vegetable Phosphate	South Coventry	30.00	...	0.10	0.54	1.40	2.04	1.70	4.75	4.54	0.43	9.72	9.0	9.29	8.0	7551
7552	Root Fertilizer	Norwich Town	30.00	0.27	1.07	0.37	1.40	3.11	2.50	4.95	3.55	0.51	9.01	9.0	8.50	8.0	7552
7553	Tobacco Grower	Windsor	39.50	1.09	0.06	1.52	2.35	5.02	4.50	1.44	4.52	0.26	6.22	6.0	5.96	5.0	7553
	F. E. Boardman, Middletown, Conn.																
7800	Fertilizer for Potatoes and General Crops	Cromwell	.....	....	1.76	0.50	1.62	3.88	3.29	6.81	1.31	0.45	8.57	....	8.12	7.0	7800
7801	Tobacco Fertilizer	Middletown	34.00	0.16	1.52	0.62	1.35	3.65	3.29	4.46	3.42	0.29	8.17	....	7.88	7.0	7801
	Bowker Fertilizer Co., New York City.																
7642	High Nitrogen Mixture without Potash	Meriden	47.50	3.58	3.98	0.10	1.57	9.23	8.23	4.10	1.18	0.27	5.55	6.0	5.28	5.0	7642
7425	Superphosphate with Ammonia 1%	Jewett City	24.00	0.32	0.15	0.22	0.30	0.99	0.82	5.23	5.07	1.60	11.90	11.0	10.30	10.0	7425
7339	Superphosphate with Ammonia 2%	Westport	28.00	0.90	0.82	0.34	0.60	2.66	1.65	7.25	3.27	1.38	11.90	11.0	10.52	10.0	7339
7555	Superphosphate with Ammonia 3%	Westport	30.00	0.83	0.75	0.27	0.63	2.48	2.47	7.34	3.19	1.38	11.91	11.0	10.53	10.0	7555
7424	Superphosphate with Ammonia 4%	New Canaan	.....	....	1.27	0.49	1.69	3.45	3.29	7.73	3.30	0.79	11.82	11.0	11.03	10.0	7424
7426	Superphosphate with Ammonia 5%	Meriden	30.50	....	1.89	0.61	1.30	3.80	4.11	6.62	1.91	1.13	9.66	9.0	8.53	8.0	7426
7554	Tobacco Grower 1916	Windsor	.....	0.97	0.10	0.04	3.17	4.28	4.11	2.11	2.49	0.52	5.12	5.0	4.60	4.0	7554
	E. D. Chittenden Co., Bridgeport, Conn.																
7299	Complete Tobacco and Onion Grower (no Potash)	Suffield	32.50	2.30	0.39	0.52	0.59	3.80	3.29	5.66	4.52	2.29	12.47	11.0	10.18	10.0	7299
7708	Vegetable and Onion Grower without Potash	Westport	29.00	0.50	0.32	0.86	0.86	2.54	2.47	2.95	6.70	2.98	12.63	11.0	9.65	10.0	7708
	The Everett B. Clark Seed Co., Milford, Conn.																
7320	Ammoniated Bone Phosphate	Milford	32.00	2.51	0.37	0.57	0.66	4.11	3.29	5.18	4.47	2.46	12.11	11.0	9.65	10.0	7320
7507	Ammoniated Bone Phosphate	Milford	32.00	....	2.41	0.26	0.80	3.47	3.29	7.33	2.54	1.93	11.80	11.0	9.87	10.0	7507

TABLE II.—NITROGENOUS SUPERPHOSPHATES

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealer's cash price per ton.
	Sampled by Station Agent:		
	The Coe-Mortimer Co., New York City.		
7427	H. G. Ammoniated Superphosphate 1916	Abington	$31.00
7709	Ideal Tobacco Fertilizer without Potash 1916	Windsor	.....
7803	Morco Top Dresser without Potash	Poquonock	45.00
7556	Prolific Crop Producer 1916	Simsbury	33.00
7802	XXV Ammoniated Phosphate 1916	Canaan	26.00
	Essex Fertilizer Co., Boston, Mass.		
7804	Corn and Vegetable	Willimantic	36.00
7805	Market Garden and Potato Manure	Poquonock	34.00
7643	Tobacco Manure	Hazardville	40.00
7300	XXX Fish Fertilizer	Suffield	33.00
	The L. T. Frisbie Co., New Haven, Conn.		
7428	Connecticut Special for All Crops	New Britain	34.00
7321	Corn and Grain Fertilizer	New Haven	28.00
7340	Market Garden and Top Dresser	New Britain	39.00
7429	Potato and Vegetable Grower	Highwood	.....
7341	Tobacco Special	Glastonbury	34.00
	International Agricultural Corporation, Buffalo, N.Y.		
7342	Buffalo Farmers Choice	Watertown	27.50
7322	Buffalo New England Special	Ansonia	31.00
7806	Buffalo Standard	Winsted	35.00
7508	Buffalo Top Dresser	West Cheshire	44.00
7430	Buffalo Vegetable and Potato	Watertown	33.50
	Lister's Agricultural Chemical Works, Newark, N. J.		
7850	Plant Food 1916	Danbury	28.00
	Lowell Fertilizer Co., Boston, Mass.		
7302	Animal Brand	Suffield	34.00
7323	Bone Fertilizer	Wallingford	30.00
7510	Corn and Vegetable	Warehouse Point	40.00
7509	Empress Brand	Simsbury	30.00
7511	Market Garden, Special Grass and Lawn Dressing	Rockville	38.00
7301	Potato Phosphate	Suffield	36.00
7557	Tobacco Grower	Warehouse Point	37.00
	E. Manchester and Sons, Winsted, Conn.		
7644	1916 Formula	Ellington	28.00
7645	1916 Special	Ellington	34.00
	The Mapes Formula and Peruvian Guano Co., New York City.		
7512	Cereal Brand (War Special)	Hartford	29.00
7513	General Crop (War Special)	Danielson	26.00

WITHOUT POTASH—(*Continued*).

Nitrogen.						Phosphoric Acid.							
				Total.					Total.		So-called "Available."		
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, water-insoluble.	Found.	Guaranteed.	Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Station No.
0.93	0.96	0.43	0.54	2.86	2.47	6.19	4.20	1.00	11.39	11.0	10.39	10.0	7427
1.06	0.06	0.20	3.54	4.86	4.53	1.71	2.27	0.24	4.22	4.0	3.98	3.0	7709
3.14	3.58	0.27	1.63	8.62	8.23	4.50	1.27	0.36	6.13	6.0	5.77	5.0	7803
0.41	1.02	0.91	1.16	3.50	3.29	7.78	2.88	1.07	11.73	11.0	10.66	10.0	7556
....	0.14	0.40	0.66	1.20	0.82	6.95	3.33	0.81	11.09	11.0	10.28	10.0	7802
....	1.68	0.93	1.08	3.69	4.10	9.10	3.52	0.72	13.34	11.0	12.62	10.0	7804
0.38	0.68	0.69	1.13	2.88	2.87	7.28	3.02	1.48	11.78	11.0	10.30	10.0	7805
0.52	0.10	0.95	2.39	3.96	4.10	4.35	3.08	0.81	8.24	7.0	7.43	6.0	7643
0.36	0.51	0.92	0.90	2.69	2.46	6.91	4.28	0.90	12.09	11.0	11.19	10.0	7300
0.35	0.51	0.89	0.83	2.58	2.46	7.33	4.24	0.52	12.09	11.0	11.57	10.0	7428
....	0.36	0.69	0.73	1.78	1.64	6.43	4.32	0.51	11.26	11.0	10.75	10.0	7321
....	2.29	0.96	1.20	4.45	4.10	7.54	4.02	1.04	12.60	11.0	11.56	10.0	7340
....	1.41	1.06	1.12	3.59	3.29	8.02	3.31	0.63	11.96	11.0	11.33	10.0	7429
0.48	0.08	1.02	2.65	4.23	4.10	3.84	3.42	1.06	8.32	7.0	7.26	6.0	7341
....	0.34	0.12	0.53	0.99	0.80	5.95	3.90	0.17	10.02	11.0	9.85	10.0	7342
....	0.57	0.56	0.80	1.93	1.60	5.57	5.18	1.98	12.73	11.0	10.75	10.0	7322
....	1.40	0.94	0.97	3.31	3.30	7.31	3.82	2.11	13.24	11.0	11.13	10.0	7806
2.46	0.56	0.57	2.14	5.73	5.80	2.48	4.48	2.47	9.43	7.0	6.96	6.0	7508
0.15	0.83	0.28	1.28	2.54	2.50	7.35	2.66	0.20	10.21	11.0	10.01	10.0	7430
0.09	0.10	0.35	0.52	1.06	0.82	6.99	3.69	1.04	11.72	11.0	10.68	10.0	7850
0.39	0.69	0.87	1.04	2.99	2.87	6.82	4.53	1.32	12.67	11.0	11.35	10.0	7302
....	0.36	0.92	0.80	2.08	2.05	5.81	4.05	1.51	11.37	11.0	9.86	10.0	7323
0.51	1.51	0.93	1.15	4.10	4.10	6.62	4.11	2.34	13.07	11.0	10.73	10.0	7510
0.08	0.40	0.47	0.66	1.61	1.25	7.70	3.12	0.46	11.28	11.0	10.82	10.0	7509
0.13	1.88	1.74	2.00	5.75	4.92	3.39	4.90	2.56	10.85	9.0	8.29	8.0	7511
0.35	0.96	0.90	1.19	3.40	3.28	6.46	4.76	1.45	12.67	11.0	11.22	10.0	7301
0.61	0.10	1.33	2.48	4.52	4.10	3.98	3.21	0.61	7.80	7.0	7.19	6.0	7557
0.35	0.07	1.06	1.10	2.58	2.46	6.65	4.79	1.43	12.87	....	11.44	10.0	7644
0.15	2.30	0.97	1.20	4.62	4.11	8.20	3.42	0.65	12.27	....	11.62	10.0	7645
2.02	0.00	0.15	0.68	2.85	2.47	0.70	5.35	3.62	9.67	8.0	6.05	6.0	7512
1.02	0.00	0.09	0.70	1.81	1.65	1.45	6.04	4.16	11.65	8.0	7.49	8.0	7513

TABLE II.—NITROGENOUS SUPERPHOSPHATES

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealer's cash price per ton.
	Sampled by Station Agent:		
	National Fertilizer Co., New York City.		
7324	Nitrogen Phosphate Mixture No. 2	Meriden	.....
7343	Nitrogen Phosphate Mixture No. 4	Silver Lane	$34.00
7646	Tobacco Special without Potash	Windsor Locks	.....
	New England Fertilizer Co., Boston, Mass.		
7515	Corn and Grain Fertilizer	South Manchester	30.00
7514	Corn Phosphate	Unionville	32.00
7851	High Grade Potato Fertilizer	East Granby	36.00
7648	Potato Fertilizer	Rockville	32.00
7649	Special Tobacco	Warehouse Point	36.00
7647	Superphosphate	Unionville	34.00
	Olds and Whipple, Hartford, Conn.		
7516	High Grade Tobacco Starter	Cromwell	53.00
7795	Special Grass Fertilizer	Hartford	36.75
7517	Special Phosphate	Silver Lane	32.00
7344	Tobacco Special	Silver Lane	37.50
	Parmenter and Polsey Fertilizer Co., Boston, Mass.		
7651	P. & P. Grain Grower	North Stonington	26.50
7518	P. & P. Plymouth Rock Fertilizer	Plantsville	30.00
7710	P. & P. Potato Fertilizer	Plantsville	.....
7711	P. & P. Special Tobacco	Cromwell	.....
7650	P. & P. Star Brand Superphosphate	Cromwell	.....
	The Rogers and Hubbard Co., Middletown, Conn.		
7652	Hubbard's Bone Base Oats and Top Dressing	Branford	48.00
7656	Hubbard's Bone Base Soluble Corn and General Crops Manure	Branford	37.00
7856	Hubbard's Bone Base Soluble Tobacco Manure	Middletown	.....
7657	Rogers' All Soils-All Crops Phosphate	Meriden	38.00
7658	Rogers' Complete Phosphate	Meriden	38.00
7659	Rogers' H. G. Oats and Top Dressing	Meriden	55.00
7660	Rogers' H. G. Soluble Corn and Onion Manure	Somersville	.....
7661	Rogers' H. G. Soluble Tobacco Manure	Glastonbury	43.00
7662	Rogers' Potato Phosphate	Meriden	38.00
7855	Rogers and Hubbard's All Soils-All Crops Phosphate	Middletown	36.00
7854	Rogers and Hubbard's Complete Phosphate	Middletown	29.00
7853	Rogers and Hubbard's Potato Phosphate	East Hampton	34.00
	F. S. Royster Guano Co., Baltimore, Md.		
7664	Curfew Ammoniated Superphosphate	Milford	31.50
7857	Curfew Ammoniated Superphosphate	Northford	33.50
7665	Good Will Ammoniated Superphosphate	Plainville	38.00
7858	Innovation Ammoniated Superphosphate	Northford	30.50
7666	Penguin Ammoniated Superphosphate	Milford	26.00
7663	Stevens' Formula	Glastonbury	35.00

WITHOUT POTASH—(*Continued*).

Nitrogen.						Phosphoric Acid.							Station No.
				Total.					Total.		So-called "Available."		
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, water-insoluble.	Found.	Guaranteed.	Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	
0.24	0.56	0.28	0.74	1.82	1.65	7.34	3.29	1.46	12.09	11.0	10.63	10.0	7324
0.53	1.43	0.50	0.95	3.41	3.29	7.25	3.31	1.34	11.90	11.0	10.56	10.0	7343
1.36	0.00	0.09	3.43	4.88	4.53	1.54	2.12	0.70	4.36	4.0	3.66	3.0	7646
....	0.37	0.37	0.53	1.27	1.23	9.00	2.36	0.26	11.62	11.0	11.36	10.0	7515
0.09	0.42	0.86	0.93	2.30	2.06	6.18	4.52	2.00	12.70	11.0	10.70	10.0	7514
0.31	1.01	0.59	1.46	3.37	3.28	7.87	2.12	1.61	11.60	11.0	9.99	10.0	7851
0.46	0.06	0.87	1.10	2.49	2.46	7.03	4.51	1.41	12.95	11.0	11.54	10.0	7648
0.58	0.06	0.87	2.51	4.02	4.10	4.39	2.93	0.96	8.28	7.0	7.32	6.0	7649
....	0.94	1.12	1.23	3.29	2.88	7.73	3.77	0.61	12.11	11.0	11.50	10.0	7647
3.54	0.14	0.45	6.58	10.71	10.70	1.65	2.52	0.87	5.04	3.0	4.17	3.0	7516
2.28	0.10	0.45	2.85	5.68	4.95	1.08	3.02	3.01	7.11	4.0	4.10	4.0	7795
1.32	0.06	0.31	3.22	4.91	4.18	2.84	2.24	2.33	7.41	4.0	5.08	4.0	7517
0.85	0.11	0.56	3.48	5.00	4.50	2.06	3.71	0.18	5.95	5.0	5.77	5.0	7344
0.13	0.05	0.67	0.52	1.37	1.23	6.31	3.30	1.24	10.85	11.0	9.61	10.0	7651
0.42	0.10	1.23	1.32	3.07	2.88	6.96	4.09	2.06	13.11	11.0	11.05	10.0	7518
0.15	0.36	0.79	0.93	2.23	2.05	6.38	4.93	1.52	12.83	11.0	11.31	10.0	7710
0.57	0.07	0.92	2.79	4.35	4.10	4.57	3.04	1.33	8.94	7.0	7.61	6.0	7711
0.47	0.46	0.23	1.31	2.47	2.46	6.88	4.43	0.74	12.05	11.0	11.31	10.0	7650
5.10	0.09	0.28	0.55	6.02	6.00	0.00	6.38	6.43	12.81	12.0	6.38	6.0	7652
1.26	0.10	0.64	0.52	2.52	2.50	2.88	6.50	3.71	13.09	12.0	9.38	10.0	7656
3.12	0.48	0.06	1.42	5.08	5.00	0.13	11.38	5.07	16.58	13.0	11.51	10.0	7856
1.60	0.04	0.38	1.58	3.60	3.30	3.69	3.48	1.98	9.15	9.0	7.17	7.0	7657
0.18	0.04	0.43	0.52	1.17	1.00	5.15	3.62	2.53	11.30	11.0	8.77	9.0	7658
4.80	0.10	0.50	0.62	6.02	6.00	0.12	4.56	7.82	12.50	12.0	4.68	6.0	7659
1.11	0.08	0.37	0.87	2.43	2.50	2.88	6.18	3.43	12.49	12.0	9.06	10.0	7660
3.02	0.18	0.84	1.20	5.24	5.00	0.12	7.03	5.91	13.06	13.0	7.15	10.0	7661
0.76	0.16	0.78	0.63	2.33	2.00	5.57	6.74	3.49	15.80	15.0	12.31	13.0	7662
2.25	0.10	0.50	0.88	3.73	3.30	2.48	3.48	3.48	9.44	9.0	5.96	7.0	7855
0.10	0.10	0.45	0.54	1.19	1.00	5.20	3.49	2.99	11.68	11.0	8.69	9.0	7854
0.61	0.14	0.78	0.57	2.10	2.00	5.86	6.53	3.70	16.09	15.0	12.39	13.0	7853
....	1.02	0.63	1.33	2.98	3.29	5.49	3.07	1.80	10.36	8.5	8.56	8.0	7664
....	1.56	0.22	1.36	3.14	3.29	5.17	3.07	0.88	9.12	8.5	8.24	8.0	7857
....	1.66	0.83	1.69	4.18	4.11	5.55	3.60	2.12	11.27	8.5	9.15	8.0	7665
0.17	1.55	0.14	1.03	2.89	2.47	5.23	2.21	0.56	8.00	8.5	7.44	8.0	7858
....	0.53	0.65	0.64	1.82	1.65	7.32	3.54	1.27	12.13	10.5	10.86	10.0	7666
0.22	0.86	0.13	3.07	4.28	4.11	4.96	1.54	0.38	6.88	6.5	6.50	6.0	7663

TABLE II.—NITROGENOUS SUPERPHOSPHATES

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealer's cash price per ton.	Nitrogen. In Nitrates.	Nitrogen. In Ammonia.	Nitrogen. Organic, water-soluble.	Nitrogen. Organic, water-insoluble.	Nitrogen. Total. Found.	Nitrogen. Total. Guaranteed.	Phosphoric Acid. Water-soluble.	Phosphoric Acid. Citrate-soluble.	Phosphoric Acid. Citrate-insoluble.	Phosphoric Acid. Total. Found.	Phosphoric Acid. Total. Guaranteed.	Phosphoric Acid. So-called "Available." Found.	Phosphoric Acid. So-called "Available." Guaranteed.	Station No.
	Sampled by Station Agent:																
	Sanderson Fertilizer and Chemical Co., New Haven, Conn.																
7725	Formula B 1916 without Potash	Wallingford	$35.00	0.91	0.65	0.38	1.21	3.15	3.29	8.54	2.70	0.84	12.08	11.0	11.24	10.0	7725
7325	H. G. Ammoniated Phosphate	Highwood	.....	0.60	0.89	0.61	1.21	3.31	3.29	3.46	6.26	1.54	11.26	11.0	9.72	10.0	7325
7345	Special without Potash	Highwood	26.00	0.57	0.29	0.74	1.08	2.68	2.47	2.06	7.33	1.45	10.84	11.0	9.39	10.0	7345
	C. M. Shay Fertilizer Co., Groton, Conn.																
7667	Brown's Complete Fertilizer	Groton	28.50	0.25	0.12	0.65	1.47	2.49	2.06	1.21	3.79	2.77	7.77	8.0	5.00	....	7667
7712	Brown's Formula	Guilford	34.50	0.50	0.24	1.07	1.64	3.45	3.30	0.94	5.71	2.57	9.22	10.0	6.65	....	7712
7713	Brown's Oats and Top Dressing	Guilford	42.00	3.15	0.10	0.98	1.11	5.34	4.94	0.04	4.94	4.44	9.42	10.0	4.98	....	7713
7859	Shay's Formula	Guilford	.....	0.46	0.18	1.00	1.72	3.36	3.30	1.75	5.52	2.15	9.42	10.0	7.27	....	7859
	M. L. Shoemaker and Co., Philadelphia. Pa.																
7303	Swift-Sure Superphosphate for Tobacco and General Use	Windsor Locks	36.00	1.14	0.00	1.05	1.44	3.63	3.29	7.01	3.96	1.25	12.22	12.0	10.97	9.0	7303
	Springfield Rendering Co., Springfield, Mass.																
7860	Animal Fertilizer, Complete Manure for All Crops	Thompsonville	32.00	0.40	0.55	0.87	0.81	2.63	2.46	7.80	3.70	0.46	11.96	11.0	11.50	10.0	7860
	Virginia-Carolina Chemical Co., New York City.																
7870	Ammoniated Bone Phosphate for All Crops	North Haven	27.00	0.22	0.12	0.71	0.81	1.86	1.65	4.35	5.46	2.11	11.92	11.0	9.81	10.0	7870
8212	Beef, Blood and Bone "BBB" (without Potash)	Winsted	35.00	0.17	0.19	0.69	2.23	3.28	3.29	5.30	5.21	1.87	12.38	11.0	10.51	10.0	8212
8213	H. G. Corn and Vegetable Compound (without Potash)	Milford	26.00	0.53	0.19	0.79	0.76	2.27	2.47	4.65	5.31	2.01	11.97	11.0	9.96	10.0	8213
8214	20th Century Potato Manure (without Potash)	Winsted	37.00	0.29	0.33	0.80	2.95	4.37	4.12	4.67	4.73	3.84	13.24	11.0	9.40	10.0	8214
	Wilcox Fertilizer Co., Mystic, Conn.																
7871	Wilcox Complete Bone Phosphate	Ellington	27.50	0.24	0.11	0.65	1.07	2.07	1.65	4.16	6.68	4.59	15.43	13.0	10.84	12.0	7871
7587	Wilcox Corn Special	Gildersleeve	31.00	....	....	....	....	3.26	3.30	7.26	2.87	1.61	11.74	11.0	10.13	10.0	7587
7588	Wilcox Corn Special	Gildersleeve	30.50	0.40	0.08	1.05	2.11	3.64	3.30	3.77	5.09	3.11	11.97	11.0	8.86	10.0	7588
7304	Wilcox Grass Fertilizer	Suffield	39.00	1.77	0.07	0.68	1.86	4.38	4.12	3.25	5.39	2.75	11.39	9.0	8.64	8.0	7304
7705	Wilcox Grass Fertilizer	Meriden	31.50	0.89	0.11	0.43	2.58	4.01	4.12	4.22	4.80	2.06	11.08	9.0	9.02	8.0	7705
7872	Wilcox Special Superphosphate	Branford	27.50	0.22	0.12	0.22	1.36	1.92	1.23	5.54	3.24	5.01	13.79	11.0	8.78	10.0	7872
7796	Wilcox 6–8 Mixture	Ellington	38.50	0.93	0.40	0.67	2.99	4.99	4.95	2.58	5.15	4.26	11.99	9.0	7.73	8.0	7796
	Sampled by Purchasers and Others:																
7540	Bowker's Alkaline Tobacco Grower	*West Suffield:*—S. Viets.	31.50	0.84	0.02	3.35		4.21	4.11	2.55	2.44	0.69	5.68	5.0	4.99	4.0	7540
7687	Bowker's Alkaline Tobacco Grower	*West Suffield:*—S. Viets.	31.50	1.11	0.05	0.09	3.21	4.46	4.11	2.31	2.59	0.35	5.25	5.0	4.90	4.0	7687
7436	Bowker's High Nitrogen Mixture	*Portland:*—J. Gotta	49.50	3.97	3.23	1.80		9.00	8.24	4.56	1.45	0.32	6.33	6.0	6.01	5.0	7436
7435	Bowker's Superphosphate	*Portland:*—J. Gotta	32.50	0.17	1.05	2.27		3.49	3.30	7.44	3.11	1.16	11.71	11.0	10.55	10.0	7435
7527	Sanderson's High Grade Ammoniated Phosphate	*Branford:*—A. E. Plant Sons Co.	32.50	1.12	1.18	1.23		3.53	3.29	8.17	2.76	1.01	11.94	11.0	10.93	10.0	7527
7629	Shay's Brown's Special for Oats and Top Dressing	*East Haddam:*—E. E. Smith	40.00	1.88	0.16	3.24		5.28	5.36	1.05	6.62	3.28	10.95	10.0	7.67	....	7629
7525	Wilcox Corn Special	*Branford:*—A. E. Plant Sons Co.	33.50	0.91	0.06	2.65		3.62	3.30	3.72	5.65	2.83	12.20	11.0	9.37	10.0	7525

WITHOUT POTASH—(*Concluded.*)

VI. MISCELLANEOUS FERTILIZERS, LIME, ASHES, ETC.

SHEEP AND GOAT MANURE.

7637. Excelsior Brand Pulverized Sheep Manure. Sold by A. H. Case and Co., Buffalo. Stock of J. J. Cahill, Warehouse Point.

7840. Sheep's Head Brand Pulverized Sheep Manure. Sold by Natural Guano Co., Aurora, Ill. Stock of Frank S. Platt Co., New Haven.

7841. Wizard Brand Manure. Sold by Pulverized Manure Co., Chicago. Stock of Brower and Malone, Norwalk.

7848. South American Sheep and Goat Manure. Sold by Sanderson Fertilizer and Chemical Co., New Haven. Sampled at factory.

Station No.	7637	7840	7841	7848
Per cent of				
Nitrogen as nitrates	0.06	0.11	0.06	0.14
" as ammonia	0.04	0.55	0.10	0.02
" as organic	1.51	1.92	1.84	1.23
" total found	1.76	2.58	2.00	1.39
" total guaranteed	1.00	2.25	1.80	1.23
Phosphoric acid, water-soluble	0.41	1.35	0.50	0.17
" " citrate-soluble	0.73	0.43	0.55	0.70
" " citrate-insoluble	0.20	0.18	0.19	0.12
" " total found	1.34	1.96	1.24	0.99
" " total guaranteed	*0.87	1.25	1.00	1.00
Potash found	1.29	2.05	2.59	3.80
" guaranteed	1.00	1.50	1.00	2.00
Chlorin	0.23	0.90	0.45	1.65
Cost per ton	$30.00	30.00	37.00	30.00

These dried manures are chiefly of interest to florists and to greenhouse or lawn owners. As we have said in previous reports, they are out of the question for general farm use, because horse manure supplies three or four times as much plant food for the same money and the extra vegetable matter should be supplied in farm crops and residues.

WOOD ASHES.

Twenty-nine samples called "wood ashes" have been examined. **6966** from The Grangers' Lime Co., and **7387** from Pennsylvania are probably lime-kiln ashes. **6965, 6991, 7807, 7378** are of

* "Available" phosphoric acid guaranty.

ANALYSES OF WOOD ASHES.

Station No.	Car No. and Purchaser or Dealer.	Water.	Insoluble in acid (sand).	Water-soluble Potash.	Lime.	Magnesia.	Phosphoric Acid.	Cost per ton.
7259	F. S. Bidwell & Co., Windsor Locks. Fairview Farm, Hartford	....	....	3.71	.....	....	....	$21.15
7386	T. H. Framley, Newport, R. I. F. H. Rolf, Guilford	15.03	11.80	5.54	26.20	4.02	2.34	18.00
6966	Grangers' Lime Co., West Stockbridge, Mass.	....	12.90	0.22	51.00	....	0.38	.....
7017	..... L. B. Haas & Co., Hartford	....	10.00	5.24	29.58	3.88	2.00	.....
7387	W. F. Leidy, Swarthmore, Pa. S. D. Woodruff & Sons, Orange	3.30	9.85	0.16	56.14	trace	0.19	18.00
6983	..... Geo. D. Nichols, Shelton (Soft wood ashes)	....	31.00	2.90	20.14	6.48	1.09	.....
6839	Olds & Whipple, Hartford. 65540 Michael Driscoll, Poquonock	....	....	4.22	.....	....	....	*21.10
6965	Olds & Whipple, Hartford. 48872 Michael Driscoll, Poquonock	....	....	1.47	.....	....	....	*7.35
6990	Olds & Whipple, Hartford. 7496 E. O. Gates, New Hartford	....	....	5.61	.....	....	....	*28.05
6991	Olds & Whipple, Hartford. 44776 W. S. Pinney, Suffield	....	....	2.19	.....	....	....	*10.95
7004	Olds & Whipple, Hartford. 203729 James Conroy, East Windsor	....	....	4.75	.....	....	....	*23.75
7005	Olds & Whipple, Hartford. 87294 R. M. Thompson, South Manchester	....	....	4.57	.....	....	....	*22.85
7258	Olds & Whipple, Hartford. 65089 J. B. Stewart, Windsor	....	....	7.71	.....	....	....	*38.55
7279	Olds & Whipple, Hartford. 35660 O. J. Thrall, Windsor	....	....	6.57	.....	....	....	36.13
7493	Olds & Whipple, Hartford. 90237 R. M. Thompson, South Manchester	....	4.93	6.89	32.34	3.50	2.97	*34.45
7537	Olds & Whipple, Hartford. 65125 Geo. M. Grant, Melrose	....	8.80	6.20	32.82	3.24	2.25	34.10
7539	Olds & Whipple, Hartford. 65050 James Conroy, Warehouse Point	....	7.75	6.23	31.16	2.90	1.94	34.27
7500	Olds & Whipple, Hartford. 9152 R. L. Thrall, Hartford	....	2.34	4.34	44.16	3.84	2.47	23.87
7750	Olds & Whipple, Hartford. 61741 John Wolf, Windsor	....	9.96	5.91	34.74	2.96	2.01	*29.55
7751	Olds & Whipple, Hartford. 101769 Geo. M. Grant, Melrose	....	7.06	6.55	34.98	3.46	1.97	*32.75
7793	Olds & Whipple, Hartford. 12267 Howard Kirbell, Silver Lane	....	8.17	5.37	35.36	2.82	2.17	26.85
7807	Olds & Whipple, Hartford. 8283 Olin Wheeler, Burnside	....	5.53	2.53	41.38	3.34	2.10	*12.65
7866	Olds & Whipple, Hartford. 8034 E. O. Gates, New Hartford	....	7.22	6.46	31.10	3.85	2.34	*32.30
8220	Olds & Whipple, Hartford. 18262 J. C. Eddy, Simsbury	....	7.24	4.47	28.60	3.68	2.03	*22.35
7378	Geo. S. Phelps & Co., Thompsonville	1.43	51.55	0.77	18.80	3.30	1.24	.....
6999	Geo. Stevens, Peterboro, Ont. 55478 H. A. Henshaw, Suffield	....	13.25	3.28	.....	....	1.42	15.50
7460	Geo. Stevens, Peterboro, Ont. .... J. C. Thompson, Unionville	13.03	11.01	4.76	31.48	2.48	1.56	18.50
7335	Chas. Stevens, Napanee, Ont. .... John B. Cannon, Granby	4.03	10.45	5.24	38.30	....	1.73	.....
7749	Swift & Co. .... Julius Reck, Bridgeport	....	5.34	6.91	36.70	5.76	1.75	15.00

* $5.00 per unit of water-soluble potash.

very poor quality, the last named being more than half sand and soil. The others are of fair to good quality.

All the samples sold by Olds & Whipple are stated to be not Canadian but domestic ashes and show decided superiority to the so-called Canadian Hard Wood Ashes sold in previous years. With the exceptions above noted the average per cent of potash in 23 samples is 5.36, the average per cent of phosphoric acid in the 16 samples in which it was determined was 2.00.

This shows, what we have constantly maintained, that the very inferior quality of ashes sold in this state in late years is to be explained by the carelessness or fraud of makers or dealers. The quality of the pure ashes from hard wood is as good as ever.

Ashes should never be bought without a guaranty of water-soluble potash. No other kind of potash is wanted. There should also be a full understanding that a rebate is to be given by the seller for any potash deficiency and the terms of the rebate agreed upon in advance. "Ashes" and "Canada hard-wood ashes" as offered in market have no definite composition and much money has been lost by farmers in the purchase of inferior ashes.

GROUND LIMESTONE, OTHER LIMES AND OYSTER SHELLS.

6970. Ground Limestone. Sold by The Grangers' Lime Co., West Stockbridge, Mass.

7653. Ground Limestone. Sold by The Grangers' Lime Co., West Stockbridge, Mass., to L. H. Healey, North Woodstock.

7672. Ground Limestone. Sold by The Grangers' Lime Co., West Stockbridge, Mass., to Rogers and Hubbard Co., Middletown.

7673. Ground Limestone. Sold by The Grangers' Lime Co., West Stockbridge, Mass., to Apothecaries Hall Co., Waterbury.

All of the above samples were drawn and sent by the manufacturer.

7197. Ground Limestone. Sold by Stearns Lime Co., Danbury. Sampled by station agent at factory.

7282. Ground Limestone. Sold by Stearns Lime Co., Danbury. Sampled and sent by J. A. Sherwood, Long Hill.

6982. Lime sampled and sent by H. A. Smith, Newtown.

7284. Lime from "Yellow Factory," Chester. Sampled and sent by John H. Fay, county agent, Middletown.

7283. Lime from acetylene gas plant. Sampled and sent by John H. Fay, county agent, Middletown. May be taken from the factory without charge.

7007. Limeoid. Sampled and sent by The Burns Co., Bridgeport.

7337. Burnt Lime. Sold by Gault Bros., Westport. Stock of W. H. Burr, Westport. Sampled by station agent.

7009. Ground Oyster Shells. Sent by F. E. Rogers, county agent, New Haven.

7383. Sampled and sent by Jas. O. Wooster, Fairfield. Qualitative tests showed this to be a ground limestone containing a large amount of moisture.

The first six samples are quite pure calcitic limestones containing little magnesia. **6982** is a ground magnesian limestone, representative of the larger part of the deposits in western Connecticut. **7283** and **7284** are factory wastes, the one from the acetylene plant containing more than half its weight of water. We find nothing likely to injure crops in either product and acetylene lime has been used on land with success.

ANALYSES OF LIMES AND OYSTER SHELLS.

Station No.	6970	7653	7672	7673	7197	7282
Per cent of						
Lime	48.60	51.24	49.68	49.26	43.70	43.44
Magnesia	small	*	*	*	*	*
Insoluble in acid	6.65	6.60	6.37	6.25	10.80	10.95
Station No.	6982	7284	7283	7007	7337	7009
Per cent of						
Lime	36.00	61.56	31.89	43.20	40.90	39.90
Magnesia	22.93	*	*	much	*	*
Insoluble in acid	2.25	†2.15	‡0.40	0.50	1.55	§

MUCK, PEAT, HUMUS, ETC.

Fourteen samples were analyzed as follows:

6452. Swamp muck from swamp west of Beaver Brook reservoir near Bridgeport Ave., Milford. Sent by Eli Whitney, New Haven.

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* Not determined.

† Contains 0.75 per cent moisture and 0.47 per cent organic matter.

‡ Contains 52.40 per cent moisture.

§ Contains 16.56 per cent moisture.

ANALYSES OF PEAT, MUCK, ETC.

Station No.		Composition as received.						Calculated water-free.				
		Water.	Mineral Matter.	Organic Matter.	Nitrogen.	Phosphoric Acid.	Potash.	Mineral Matter.	Organic Matter.	Nitrogen.	Phosphoric Acid.	Potash.
6452	Swamp Muck	71.62	13.44	14.94	0.40	0.06	0.06	52.65	47.35	1.41	0.21	0.20
6870	Humus No. 1	10.72	24.90	64.38	2.23	.....	.....	27.88	72.12	2.49	....	....
6871	Humus No. 2	16.50	23.38	60.12	2.14	.....	.....	27.99	72.01	2.55	....	....
6872	Humus No. 3	14.13	16.05	69.82	3.02	.....	.....	18.69	81.31	3.51	....	....
6878	Beard Swamp Muck	79.14	11.91	8.95	0.25	0.03	0.04	57.09	42.91	1.20	0.14	0.19
6879	Pump House Swamp Muck	84.32	0.91	14.77	0.28	0.02	0.01	5.80	94.20	1.79	0.13	0.06
7388	Peat, four feet from surface	41.85	9.64	48.51	1.45	.....	.....	16.58	83.42	2.49	....	....
7389	Peat, eight feet from surface	49.99	4.47	45.54	1.16	.....	.....	8.94	91.06	2.32	....	....
7390	Dried and ground peat	12.13	45.25	42.62	1.15	.....	.....	51.50	48.50	1.31	....	....
6455	Pasture muck	.....	80.80	.....	.....	.....	.....	.....	.....	.....	....	....
8227	Beaver Brook	85.99	1.84	12.17	0.31	0.01	0.02	13.13	86.87	2.21	0.07	0.14
8228	Beaver Brook	82.41	3.47	14.12	0.33	0.01	0.02	19.73	80.27	1.88	0.06	0.11
8229	Beaver Brook	83.47	3.93	12.60	0.29	0.01	0.01	23.77	76.23	1.75	0.06	0.06
8252	Muck from a wet "hollow"	72.39	14.13	13.48	0.33	.....	.....	51.15	48.85	1.19	....	....

6870, 6871 and **6872.** Humus sent by Branford Farms, Groton.

6878. Beard Swamp muck. Sent by Eli Whitney, New Haven.

6879. Pump House Swamp muck. Sent by Eli Whitney, New Haven.

7388. Peat taken from four feet below surface. Sent by Lansing Lewis, New Haven.

7389. Peat taken from eight feet below surface, many roots present. Sent by Lansing Lewis, New Haven.

7390. Dried and ground peat. Sent by Lansing Lewis, New Haven.

6455. Pasture muck. Sent by H. E. Russell, Brookfield.

8227, 8228, 8229. Muck from Beaver Brook, Milford. Sampled and sent by Prof. W. L. Slate, Jr., Storrs.

8252. Vegetable matter from a low, wet hollow. Sent by R. B. Kelly, New Canaan.

Of the above samples, concerning which we have no further information, **6879, 7389, 7388, 6872, 8227** and **8228** are quite pure vegetable matter, the largest amount of mineral matter in the dry substance of any of them being less than 20 per cent. All of them, when partly dry, would make admirable absorbents for liquid manure and a valuable adjunct to manure because of their water-holding capacity in sandy soils. The nitrogen being in form quite resistant to decay is of little immediate farm value.

COMPOSITION OF SHADE-GROWN TOBACCO STALKS.

A sample containing seven stalks of shade-grown tobacco, from which the leaves had been primed, was sent by W. H. Olcott, South Manchester, with a request for analysis.

The stalks as received weighed 10 lbs. 7½ oz., and contained

Water	82.44
Dry matter	17.56
	100.00
Nitrogen	0.366
Phosphoric acid	0.084
Potash	0.565

There are contained in

	One ton stalks	*10,000 stalks*
Water	1,649 lbs.	12,338 lbs.
Dry matter	351 "	2,632 "
Nitrogen	7.3 "	55 "
Phosphoric acid	1.7 "	13 "
Potash	11.3 "	85 "

Green stalks would not pay for cartage but if turned under in the fall would supply very considerable amounts of nitrogen and potash, as the analysis shows.

MISCELLANEOUS MATERIALS.

6972. "Davidge's Special Phosphorus." Made by Hudson Carbon Co., Ballston Spa, N. Y. Cost $40.00 per ton. Guaranteed 5 per cent phosphoric acid. Sampled and sent by A. A. Young, Jewett City. This material is advertised for florists' use.

Moisture	1.85
Mineral matter	73.78
Organic matter	24.37
Nitrogen	0.98
Phosphoric acid, water-soluble	0.05
" " citrate-soluble	1.68
" " citrate-insoluble	15.39
" " total	17.12
Potash	0.45

2999. Rape Meal. Contained 5.96 per cent of nitrogen, which by the permanganate methods showed a high solubility.

7198. Waste Powder. This is understood to be sweepings from a factory and to consist chiefly of gunpowder. Sent by S. W. Eddy, Avon. It contained 10.28 per cent of nitrate nitrogen and 34.50 per cent of potash, equivalent to 74.04 per cent potassium nitrate (saltpeter). This waste powder, composed of sulphur, charcoal and nitrate of potash, would be valuable in a special potato mixture, but the risks attending its transport and storage are of course great.

7199. Soot from chimney flues. Sent by S. W. Eddy, Avon. It contained about 98.5 per cent of mineral matter with 1.05 per cent of phosphoric acid, 0.35 per cent of potash and no nitrogen.

6969. Lint refuse. Sent by F. A. Wheeler, Norwich. It contained 0.94 per cent of nitrogen and 42.38 per cent of mineral matter (mostly sand). It was suggested that it might be used as a mulch if got without other cost than cartage.

7254. Dirt from under cotton carding machines. Sent by The Palmer Bros. Co., Fitchville. It contained 1.24 per cent of nitrogen, 0.17 per cent of phosphoric acid and 1.24 per cent of potash.

7336. Harbor Mud. Sent by Prof. A. G. Gulley, Storrs. It contained

Water	3.55
Insoluble in acid (sand)	75.60
Nitrogen	0.99
Phosphoric acid	0.77
Potash	0.05
Lime	1.24

On light land some kinds of marine mud, after partial drying and freezing, have proved valuable as a dressing.

7742. Finely powdered material sent by G. L. Howe, Rocky Hill. It contained 0.10 per cent of nitrogen, 0.74 per cent of phosphoric acid, no potash, 2.60 per cent of lime and 83.24 per cent of insoluble mineral matter. There was some carbonaceous matter present and the substance had the general characters of flue dust.

6992. Rock. **6993.** Sand. Sent by C. C. Hewitt, Uncasville. These samples contained 96.15 and 94.70 per cent, respectively, of matter insoluble in acid (sand) and are without value as fertilizers.

6994 and **6995.** Ground charred corn cobs. Sent by C. C. Hewitt, Uncasville. They contained 1.95 and 2.01 per cent of potash, respectively.

7222. Sent by North-Eastern Forestry Co., Cheshire. Fertilizer which had been in storage for four years, originally claimed to contain 14 per cent of potash. It contained 3.36 per cent of nitrogen, 10.20 per cent of phosphoric acid and 7.05 per cent of potash.

7382. Mixture of odds and ends, including a mixed fertilizer, tankage, acid phosphate and blood. Sent by L. M. Benham, Highwood. It contained 2.75 per cent of nitrogen, partly in form of nitrates, 11.71 per cent of phosphoric acid and 2.06 per cent of potash.

7008. Stone Dust. Sent by The Burns Co., Bridgeport. It contained 91.85 per cent of matter insoluble in acid (sand) and was without agricultural value.

7379. Refuse sent by E. E. Burwell with request for a test for potash was found to contain 0.37 per cent.

6225. Fertilizer sold by Oleum Products Co., Scranton, Pa. Sent by Benj. Fenn, Milford. It contained 0.27 per cent of nitrogen, 3.43 per cent of phosphoric acid and 0.31 per cent of potash.

6989. Sent by Lilian C. Alderson, Greenwich, with the question whether it was a superphosphate. It contained 0.35 per cent of nitrogen, 0.41 per cent of potash and no phosphoric acid.

6824 and **6825.** Mixed fertilizers sent by Henry Dryhurst, Jr., Meriden, with a request for a test for potash, of which they were found to contain 1.79 and 3.03 per cent, respectively.

7701. Waste odds and ends of fertilizer from stock of Station. It contained 5.50 per cent of nitrate nitrogen.

7195. Material thought to be nitrate of soda. Sent by A. N. Farnham, Westville. It contained no nitrate nitrogen, 0.45 per cent of potash and chlorin equivalent to about 93 per cent of common salt.

6887, Coarse Salt, and **6888,** Fine Salt. Sent by L. T. Frisbie Co., New Haven. These were thought to contain considerable nitrogen but analysis showed only 0.04 and 0.12 per cent, respectively.

6828. A mixture of nitrate of soda and muriate of potash. Sent by W. A. Henry and Son, Wallingford; contained 15.46 per cent of potash, with much soda and nitrate nitrogen.

8241. A fertilizer sent by Joseph Carson, Hazardville, with the inquiry whether it contained corn meal, contained no corn meal or other starchy matter.

8246. "Special Potash Ash" from the Chemical Products Co. of Pennsylvania. Sent by E. K. Dean, Amenia Union; contained only 0.51 per cent of water-soluble potash.

MISCELLANEOUS SOIL TESTS.

These tests are here noticed because they have relation to the use of fertilizers and amendments.

More than 60 samples of soil have been tested for acidity by the Jones method in answer to requests from their owners. The test is designed to give the number of pounds of actual lime, CaO, required per acre to make the soil neutral in reaction.

Soils will, however, often produce good crops with considerably less than this amount.

The highest lime requirement indicated in any of the soils examined was 7020 pounds. One sample (soil from alfalfa land which had been very heavily limed for some years) was found to be alkaline and the lowest lime requirement in any other was 630 pounds.

EXAMINATION OF SOILS FROM TOBACCO FIELDS.

Very general complaint has been made in the last few years that the yield of old tobacco lands was in many cases growing less. More striking has been the appearance in tobacco fields of areas of varying size where the crop either failed entirely or was stunted and sickly.

In order to see if the reaction of the soil on these spots showed any difference from that of parts of the field where growth was normal, samples both of the normal and the "sick soil" were drawn from twelve different fields and the acidity tested by the Jones method.

The average lime requirement of the normal soils was 1190 pounds, that of the "sick" spots 1242 pounds. In seven cases the lime requirement on the soil of the normal part of the field was less than that on the "sick" portion and in four cases it was more. These differences are certainly too small to be significant.

FURTHER CHEMICAL EXAMINATIONS OF SOIL FROM TOBACCO FIELDS.

The object in making these analyses was to find whether the failure of tobacco to grow satisfactorily on certain fields or parts of fields could possibly be attributed to a difference in the composition of the soil. The samples were drawn either by members of the Station staff or by the owners of the land who were fully instructed as to the method and precautions in sampling.

The data regarding the samples are as follows:

4738 and **4739,** soils to the depth of 9 inches from farm of Edgar E. Woodbury, Warehouse Point.

4739. Tobacco has been grown on this land almost constantly for 80-100 years. As good tobacco is grown here as anywhere in

the field though the yield of the whole field is not entirely satisfactory.

4738, from a portion of the same field, under the same treatment, where the plants are obviously stunted and not nearly so large or productive as on the rest of the field. The sample was taken from the east end where growth is poorest.

4740 and **4741**. Soils to a depth of 9 inches from tobacco land of H. E. Ellsworth, Simsbury. Tobacco has been grown here for many years, for the last 2 or 3 years under shade.

4741 from land where tobacco grows satisfactorily.

4740 from spots where the growth is stunted and poor.

The official method of soil analysis was followed, those elements only being determined which are soluble in acid.

	E. E. Woodbury.		H. E. Ellsworth.	
	Good.	Poor.	Good.	Poor.
	4739	**4738**	**4741**	**4740**
Fine soil	89.87	89.09	90.64	87.58
Gravel	10.13	10.91	9.36	12.42
	100.00	100.00	100.00	100.00
ANALYSIS OF FINE SOIL.				
Water	0.26	0.28	0.84	0.70
Other volatile matter	4.51	3.72	7.06	5.44
Insoluble in acid	88.93	90.62	88.45	87.90
Potash	0.15	0.16	0.15	0.19
Soda	0.08	0.10	0.09	0.08
Lime	0.35	0.44	0.34	0.48
Magnesia	0.49	0.51	0.31	0.38
Oxide of iron and alumina	5.00	4.36	3.32	4.85
Phosphoric acid	0.36	0.29	0.10	0.30
	100.13	100.48	100.66	100.32
Nitrogen	0.11	0.09	0.19	0.16

A comparison of each good soil with the poor soil from the same field shows no significant difference in composition, to which a difference in crop production could be attributed. The only striking difference is that the analysis of the poor soil from Ellsworth showed three times as much phosphoric acid as the good soil.

This field was visited by Dr. Clinton after harvest when most of the roots were dead. Examinations in both parts of the field showed slight infection with the root rot fungus, *Thielavia basicola*, but not in an amount which would be likely to interfere seriously with crop production.

As it has been suggested that an accumulation of water-soluble salts in the surface soil was the cause of the poor spots where tobacco did not grow normally, the following tests were made.

The tests consisted in shaking a weighed portion of soil for some time with water, filtering and determining in the clear solution the elements named.

In one case, the method of extraction by percolation used by the Massachusetts station was tried for comparison:

3008 and **3301** were sampled and sent by S. W. Bristol, Collinsville, **3301** from land yielding good tobacco, **3008** from spots where the yield was very inferior. **3007** was sampled by W. A. Hamlin, Suffield. For the last three years quality and yield of leaf have steadily grown poorer. His statement shows that it has been well fertilized, 2500 to 3000 of a mixed tobacco fertilizer per acre each year, 300 lbs. of lime in 1910 and 1911, and 1000 lbs. of lime in 1912. No lime was added in 1913, the year in which the sample was taken.

3719 East field and **3720** West field were sampled and sent by E. G. Beinhart of the U. S. Bureau of Plant Industry. These are from land of Henry Adams, Suffield, which yearly for the last ten years has had 1200 lbs. per acre of a standard tobacco fertilizer, together with one ton of cotton seed meal and 200 lbs. of lime.

The tobacco on the areas represented by the samples was inferior as compared with other parts of the field.

The samples were taken from slight depressions in the field, ranging from 100 to 3000 sq. ft. in area and the owner states that in dry periods the surface of these depressions is covered with a thin gray crust.

Following are the analyses of the solid matter in the aqueous extracts. The figures are percentages in the fine soil.

The extracts, where not otherwise stated, were prepared by the method described by Haskins, shaking a given weight of soil with water and making determinations in an aliquot part of the filtered solution.

A percolation method was used in some cases, 200 grams of soil being washed on a filter till 1000 cc. of filtrate were collected.

	Collinsville S. M. Bristol. Poor.	Collinsville S. M. Bristol. Good.	Suffield. W. A. Hamlin. Poor.	Suffield. W. A. Hamlin. Poor.	Suffield. Henry Adams. Poor.	Suffield. Henry Adams. Poor.
	3008*	3301*	3007*	3007†	3719†	3720‡
Total residue containing	.082	.040	.186	.205	.407	.473
Potash	.016	.009	.016	.012	.010	.010
Soda	.008	.007	.009	.012	.010	.012
Lime	.021	.002	.060	.055	.035	.050
Magnesia	.003	trace	.016	.013	.015	.012
Phosphoric acid	trace	trace	trace	trace	trace	trace
Iron oxide	....	....	....	....	.013	.011

Calculated on 2 million lbs. of soil:

§ *Total residue*	1,640	800	3,720	4,100	8,140	9,460
Potash	320	180	320	240	200	200
Soda	160	140	180	240	200	240
Lime	420	40	1,200	1,100	700	1,000
Magnesia	60	..	320	260	300	240
Oxide iron	..	..	..	..	260	220

In the last two samples the residue was largely organic.

In the one sample of soil producing good tobacco the amount of soluble lime was very much smaller than in any of the others and this seems to be the only significant feature. The sum of the four ingredients, soluble potash, soda, lime, and magnesia, is in the single good soil .018, in the four "sick" soils .087. It is unfortunate that we have not more comparisons of good and poor spots from the same field. The average of Haskins' tests in Massachusetts was .0435 on good soils and .0808 on sick soils.

In the two analyses of the acid-soluble part of the soil the sum of percentages of the four ingredients named above in good soils was 0.98, in poor soils 1.17.

A single analysis of soil from the farm of W. A. Henry & Son, Wallingford, may here be given though not a tobacco soil. The history of the soil is not known. It had not been cultivated recently and was in meadow.

* Soil extracts neutral to litmus.
† This extract prepared by percolation.
‡ Soil extracts acid to litmus.
§ Largely organic.

The analysis was made on the acid-soluble portion of the water-free, fine soil by the official method.

Insoluble and silica	84.20
Loss on ignition	5.20
Potash	0.24
Soda	0.13
Lime	0.31
Magnesia	0.54
Oxide of iron and alumina	8.36
Phosphoric acid	0.10
Sulphuric acid (So_3)	0.09
	99.17
Nitrogen	0.16

PART II.

SIXTEENTH REPORT

OF THE

State Entomologist of Connecticut

To the Director and Board of Control of the Connecticut Agricultural Experiment Station:

I have the honor to submit the following as my sixteenth report as State Entomologist of Connecticut for the fiscal year ending September 30, 1916. The inspection of the nurseries was not completed before that date, but as it is desirable to have them all in one list, they are included here. The presence of the white-pine-currant blister rust has necessitated extra inspection work, though, as this is a fungous disease, both the botanical and forestry departments have aided in its eradication. The chief entomological features of the year as well as accounts of the routine work of the department, and a few special articles, will be found in the following pages.

Respectfully submitted,

W. E. Britton,
State Entomologist.

Report of the Receipts and Expenditures of the State Entomologist from October 1st, 1915, to September 30th, 1916.

Receipts.

From E. H. Jenkins, Treasurer	$3,750.00	
Account of 1915, balance	761.54	
State Comptroller, Apiary Inspection Account	10.70	
" " Gipsy Moth Control Account	713.00	
Miscellaneous sources for lantern slides	2.85	
		$5,238.09

EXPENDITURES.

For Field, office and laboratory assistance:		
B. H. Walden, salary	$1,500.00	
Q. S. Lowry, salary	1,041.65	
M. P. Zappe, salary*	787.49	
Grace A. Foote, salary†	489.86	
Other assistance	41.00	
		$3,860.00
Printing and illustrations		15.64
Postage		25.01
Stationery		13.56
Telegraph and telephone		4.44
Office supplies		8.43
Library		50.53
Laboratory supplies		49.63
Express, freight and cartage		3.59
Tools and supplies		34.25
Traveling expenses		198.91
Balance, cash on hand		974.10
		$5,238.09

Memorandum:—This account of the State Entomologist has been duly audited by the State Auditors of Public Accounts. By provision of the Legislature at its 1915 session, all expenses for the work of suppressing gipsy and brown-tail moths and of inspecting imported nursery stock are paid by order of the Comptroller on receipt of duly approved, receipted, and certified vouchers, and the accounts may be found in the Comptroller's office in the State Capitol at Hartford. The items of $10.70 and $713.00 credited above as having been received from the State Comptroller, are not real receipts, but are virtually transfers from other appropriations to cover time expended on work for which such appropriations were made.

SUMMARY OF INSPECTION AND OFFICE WORK.

325 samples of insects received for identification.
88 nurseries inspected.
79 regular nursery certificates issued.
19 parcels of nursery stock inspected and certified.
23 orchards and gardens examined.
291 shipments, containing 2,102 cases, 1,998,178 plants imported nursery stock inspected.
94 shipments, or 32.3 per cent. found infested with insects or fungi.
467 apiaries, containing 3,898 colonies, inspected.
88 apiaries, containing 275 colonies found infested with European foul brood.
5 apiaries, containing 6 colonies found infested with American foul brood.

* For ten months. † For thirty-five weeks.

2 apiaries, containing 2 colonies found infested with pickled or sac-brood.
2037 letters written on official work.
768 post cards written on official work.
300 reports of inspection to Federal Horticultural Board.
1230 bulletins, etc., mailed on request or to answer inquiries.
99 packages sent by mail or express.
28 lectures and addresses made at institutes, granges, etc.

PUBLICATIONS OF ENTOMOLOGICAL DEPARTMENT, 1916.

By W. E. Britton:

Fifteenth Report of the State Entomologist (Part II. of Station Report for 1915): 112 pages, 6 figures, 16 plates; 10,000 copies distributed in April.

Report of the Committee on Injurious Insects, Proceedings Connecticut Pomological Society, page 35, 5 pages, 1916.

Report of the Committee on Injurious Insects, Proceedings Connecticut Vegetable Growers Association, page 9, 2 pages; page 82, 3 pages; also page 17 "Insects Attacking the Potato," 4 pages, 1915-1916.

Further Notes on *Diprion simile* Hartig, Journal of Economic Entomology, Volume 9, page 281, 2 pages, 1916.

The House Fly as a Disease Carrier and How Controlled (New and revised edition of a paper issued in 1912), Connecticut State Board of Health, 12 pages, 1916.

Report of the Anti-Mosquito Committee of the New Haven County Public Health Association, Monthly Bulletin, Connecticut State Board of Health, 3 pages, September, 1916.

A Dangerous Pine Sawfly (*Diprion simile* Hartig), Tree Talk, Volume 3, page 45, 2 pages, November, 1915.

By W. E. Britton and Quincy S. Lowry:

Bulletin 190, Insects Attacking Cabbage and Allied Crops in Connecticut, 23 pages, 17 figures; 10,000 copies distributed in April.

By B. H. Walden:

Anti-Mosquito Work in Connecticut, Proceedings Second Annual Meeting New Jersey Mosquito Extermination Association, page 81, 3 pages, 1915.

By P. L. Buttrick:

Bulletin 189, A Mosquito Survey at the Mouth of the Connecticut River, 32 pages, 1 map in colors; 2,000 copies distributed in March and April.

Department Staff.

W. E. Britton, Ph.D. ..... *State and Station Entomologist.*
B. H. Walden, B.Agr. ..... *First Assistant.*
Quincy S. Lowry, B.Sc. ..... *Assistant.*
Irving W. Davis, B.Sc. ..*Assistant and Deputy in Charge of Moth Work.*
Max P. Zappe, B.S. ..... *Assistant.*
Miss Grace A. Foote, B.A. ..... *Clerk and Stenographer.*

H. W. Coley, Westport
A. W. Yates, Hartford } ..... *Apiary Inspectors.*

Messrs. Walden, Lowry, Davis, and Zappe have continued as assistants and have aided in the general work of the department, particularly the inspection of nurseries and of imported nursery stock.

Mr. Walden has been in charge of all work during the absence of the Entomologist and has done most of the photographic work of the department which includes the making of negatives, prints, enlargements and lantern slides. He has also devised and made certain pieces of special apparatus for photographic work. He was assigned the inspection of the mosquito drainage work in Branford, Guilford, and Madison, and this occupied most of his time during the summer. He was, however, able to continue certain experiments on the control of the white pine weevil at Rainbow.

Mr. Davis has been in charge of the field work in suppressing the gipsy moth and the brown-tail moth, and has resided in Danielson throughout the entire year, except from August 15 to September 15, when he was in New Haven assisting in the annual inspection of the nurseries of the State. Mr. Davis' salary has been paid by the Comptroller out of the gipsy moth appropriation.

Mr. Lowry has conducted some field experiments in controlling the insects attacking cucumber, squash, and pumpkin at the Station farm at Mt. Carmel. He also investigated an outbreak of the eight-spotted forester, *Alypia octomaculata* Fabr., which occurred in the city of New Haven. Mr. Lowry has done a large portion of the work of inspecting nursery stock, both that growing in the nurseries of the State and that coming in from foreign countries.

Mr. Zappe was employed during May and June in inspecting pine trees for the white-pine-currant blister rust, under the direction of the State Forester, and for these two months was on the Federal payroll. Under the direction of the Entomologist, he has carried on some detailed studies on the life history, distribution, habits, and food plants of the imported pine sawfly, *Diprion simile*. He has also made the laboratory and insectary records, inspected much nursery stock and has done considerable work on the insect collection.

Miss Foote has done the stenographic and clerical work of the office, which consists of keeping all the records of inspection of apiaries and of imported nursery stock, indexing literature and insect collections, writing letters, typing manuscripts, filing letters and pamphlets, etc. During her vacation and for a short time when she was called home on account of sickness, Miss Alice C. Heath acted as substitute.

Messrs. Coley and Yates have inspected apiaries, as in former years, on a *per diem* basis, their wages and expenses being paid by order of the Comptroller, on duly accredited vouchers, out of an appropriation for the purpose.

All the members of the staff and others mentioned above have worked faithfully and conscientiously, and each deserves credit for whatever degree of success has been reached in the work of the department.

New Equipment.

During the early summer an out-door insectary about 10x16 feet in size was erected near the laboratory. It was built of a wood frame covered with a strong galvanized wire netting having a fine mesh. At first a removable and adjustable canvas roof was constructed, but in the fall this was replaced by a more permanent and stronger roof of boards and shingles. It was feared that the canvas would not carry the weight of snow which sometimes accumulates during the winter. This building is shown on plate 1, a.

A microscope slide cabinet holding 1,500 slides, a No. 4402 micro-Tessar photographic lens, and a second hand No. 3 special Kodak, fitted with Bausch and Lomb No. 11B Tessar lens and compound shutter, have been purchased during the year.

The insect collection has been enriched by a gift of 28 species of beetles of the family Dytiscidæ, from Mr. F. Waldo Dodge of Melrose Highlands, Mass. The specimens are correctly named and neatly mounted, and supplement the other species of this family in the collection.

Chief Lines of Work.

The routine and control work required by law continue to occupy a major portion of the time and efforts of members of the department staff. This includes the inspection of nurseries, inspection of orchards, gardens, greenhouses, etc., on request, the suppression of gipsy and brown-tail moths, and the inspection of apiaries. Since 1909, when nests of the brown-tail moth were found on stock imported into New York State, we have endeavored to examine all nursery stock entering Connecticut coming from outside the United States, and this inspection has been fairly complete since the establishment of the Federal Horticultural Board with its excellent system of permits and notices, in 1912.

The gipsy and brown-tail moth suppression work has been in immediate charge of Mr. Davis and has required much thought and attention. As provided by law, the work was placed upon a different basis beginning October 1, 1916. All bills are now paid by order of the Comptroller on vouchers which have been receipted and certified, and duly approved by the State Entomologist. The State Entomologist still has general charge of the work, is authorized to make rules and regulations, and must approve all accounts before they can be paid.

Under the new mosquito drainage law, the Director of the Station is authorized to make rules and orders concerning the drainage of swamp lands to eliminate mosquito breeding, and may order any marsh ditched, whenever suitable funds have been raised for the purpose. The Director is also charged with the approval of the work, after which the towns are obliged to maintain it.

As a large drainage project was under way involving all the salt marsh areas in the towns of Madison, Guilford, and the eastern part of Branford, the Director called upon the entomological department to inspect the work and Mr. Walden was

assigned the task. This work required the most of his time from April 1 to September 1. Mr. Walden has also inspected about 32,000 feet of ditches cut in salt marshes in Saybrook and about 15,000 feet in the lower part of the West River marsh in the town of Orange near New Haven.

Experiments in controlling the white pine weevil have been in progress for several years, and during 1916 were continued at Rainbow by Mr. Walden. The study of the imported pine sawfly, *Diprion simile* Hartig, commenced last year, has been continued by Mr. Zappe under the writer's supervision. A number of interesting observations were made on habits and food plants, and some new parasites were reared. This work was carried on in the new out-door insectary.

Experiments in controlling the insects attacking squash, pumpkin, and cucumber, and particularly the striped cucumber beetle and the squash borer, were conducted by Mr. Lowry under the writer's supervision, at the Station farm at Mt. Carmel. One-half acre of ground was devoted to this work and especially with the squash borer the treated rows gave a good crop of squashes, while the untreated rows had many of the vines killed, resulting in a small crop. This work will probably be continued next year.

The Entomologist has kept under observation during the season a scale-insect on silver maple.

The entomological supervision of the Station orchards at Mt. Carmel has been continued, and Messrs. Lowry and Zappe have examined the young apple and peach trees for borers, as in preceding years.

The Entomologist has given considerable time to forthcoming bulletins on insects to be published by the Connecticut Geological and Natural History Survey. Bulletin No. 22, "The Hymenoptera of Connecticut," which is about to be issued, has required reading and correcting of proof. He has also written a portion, and edited the remainder of a series of papers on the "Hemiptera of Connecticut," which will appear as an early bulletin of the Survey.

The following pages give a more detailed account of the work of the department for the year.

INSPECTION OF NURSERIES.

This work was commenced on August 8, and finished October 11, and was done by Messrs. Lowry, Davis, Zappe, Walden, and Britton. Dr. Clinton, Botanist, accompanied the party occasionally and visited a few of the larger nurseries, giving particular attention to the white-pine-currant blister rust, which has been found in two nurseries.

As was the case last year, the Ford car was used to transport the men, especially to the larger nurseries. The car was thus available for about a month, but was needed on the gipsy moth work by Mr. Davis after September 15.

On account of the outbreak of the white-pine-currant blister rust, an inspection of all white-pine plantations, where imported stock was used, was made in May and June by Station men in coöperation with the U. S. Department of Agriculture. This work was in charge of Mr. W. O. Filley, State Forester, but members of the botanical and entomological departments assisted. Some of the larger nurseries had previously imported pines from Europe and these were, therefore, inspected early in the summer. All nurseries were inspected for this as well as other pests in late summer, when the regular annual inspection was made. In August and September this disease was found on currants in a few nurseries and all diseased stock destroyed.

On the whole the nurseries were found to be in unusually good condition, though the inspection was uncommonly rigid. In 37 nurseries no pests were found; in 23 there were traces of San José scale. Oyster-shell scale was noted in 30; scurfy scale, 5; euonymus scale, 2; pine leaf scale, 2; spruce gall louse, 10; white pine weevil, 3; sawfly larvae on pine, 7; chestnut blight, 5; fire blight, 2; black knot, 6; white-pine-currant blister rust, 2; tulip tree scale, West Indian peach scale, *Kermes, Lina scripta,* linden borer and leopard moth, 1 each.

In all cases the infested trees or plants were suitably marked and reported to the owner with written orders regarding destruction or treatment. No certificates were issued unless these instructions had been carried out.

Besides the regular inspection and certification of nurseries, six inspection trips have been made, and 19 parcel certificates issued to persons who are not regular nurserymen, but who wish to ship woody plants, and are unable to do so without certificates.

Four nurseries have been inspected twice, in addition to the blister-rust inspection of pines in May and June which included practically all nurseries having pines.

Of the 83 names on the nurserymen's list, 15 are new since the publication of the list for 1915. Three have discontinued the business in Connecticut. The area now devoted to growing nursery stock in Connecticut is 1,526 acres. The list for 1916, together with date and number of certificate and acreage of each, is as follows:

NURSERY FIRMS IN CONNECTICUT RECEIVING CERTIFICATES IN 1916.

Name of Firm	Address	Acreage	Certificate Issued	No. of Certificate.
Alderson & Dell, The Misses	Greenwich	1	Nov. 23,	802
Barnes Bros. Nursery Co.	Yalesville	155	Sept. 27,	749
Beattie, Wm. H.	New Haven	1	Sept. 27,	759
Bowditch, J. H.	Pomfret Center	4	Sept. 8,	734
Brainard Nursery & Seed Co.	Thompsonville	6	Sept. 18,	741
Bradley, H. M.	Derby	1	Sept. 27,	758
Bradley, Smith T.	New Haven	1	Sept. 13,	740
Braley & Co., S. A.	Burnside	1	Aug. 28,	729
Bretschneider, A.	Danielson	1	Oct. 2,	771
Brooks Bros.	Westbrook	2	Oct. 11,	790
Burroughs, Thos. E.	Deep River	2	Oct. 16,	795
Burr & Co., C. R.	Manchester	300	Sept. 5,	730
Chapman, C. B.	Groton	1	Oct. 9,	788
Chapman, C. E.	North Stonington	2	Oct. 9,	787
Comstock & Lyon	Norwalk	60	Nov. 9,	800
Conine Nursery Co., The F. E.	Stratford	50	Sept. 29,	763
Conley, L. D.	Ridgefield	3	Oct. 2,	765
Conn. Agricultural College (Prof. A. G. Gulley)	Storrs	2	Oct. 2,	769
Conn. Agri. Experiment Station (W. O. Filley, State Forester)	New Haven	1	Sept. 27,	761
Conway, W. B.	New Haven	1	Sept. 18,	742
Cross Highway Nurseries	Westport	6	Oct. 18,	796
Dallas, Inc., Alexander	Waterbury	3	Sept. 20,	743
Dehn & Bertolf	Greenwich	25	Oct. 6,	781
Dowd, Frank C.	Madison	3	Oct. 4,	777
Elm City Nursery Co., Woodmont Nurseries, Inc.	Woodmont & New Haven	155	Oct. 4,	772
Fairfield Landscape & Nurseries Co.	Cannon Station	5	Nov. 29,	807
Gardner's Nurseries	Cromwell	10	Aug. 28,	727
Geduldig, G., Estate of	Norwich	1	Oct. 2,	770

Name of Firm	Address	Acreage	Certificate Issued	No. of Certificate.
Goodwin Associates, Inc., The James L.	Hartford	1	Oct. 11,	792
Hartford Park Commissioners (G. A. Parker, Supt.)	Hartford	3	Sept. 27,	752
Heath & Co., H. S.	Manchester	50	Sept. 5,	732
Hilliard, H. J.	Sound View	1	Oct. 11,	791
Holcomb, Irving (2)	Simsbury	1	Oct. 4,	778
Horan & Son, Jas.	Bridgeport	1	Sept. 27,	753
Houston & Sons, J. R.	Mansfield	4	Oct. 4,	776
Hoyt's Sons Co., The Stephen	New Canaan	300	Oct. 2,	764
Hubbard & Co., Paul M.	Bristol	12	Oct. 30,	798
Hunt & Co., W. W.	Hartford	12	Oct. 6,	779
Isselee, Charles	Stamford & Greenwich	3	Oct. 4,	774
Kelley, James	New Canaan	1	Sept. 9,	736
Kellner, Herman H.	Danbury	1	Oct. 2,	767
Laurel Park Farm & Nurseries	Burnside	90	Oct. 6,	782
Long, J. A.	East Haven	1	Sept. 13,	739
Mallett & Co., G. A.	Bridgeport	1	Oct. 9,	785
Maplewood Nursery Co. (T. A. Peabody, Mgr.)	Norwich	1	Oct. 16,	794
Marigold Farm	New Canaan	1	Sept. 11,	737
McDermott, E. F.	Windsor	1	Oct. 4,	773
Meier & Gillette	West Hartford	2	Sept. 25,	748
Munro, Charles	New Haven	1	Sept. 13,	738
New Haven Nurseries Co.	New Haven	10	Dec. 1,	808
New Haven Park Commissioners (G. X. Amrhyn, Supt.)	New Haven	30	Oct. 9,	786
New London Cemetery Ass'n. (F. S. Newcomb, Pres.)	New London	1	Nov. 27,	804
Northeastern Forestry Co.	Cheshire	20	Sept. 9,	735
Oakland Nurseries	Manchester	50	Sept. 5,	731
Palmer, L. M.	Stamford	5	Oct. 4,	775
Park Gardens	Bridgeport	1	Sept. 27,	762
Pequod Nursery Co. (2)	Meriden	15	Sept. 27,	750
Phelps, J. Wesson	Bolton	1	Nov. 28,	805
Phelps & V. T. Hammer Co., The J. W.	Branford	2	Nov. 28,	806
Pierson, Inc., A. N.	Cromwell	35	Aug. 28,	728
Platt Co., The Frank S.	New Haven	1	Nov. 9,	799
Pomeroy, Edwin C.	Northville	1	Oct. 2,	768
Purington, C. O.	Hartford	1	Oct. 20,	797
Raab, Joseph O.	Ansonia	1	Sept. 27,	755
Reck, Julius	Bridgeport	1	Sept. 27,	757
Roehrich, W. G.	Stratford	1	Sept. 27,	754

Name of Firm	Address	Acreage	Certificate Issued	No. of Certificate.
Rowe, Henry C.	Groton	2	Nov. 25,	803
Saxe & Floto	Waterbury	1	Sept. 20,	744
Schleichert, F. C.	Bridgeport	2	Sept. 22,	746
Scott, J. W.	Hartford	5	Jan. 10,	809
Sierman, C. H.	Hartford	3	Sept. 25,	747
South Wilton Nurseries	South Wilton	5	Oct. 9,	784
Stamford Seed & Nursery Co.	Stamford	1	Oct. 6,	783
Steck, Charles A.	Bethel	2	Oct. 2,	766
Stratfield Nursery Co.	Bridgeport	4	Sept. 27,	756
Traendly & Schenck	Rowayton	2	Oct. 11,	793
Upson, R. E. (2)	Marion	3	Sept. 20,	745
Vidbourne & Co., J.	Hartford	7	Oct. 6,	780
Wallace, Arthur T.	Wallingford	1	Nov. 20,	801
Wallingford Nurseries (2)	Wallingford	10	Sept. 27,	751
Wilson & Co., C. E.	Manchester	7	Sept. 5,	733
Yale University Forest School	New Haven	2	Sept. 27,	760
Young, Mrs. Nellie A.	Pine Orchard	1	Oct. 11,	789
Total		1,526 acres		

INSPECTION OF IMPORTED NURSERY STOCK.

The quantity of woody, field-grown nursery stock entering Connecticut from Europe has not shown a material falling off, as might be expected on account of the war. During the fiscal year just ended, we have inspected 291 shipments, containing 2,102 cases and 1,998,178 plants, as against 264 shipments, 1,349 cases and 2,102,222 plants the preceding year.

The same system of notices and permits arranged by the Federal Horticultural Board as was used last year still remains in force, and seems to be satisfactory. Altogether 300 reports of inspection have been made to the Federal Horticultural Board. During the past year this inspection work has required the equivalent time of one man working 197 days of 7½ hours each or about two-thirds of the working time of an entire year. The cost of this work including time and traveling expenses, has amounted to about $1,120.00 and has been paid from the appropriation for suppressing gipsy and brown-tail moths and for inspecting imported nursery stock, by the State Comptroller on duly accredited vouchers.

The sources of this stock are about the same as last year, except that none was received from Germany or Italy, and the quantity from Holland shows an increase, and that from Belgium a decrease. These differences are probably more apparent than real, as it is understood that considerable stock is transported from Belgium into Holland and then shipped to America. The figures appear in the following table:

SOURCES OF IMPORTED NURSERY, 1915-1916.

Country	No. of Shipments	No. of Cases.
Holland	154	1,432
Belgium	75	380
France	27	168
England	20	82
Ireland	3	3
Scotland	8	9
Japan	4	28
Total	291	2,102

In addition to the figures given above, notice was received of 12 other shipments containing 42 cases. Of these, two shipments were refused, two consisted of orchids and were examined at the port of entry by Federal inspectors, five contained herbaceous plants, and one, seeds, and these were not inspected. One never reached its destination, and one was retained in New York.

Of the 291 shipments examined, 94, or 32.3 per cent, were found infested with various insects or plant diseases, some of which may be considered pests. Some of the plant diseases were identified by Dr. G. P. Clinton, Botanist of this Station, and others and some of the insects were determined by specialists of the U. S. Department of Agriculture at Washington. These infestations are given in the following list:

INFESTATIONS FOUND, 1915-1916.

Plant Diseases.

Exobasidium on Azalea. (48 shipments.)
M. Debaerdemaeker, Evergem, Belgium (3); J. De Duysseleyr (5), O. De Vuyst (5), K. J. Kuyk (2), Arthur De Meyer (4), Societe Anonyme Horticole, Mont St. Amand (2), Ghent, Belgium; Bier & Ankersmit (6), De Coster Bros. (2), Melle, Belgium; August Toeffaert (4), Alphonse Colle, Destelbergen, Belgium; Haerens Co. (August Haerens) (2), Somergem, Belgium; De Bruyne Bros. (3),

L. Ch. Vander Linden Bros., P. T. Vander Sypt, Loochristy, Belgium; De Bruycker & B. Droesbeke, Wyncket St. Croix, Belgium (2); De Bruycke & L. Driesbeke, Gand, Belgium; Van Dillewyn & Thiel, Meirelbeke, Belgium (4).

Crown gall.
On rose. King's Acre Nurseries, Hereford, England; Vincent Lebreton's Nursery, La Pyramide-Trelaze, France; Levavasseur & Fils, Ussy, France.

Phyllosticta sp. on Rhododendron.
Schaum & Van Tol, Boskoop, Holland.

Phyllosticta aucubicola Sacc. on Aucuba.
D. Nieuwenhuis & Zonen, Lisse, Holland.

Fungus on Palm.
P. T. Vander Sypt, Loochristy, Belgium.

Sterile mycelium of fungus.
Ant. Roogen & Son, Hagerswoude, Holland.

Ascomycete, Immature, on apple.
Franco-American Seedling Co., Angers, France.

Sclerotinia stage of *Botrytis* on Golden Privet.
W. Fromow & Sons, Windlesham, Surrey, England.

Pestalozzia guepini on Rhododendron. (3 shipments.)
Schaum & Van Tol (2), H. den Ouden & Son, Boskoop, Holland.

Insects.

Oyster Shell Scale. On *Buxus.*
Ebbinge & Van Groos, Boskoop, Holland (3); J. Blaauw & Co., Schaum & Van Tol, K. Rosbergen & Son, L. D. Endtz & Co., W. Van Kleef & Son., Jac. Akerboom & Sons, H. M. Hardyzer, D. Nieuwenhuis & Zonen, Lisse, Holland; Verkade Van Kleef, Waddinxveen, Holland.

Diaspine Scale.
On Palms. Societe Anonyme Horticole de Mont St. Amand, Ghent, Belgium.
On Aspidistras. K. J. Kuyk, Ghent, Belgium; Bier & Ankersmit, Melle, Belgium.
On Bay Trees. Aug. Toeffaert, Destelbergen, Belgium.

Scale on Rose stock. L. Renault, Orleans, France.

Chionaspis salicis Linn. (egg stage) Green Ash cross stick. W. Fromow & Sons, Windlesham, England.

Coccus hesperidum. Societe Anonyme Horticole de Mont St. Amand, Ghent, Belgium.

Pseudaonidia paeoniae Ckll. Rhododendron. Yokohama Nursery Co., Ltd., Yokohama, Japan.

Emphytus cinctus on Manetti stock. Franco-American Seedling Co., Angers, France; Hemeray-Aubert, Orleans, France.
On (?). G. Bernard (or Benard), Olivet, France; Levavasseur & Fils, Ussy, France.
Larvae on Manetti stock. Levavasseur & Fils, Ussy, France.

Capsid. On Myrobolan plums. Doorne Bosch & Zoon, Veenham, Holland.
Psyllids on *Buxus*. Schaum & Van Tol, Boskoop, Holland; Jac. Akerboom & Sons, Boskoop, Holland.
Agelastica alni Linn. (3).
H. den Ouden & Son, Van Gelderen & Co., Schaum & Van Tol, Boskoop, Holland.
Aleyrodes on Azalea. Van Dillewyn & Thiel, Meirelbeke, Belgium (2); Aug. Haerens, Somergem, Belgium.
Woolly Aphis. Roots of Spruce Trees. Franco-American Seedling Co.
Apple. Franco-American Seedling Co., Angers, France.
Rhodites sp. gall. *Rosa rubiginosa*. G. Bernard, Orleans, France.
Cynipid gall on oak. Union Nurseries, Oudenbosch, Holland.
Coccinellid beetle. Vincent Lebreton's Nursery, La Pyramide-Trelaze, France.
2 Staphylinid beetles. Jac. Smits & Co., Naarden, Holland.
Tussock moth egg mass. On Maple. Ebbinge & Van Gross, Boskoop, Holland (2). Union Nurseries, Oudenbosch, Holland.
On (?) Vincent Lebreton's Nursery, La Pyramide-Trelaze, France.
Dead Lepidoptera. Arthur De Meyer, Mont St. Amand, Ghent, Belgium.
Lepidopterous cocoon. On Evergreen. Koster & Co., Boskoop, Holland.
On (?). Vincent Lebreton's Nursery, La Pyramide-Trelaze, France; De Bruyne Bros., Loochristy, Belgium; 2 parasitized. Ebbinge & Van Groos, Boskoop, Holland.
Lepidopterous larva, probably Pyralid. On Azalea. Van Dillewyn & Thiel, Meirelbeke, Belgium.
Empty cocoon and larval skin of Gipsy Moth. On Apple. Franco-American Seedling Co., Angers, France.
Dipterous pupa. On Rhododendron. C. Van Kleef & Co., Boskoop, Holland.
Coleopterous larva. On Rhododendron. C. Van Kleef & Co., Boskoop, Holland.
Empty Sawfly cocoon. Levavasseur & Fils, Ussy, France; De Bruyne Bros., Loochristy, Belgium.
Sawfly larvae and pupae. Vincent Lebreton's Nursery, La Pyramide-Trelaze, France.
Work of borers in roots of oak. Louis Leroy's Nursery Co., Angers, France.
Spider's eggs on *Buxus*. Ebbinge & Van Gross, Boskoop, Holland.
Centipede in packing material. Schaum & Van Tol, Boskoop, Holland.

INSPECTION OF APIARIES.

The total number of apiaries inspected in 1916 is 467, as against 494 for the preceding year. The cost per apiary and per colony averaged slightly more than in 1915. As in former years Mr. H. W. Coley of Westport has made the inspections in Fairfield, New Haven, Middlesex, and New London counties, and Mr. A. W. Yates of Hartford has covered Litchfield, Hartford, Tolland, and Windham counties.

Some inspections were made in each county, but, of course, not in each town. In all 96 towns, as against 90 last year, were visited by the inspectors, and apiaries were examined in each town. This is a larger number than has even been visited before in a single season since the advent of apiary inspection in Connecticut in 1909. Of this number the towns of Ashford, Ansonia, Bethany, Brookfield, Brooklyn, Canaan, East Haddam, Greenwich, Guilford, Hampton, Huntington, Kent, Mansfield, Monroe, New Milford, Newtown, North Haven, Norfolk, Orange, Plainfield, Prospect, Salem, Salisbury, Scotland, Sharon, Simsbury, Southbury, Southington, Stafford, Suffield, Tolland, Willington, Windham, Wolcott, and Woodbridge were not covered in the work last year, and apiaries in the towns of Ansonia, Ashford, Bethany, Brookfield, Canaan, Guilford, Kent, Monroe, New Milford, Orange, Plainfield, Salem, Salisbury, Simsbury, Tolland, Wolcott, and Woodbridge have never before been officially inspected. In Fairfield county 117 apiaries were inspected, in Hartford county 98, and in New Haven county 71. In each of Fairfield and New Haven counties, 21 towns were visited by the inspector, and in Hartford county 18 towns.

Foul brood was found in all the counties of the State, European foul brood occurring in seven towns in Fairfield county, 10 towns in New Haven county, two towns in Middlesex county, seven towns in New London county, four towns in Litchfield county, five towns in Hartford county, six towns in Tolland County, and six towns in Windham county. Both European and American foul brood were found in one town in New London county, one town in Middlesex county, and in three towns in Fairfield county. The percentage of diseased apiaries and colonies is somewhat less than last year for European foul brood, but slightly greater for American foul brood.

The statistics regarding the apiaries inspected in each town in each county are given in the following tables, the summary appearing on page 82.

APIARIES INSPECTED, 1916.

	No. Apiaries			No. Colonies	
	Inspected	Diseased*	Quarantined	Inspected	Diseased*
FAIRFIELD COUNTY.					
Bethel	18	2	0	54	2
Bridgeport	1	0	0	58	0
Brookfield	4	0	0	32	0
Danbury	13	0	0	141	0
Darien	2	0	0	56	0
Easton	2	0	0	83	0
Fairfield	9	0	0	94	0
Greenwich	4	0	0	60	0
Huntington	1	1†	0	7	5¶
Monroe	5	2	0	81	3
New Canaan	6	0‖	0	28	0
Newtown	4	3†	1	60	8¶
Norwalk	4	0	0	33	0
Redding	5	0	0	34	0
Ridgefield	5	3¶	0	64	7¶
Stamford	5	3§	0	51	8††
Stratford	2	0	0	45	0
Trumbull	3	0	0	69	0
Weston	3	0	0	20	0
Westport	6	0	0	66	0
Wilton	15	1	0	197	2
	117	15	1	1,333	35
NEW HAVEN COUNTY.					
Ansonia	2	1	0	15	2
Beacon Falls	1	0	0	4	0
Bethany	1	0	0	5	0
Cheshire	6	0	0	76	0
Derby	6	0	0	74	0
Guilford	2	1	0	9	3
Hamden	2	0	0	9	0
Madison	1	1	0	29	1
Meriden	12	2	1	129	4
Middlebury	2	1	0	43	35
Milford	3	0	0	26	0
Naugatuck	4	1	1	37	12
New Haven	3	1	0	8	2
North Haven	2	0	0	79	0
Orange	1	0	0	1	0
Prospect	9	1	0	88	8
Seymour	2	0	0	16	0
Southbury	4	1	0	12	1
Waterbury	5	0	0	37	0
Wolcott	1	1	1	18	18
Woodbridge	2	0	0	3	0
	71	11	3	718	86

	No. Apiaries			No. Colonies	
	Inspected	Diseased*	Quarantined	Inspected	Diseased*
MIDDLESEX COUNTY.					
Chatham	7	3†	0	67	7¶
East Haddam	9	4	0	83	6
	16	7	0	150	13
NEW LONDON COUNTY.					
Bozrah	2	2	0	10	3
Lisbon	1	1	0	4	1
Montville	10	6	0	36	9
New London	1	1	0	10	2
Norwich	3	0	0	133	0
Old Lyme	2	1†	0	52	3**
Salem	6	5	0	13	10
Waterford	3	1	0	59	2
	28	17	0	317	30
LITCHFIELD COUNTY.					
Canaan	10	1	0	67	3
Harwinton	1	0	0	1	0
Kent	5	1	0	40	1
New Milford	3	0	0	3	0
Norfolk	3	1	0	9	2
Salisbury	6	0	0	27	0
Sharon	8	0	0	30	0
Torrington	11	6	0	58	7
	47	9	0	235	13
HARTFORD COUNTY.					
Berlin	6	0	0	66	0
Bloomfield	9	5	1	133	11
Bristol	2	2	0	6	4
East Hartford	1	0	0	3	0
East Windsor	4	0	0	14	0
Enfield	5	0	0	9	0
Farmington	3	0	0	35	0
Glastonbury	15	1	0	67	4
Hartford	11	0	0	61	0
Manchester	1	0	0	4	0
Plainville	4	3	0	14	7
Simsbury	3	0	0	10	0
Southington	6	0	0	54	0
South Windsor	2	0	0	31	0
Suffield	9	0	0	27	0
West Hartford	11	1	0	65	3
Windsor	1	0	0	4	0
Windsor Locks	5	0	0	28	0
	98	12	1	631	29

	No. Apiaries Inspected	Diseased*	Quarantined	No. Colonies Inspected	Diseased*
TOLLAND COUNTY.					
Andover	3	1	0	9	6
Bolton	4	0	0	7	0
Coventry	11	3	0	88	27
Ellington	2	0	0	12	0
Mansfield	5	1	0	62	4
Stafford	2	1	0	18	1
Tolland	2	1	0	18	1
Vernon	8	0	0	74	0
Willington	11	6	0	49	22
	48	13	0	337	61
WINDHAM COUNTY.					
Ashford	1	0	0	10	0
Brooklyn	3	1‡	0	27	1‡‡
Hampton	3	2‡	0	10	4‡‡
Killingly	7	1	0	20	2
Plainfield	4	1	0	15	1
Pomfret	8	1	0	34	1
Putnam	9	1	0	22	2
Scotland	4	0	0	25	0
Windham	3	2	0	14	11
	42	9	0	177	22

SUMMARY OF APIARY INSPECTION.

County	No. Towns	No. Apiaries Inspected	Diseased	No. Colonies Inspected	Diseased
Fairfield	21	117	15	1,333	35
New Haven	21	71	11	718	86
Middlesex	2	16	7	150	13
New London	8	28	17	317	30
Litchfield	8	47	9	235	13
Hartford	18	98	12	631	29
Tolland	9	48	13	337	61
Windham	9	42	9	177	22
	96	467	93	3,898	289

* European foul brood unless otherwise indicated.
† An apiary with both American and European foul brood.
‡ One apiary infested with sacbrood.
§ Two apiaries with disease of adult bees.
‖ One apiary killed by European foul brood.
¶ One colony has American foul brood.
** Two colonies with American foul brood.
†† Six colonies with disease of adult bees.
‡‡ One colony with sacbrood.

	Apiaries	Colonies
Number inspected	467	3,898
Infested European foul brood	88	275
Per cent infested	18.8	7.05
Infested American foul brood	5	6
Per cent infested	1.07	.15
Pickled or sacbrood	2	2
Average number of colonies per apiary		8.34
Cost of inspection		$750.34
Average cost per apiary		1.61
Average cost per colony		.19

CONTROLLING THE GIPSY AND BROWN-TAIL MOTHS.*

By W. E. BRITTON and IRVING W. DAVIS.

Notwithstanding the fact that the law provides that towns shall, when ordered by and under the direction of, the State Entomologist, suppress the gipsy and brown-tail moths, it was thought best, for the present at least, to keep the gipsy moth work in the hands of trained men. It would be very difficult, if not impossible, for the several towns to secure trained and experienced men for this work, and consequently the results which they might accomplish would not be of maximum effectiveness. Plans to this effect were, therefore, prepared, and these plans, together with the more important purchases of supplies and equipment, have been duly approved by the Station Board of Control, as provided in Section 3, Chapter 267, Public Acts of 1915. The following pages give a brief account of the work accomplished under the act.

GIPSY MOTH WORK.

AREA INFESTED AND CHARACTER OF INFESTATIONS.

At the beginning of the fiscal year 20 towns were thought to be infested by the gipsy moth, but during the winter Ashford was found infested by the Federal scouts, making 21 in all. These towns have a total area of about 730 square miles and are as follows:

* This paper was included in the report, which the law requires the State Entomologist to make to the General Assembly. It is here given with slight emendations.

Thompson	Brooklyn	Voluntown
Putnam	Hampton	Griswold
Pomfret	Chaplin	Sprague
Woodstock	Sterling	Lisbon
Eastford	Plainfield	North Stonington
Ashford	Canterbury	Stonington
Killingly	Scotland	Groton

Since the manuscript of this paper was prepared, the Federal scouts have found an infestation in Mansfield near the eastern boundary. As Mansfield contains 46 square miles, the total infested area must now be regarded as 776 square miles.

All of these towns are shown on the accompanying map, figure 1.

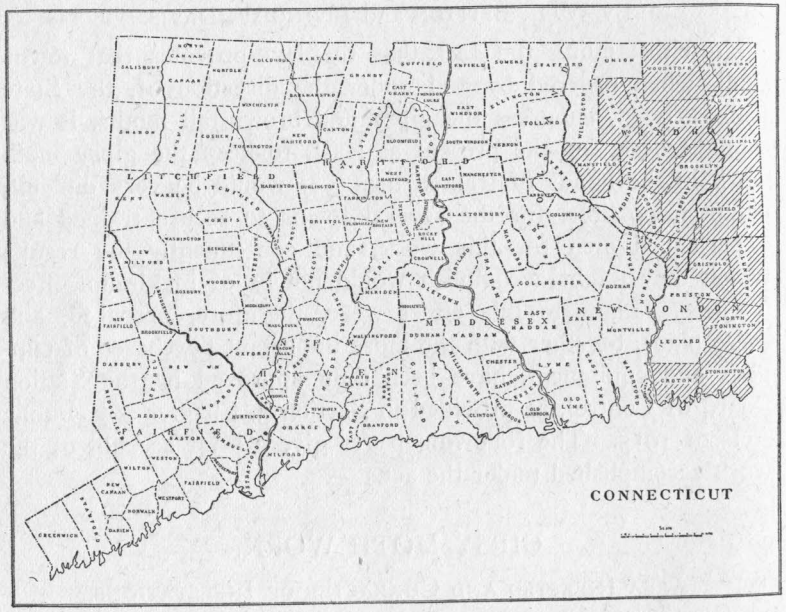

FIG. 1. Map of Connecticut, shaded portion showing area now infested by the gipsy moth.

The worst infested towns are Thompson, Putnam, Woodstock, and Pomfret, having an area of about 172 square miles. The number of infestations in each of these towns was found to be somewhat less than during the preceding year, as the following table will show:

Town	Number of Infestations 1915	1916
Thompson	166	100
Putnam	24	21
Woodstock	40	21
Pomfret	22	27
Total	252	169

Mr. Davis employed scouts from about November 1 to May 1, and during this time they searched the towns of Thompson, Putnam, Woodstock, Pomfret, Killingly, and Brooklyn, and destroyed all egg clusters found. All other towns were searched by the Federal scouts. No gipsy moths were found in the towns of Sterling, Voluntown, Sprague, and Lisbon, and none were found in Killingly by State or Federal scouts, though one caterpillar was reported by Mr. Woodward from East Killingly, near the Rhode Island line. Fewer infestations were also found in Hampton, Griswold, and Groton, though more were found in Eastford, Scotland, Canterbury, Chaplin, Stonington, and North Stonington. The same number occurred in Brooklyn and Plainfield, and the additional town of Ashford was found by the Federal scouts to be slightly infested in four places.

ORGANIZATION.

Irving W. Davis, B.Sc., a graduate of the Massachusetts Agricultural College, class of 1911, was already in charge of this work at the time the law was enacted, and on my recommendation, he was formally appointed Assistant and Deputy in Charge of Moth Work by the Board of Control of the Connecticut Agricultural Experiment Station, as provided in Section 3 of the act. Throughout the year Mr. Davis has resided in Danielson, where he may be reached by telephone, 28-3, or by mail. He has also employed men for the necessary work of scouting, cutting brush, spraying, applying tanglefoot, and examining the sticky bands. Trained scouts have been paid the same wages as is paid by the Federal Bureau of Entomology for this work, viz., from $2.56 to $3.20 per day, the latter being paid only to foremen who have had much experience. As our appropriations have never been adequate to cover the entire work, we have been obliged to depend on the coöperation of the Bureau of Entomology, and it frequently happens that both State and Federal men may be

employed in the same vicinity, or perhaps board at the same place. Consequently it seemed desirable to make hours and wages correspond as nearly as possible.

Untrained men have been employed temporarily for cutting brush and handling hose for $2.00 per day.

In general the men are not allowed their expenses, except in special cases where moved from one town to another or where sent on trips involving an actual outlay.

The number of men employed has varied from 8 to 25 as the exigencies of the work required.

Coöperation with Federal Agents.

From the start there has been the most cordial coöperation between the Federal and State forces seeking to control these dangerous insect pests. As a rule, each year the territory has been divided, each covering a portion and being responsible for it. As a Federal problem, perhaps the most important phase of this work is to prevent the further spread of the gipsy moth to other states; hence many towns not known to be infested have been examined by Federal men. On the other hand it seemed to us a better use of State funds to expend them in eradicating known infestations, rather than in hunting for new ones. Consequently during the year just closed, the Federal men have scouted the outside towns or those on the border of the infestations, while the State forces have endeavored to suppress the pest in the area most thickly infested. Even the Federal scouts have often been placed under the general supervision of Mr. Davis, and have reported all infestations to him. Likewise he has reported to the Federal agents all infestations found by the State scouts. Our thanks are due to Messrs. A. F. Burgess, L. H. Worthley, and other members of the Bureau of Entomology for this coöperation.

Equipment.

No extensive equipment has been added during the fiscal year, but free use has been made of the power sprayer, the Ford touring car, and the motor cycle and bicycles purchased during the preceding year. Four sets of tools and four tool boxes were purchased for the scouting crews at a total cost of $85.38.

Supplies.

For spraying the trees in and around the principal infestations, two tons of arsenate of lead were purchased at a cost of $295.76, and for banding the trees in and around the infestations, one ton of tanglefoot was purchased at a cost of $375.00. A portion of each kind of material was not used and is available for the coming season.

Methods of Scouting for Egg-Clusters.

Since the gipsy moth passes the winter in the egg stage, locating and destroying the egg-clusters has proven one of the best methods of controlling this pest.

The scouting for these egg-clusters, as it has been carried on in Connecticut, is commonly known as "roadside scouting." By this is meant the examination of all trees outside of woodland, and in wooded areas to examine or "scout" the trees for a distance of from 50-200 feet from the clearing, the distance depending on the species of trees and type of growth. Recent work by the United States Department of Agriculture has shown that this insect is spread principally by means of wind, and, therefore, it is necessary to scout carefully all windswept areas, paying particular attention to the apple and oak trees, which are the favorite food of the gipsy moth.

The organization has consisted of from one to four crews, each group or crew having at least four men and a foreman. The men or "scouts," as they are termed, are each equipped with a small mirror and a knife, the end of the blade of which is curved. The former is used to examine the under side of rocks, cavities in old trees, etc., while the latter is used to pull off pieces of dead bark, and for the man to mark his tree. Each man is given a special mark when he begins work, and it is equivalent to his writing his name on each tree that he examines. For example:—Scout J. J. Fitzgerald while scouting in the town of Killingly uses the mark —L, and all trees in that town which bear that mark show that he has examined them and is, therefore, responsible for them. Should any egg-clusters of the moth be found on that tree later, the man who examined it could be ascertained immediately. The foreman of the crew is not allowed to mark a tree until after a scout has done so, and

when the foreman's mark appears it places the responsibility on him. This also has the additional advantage of keeping the foreman behind his men so that he can follow their work better.

Besides the equipment that each man carries, each crew is required to have with it at all times, a can of creosote, a can of white paint, and a small hatchet. Each crew has a box of tools which is left at the boarding-house. This box contains axes, saws, etc., to be used in chopping out around the infestations.

The men are required to work eight hours a day. They leave their boarding-house at 7 o'clock and their time begins at 7.30. The working period is from 7.30 to 12.00 and from 12.30 to 4.00, after which they walk home in their own time. In the case of stormy or inclement weather, the men chop or burn brush around the infested localities, but if the day proves too stormy they are allowed to return to the boarding house, but are subject to the foreman's call up to 3 o'clock in the afternoon.

In order to make the work as simple and as efficient as possible, blue-print maps are made of the roads in each town, and each road is lettered, the main roads being lettered as A, B, C, D, etc., while the side roads are designated according to their location as A1, A4, B14, C9, etc. One of these maps is given to the foreman, and on this he designates the infestations found; another copy is filed in the office of the State Entomologist at New Haven, and a third is retained by the deputy.

Gummed paper arrows are used to enable anyone familiar with the work to find the crews. The foreman leaves one of these in front of the boarding-house each morning, with the arrow pointing in the direction that the crew is working. On this arrow is written the date, time the arrow was placed there, where the crew will work that day, and the foreman's initials. One of these arrows is also placed at each crossroad that is passed, and bears a legend similar to the first.

Reports are made by the foreman twice each week, and contain the name of the town being scouted, the date, the foreman's name, the name of the road worked, the number of miles scouted each day, the miles of wooded growth, the time lost and the reason, the number of trees examined (apple and shade), and if any infestations are found, the owner of the land, his address, the location of the infestation and the number of egg-clusters.

When the work has been completed in a town a similar report is sent in, which covers all of the infestations in that town.

Applying and Inspecting Bands.

During the first part of May the trees in and about the infested localities are scraped so as to smooth the bark, but not enough to injure the cambium or inner bark, and the tree is banded with a sticky substance known as "tree tangle-foot." This prevents the gipsy moth caterpillars from crawling up the trees, and as these localities are visited every day or so during the caterpillar season, the young caterpillars may be easily destroyed. The caterpillar season lasts from the middle of May until the middle or last of July.

When the infestations are plentiful, the men are able to use bicycles in the work, but in the outlying districts where the infestations are far apart, motorcycles have been used in visiting them.

Spraying.

In case any of the infestations assume a serious nature, we try to spray them during the month of June. At this time the caterpillars are rather small and it does not require as much poison to kill them, and the leaves have grown enough to have plenty of surface to hold the poison. The mixture used is arsenate of lead, 6 pounds in 50 gallons of water. The spraying is accomplished by the use of a Fitzhenry-Guptill power sprayer. This has a 10-12 horse-power gasoline engine, and a 400 gallon tank to hold the mixture. In spraying these localities, 1,500 feet of hose is used, and in the running of the sprayer a crew of about four men besides the engineer and nozzleman are required. This past season this machine was used to spray 60 of the worst infestations in the State.

Details of Gipsy Moth Work by Towns.

The details of the infestations and of the suppression work in each town have been prepared by Mr. Davis, and are described briefly in the following pages:

Thompson—100 infestations—1,359 egg-clusters.

Thompson, covering an area of 49 square miles, and situated as it is on the border of Rhode Island and Massachusetts, has

always been the most seriously infested of any of the Connecticut towns, and this past year has proved no exception.

The number of infestations (100) showed a decrease from the previous year when 166 were located. These infestations, however, were well distributed throughout the entire town, although a large number were situated in the vicinity of the road leading from Brandy Hill to Webster, Mass. In this group was located the largest infestation found during last winter, numbering 398 egg-clusters. Large infestations were also found near the village of Grosvenordale, on the State road about a mile south of Wilsonville, and on the road from Brandy Hill to the Quaddick reservoir.

During the early part of the summer work, several of these infestations showed a large number of larvae, and 39 of the most serious infestations were sprayed. The work closed on the 22d of July, but this town with the rest of the infested area will be thoroughly scouted this coming winter.

Woodstock—21 infestations—127 egg-clusters.

The finding of only 21 infestations in the town of Woodstock during the winter of 1915-16, reduced the number of colonies almost half from the previous year when 40 were located.

The majority of the infestations found were in the vicinity of the villages of East Woodstock and West Woodstock, with scattering ones in various parts of the town. One infestation, which was found about a mile and a half south of West Woodstock, was perhaps the worst one in the town this season. Here several large larvae were found outside of the banded area, but by doing extra scouting in that locality the number was greatly diminished before the end of the season.

None of the gipsy moth colonies in Woodstock were sprayed, as they were not deemed serious enough to warrant it, and on July 22d the work of patrolling the banded area closed for the season.

Putnam—21 infestations—141 egg-clusters.

The gipsy moth infestations in the town of Putnam numbered 21, and while 10 of these contained only a single egg-cluster each, there were several comparatively large ones. The largest in the town was one of 52 egg-clusters, which was located near

the Woodstock line on land owned by Mr. Henry Maynard. Early in the season a number of larvae were found here feeding on small oak growth, and this infestation together with 8 others in the town was sprayed.

Among other infestations of importance in Putnam, were those located on the State road about two miles east of the city of Putnam, one in the south part near the grounds of the Putnam Country Club, and one on a cross-road a mile to the east of the city. This last mentioned infestation was located on a roadside apple-tree, and during the early part of June a large number of gipsy moth caterpillars were found feeding on low brush on the opposite side of the road. This brush was cut and burned, and the remaining foliage on either side of the road was sprayed. The last few visits to this infestation failed to reveal any larvae, and it is believed that this infestation together with the others in this town have been exterminated.

Pomfret—27 infestations—686 egg-clusters.

The first part of the scouting done in Pomfret last winter was in the eastern section of the town, and as there were but few infestations located, it was believed that this town was comparatively free from the pest. As the work was carried to the western portion of the town, however, a number of infestations were located on a thickly wooded ridge which extends north and south along the western border of Pomfret.

Here the most serious infestation in the State was found, consisting of 304 egg-clusters and covering approximately ten acres of woodland. This growth was thinned and the remaining trees banded with tanglefoot, and the entire area sprayed. During the woodland scouting in August this section was again covered, and 20 egg-clusters found. (See plate II, b.)

Just previous to the spraying work a number of egg-clusters and larvae were found close to an infestation in the northern part of the town near the Putnam and Woodstock lines. This was thoroughly sprayed, and by the end of the season we were unable to find any more larvae in this vicinity.

Eastford—5 infestations—93 egg-clusters.

Of the five infestations found in Eastford, four were located in the eastern part of the town near the Pomfret line, while the

fifth, a pupa case, was found on the road leading from Phoenixville to Ashford.

The work of patrolling the infestations was carried on here as in the other infested towns, but none of the colonies in this town assumed serious nature.

Ashford—49 infestations—20 egg-clusters.

The scouting during the winter of 1915-16 found the town of Ashford infested by the gipsy moth for the first time. Four infestations were located, the largest consisting of 12 egg-clusters and situated about two miles south of the village of Warrenville.

During the summer work only eight gipsy moth caterpillars were found in this town. (See plate II, a.)

Killingly—0 infestations—0 egg-clusters.

Although this town has been infested for the past two years, a thorough scouting, and later a careful trailing, failed to reveal any egg-clusters of the gipsy moth.

Toward the latter part of the caterpillar season it was reported that a gipsy moth caterpillar had been taken in East Killingly near the Rhode Island line, but an examination of the nearby trees failed to show any evidence of the pest.

Brooklyn—2 infestations—13 egg-clusters.

The two infestations found in the town of Brooklyn were widely separated, one being in the southwestern corner, and the other in the northeastern corner of the town. At the former no larvae were found, but at the latter several appeared early in the season and this infestation was sprayed. No caterpillars were found after the middle of July, and at the time the summer work closed this infestation appeared free from the pest.

Hampton—6 infestations—151 egg-clusters.

Six infestations of the gipsy moth were found in the town of Hampton during the last winter, and all of them were grouped in the northwestern corner of the town. The largest of these contained 127 egg-clusters, and was located in an old orchard owned by Mr. Fowler. This infestation assumed a serious nature early in the season, and that together with the neighboring growth was sprayed with arsenate of lead.

The other infestations, while showing a number of caterpillars in the early part of the work, were apparently free from the pest before the season closed.

Chaplin—2 infestations—16 egg-clusters.

During the scouting in the town of Chaplin two colonies of gipsy moths were found within its limits. Both of these were in the eastern part of the town near the Hampton line, and contained 4 and 12 egg-clusters respectively. The latter was on the State road just below Clark's Corner. Here a few caterpillars were taken early in the summer, but nothing was found the latter part of the season.

Sterling—0 infestations—0 egg-clusters.

During the winter of 1915-16 this town was thoroughly scouted, but no signs of the gipsy moth were found.

Plainfield—1 infestation—160 egg-clusters.

The only gipsy moth infestation found in the town of Plainfield during last winter was located in the western part of the town near the Quinebaug River. This numbered approximately 160 egg-clusters, and while a large proportion of these were found in the trunk of a large apple tree, there were several scattered in the nearby undergrowth. During the month of June a number of larvae were taken here, but none were found during the later visits to this infestation.

Canterbury—10 infestations—211 egg-clusters.

Though six of the 10 infestations in the town of Canterbury were of but a single egg-cluster each, two rather large colonies were located. One of these was situated on the land of Mr. Charles Hyde near the road leading from Brooklyn to Canterbury, and the other a little to the west of the village of Westminster on land owned by Mr. Davis. The former contained 80, and the latter 115 egg-clusters.

These two infestations were the most serious in Canterbury, and in each case the underbrush was cut and the trees pruned. As several larvae were taken early in the season and none later, it is believed that both of these colonies were exterminated before the summer work finished.

Scotland—4 infestations—24 egg-clusters.

Of the four infestations located in the town last winter, one found in the woods close to the Hampton line was the largest. This consisted of 18 egg-clusters and was the only colony in the town where any larvae were taken during the summer. Thirteen caterpillars were taken early in the season, but during the later visits none were found.

Voluntown—0 infestations—0 egg-clusters.

No egg-clusters were found in this town during the past winter's scouting.

Griswold—2 infestations—6 egg-clusters.

There were two gipsy moth colonies found in this town during the winter scouting of 1915-16. One of these colonies consisted of one egg-cluster and was found near the banks of the Quinebaug River, while the other, a colony of five egg-clusters, was located in the southeastern corner of the town near the Preston line. Several larvae were found at the latter infestation early in the season, but during the last few weeks of the work none were taken, and it is hoped that both of these colonies have been exterminated.

Lisbon—0 infestations—0 egg-clusters.

The town was scouted last winter, but no evidence of the gipsy moth was found.

Sprague—0 infestations—0 egg-clusters.

No signs of the gipsy moth were found in Sprague during the past winter.

North Stonington—2 infestations—71 egg-clusters.

Two infestations were found in this town, one a pupa case and the other a colony of 71 egg-clusters. The latter was located in an orchard about a mile to the west of the North Stonington post office. This infestation was rather serious and was not sprayed, owing to the need of the sprayer in the northern towns. Extra scouting work was done in this locality, and when the season closed over 900 caterpillars had been destroyed.

Stonington—2 infestations—55 egg-clusters.

Only two colonies of gipsy moths were found in Stonington during the scouting of 1915-16. One of these was found near Wequetequock and the other in Pawcatuck near the city of Westerly, R. I. Neither of these colonies showed many larvae during the summer work, and during the later visits none were found.

Groton—1 infestation—1 egg-cluster.

The result of the scouting in the town of Groton during last winter was the finding of a small egg-cluster on Pearl Street in the village of Mystic. This infestation was watched during the summer, but no larvae were found.

Statistics of Infestations.

The statistics of the infestations for each town are given in the following table:

Town	No. of Infestations	No. Egg-clusters Destroyed	No. of Bands Applied	No. of Infestations Sprayed	No. of Larvae Destroyed
Thompson	100	1,359	5,665	39	11,906
Woodstock	21	127	615	0	562
Putnam	21	141	1,243	9	7,007
Pomfret	27	686	3,749	10	5,700
Eastford	5	93	371	0	42
Ashford	4	20	264	0	8
Killingly	0	0	0	0	1*
Brooklyn	2	13	43	1	65
Hampton	6	151	129	1	4,176
Chaplin	2	16	49	0	42
Sterling	0	0	0	0	0
Plainfield	1	160	17	0	785
Canterbury	10	211	501	0	135
Scotland	4	25	289	0	130
Voluntown	0	0	0	0	0
Griswold	2	6	113	0	53
Lisbon	0	0	0	0	0
Sprague	0	0	0	0	0
North Stonington	2	71	63	0	989
Stonington	2	55	38	0	70
Groton	1	1	16	0	0
Totals	210	3,135	13,165†	60	31,671

* Reported to the office by Mr. Woodward of East Killingly.

† In addition to this number of bands, 349 bands of Raupeleim were used in Thompson and Stonington.

Apple trees examined by State scouts during the winter 1915-16:

Thompson	38,277
Woodstock	53,583
Putnam	14,861
Pomfret	49,256
Killingly	22,960
Brooklyn	26,642
Total	205,579

Shade trees examined by State scouts during the winter 1915-16 (Shade trees counted are only those which stand within 100 feet of a building. No record was kept of roadside trees examined):

Thompson	8,290
Woodstock	9,356
Putnam	4,429
Pomfret	9,702
Killingly	5,481
Brooklyn	5,014
Total	42,272

Total expended by the State in gipsy moth work for the year ending September 30, 1916, $11,491.42.

BROWN-TAIL MOTH WORK.

The last two years ending September 30, 1915, saw such an increase of the gipsy moth in Connecticut, that it seemed best to use the most of our available funds in the control of this serious pest. The brown-tail moth work done during this period had, therefore, not been in the eastern towns of the State, which were known to be infested with this pest.

Upon examination of this section last fall it was deemed advisable to have the four towns in the northeastern corner of the State, namely,—Thompson, Woodstock, Putnam, and Pomfret, take measures to destroy this pest within their respective limits, as provided by law. Accordingly Mr. J. H. Osgood of Putnam, who has had much experience in this particular line of work, was appointed agent in each of these towns and whenever possible trained local men to help him in the work. Through this same means these four towns were scouted and the following

table shows the number of webs destroyed and the amount expended:

Town	Webs destroyed	Cost	Reimbursed by State
Thompson	1,652	$ 72.51	$ 36.25
Woodstock	7,518	212.50	106.25
Putnam	3,008	81.00	41.50
Pomfret	2,272	91.00	45.50
Total	14,450	$457.01	$229.50

During the month of March when there were several heavy snow storms, the gipsy moth crews were located in Killingly, and on days when they were unable to scout, they spent their time in destroying brown-tail webs. Through this means about 1,650 webs were cut and burned, the most of them being taken in the town of Killingly, although some 500 were found in the town of Brooklyn.

It has been our custom to have a few trained men scout the towns just west of those known to be infested with this pest and under the Federal quarantine, and during last winter Mr. John H. Osgood took charge of these men. No new towns were found to be infested, and a decrease was noted in those towns near the border, a few of which Mr. Osgood examined for the purpose of determining the spread of parasites. The cost of this work of scouting along the border of the quarantined area was $186.61. The total cost to the State for brown-tail work was $416.11.

Present Appropriation.

Out of the biennial appropriation of $21,000.00 for suppressing gipsy and brown-tail moths, and inspecting imported nursery stock, we have expended $13,026.20 distributed about as follows:

Gipsy moth work	$11,491.42
Brown-tail moth work, including 50 per cent rebate to towns of $229.50	416.11
Inspecting imported nursery stock	1,119.67
	$13,027.20

This leaves only $7,972.80 for the coming year.

Federal Expenditures in Connecticut.

In addition to the total amounts expended by the State, Federal agents in hearty coöperation with us have expended nearly $15,000.00 in gipsy moth work during the year just closed.

State Appropriation for Next Biennial Period.

It will be seen from the foregoing that during the past year about $28,000.00 has been expended in this work in Connecticut by the State and Federal Government. In case large additional infestations should be discovered, our funds would be wholly inadequate; consequently, we have asked for an appropriation of $60,000.00 for this purpose for the two fiscal years ending September 30, 1919.

Future Work and Recommendations.

In future moth work it will be necessary to employ more crews and to start trailing. By "trailers" we mean the men who examine the towns and check the work of the scouting crews. These are very important, as they furnish the main office with data of the exact results accomplished by each crew. I would also recommend the purchase of more spraying equipment, because our present outfit is inadequate and will not enable us to spray many infestations in the short time when spraying can be done. More bicycles are also needed; though we have purchased some bicycles, the majority that we use have been borrowed from the Federal Government. More motor vehicles will soon be needed. Judging from our experience with motorcycles, apparently Ford automobiles are about as cheap to operate and can be used on the work throughout the winter. If the infestations increase to any alarming extent, it will probably be advisable to establish a parasite laboratory within the State. This could be maintained in conjunction with the Federal work, and the cost would be insignificant in comparison with the results obtained, as parasites help control both the gipsy moth and the brown-tail moth.

A DESTRUCTIVE APHID ON TURNIPS.

Aphis pseudobrassicæ Davis.

On September 19, Mr. A. N. Farnham telephoned to the Station regarding serious injury to his turnips and kale by aphids, and requested an inspection. In company with Mr. Farnham I visited the farm that day, and saw several fields where damage had been done. One of these fields, which is situated just west or northwest of Pine Rock, contained two or three acres of turnips. A

portion (perhaps a half acre) had been planted to white egg turnips and the plants had been killed. These plants were of good size but had at first turned yellow, then brown, and now they were entirely dead and lay flat upon the ground. This had all happened within a few days, and the plants went down very quickly after the presence of the aphids was noticed. The other portion of the field was covered with rutabagas or Swedish turnips, which were attacked and injured though not as yet killed. There were patches here and there where the leaves were turning yellow. Plate V, a shows the edge of the field, and where the rows of white egg turnips had been killed. In another field south of Pine Rock eight rows of white egg turnips were rapidly being destroyed by the aphids, though at this time the leaves were still green and turning yellow. When visited October 2 the plants were nearly all dead. Swedish turnips on either side of the egg turnips had not as yet been greatly injured, though infested.

We also examined a newly-set field of kale on the top of the hill along Osborn Avenue. The plants were already infested.

Identity.

Considerable material was gathered and taken to the laboratory. Some of the leaves were photographed and are shown on plate IV, b. Some of the aphids were mounted on slides, and were identified as the turnip aphis, *Aphis pseudobrassicæ* Davis, a species described in 1914, by Mr. John J. Davis of the Bureau of Entomology. In order to verify the identification, some of the slides were sent to Dr. Edith M. Patch, of Orono, Me., who reported that the determination was correct for most of the specimens, but that on two of the slides, another species, the green peach aphis, *Myzus persicæ* Sulzer, was present. After this we examined much material and mounted a good series of specimens, and can state with certainty that the turnip aphis was by far the most abundant, and was evidently the one chiefly responsible for the damage.

Distribution.

Apparently this aphis was widely destructive in 1916, as complaints were received from A. N. Farnham and W. L. Mitchell, New Haven; Charles M. Jarvis, Berlin, and D. L. Clarke &

Sons, Milford. Mr. Huber, vegetable grower, also reports considerable damage around East Hartford, and at Green's Farms. We examined specimens, however, only from Mr. Farnham's field, though we understood that the insect was destructive throughout Highwood. Presumably the same species is also responsible for the injury elsewhere.

Distribution in Other States.

According to Paddock*, the turnip aphis has been recorded from New York, Indiana, Minnesota, Oklahoma, Louisiana, Florida, and Texas, and probably occurs throughout the United States. In general it has probably been mistaken for *Aphis brassicæ*, as it feeds upon the same kind of plants.

Life History.

No life history studies of the turnip aphis have been made in Connecticut and most of the observations on record are from Texas. It is not known where the aphids pass the entire season, but they appeared on the turnips in August and September and were found there until the following May. In the spring the infestations are heavy in Texas and continue until the crops are harvested or otherwise disposed of.

The species reproduces asexually in Texas where 19 generations were recorded between January and the following August. The sexual forms are unknown.

Description.

The original description† of the turnip aphis is as follows:

"*Wingless viviparous female:*—Entire body pale whitish green, head slightly dusky. Abdomen with a longitudinal row of impressed dots along each side in line with the cornicles; also on each side of the median dorsal line is a row of transverse shining areas with a reticulated surface, those on the last four or five segments usually united; and a similar row of smaller areas on each side. These shining reticulated areas contrast with the rest of the body which is dull and very slightly pulverulent. Thoracic segments with similar transverse areas. In specimens just molted the entire body appears shining and reticulated.

* Bull. 180, Texas Agricultural Experiment Station, 1915.

† Canadian Entomologist, Vol. xlvi, page 232, 1914.

"Eyes black. Antennae blackish excepting segments I, II, and basal half of III which are pale; reaching a little beyond the middle of the body; segment III longest, it being half to three-fourths longer than VI filament; segments V and VI base with the usual distal sensoria. Beak reaching to coxae of second pair of legs. Legs pale with dusky joints, the tips of the tibiae and all of the tarsi black. Cornicles pale with the tip dusky, slightly swollen towards the tip and constricted just before the apex, and noticeably longer than the cornicles of *A. brassicæ*. Cauda conical, and dusky to blackish.

"Measurements, as follows (averages from six individuals): Length of body 1.66 mm.; width 1.00 mm.; cornicle 0.226 mm.; cauda 0.140 mm.; antenna I, 0.080; II, 0.061; III, 0.399; IV, 0.202; V, 0.160; VI, base 0.122; VI, filament 0.287; total average length 1.311 mm.

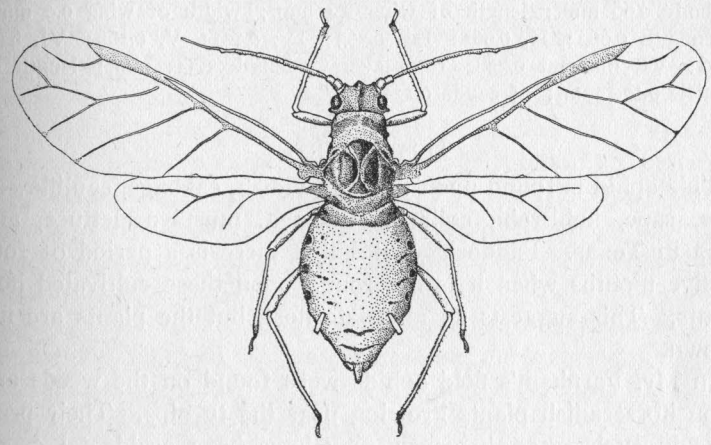

Fig. 2. The turnip aphid, *Aphis pseudobrassicæ*, winged female, greatly enlarged.

"Pupa. Head dusky, remainder of body cream color or with a faint greenish tint, and covered with a slight whitish pulverulence, excepting the shining areas which are covered with a noticeable reticulation, and which are placed as follows:—a row of oval or transverse areas on each side of the median dorsal line and a row of smaller and more circular ones laterad of these on each side, about in line with the cornicles.

"Eyes black. Antennae pale dusky, the distal ends of segments being more so, relative lengths of segments as in the winged female. Wing pads blackish. Legs pale dusky with the joints, distal end of tibiae, and tarsus blackish. Cornicles dusky, paler at middle, blackish at tips, and similar in shape to those of the wingless female.

"*Winged viviparous female:*—Head and thorax black. Abdomen pale apple green with a tint of nile green and a row of three black spots on each side anterior to the cornicles; a row of small impressed dots on

each side dorsad of the larger spots; and in addition a few scattered inconspicuous dusky markings on the dorsum, and the last three segments with black transverse, dorsal median markings.

"Eyes black. Antennae black; almost reaching to base of cornicles; segments III and VI filament subequal; segment III with 19 to 26 moderately tuberculate circular sensoria irregularly placed, IV with 6 to 10, often more or less in a row, V and VI base with the usual distal sensoria and not infrequently segment V bears one or two near the base. Wings with black and rather conspicuous veins, and the terminal branch of the media nearer the apex of wing than where it first branches. Legs with femur pale brownish to blackish, tibia pale brownish with tip black and tarsus black. Cornicles dusky, paler at tips, and shaped as in the wingless form. Cauda concolorous with the abdomen or paler. Measurements as follows (averages from six individuals): Length of body 1.4 mm.; width of body 0.66 mm.; length of wing 2.4 mm.; width of wing 0.9 mm.; antenna I, 0.069; II, 0.061; III, 0.363; IV, 0.191; V, 0.165; VI, base 0.126; VI, filament 0.358; total average length 1.333 mm.; length of cornicle 0.172 mm.; of cauda 0.134 mm."

Host Plants.

This aphid is found upon turnip, raddish, cabbage, cauliflower, kale, rape, kohl-rabi, collard, rutabaga, mustard, lettuce, and bean in Texas. Paddock* states that there is a period of four or five months when it is not found upon these cultivated host plants. This suggests an alternate host, but the plants are not known.

In Mr. Farnham's field aphids were found on the weeds and upon horseradish plants growing near the turnips. Their presence in such cases, however, may have been accidental or on account of their great abundance, and does not necessarily mean that these plants are real hosts.

Injury to Crops.

The injury is due to the large number of aphids sucking out the sap. When the infestation is severe, the leaves turn yellow and later brown, and soon wither and die. In regions of extensive areas devoted to truck crops, especially cruciferous plants, serious damage may result.

At Mr. Farnham's the infested turnips and kale were entirely killed. As there were many other fields in the same locality and nearly all similarly affected, it must have caused thousands of dollars of damage in the State in 1916.

* Bull. 180, Texas Agricultural Experiment Station, 1915.

Natural Checks.

In Mr. Farnham's three fields, two of which were perhaps half a mile apart, lady beetles were abundant in both the larval and adult stages and many pupae were fastened to the under sides of the leaves. The commonest species observed were the nine-spotted lady beetle, *Coccinella ix-notata* Hbst., and the five-spotted lady beetle, *Coccinella transversoguttata* Fabr. (*V-notata*). Many leaves were found which were entirely cleaned of the aphids by the lady beetles, though there were plenty of cast skins showing that aphids had been present and abundant. In Texas *Aphis pseudobrassicæ* is strongly parasitized by two Hymenopterous parasites, *Dieretus rapæ* Curt. and *Lysiphlebus testaceipes* Cress. These were not observed by us in connection with this aphid in Connecticut in 1916.

When examining this aphid material in the laboratory, it was noticed that a few individuals had been killed by a fungous disease. These were shown to Dr. G. P. Clinton, Botanist of the Station, and at his request sent to Dr. A. T. Speare of the Bureau of Entomology at Washington, who is at work on this group of fungi. Dr. Speare identified it as *Entomopthora aphidis* Hoff.

On October 2, this fungus was far more noticeable than on the previous visit and the under surface of the leaves was covered with aphids which had been killed by it, and giving the leaf a brownish color. Many of the wingless aphids showed a pinkish color, which, as Dr. Clinton pointed out, is an indication that they are infected. He examined several and found mycelium in their bodies. These fungous-killed aphids are shown on plate V, b.

These natural checks did not combine to save the crops at Mr. Farnham's in 1916, bright as the outlook appeared for them to do so. They were too late. Conditions for their rapid multiplication were favorable only after the aphids had increased to such an extent that the plants had died from their attacks.

Remedies.

At the start it seemed doubtful if artificial remedies could be employed to advantage in control of this pest, particularly after the whole field became infested. Mr. Huber suggested that

where colonies first started here and there in a field, straw be burned over the infested plants in order to kill the aphids and prevent their further spread.

In Texas many tests were conducted to control this aphis by spraying and by fumigating. One of the most successful was spraying the under leaf surface by means of an elbow tube and nozzle, using common laundry soap, 1 lb. in 7 gals. of water. Even though this treatment could not be applied to the whole field, it might well be employed to kill the first colonies as they appear in spots over the field.

LITERATURE.

Davis, John J., Canadian Entomologist, Vol. xlvi, page 231, 1914 (original description, with figures).

Paddock, F. B., Texas Agricultural Experiment Station, Bull. 180, 1915 (full account).

THE CONTROL OF APHIDS IN FIELDS OF SEED BEETS.

In the Report of this Station for 1915, page 191, is a brief account of damage in Milford to fields of seed beets owned by the Everett B. Clark Seed Company. Three species, *Aphis rumicis* Linn., *Macrosiphum solanifolii* Ashm., and *Myzus persicæ* Sulz., were present on the plants as well as on lambs' quarters and pigweed growing about the field, though the first species, being much the most abundant, was probably responsible for most of the damage.

On June 20, 1916, the writer visited the fields of the Clark Seed Company with Mr. F. E. Rogers, of the New Haven County Farm Bureau. At this time the brown species, *A. rumicis,* had just commenced to form colonies around the succulent stem and leaves near the tops of the taller plants, especially around the margins of the field. Only a few individuals were present in each colony and the plants had not yet been injured. We examined several fields, none of which were exempt, as small colonies were detected here and there, usually occurring on the upper portion of the tallest stalks and being more numerous around the edges of the field.

Mr. Clark was advised to send a careful man through the fields with a small knapsack spray outfit and to spray thoroughly that portion of each plant seen to be infested. "Black Leaf 40," one teaspoonful in a gallon of water with a little soap added, was the material used. A second visit was made in company with Mr. Rogers, July 11. We saw innumerable places where the spray had hit the aphid colonies and there were many dead aphids on the stalks and leaves. On the whole the treatment had been effective. A few living aphids were found here and there, and Mr. Clark promised to go over the fields again, and it surely would pay to do it. At this time there was promise of a heavy crop of beet seed, and by checking the aphids so as to protect the plants for another month, the crop would be sufficiently mature to be safe from injury.

This treatment is far less expensive than to spray all the plants in the field, even with a power outfit, and by taking it in season the aphids can be controlled by killing them when the colonies are small though conspicuous and before they spread to all the plants. The writer believes this to be an important point in the treatment of other kinds of aphids also, though some crops do not lend themselves so well to it as does the beet seed crop.

THE WHITE-MARKED TUSSOCK MOTH.

Hemerocampa leucostigma, S. & A.

From time to time serious damage is done to shade trees in the larger towns and cities on account of the attacks of the white-marked tussock moth, the larvae of which feed upon the leaves. Thus, in various times outbreaks have occurred in Washington, Baltimore, Philadelphia, New York, Albany, New Haven, Providence, Boston, and probably in many other cities. This insect is usually a greater pest in towns and cities than in the open country, yet in 1908* it caused serious damage in the apple orchards of western New York, one grower estimating his loss as high as 25 per cent of the total value of the crop. It has been taken repeatedly in Connecticut on both orchard

* Bulletin No. 312, New York (Geneva) Agricultural Experiment Station, 1909.

and shade trees. In 1905* it was abundant in New Haven and Hartford and defoliated many shade trees including elm, chestnut, horse chestnut, and poplar, and again in 1916 it was noticeable in many towns of the State. In Albany and Troy, N. Y., more than thirty years ago Dr. Lintner observed a different form of injury by the caterpillars of this insect. They ate the tender bark of new shoots of the elm, thus girdling them and causing them to break off and drop to the ground. In a paper read in 1895 Dr. Lintner† states that this girdling has been observed each year since 1883.

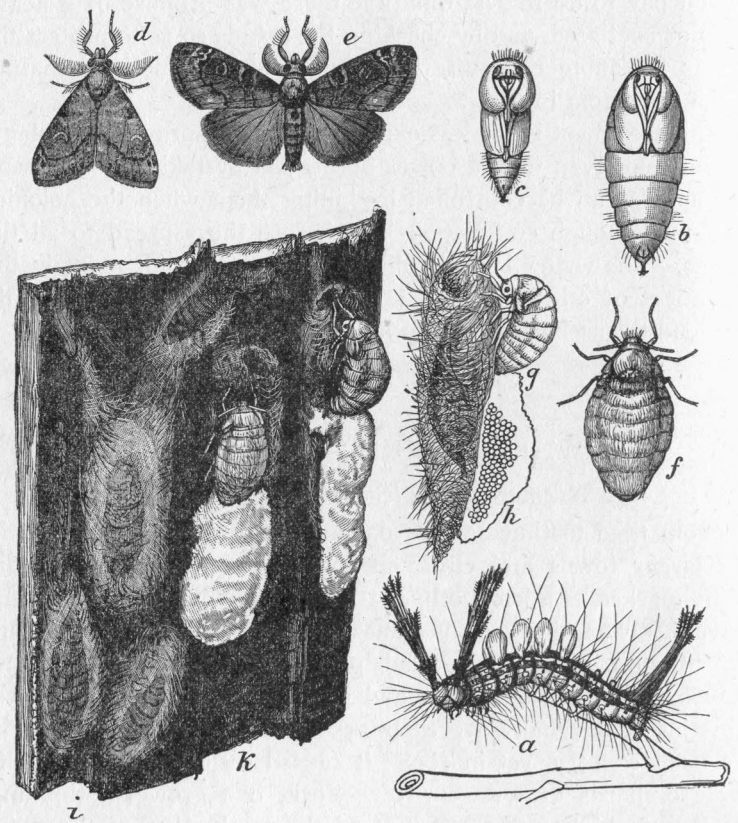

FIG. 3. White-marked tussock moth. a, larva: b, female pupa: c, male pupa: d, e, male moth: f, female moth: g, female laying eggs: h, egg-mass: i, k, cocoons—all slightly enlarged. (After Howard, Bur. Ent., U. S. Dept. Agr.)

* Report Conn. Agr. Expt. Station, page 230, 1905.

† Report, New York State Entomologist, II, page 124, 1895.

During the season just closed, the white-marked tussock moth has been received at the Station 17 times, including three times from points in New York State. In most cases it was reported from shade trees, but in one instance the caterpillars were feeding on peach and in another on quince.

In September specimens were sent us from New London with a request for an inspection, as it was feared that the gipsy moth was present there. Consequently Mr. Davis visited New London on September 22, and found the insect in question to be the white-marked tussock moth, which was abundant there.

The egg-clusters are conspicuous on the trunks and larger branches of trees during the winter months, where they appear as white foamy masses, characteristically shown on plates VI, and VII, a and c.

LIFE HISTORY AND HABITS.

Along the coast and up the river valleys and in fact over most of the area of Connecticut, there are two generations each year of the white-marked tussock moth. Felt* reports that only one generation occurs normally in Albany, and there are at least three annual broods in the vicinity of Washington, D. C.

The insect passes the winter in the egg stage. These eggs hatch in May in Connecticut, and the young caterpillars feed upon the under side of the leaves eating at first only the green portion and leaving the veins and upper epidermis. As the caterpillars increase in size, they eat holes entirely through the leaves, and when nearly full grown are voracious feeders and devour the whole leaf except perhaps the largest veins. The larval or caterpillar stage lasts about five weeks, during which time the caterpillars molt or cast their skins five times. When nearly mature the caterpillars have the habit of crawling considerable distances, and are able to go over the ground from one tree to another. If numerous, they migrate from the defoliated trees, and may be seen crawling over fences, sidewalks, or upon vehicles, and in this way they spread to other trees.

It is usually about the first week in July in Connecticut when the mature larva transforms. It spins some silken threads and with them mixes some of the long hairs from its own body,

* Insects Affecting Park and Woodland Trees, Vol. 1, page 135, 1905.

forming a gray cocoon, which is usually placed on the rough bark of the trunk or larger branches, though sometimes on the small twigs or leaves, and on buildings, fences, and monuments. The insect remains in the cocoon about two weeks. The male on emerging flies about and is attracted to lights. The female, having no wings, cannot fly, and though she may crawl short distances, usually deposits her cluster of eggs on the old cocoon. The egg-mass is pure white, of a frothy texture, and contains from 100 to 500 eggs. It is shown on plate VII, a. The eggs laid in July soon hatch and the caterpillars feed through August and into September, when they become full grown and pupate. In 1905, the adults emerged from many of these cocoons. Normally the winter is passed in the egg state, though Packard, quoting Riley,* states that occasionally a living pupa may be found in the winter.

Food Plants.

The white-marked tussock moth has a long *menu,* including nearly all kinds of fruit trees, most of the forest and shade trees except conifers, as well as many common shrubs. Among the shade trees, poplar, elm, horse chestnut, linden, and soft maple seem to be preferred.

Distribution.

The white-marked tussock moth is found from Florida to Nova Scotia and as far west as Nebraska. It is probably the most abundant in southern New England and the Middle Atlantic States.

Description.

The caterpillars are distinguished by the four yellow or white brush-like tufts of hair standing upright in a row on the back. A broad black band extends longitudinally along the back, bordered by yellowish subdorsal stripes. Laterally the caterpillar is dark gray with yellow tubercles. Head bright red. There are two long pencils or plumes of black hairs projecting forward over the head and one similar plume extending backward at the tail. This is one of the most striking and beautiful caterpillars found in Connecticut, and may often be seen crawling on the

* Fifth Report, U. S. Entomological Commission, page 264, 1890.

sidewalk, trunks of trees, fences, etc. When fully grown the caterpillar is about one and three-fourths inches long, and its general appearance is shown on plate VII, d.

The female is about five-eighths of an inch long, gray, and wingless, and resembles the female canker worm only larger. The male has a wing-spread of about one and one-fourth inches and is dull gray with rather inconspicuous marking on the fore wings, with slender body, and large and feathery attennae as shown on plate VII, b. The cocoons are dark gray or slate-color, and about three-fourths of an inch long.

The egg-masses are usually about one-half inch in diameter though irregular in shape and size. They are usually laid upon the old cocoon and are pure white and very conspicuous.

Parasites and Natural Checks.

It is known that certain species of birds feed upon the caterpillars, especially in their younger stages. Unfortunately native birds are not sufficiently abundant in cities to hold the moth in check. The robin, the Baltimore oriole, the yellow-billed cuckoo, the whip-poor-will, the phoebe, the chimney swift, the blue jay, and the English sparrow have been observed feeding upon the caterpillars. Several insect parasites have been recorded. In New York State in 1908, the ichneumon flies (*Pimpla*) *Scambus inquisitoriellus* Dalla Torre (= *inquisitor*) and (*P.*) *S. conquisitor* Say, were abundant, the former being the more numerous. These two species infested about 95 per cent. of all the parasitized cocoons in the vicinity of Geneva and Lockport. Around Geneva about 60 per cent of all cocoons were parasitized, and in some orchards around Lockport the parasitism reached 80 per cent.

Dr. L. O. Howard* states that in Washington in 1895 about 90 per cent of the larvae were killed by parasites. Of these *Scambus inquisitoriellus* D. T. (*Pimpla inquisitor* Say) and *Chalcis ovata* Say were the most effective. He also records the following as primary parasites of the white-marked tussock moth: *Scambus marginatus* Provancher, (*Pimpla annulipes* Say) *Amorphota orgyiæ* How, *Meteorus communis* Cress., *M. hyphantriæ*

* Technical Series, No. 5, Division of Entomology, U. S. Department of Agriculture, 1897.

Riley, *Limneria valida* Cress., *Limneria* sp., *Theronia fulvescens* Brullé., *Apanteles delicatus* How., *A. hyphantriæ* Riley, *A. parorgyiæ* Ashm., *Pteromalus cuproideus* How, *Cratotechus orgyiæ* Fitch, and *Telenomous orgyiæ* Fitch. In addition to these primary parasites Howard lists a large number of hyperparasites which often counteract the good done by the primary parasites in checking the white-marked tussock moth. Several two-winged or dipterous parasites have been reared from the cocoons, as follows:—*Frontina aletiæ* Riley, *F. frenchii* Williston, *Tachina mella* Walker, *T. clisiocampæ* Townsend, *Euphorocera claripennis* Macquart, *Exorista griseomicans* Van der Wulp, *Winthemia quadripustulata* Fabricius, *Sisyropa* sp.

Control Measures.

There are two chief methods of controlling this insect: (1) by poisoning the foliage, and (2) by destroying the egg-clusters.

Spraying. A thorough spraying of the foliage in June will destroy the larvae of the first brood. Lead arsenate (3 lbs. of the paste in 50 gallons of water) is probably the best poison for this purpose. As it adheres well to the foliage it may not be necessary to repeat the application, unless the second brood caterpillars are very abundant and migrate from adjacent unsprayed trees. In such cases they will be able to find sustenance on foliage which has formed subsequent to the application of the poison, and a second spraying in August may be advisable.

Destroying the Egg-clusters. The destruction of the eggs is often the most economical method of destroying the pest, and this can be accomplished in two ways; (1) by scraping off and burning the egg-masses, or (2) by treating them on the tree with something that will prevent their hatching. The former method is practiced in New York and some other large cities, where men employed for the purpose become very expert in the use of a specially made tool, consisting of a small hoe blade mounted on the end of a long pole. By means of this tool many of the egg-clusters can be reached from the ground and dislodged. But if left upon the ground and not destroyed, these eggs will hatch. Hence they should be gathered and burned or saturated with creosote to prevent hatching.

A simpler method is to soak the egg-masses *in situ* with crude creosote by means of a brush or sponge mounted on a long pole. This can be dipped in the creosote and pressed against the egg-masses. As the creosote discolors the pure white eggs, it is easy to distinguish the treated from the untreated eggs. This creosote has long been used to kill gipsy moth eggs and is effective if a sufficient amount of the liquid is used to thoroughly soak through the mass. Otherwise some of the eggs may survive.

It should be borne in mind that the treated and discolored egg-clusters will remain for a time on the bark, and render the trees more or less unsightly. In case of choice shade trees near the home, it may be advisable to remove them, just for the sake of appearance.

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THE ROSE CHAFER.

Macrodactylus subspinosus Fabr.

For many years this insect has caused much damage to growing fruit and garden crops in Connecticut, and it was particularly troublesome in 1916.

In the Report of this Station for 1905, page 259, is a brief note regarding damage to young peach fruits by rose chafers and the injury is shown on plate XII, b, of the same Report. Aside from a mere mention this is the only place in the reports

of the State Entomologist where any information is given regarding the rose chafer. A brief account of its injury, life history, and the control methods to be used against it is given here for the information of the many orchard and garden owners who suffer from its ravages throughout the State.

It is generally considered that the rose chafer is a much more serious pest on sandy soils, for it breeds chiefly on such soils. The soil is sufficiently sandy in Connecticut for it to be present in destructive numbers all over the State, but it is especially abundant along the coast.

Distribution.

The rose chafer occurs from Canada southward to Virginia and Tennessee and as far west as Colorado and Oklahoma. The region of its greatest abundance and, therefore, of its greatest destructiveness, is in Southern New England and the Middle Atlantic States. Though it has been reported as especially destructive in certain sections of Maryland, Virginia, West Virginia, Pennsylvania, New York, Ohio, Indiana, Illinois, Nebraska, Kansas, Michigan, Vermont, Massachusetts, and Rhode Island, it is not uniformly destructive throughout these states, and does little damage on the larger areas where the soil is a heavy clay. As has already been stated, the insect breeds in sandy soils and may be expected to cause its greatest devastation over sandy areas.

Injury Caused by the Rose Chafer.

Injury to Plants. Grapevines were injured by the rose chafer as early as 1810, and always have been a favorite food of the beetles, which emerge in this latitude just before the middle of June and begin their attack at the blossoming time of the grapes. They eat away the blossoms and newly set fruit, often entirely destroying the crop. They also feed upon the leaves, riddling them and sometimes almost defoliating the vines.

Though grape vines have long been a preferred food, the rose chafer is by no means confined to them, but attacks all kinds of trees and shrubs. Fruit trees are often seriously damaged, and the work of the adult beetles is common on shade trees. Plate IX, d, shows some small peaches which have been eaten by the

beetles. The writer recalls that in 1906, in Stonington nearly all of the native vegetation was attacked and many of the cultivated trees and shrubs had their leaves riddled. Even the greenbrier, *Smilax sp.* was defoliated. In fact when these beetles are exceptionally abundant, almost all forms of vegetation are attacked and devoured. Plate VIII, b, shows the characteristic injury on a birch leaf.

One of the most disgusting forms of injury caused by the rose chafer is that which this insect inflicts upon choice flowers, such as roses, paeonies, and late blooming iris in the garden. Plate VIII, a, shows the chafers feeding upon a rose. White roses and white paeonies are especially sought by the beetles, which eat holes in the petals, and soil the flowers so that they are worthless. They also attack pink and other light-tinted varieties, but seldom molest the dark ones. As the light-colored flowers are usually the most effective in the ornamental garden, they cannot well be eliminated in favor of the dark colors. The beetles are usually on hand in time to attack roses and paeonies.

Injury to Chickens. It is not wholly as a pest of plants that we must consider the rose chafer an injurious insect. It has often been stated that chickens would die soon after eating the beetles. This was first called to the writer's attention by Professor G. H. Lamson, Jr., of the Connecticut Agricultural College at Storrs, who has recently published a short account of his investigations.* From 15-20 rose chafers are enough to kill a week-old chicken that eats them. It takes from 25-45 rose chafers to kill a chicken three weeks old. Mature fowls and chickens ten weeks old and upwards are seldom killed. An extract was made from rose chafers and this, when injected into rabbits, killed them in a few minutes. These results lead Professor Lamson to believe that rose chafers contain a neuro toxin which affects the heart action of both chickens and rabbits, and renders them a dangerous food for young chickens. Chickens, therefore, should be kept in a mowed field away from grapes, flowering shrubs, or herbaceous plants during rose chafer time and especially when rose chafers are abundant.

* Journal of Economic Entomology, Vol. 8, page 547, 1915.

Life History.

The beetles emerge from the ground and attack plants usually about June 10-12 in New Haven. The earliest record in the Station collection is June 9. Of course, this date varies somewhat each year according to climatic conditions, yet it is fairly constant for a given locality. I well remember hearing a fruit grower state that the beetles had not failed for many years to appear on June 12 at his place in North Windham. The beetles are usually feeding for about four weeks, and are present for about six weeks, though diminishing in numbers toward the end of this period, then they disappear entirely. There is only one generation or brood each year. Soon after emerging the beetles mate, and they are usually found in pairs on the foliage. The female lays her eggs singly, a few inches below the surface of the ground, usually depositing from 24 to 36 eggs. The eggs soon hatch and the young larvae feed upon the succulent roots of grass and other plants, becoming full grown by late autumn when they descend deeper into the ground below the frost line. The following spring in April or May they ascend, transform to pupae in earthern cells, and from two to four weeks later the beetles dig their way out into the open air and attack the plants. The adult lives, on the average, about three weeks.

Description.

The adult beetle is yellowish-brown with head, thorax, and body together about one-third of an inch long, and with long sprawling legs. There is usually a greenish tint on the thorax and the legs are deep honey-yellow with black spines. The beetle is shown on plate IX, c.

The larva is yellowish-white with pale brown head. The egg is smooth, oval, about 1.5 mm. in length, white, and semitransparent. Two eggs as laid in the soil are shown on plate IX, b, about two and one-half times enlarged.

Control Measures.

The rose chafer is an exceedingly difficult insect to control by ordinary measures, and though many practices have been advised, most of them have proved unsatisfactory when the beetles are present in large numbers.

Spraying with Arsenical Poisons. Grapes in the vineyard should be sprayed heavily and thoroughly just before the blossoms appear and again after the blossoms fall, using lead arsenate (paste) 5 lbs. in 50 gallons of water. This spray may also be applied to the foliage of any shade trees or ornamental shrubs around the place, and also to fruit trees unless the fruit is nearly ready to harvest. Even when covered with this poison, the leaves and fruit will often be somewhat injured, because the beetles are obliged to do considerable feeding before they obtain enough poison to kill them.

Covering with Bags or Netting. The newly-set clusters of grapes are often enclosed in a paper or cloth bag which is pinned tightly around the stem. This will protect the fruit from being injured by the rose chafer as well as several other insect pests, and is a practice that may well be adopted on a small scale, as in the home garden. It is hardly practicable in the vineyard. Likewise choice shrubs and small trees may be protected by covering them with mosquito netting to keep away the beetles.

Hand Picking. When the beetles are on flowers, like roses, paeonies, etc., which cannot well be protected, hand picking is about the only remedy. A good way to destroy them is to drop them into a tin can containing kerosene.

Cultivation. It has been found that the pupa is easily destroyed, while the larvae and adults are hard to kill. This suggests plowing and harrowing the ground, or deep cultivation, at the time the insect is in the pupa stage, say during the last week in May.

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EXPERIMENTS IN CONTROLLING THE STRIPED CUCUMBER BEETLE AND THE SQUASH BORER.

By W. E. Britton and Quincy S. Lowry.

At the Station farm, Mt. Carmel, in 1916, one-half acre of ground was assigned to this department for use in field experiments in the control of certain insects attacking cucurbits. Chief among these insects are the striped cucumber beetle, *Diabrotica vittata* Fabr., and the squash borer, *Melittia satyriniformis* Hübn., though observations were made on the squash bug, *Anasa tristis* Degeer, and some other species. All plants were grown from seed planted May 25. The following varieties were grown: Cucumbers—Davis Perfect, White Spine, and Long Green; Squashes — Fordhook, Delicata, Boston Marrow, Hubbard; Pumpkin—Small Sugar. These tests do not show satisfactory results, and we expect to continue them. Nevertheless, they indicate certain possible lines of treatment, and the uselessness of others, so we mention them here.

Striped Cucumber Beetle.

Striped beetles were more abundant than the writers have ever seen elsewhere. They attacked both cucumbers and squashes before they appeared above ground and nearly all plants were ruined, notwithstanding the various treatments applied. Consequently it was necessary on June 23 and 24 to replant the whole field. The plants in some of the rows were covered with protectors as shown on plate I, b, and if applied early enough, these protectors will probably prove as effective as any treatment. In most cases, however, beetles were already at work on the stems of the plants below the surface of the ground before the protectors were placed over the plants. Probably there were also some beetles that emerged from the ground under each frame. Undoubtedly these protectors will keep off the beetles which fly to the field.

In using arsenical poisons, the dry or powdered form seemed to be rather more effective than the same amount of poison applied as a spray.

We hope to continue this work next season, and will test the protectors placed over the hills when the seeds are planted.

Squash Borer.

After the attack of the striped beetle had subsided, there were enough squash and pumpkin plants left for a fair crop, except for the injury caused by the squash borer. Few adults were noticed on the field, yet when the plants were carefully examined on August 1, several were found to be infested with young borers. It was intended that plants of each variety be given the same treatment, but through some oversight this was not done. We have, therefore, no good basis for comparing yields, yet it was certain that more plants were saved where the young borers were cut out than was the case with the check plants, or where only the vines were covered with soil.

Rows 21-26 were examined closely for borers. Their presence is indicated by the "sawdust" thrown out of the stem. With a small sharp knife, a longitudinal incision was made in the stem and the larva killed by cutting with the knife. If taken in season the vines are not much injured and the wound soon heals.

The first cutting out was done August 4, though the two rows of pumpkins were not examined until August 7, when 45 borers were found in row 25, and 55 in row 26.

On August 16, the check rows had lost a greater number of plants than the adjoining rows, where the vines were covered with soil, but finally did not give any better yield. The best results were obtained where the borers were cut out.

The following table shows the varieties, treatment, and also the yield based upon a count of the mature squashes and pumpkins October 11:

Results of Treatment on Squashes and Pumpkins.

Variety	No. of Row	Yield	Treatment
Boston Marrow	17	13 squashes	Check. No treatment.
	18	15 "	
	19	5 "	Vines covered with soil.
	20	9 "	
Hubbard	21	58 "	Borers cut out.
	22	45 "	
	23	44 "	
	24	59 "	
Small Sugar	25	96 pumpkins	
	26	54 "	

It is planned to continue the trials, using different treatments of the same variety the coming year. Probably the greatest benefit will follow the combined treatments of cutting out the borers and covering the vines with soil.

OUTBREAK OF THE EIGHT-SPOTTED FORESTER.

Alypia octomaculata Fabr.

Order *Lepidoptera*, Family ZYGAENIDAE.

By QUINCY S. LOWRY.

During the past summer the eight-spotted forester occurred in large numbers in the neighborhood of Howard Avenue, New Haven. Though present each year, it seldom attracts attention, and there are no records, at least since the office of State Entomologist was established in 1901, which indicate that the eight-spotted forester has been anything like as abundant in Connecticut as during this outbreak.

The writer was sent to the home of Mr. E. A. Prince at 498 Howard Avenue, New Haven, to investigate a complaint made by him that his grape arbors and Virginia creepers were being rapidly defoliated by "worms." At this date, July 22, 1916, the Virginia creepers were entirely stripped (see place X, a) and the grape arbors nearly so; even the young clusters of fruit were badly eaten by the caterpillars, which were present by the thousands. These proved to be the larvae of the eight-spotted forester, *Alypia octomaculata* Fabr.

Mr. Prince was advised to spray at once with arsenate of lead all the foliage remaining on his premises. This was done, and when the arbors were inspected again on July 28, it was difficult to find any living larvae to collect for rearing purposes in the laboratory. However, there were quantities present in adjoining yards.

Only brief accounts of this insect have been recently published, and these do not figure this insect as being of any economic importance. If the eight-spotted forester should appear in abundance in commercial vineyards a great amount of damage would be caused, considering the number of caterpillars in this outbreak in the city yards of New Haven.

LOCALITY INFESTED.

The locality infested was within the radius of a mile from the junction of Howard and Kimberly Avenues, where any grape vines or Virginia creepers were present, and great numbers of these caterpillars were found to be completely destroying the foliage by the twenty-eighth of July. There is no doubt that this pest is very local in its habits, as it did not appear in any other section of the city, neither was it reported from any of the commercial vineyards of the State.

FOOD PLANTS.

These caterpillars cause the greatest amount of damage to the grape, both the wild and cultivated varieties. However, the Virginia creeper, *Ampelopsis quinquefolia* Michx., is another favorite food plant, and the common barberry, *Berberis vulgaris* Linn., and varieties of rose were found to be readily eaten by these larvae on the estate of Mr. Prince, which may have been due to the fact that the foliage of the grape and Virginia creeper at this date had been nearly destroyed, and they were forced to feed on what foliage remained.

In 1891 an article was published by C. V. Riley* who says, "*Alypia octomaculata* is one of the most troublesome caterpillars; the great abundance of Ampelopsis vines in the parks and especially around it covering 'squatter sovereignty' houses, affords congenial food for its rapid propagation. In the parks the vines are twice annually treated with a solution of London purple applied with a spraying machine. This has proved most effective, and the vines do not seem to be injured as easily as most plants by the arsenates."

DISTRIBUTION.

Morris† reports that the eight-spotted forester is common in the northern states, while Dr. John B. Smith‡ lists it as being common through the eastern and central United States. Saunders§ states that it is very generally found throughout the United States and Canada, while Dyar‖ gives its distribution as being

* Insect Life, Vol. iv, p. 61.

† Morris, Lepidoptera of North America, page 132, 1860.

‡ Smith, Economic Entomology, page 263, 1896.

§ Saunders, Insects Injurious to Fruits, page 262, 1900.

‖ Dyar's List of North American Lepidoptera, page 97, 1902.

the Atlantic States. The station collection shows that adults were collected from New Haven, Stonington, and Watertown, Connecticut, also from Savoy, Massachusetts, a majority of these specimens being collected in May and June.

Habits.

It seems to be a well known fact that this pest occurs only in cities and towns, and has never been reported from this State as causing damage to vineyards or arbors located in the country.

As the caterpillars feed in the day time and are exposed, it makes it a rather easy pest to control; they are also very local in their injury, this outbreak being confined to a very small area. Inasmuch as the adult is a day-flyer and because of its local habits, it should be effectually controlled if proper treatment be given when the larvae are first found feeding. They are very voracious leaf feeders, and if the foliage has been sprayed with arsenical poisons it will prove very destructive to them.

Life History.

The adult, or moth, generally appears in Connecticut during the months of May and June, and probably lays its eggs soon after it emerges from the ground.

The young caterpillars are whitish in appearance and feed beneath the leaves, growing very rapidly. The caterpillar when full grown goes into the ground to pupate about the first of August. This year a majority had pupated on August 2. It changes into a chrysalis within a slight cocoon, just below the surface of the ground. In Connecticut the insect passes the winter in the chrysalis stage, the adult appearing the next spring and having one brood. In Missouri, however, Riley* reports that the adult issues soon after it changes from the larva to the chrysalis form, also that there are two broods annually in Missouri, and that a third brood was obtained in Illinois in 1870. J. B. Smith† reports but one brood in New Jersey, and Lugger‡ also reports that this species is single brooded in Minnesota and passes the winter in the pupal stage.

* Riley, Sixth Annual Report of State Ent. of Mo., 1874, page 95.
† Smith, Economic Ent., page 263, 1896.
‡ Lugger, Minnesota Insects, Bull. 61, page 121, 1898.

Description.

Egg. The egg of this pest has never been observed by the writer and consequently cannot be figured or described here.

Larva. The average length of the full grown larvae is 35 mm. The general color of the larvae is brown with a bluish cast. The head and cervical shield are of a shiny bright deep orange, covered with several black dots. The segments are transversely banded with narrow black and whitish bands, each segment having a broader band of orange. This orange band is sometimes lacking on the second and third segments, and is interrupted in the center of the seventh, eighth, and ninth segments. The orange band is dotted with small black dots; even when the bands are not present on the second and third segments, the black dots are present. Each dot produces a short white hair, and they are arranged in two rows, alternating in the rows. Between the orange bands, the black and white transverse lines appear. The eleventh segment has a prominent hump, and laterally between the tenth and eleventh segments appears a whitish spot, which is larger than the white markings that appear between the other segments just below the spiracles. These markings give the appearance of a wavy whitish line, which is only broken by the interruption of the orange bands. The legs are black; the false legs have two black spots near the bases which are orange.

Chrysalis. The larva changes to its chrysalis within a slight cocoon, which is made of particles of soil or sand and measures about three-fourths of an inch in length. The chrysalis is dark brown in color and measures one-half inch in length.

Adult. The female moth is of a deep velvety blue-black color. The forewings have two large circular pale yellow spots, and the hind wings two smaller white spots. The shoulder-covers are yellow, and the first and second pairs of legs are tufted with orange. The male moth differs slightly from the female, having larger wing spots in proportion to its size, and it also has a white mark on the tip of its abdomen. The abdomen of the female is entirely black. Females in the station collection have a wing-expanse of one and three-eighths inches; the males average one and one-fourth inches.

The larvae, pupae, adults and parasite are shown on plate XI.

Parasites.

Undoubtedly many different species of birds feed upon these caterpillars and help largely to keep this pest in check. In the laboratory two Tachinid parasites emerged August 15, and were identified by Mr. Harrison E. Smith as *Winthemia quadripustulata* Fabr. Whether this is an important parasite that will keep the insect in check another year remains a question.

Control Methods.

Hand picking has been recommended as a control method where the caterpillars appear in small numbers and when arsenical sprays cannot be used to advantage. Spraying with arsenate of lead, three pounds in 50 gallons of water, is very effective, one spraying being sufficient in most cases. Pyrethrum in the form of a spray, two ounces to a gallon of water, will prove effective, especially if applied when the caterpillars are small. London purple is an old remedy which was much used in New York City about 1890, being recommended by E. B. Southwick, who had charge of the trees and shrubs in Central Park.

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THE PINE TIP MOTH.

Pinipestis zimmermani Grote.

During the course of the work of inspecting the white pine plantations by the botanical and forestry departments, on account of the blister rust, early in the summer of 1916, many infested pines were found and destroyed. Sections of the trees containing the fungus were placed in heavy paper bags and brought to the Station. These were stored in the botanical laboratory, where a few weeks afterward several small moths were observed on the windows. These were collected and examined and were found to be two species, *Pinipestis* (*Nephopteryx*) *zimmermani* Grote and *Dioryctria abietella* D. & S. As they were suspected of having emerged from some of the pine wood, subsequent material was placed in cages and several adults obtained. These emerged from sections of the trunk often three inches or more in diameter. This moth was reared from material gathered in Bantam, Litchfield County; New Canaan, Cannon Station, and Bridgeport, in Fairfield County; Middlebury, New Haven County; Groton, New London County; and Woodstock, Windham County. These records indicate that this insect occurs throughout the State.

Injury.

This insect is supposed to attack the base of the new growth, causing a brown pitch mass to form, and later the tip shrivels and finally turns brown. According to both Grote and Kellicott, q. v., it also attacks the bark of the trunk and larger branches, especially in the vicinity of wounds, often killing small trees. The former expressed the opinion that this insect caused more injury to young white pines than any other species.

Though this insect is known as the pine tip moth, Professor Kellicott* observed it breeding in the vicinity of wounds on the trunks of trees from six to twelve inches in diameter. He also found the larvae near galleries made by other borers and found their galleries in both trunk and branches above and below the whorls, sometimes completely girdling the stem and killing the upper portion. Particularly was the injury of this moth apparent in connection with the tunnels of the white pine weevil, *Pissodes strobi* Peck.

Life History.

There has been no opportunity for us to work out the life history of this insect, but Kellicott* states that he took many larvae on April 12, varying from .25 to .7 of an inch in length, so apparently the insect winters in the larval stage, and trans-

* Canadian Entomologist, Vol. xi, page 114, 1879.

forms to the pupal stage in early summer. The first of our adults emerged June 27, but others came out later up to August 5. Probably there is only one brood each year.

Food Plants.

This moth is known to infest the following species of pines:—white pine, *Pinus strobus;* *P. rubra;* red or Norway pine, *P. resinosa;* Scotch pine, *P. sylvestris;* stone pine, *P. cembra;* Bhotan or Japanese white pine, *P. excelsa;* and the Austrian, Corsican, and Russian pines.

Description.

Adult. Wing-expanse, 1.-1.25 inches; forewings less than one-fourth of an inch wide at widest part, ground color gray sometimes brownish, marked transversely with zigzag lighter and darker lines, as shown on plate XII, b. Rear wings nearly unicolorous, light brown, darker along the veins and near the margins. Body gray, rear margin of each abdominal segment bordered with whitish scales. Antennae brown, filiform; legs black and white.

Larva. The larval stage was not observed as we did not know that this insect was present until the moths emerged. Grote* states that the larva when full grown is from 16 to 18 mm. long and "livid or blackish green" with shining chestnut brown head and black mandibles. Its body is naked with series of black dots, each dot giving rise to a single rather stout bristle. Prothoracic shield blackish. Kellicott,† on the other hand, states that the larvae were dull white instead of "livid or blackish green," and that the hairs arise from brown instead of blackish dots.

Treatment.

So far as known there is no practicable method of control. It is always advisable to destroy, during the winter or early spring, trees or portions of trees which are known to be infested.

Literature.

Felt, E. P., Insects Affecting Park and Woodland Trees, Vol. 2, page 403, 1906.
Grote, A. R., Canadian Entomologist, Vol. ix, page 161, 1877.

* Canadian Entomologist, Vol. ix, page 161, 1877.
† Ibid., Vol. xi, page 114, 1879.

Hulst, G. D., Transactions American Entomological Society, Vol. xvii, page 136, 1890.
Kellicott, D. S., Canadian Entomologist, Vol. xi, page 114, 1879.
Packard, A. S., Fifth Report, U. S. Entomological Commission, page 731, 1890.
Zimmerman, C. D., Canadian Entomologist, Vol. x, page 20, 1878.

THE PARALLEL SPITTLE-INSECT ON PINE.

By B. H. Walden.

The parallel spittle-insect, *Aphrophora parallela* Say, has been quite abundant on pines in the forest plantation at Rainbow during the past two or three seasons. The presence of this insect is indicated by conspicuous masses of white froth one-half to three-fourths of an inch long on the twigs usually near the tips.

The spittle-insects belong to the order Hemiptera, family Cercopidae. The immature stages are passed in these froth masses and the injury to the plants is caused by sucking out the juices or sap. At least two species are very abundant during certain seasons on grasses, and probably cause considerable damage. Other species, like the parallel spittle-insect which attacks pines, cause more or less injury to various trees and shrubs, though usually much less abundant than those attacking grasses.

In 1915, the froth masses of the parallel spittle-insect were first observed on May 28; the insects at this time were a little over 4 mm. in length, which would indicate that they were in the second stage or instar. On June 30, two adults were collected on pitch pine trees and several pupa skins were observed. The insects in a number of the froth masses at this time were about 6 mm. long and were probably only in the fourth instar.

From froth masses collected on the station grounds on June 19, adults emerged on June 22 and 26. Adults in the station collection have been taken in the field from June 30 until August 10.

At Rainbow this insect was most abundant on pitch pine, but many froth masses were found on white pine and Scotch pine, and a few were observed on Norway spruce planted among the pines. No froth masses were found on Austrian pine, red pine, or Jack pine.

While these insects have often been very abundant, and their injury has been observed for years, very little has been published

regarding their habits and life histories until Professor Osborn published the results of his recent studies in 1916.* The different stages of *A. parallela* are described and figured in this publication but the only food plant mentioned is Scotch pine. Packard† and Felt‡ mention pitch pine or hard pine, and Smith§ records the species in New Jersey as occurring throughout the state (June to September) on the white pine and pitch pine, and probably it infests other species.

The adult of the parallel spittle-insect and the froth masses caused by the nymph are shown on plate XIII.

ANTI-MOSQUITO WORK IN CONNECTICUT IN 1916.

By W. E. Britton and B. H. Walden.

During 1916 considerable interest has been shown in mosquito elimination work, and the largest single contract ever awarded for this kind of work in Connecticut was executed in Branford, Guilford, and Madison, and now the salt marshes between Branford River and Hammonasset River, about 2,668 acres, are wholly ditched. Other salt marshes near New Haven and in Saybrook were also ditched, making a total of about 2,900 acres of salt marsh in the State which was ditched in 1916, making this the banner year since anti-mosquito work was started in 1912.

All ditches cut in 1912 and subsequently have been maintained in good working condition. Several improvements have been made affecting fresh swamps where malaria mosquitoes breed. These operations are described in detail in the following pages:

Work of the Connecticut Shore Mosquito Extermination Association, Inc., Branford, Guilford, Madison.

Approximately 2,668 acres of salt marsh along the Connecticut coast were ditched in 1916 to eliminate mosquito breeding. This area extends from the Branford River on the west to the Hammonasset River on the east, including the salt marsh east of the

* Maine Agr. Exp. Station, Bull. 254, page 279, 1916.
† U. S. Ent. Commission, Fifth Report, page 741, 1890.
‡ Insects Affecting Park and Woodland Trees, Vol. ii, page 686.
§ Insects of New Jersey, page 98, 1909.

Branford River in the town of Branford and all of the salt marsh in the towns of Guilford and Madison. The acreage of marshes drained in these towns is approximately as follows:

Branford	578	acres
Guilford	1,085	"
Madison	1,005	"
	2,668	"

The money to do this work was furnished by the Connecticut Shore Mosquito Extermination Association, Incorporated. This association was formed during the early part of the year and the money was raised by private subscription.

The association was desirous of having the work maintained by the towns as provided in the law passed at the last session of the Legislature. In order to take advantage of this provision it was necessary that the ditching work be done under the direction of the Director of the Agricultural Experiment Station and approved by him. Under the above law it is necessary for the Director to publish an order for such work in a newspaper having a circulation in the locality where the work is to be done. The order must be published three times, the first publication to be at least ten days before work is started. This is in order that the property owners may apply for relief from any damage that they may consider will be done to their property by the ditching. The appeal, according to the law, shall be made within ten days after the order for the work is first published. Consequently the order for this work was first published on March 16, 1916, in the Shore Line Times of Guilford, and the areas to be drained were indicated on maps, which were filed in the Town Clerk's office of each town where the work was to be done.

No appeals were filed by any of the property owners in the territory to be drained.

Owing to late snows and the general condition of the marshes at that time, it was not practicable to make a preliminary survey of the area at that time. The association was anxious to have the work started immediately without waiting for any survey to be made, and furthermore did not care to provide funds for such a survey.

The contract for the work was awarded to the U. S. Drainage and Irrigation Company, 17 Battery Place, New York, and the

work was started on March 28, 1916, twelve days after the publication of the first notice or order concerning the work. The task of inspecting the ditches was assigned to Mr. B. H. Walden.

The ditching was started in Branford at the west end of the territory, and the association immediately requested the contractor to start work in each town, so as to facilitate the collection of pledges from the residents. The contractor, therefore, placed men at Stony Creek and others on the Hammonasset marsh in Madison at the extreme eastern end of the section. This was done without consulting the Director of the Station or the inspector, and proved to be a serious handicap in the matter of inspecting and approving the work.

The Skinner spade, which makes a ditch ten inches wide and twenty-four inches deep, was used for cutting all the new ditches.

Soon after the work started objections were made by many of the marsh owners regarding the ditching. The boundaries between the various pieces of marsh property were frequently marked only by ditches. In a majority of cases these ditches had become filled with mud or clogged with vegetation. Some were so grown up that the exact location could be determined only with difficulty. There was no way to distinguish these boundary ditches from the others, and the contractor preferred to cut new ditches a few feet from the old ones. This arrangement was not only to his advantage, but the new ditches are usually more satisfactory from the mosquito elimination standpoint. New ditches drain more readily, keep their shape much better, and the cost of maintenance is much less than where old ditches are cleaned.

The owners also objected to having the marshes cut up into small sections, which interferes considerably in harvesting the salt hay. As this was the first mosquito drainage work under the present law, it seemed advisable to proceed with as little opposition from the marsh owners as possible. Therefore, considerable time was spent by the inspector and the contractor's foreman in meeting the farmers and locating the ditches as far as possible to their satisfaction. Thus many old boundary ditches were cleaned instead of digging new ones.

The work was considerably delayed owing to the contractor not being able to obtain more laborers, and a number of marsh

owners in Guilford objected to having their marshes ditched in June after the grass was well started. As some of these marshes were fairly dry with few mosquito-breeding areas, it was agreed to postpone the ditching until after the hay had been cut.

These excepted marshes were situated in three places: the upper part of the West River marsh above the Sachem's Head road, the East Creek marsh above the railroad tracks, and the upper end of the East River marsh above the main highway.

Branford Marshes.

The most important problem in Branford was the marsh east of the road to Indian Neck. The marsh extends eastward back of Hotchkiss Grove and another portion extends to the north. The surface is lower than the outer marsh towards the outlet. Just below the road was an old tide gate, which had not been repaired for several years and which failed to keep the water out. On the east side of the road a gate had previously been built in the trolley embankment to replace the old one. Though this gate was in good repair, the trolley embankment was built of rocks and gravel, and the water seeped through it for a distance of fifty or more feet, so that the water level on the marsh was not under these conditions materially lowered.

This marsh was extremely soggy with large shallow pools and much standing water in the grass areas, and was a prolific salt marsh breeding area furnishing a mosquito nuisance for the entire section from Indian Neck to Pine Orchard. The marsh was ditched in April, the contractor putting in as many ditches as were practicable owing to the soft condition of the marsh. After this, while the water did not flow in and out of the ditches freely, most of the surface water was concentrated in the ditches. Frequent inspections of the marsh were made during the season and but very little mosquito breeding was found. A tide gate was apparently necessary to lower the water in order thoroughly to drain the marsh. It was decided that the best place for a tide gate was south of the road where the old gate was located. Therefore, a pair of new gates were built and hung on the old frames, which appeared to be in fairly good shape. After placing the new gates it was soon found that they would not close tightly against this frame. The abutments on either side of the gate

also leaked considerably. Later a new frame was made of four by six inch lumber to support the gates, and fastened to the outside of the old frame. Sheet piling was placed from the edges of the frame and in front of the abutments and the space between packed with clay. After this the gates worked satisfactorily excepting when blocked with eel-grass and weeds. Owing to lack of maintenance this was removed several times either by the contractor's foreman or by the inspector.

Towards the end of the season additional ditches were cut in the marsh and many of those cut earlier in the season were cleaned. The marshes in the eastern part of Branford were well supplied with natural creeks and were, therefore, readily drained by the ditching.

Guilford Marshes.

West of Leete's Island Station and north of the railroad and highway there is a marsh of about twelve acres, which was low and soggy, breeding many mosquitoes. The outlet is through a long, crooked culvert under the highway, where it passes under the railroad. After the marsh was ditched it was found that the water did not drain out readily, and owing to the soft texture of the marsh some of the ditches were partially closed up. On August 1 additional ditches were dug, and the outlet and opening of the culvert cleaned and deepened. After this was done the water drained out and the condition of the marsh was much improved, no breeding being found there after August 1.

North of Island Bay (or Joshua Cove as it is locally known) is a marsh of about 50 acres. Between the marsh and the water on the southwest side is a large sand bar and a strip of high land over which the Stony Creek and Guilford trolley line passes. At one time the outlet of this marsh was probably near the eastern end of this sand bar, but for years the only outlet has been a ditch to the north across the highway and for several hundred feet along the southern side of the railroad embankment and then through a twenty-four-inch pipe under the railroad into the marsh northward, where a ditch was indirectly connected with the creek draining the Great Harbor meadows, a distance from the upper end of the Island Bay to the mouth of the Great Harbor Creek of about a mile and a quarter. This marsh was found to be a serious mosquito-breeding area in 1904, when a preliminary mosquito survey of the Connecticut coast was made.

A photograph showing haystacks standing in water on this marsh taken in August, 1904, was published in the Report of this Station for 1904, plate XIV, a.

It was found that an outlet could be made into Island Bay east of the sand bar where it would be protected by the rocky shore. The contractor and the owners of the marsh agreed with us that the most practicable way to drain the marsh was by opening an outlet at this point. After the ditch had been cut here, the tides flooded the upper end of the marsh which was six to eight inches lower than the southern portion. The owners felt that the water would ruin the salt hay and demanded that a gate be placed at the outlet. The contractor held that it was not a part of his contract to build tide gates, but finally agreed to build one. It was later found necessary to enlarge and lower the culvert under the trolley tracks. Considerable work was done in cleaning and deepening the outlet to the north. A new twenty-inch ditch was dug from the upper end of the railroad culvert eastward to the main creek in order to obtain more direct drainage.

Madison Marshes.

On the lower part of the large East River marsh the ditching was inspected early in July. At this time the marsh had dried out and was considered in good shape. When any breeding was found, the places were eliminated by filling or by cutting spur ditches. At the time of the August perigee the tides were unusually high each day for over two weeks. Every depression in the marsh was filled with water, and mosquito larvae were very abundant. While much of the water drained away before adults emerged, it was found necessary to do considerable more work filling and tapping pools. The same condition occurred on some of the other large marshes. In fact during this same period similar trouble was experienced on certain marshes which were drained in 1912, and which had been practically free from breeding for four years.

Within this section are a number of small marshes just back of the Madison beach, which had no adequate outlets. To carry off the water it was necessary to put in eight box culverts varying from fifteen to one hundred and fifty feet in length.

The provision for a permanent outlet for the marsh of about sixteen acres west of the West Wharf road is an engineering problem requiring the expenditure of several hundred dollars. The only place for an outlet was through the exposed sandy beach where the waves break with much force, shifting large quantities of sand during the spring and fall. The culvert put in during the past season is adequate to drain the water from the marsh, but it is a question whether it will stay in place during the winter storms.

The portion of the large Hammonasset marsh west of the Hammonasset River in the town of Madison forms the eastern boundry of the area included in the contract. This marsh was ditched during May and the early part of June. The work was inspected, and after a certain amount of perfecting work was done, practically no breeding occurred during July. Following the rains and high tides of August considerable breeding, especially on the lower portion, developed, and a large amount of additional perfecting work was done, including filling pools and cutting spur ditches.

Results of the Work.

When the height of the mosquito breeding season arrived, there were still many areas to be ditched and a large proportion of perfecting work yet remained to be done. But in spite of these facts the number of mosquitoes was greatly reduced, and the results of the work were apparent over the entire area. This fact was admitted by many of the residents and summer boarders, who were familiar with the mosquito conditions of past seasons. That the summer hotels were better patronized is indicated by the conditions of one house that was brought to the attention of the writers. During 1915 this hotel was practically empty twice during the mosquito-breeding season, and the management offered special inducements to the guests. During 1916 this hotel was filled during the whole season and was obliged to turn away many applicants.

Summary of the Work.

Approximately 2,668 acres of salt marsh in the towns of Branford, Guilford, and Madison were ditched during 1916 to eliminate mosquito breeding. The work was started March 28 and completed November 20. About 1,200,000 feet of new ditches were dug and old ditches cleaned. One new tide gate was built and one old tide gate was repaired. Twelve box culverts from 15 feet to 175 feet long were built. The whole or larger part of 81 days were spent by the inspector interviewing the marsh owners, inspecting the work, etc.

New Haven and Orange.

Maintenance work.

The Anti-Mosquito Committee of the Civic Federation of New Haven has each year raised money for the maintenance of the ditches cut during the past few years. This committee engaged Mr. P. L. Buttrick to start the cleaning of the ditches early in the season, but as Mr. Buttrick was later given a more important position as inspector of a large ditching contract at Lawrence, Long Island, Mr. J. W. Draper of West Haven was employed for the remainder of the season (June 15 to September 15) in and around New Haven, on maintenance and inspection work.

New Ditching Work.

In 1916 the funds of this committee were sufficient to maintain the old ditches and leave some money available for new ones. In ditching additional areas it seemed best to expend the money where it would do the most good. As the amount available was small, it was not sufficient to ditch the lower portion of the Quinnipiac marsh nor the marsh on the east side of the New Haven harbor north of Fort Hale Park. On the other hand there still remained an undrained area in the West River marsh which we considered as one of the most prolific sources of salt marsh mosquitoes near New Haven. This area was situated on the west side of the river in the town of Orange, between Spring Street and Congress Avenue. In West Haven some interest had been aroused and a committee appointed to raise funds and promote anti-mosquito work. Dr. Charles D. Phelps was chairman of this committee. Thus by the coöperation between these two committees, sufficient money was available to ditch this area which contained about 90 acres. The West Haven committee raised $150.00, and the remainder was

supplied by the New Haven committee, the total cost being $396.75 for cutting 15,870 lineal feet of ditches at 2½ cents per foot. The necessary legal notice was published by the Director of this Station in the New Haven Journal-Courier under date of August 29, 1916. The work was done by the United States Drainage and Irrigation Company of New York, N. Y., and on account of the scarcity of labor was considerably delayed. It was finally started on November 23 and finished on December 6. It was inspected and the ditches measured by Mr. Walden. Thus all salt marsh is now ditched south of the Congress Avenue bridge in the West River meadows.

Dr. Phelps and his committee also raised money and arranged to ditch the lower portion of the Old Field Creek marsh. The Director's order and notice was first published in the New Haven Sunday Register, December 10, 1916. There were no protests or appeals, but at the time of this writing the work had not been done. It was planned to cut 9,000 to 10,000 feet of ditches between Beach Street and Blohm Street.

Dredging of Morris Creek.

Some of the ditches at Morris Cove, cut in 1912, did not perform their work properly on account of a defective tide gate. A new tide gate was finished in 1915, but even then the water did not drain out of the ditches satisfactorily, and it was decided that the main outlet, Morris Creek, should be dredged below the tide gate. The money was, therefore, raised, the contract awarded, and it was expected that the work would be done in September, but for some reason it was delayed and the writers are informed that the dredging will be done early in the spring. After the main channel has been deepened, it will be necessary to clean out the old ditches above the tide gate. These ditches were cut in 1912 and have been cleaned somewhat and examined many times, but as they have been filled with water much of the time, it was impossible to clean them thoroughly, and, if possible, would do little good. Still there has not been much mosquito breeding in this locality. With the creek deepened sufficiently to allow the ditches to empty at low tide, they can be put in first class condition and properly maintained.

Appropriation by City of New Haven.

In the estimates of 1917, which were allowed by the Board of Finance and later adopted by the Board of Aldermen, is an item of $10,000.00 for mosquito extermination. This was asked for in the estimates of the preceding year, but was disallowed.

Ten thousand dollars will probably be sufficient to ditch all the remaining unditched salt marsh areas now existing in New Haven, and may provide for some ditching in the West River meadows north of the Congress Avenue bridge, where the marsh is of a fresh character. Some malarial mosquitoes doubtless breed in this section, which at any rate should be given some attention.

The principal sources of mosquitoes for New Haven are as follows:

Quinnipiac Marsh. The lower part lies in New Haven, and is an intensive breeding place for salt marsh mosquitoes, especially along both sides of the Middletown turnpike.

Mill River Marsh. This is a small marsh lying between the State Street bridge and East Rock. It has never been an important mosquito-breeding place, though many people seemed to regard it as such. Now the land has all been acquired by the city for park purposes, and is rapidly being filled. The Park Department will see that this area is cared for, and if additional ditches are needed, will cut them, so that none of this appropriation is needed in the Mill River marsh.

Harbor Marsh. On the east side of the harbor there is a salt marsh area of 120 acres or more, situated north of Fort Hale Park, which has never been adequately ditched. Most of this land is owned by Mr. G. H. Townshend, who has cut ditches from time to time for the purpose of increasing the yield and improving the quality of salt hay. Nevertheless, more ditches are needed, and at present this is one of the most serious breeding places of salt marsh mosquitoes existing in the southerly part of the city. Relief can be obtained only by a treatment of this area.

Beaver Swamp. Though many improvements have been made in this vicinity by the Park Department, this still remains the most constant source of malarial mosquitoes around New Haven. They breed in the grassy edges of the clear water

streams and springs. Some of the surface is oiled each year, but it is still not difficult to find the larvae during the latter part of summer. Some of the land is still in the hands of private owners, and before any comprehensive plan can be carried out it will be necessary for the city to purchase considerable property. This $10,000.00 appropriation would be entirely inadequate here, and moreover whatever is done should be along the lines of permanent park development. It is much more than a simple ditching problem.

West River Meadows. These meadows have now all been ditched below Congress Avenue, but above Congress Avenue as far north as Derby Avenue, and even to Chapel Street on the eastern side of the stream, there are lagoons and springs with clogged outlets. As this water is largely fresh, these places are doubtless furnishing some malarial mosquitoes each year. Adequate ditches should be cut connecting these places with the main stream, and the old lagoons cleaned of weeds and rubbish.

Saybrook.

During the latter part of the summer Honorable M. G. Bulkeley let a contract for ditching two areas of salt marsh at Fenwick in the town of Saybrook. About 32,000 lineal feet of ditches were cut and the total area probably amounts to over 50 acres. Much more salt marsh in the vicinity needs ditching, but a start has been made, and it is to be hoped that the work will not end here.

Hamden.

Through the efforts of the Health Officer, Dr. George H. Joslin, the town appropriated $300.00 for anti-mosquito work. Several pools and swamps in the Highwood section were filled with factory waste without expense to the owners or to the town. A fresh water swamp near Mill Rock and adjoining Lake Whitney has for years been a breeding ground for malarial mosquitoes, and malaria has been prevalent in the vicinity. Through the coöperation of the New Haven Water Company and the Winchester Repeating Arms Company, owners of the land, mosquito breeding will soon be abolished. By raising the dam of Lake Whitney about 18 inches the Water Company will flood about 50 acres of its own swamp land. The Winchester Repeating Arms Company is building a dam and pumping station by means of which the water will be pumped into Lake Whitney from a swamp of about 50 acres. Thus the two projects together will abolish mosquito breeding in a swamp of about 100 acres, formerly a prolific source of malaria mosquitoes.

ENTOMOLOGICAL FEATURES OF 1916.

The first part of the preceding winter was mild followed by severe weather and low temperature in February, which killed the peach buds on trees in the orchards back a few miles from the coast. During the spring and early summer, it was cool with heavy rainfall, so that crops were backward. On account of the rainy weather and scarcity of labor, work was behind on farms and in many cases the crops were not given attention at the right time. Up to July 1, the rainfall was greatly in excess of that of 1915 and was also above the normal, but for the remainder of the season, it was somewhat below normal.

There were complaints of wireworm injury to the roots of crops in some parts of the State. There was a certain amount of white grub injury, though less than in 1915. Cutworms were generally common and caused the usual amount of damage.

The striped cucumber beetle, *Diabrotica vittata* Fabr., was more abundant and caused more damage at the Station farm at Mt. Carmel than the writer has ever seen elsewhere.

Certain kinds of aphids were prevalent. The rosy apple aphis caused considerable injury in orchards here and there, but the green aphis seemed to be less prevalent than in 1915. The aphids on seed beets mentioned in the Report of this Station for 1915, page 191, were also present in 1916, and a brief account of the control measures, which were given a successful trial, will be found in the pages of this Report. The most notable aphid outbreak of the year was that of the turnip aphid, *Aphis pseudobrassicæ*, Davis, which seemed to cover nearly the whole State and caused damage to the turnip crop probably amounting to thousands of dollars. For a more comprehensive account of this insect and how to control it, see page 98 of this Report.

Rose chafers were also abundant and caused the usual amount of damage to grapes and other fruits, as well as to ornamental trees, shrubs, and flowers.

One of the features of the season was the great amount of injury to apples caused by the false or lined red bug, *Lygidea mendax* Reuter, which has heretofore been noticeable only in the southwestern corner of the State. In 1916, however, it was much more widespread and destructive. It was reported from Litchfield, Glastonbury, and Mansfield, and no doubt could be found all over the State. The writer saw rather severe injury from it in Milford.

The apple maggot, *Rhagoletis pomonella* Walsh, was also very abundant and caused serious damage.

The brown-tail moth has failed to spread its usual distance during the year and winter webs are now rather scarce. Nowhere have they been found abundant.

The gipsy moth has not spread perceptibly from the infestations known to exist in the summer, but since the fall scouting began a large number of small infestations consisting mostly of single egg-clusters have been found along the eastern border of Thompson and some occur in Putnam and Killingly.

The first portion of the season was favorable, as regards rainfall, for the development of mosquitoes and they were abundant. Considerable ditching was done on the salt marsh during the year, amounting to about one and a quarter million lineal feet, thus effectively draining about 2,900 acres. This is the most ever done in a single year in Connecticut. More work is planned for next season.

More detailed information regarding these insects will be found in the pages of this Report.

MISCELLANEOUS INSECT NOTES.

Scale Insect on Azalea. On July 26, we received from Hartford a rhododendron twig infested with a few large, light-gray scales occurring on the bark. These were identified by the Bureau of Entomology at Washington, D. C., as *Eriococcus azaleæ* Comstock.

Moths in Sap Bucket. On April 6, we received from Mr. George W. Best, Higganum, specimens of moths, with a statement that they were present in large numbers in maple sap. Thirty-five were found in one bucket. The specimens were too

badly crushed for accurate specific identification, but evidently belonged to the genera *Xylina* and *Scopelosoma*.

A Rare Long-Horned Beetle. Another addition to the Connecticut collection of beetles was made at Middlebury on June 2, 1916, in a specimen of *Anthophilax malachiticus* Hald. This large, metallic, bluish-green, long-horned beetle, about one-half inch long, was found walking across the road in a damp place. It is probably a wood-boring species and has been taken in Canada, Maine, New York, and Connecticut.—M. P. Zappe.

European Elm Case Bearer. On June 16, leaves of Camperdown elm were received from Fairfield, which showed several holes and also several peculiar larvae in their brown cases, known as case bearers. This is apparently the European elm case bearer, *Coleophora limosipennella* Dup., which has previously been recorded in Brooklyn and New York City by Slingerland* and Felt.† It is said that this insect is spreading and the injury increasing. Spraying with lead arsenate, as is usually practiced to control the elm leaf beetle, ought to prevent serious injury by this case bearer.

Another Spruce Gall Aphid in Connecticut. While making the annual inspection of nurseries, in two nurseries in Hartford, September 20-22, large galls were noticed on specimen trees of the Colorado blue spruce. These galls are caused by *Chermes cooleyi* Gillette, a species not hitherto recorded from the State. Plate XV, b, shows the shape of the gall. If remedial measures are necessary, probably a contact spray early in spring, as is used against the common spruce gall aphid, *Chermes abietis* Linn., would be effective.

Injury by Silver Fish. Specimens of a species of silver fish, *Thermobia domestica* Pack, were brought to the office on September 14, from Hartford where they caused much damage by gnawing paper, book bindings, etc. It is often necessary to try different remedies before success is reached. Boiled starch paste poisoned with arsenic and distributed on cloth or bits of cardboard placed around in the crevices where the silver fish

* Bulletin 233, Cornell Agr. Expt. Station, page 49, 1905.

† Insects Affecting Park and Woodland Trees, Vol. 1, p. 167, 1905.

occur, will sometimes prove effective. Pyrethrum or insect powder can also be used where it can be applied.

A Scolytid Beetle in Sugar Maple. On July 10, a section of the trunk of a small sugar maple tree was received from Pomfret with a number of small, deep tunnels in the wood. In these tunnels were several beetles which were identified as *Xyleborus dispar* Fabr. The accompanying letter stated that for several years this beetle has been at work in one part of one maple tree. The species is known to attack many different kinds of trees including fruit trees, but remedial measures, other than destroying the infested tree, are of questionable value.

The Eyed Elater. The largest click beetle occurring in Connecticut, known as the eyed elater, *Alaus oculatus* Linn., on account of the two large eye spots on the thorax, was seemingly more common than usual in 1916, and was sent to the office several times between June and November from New Haven, Hamden, Orange, and Hartford. The correspondent usually asks if this is a pest. We are obliged to answer, No. The larvae are found in decayed wood such as old logs, stumps, etc., and it can scarcely be called an injurious insect. The adult is shown on plate IX, a, photographed from a living specimen.

Abundance of Walnut Caterpillar. The walnut caterpillar, *Datana integerrima* G. & R., which has been mentioned in former reports (see Reports of this Station for 1901, page 275; 1914, page 191), was also prevalent in 1916. Specimens were received several times from New Haven, West Haven, Wallingford, Meriden, Chester, and New Canaan. The caterpillars feed in clusters upon butternut, black walnut, and hickory, and have the habit of gathering in large numbers on the trunks and larger branches at molting time. Consequently the large gray masses of cast skins are noticeable on the bark. Spraying the tree or destroying the clusters of larvae by hand are remedies.

Tarnished Plant Bug Injuring Tobacco. During July a complaint was received from Mr. R. H. Gardner, Cromwell, regarding a form of injury to tobacco caused by a small sucking bug, which was doing much damage. In order to make sure of the identity of the insect responsible, specimens were requested. It proved to be the tarnished plant bug, *Lygus pratensis* Linn., an old offender, which has caused much injury in past years to various fruit, flower, and vegetable crops. It is a difficult pest to control, but if taken in season a thorough spray of "Black Leaf 40," one pint in 50 gallons of water, to which has been added two pounds of laundry soap, should prove effective. Mr. Gardner claimed that in 1916 this insect caused damage in his tobacco fields to the amount of $500.00.

The Greenhouse Leaf-Tyer. Larvae of the greenhouse leaftyer, *Phlyctænia ferrugalis* Hübn., were received from Norwalk, January 4, 1916, where they were doing much damage to snapdragon, geranium, and cineraria by devouring the leaves. A note about this insect occurs in the Report of this Station for 1909, page 369. The larva is shown in figure 7, and the adult on plate XVI, b, of that report. The food plants include nearly all of the common vegetables, many native weeds, and a large number of ornamental herbaceous plants growing both under glass and out of doors. A good remedy is to apply paste lead arsenate at the rate of one pound in ten gallons of water. Small potted plants can be dipped in this mixture, but in spraying it is necessary to coat the under side as well as the upper surface of the leaves.

Flea Beetle on Ash. During the spring inspection of white pines for white pine blister rust, a flea beetle, *Œdionychis sexmaculata* Ill., not previously reported from Connecticut, was found at Middlebury feeding on ash (*Fraxinus*). These beetles are oblong-oval in shape, in color reddish or brownish yellow. They have the last joints of the hind tarsi globosely swollen and the hind thighs thickened for leaping. Size, about one-eighth of an inch long. On June 7, 1916, there were many beetles feeding on the ash sprouts which were growing between the rows of pine, almost defoliating some of them. There was much ash growing among the pines, but it was considered worthless because the pines would soon outgrow and kill it. Where ash is used as a shade tree or is grown for lumber, these beetles may become of some economic importance.—M. P. Zappe.

California Privet Injured Supposedly by White Grubs. On April 8, specimens of white grubs, *Lachnosterna* sp., were

brought to the office from Wallingford, with the statement that they were causing considerable injury in a small nursery by eating the bark of California privet just below the surface of the ground. Some plants had been killed, many had been girdled, and others had been eaten on one side and a callus had formed around the wound. The owner had about 35,000 plants which he had grown from cuttings. He transplanted 5,000, and found that almost every plant had been attacked. Mr. Zappe visited this nursery April 10, and found many injured plants and but few white grubs. The owner was advised to throw the soil up around the stems of the plants to induce them to make roots above the girdled areas. When the nursery was again inspected in the fall there was a good stand of plants.

Sucking Dog Louse. On May 9, several specimens of the sucking dog louse, *Hæmatopinus piliferus* Burm., were received from Fairfield, where one of several pet dogs, a beagle hound, was infested. All of the dogs slept in the same barn, but the others seemed to be free from lice. Several remedies such as flea powder, creolin, and whale oil soap were tried, but were not very effective. Kerosene and water and a thorough combing kept them down for a week or so, when they appeared again. The owner was advised to obtain some paraffine oil about 28° gravity, and to saturate thoroughly the hair and skin of the dog, and then to wash it off with soap and water an hour or so later. A subsequent letter from the owner stated that this proved a perfect success, and two such treatments a month apart completely routed the pest.

The Grape-Vine Sawfly. Larvae were received on July 15 from Wilton, and on August 26 from Bridgeport, where they were feeding on the under side of grape leaves. This insect is known as the grape-vine sawfly, *Erythraspides pygmæus* Say. It is not much of a pest in Connecticut. The larvae when mature are about a half-inch in length, greenish yellow, with head and tip of the body black, and with two transverse rows of black spots on each segment. The larvae feed in colonies, and are shown on plate XVI, b. There are two broods each season. The adult is a small, four-winged fly. Though this insect seldom causes much injury in Connecticut, it can be controlled when

abundant by spraying the grape leaves with lead arsenate, using three pounds of the paste in fifty gallons of water.

Euclemensia bassettella Clem., a Micro-Lepidopteron Bred from Scale Insects. Specimens of a *Kermes* probably *K. sassceri* King., were collected on an oak at Yalesville, April 13, 1916, by B. H. Walden. On examining this material during the summer four specimens of a small moth were found in the box, and in the scales were holes from which the moth emerged. See plate XII, c. The moth proved to be *Euclemensia bassettella* Clem. This species was described by Dr. Clemens* from Connecticut material sent to him by Mr. H. F. Bassett, of Waterbury. The original description is as follows:

> "*H. bassettella.* Fore wings bright reddish-orange, sometimes tinted with yellowish-orange, with a black spot at base above the fold of the wing, and a broad black stripe, showing bluish or greenish reflections, along the inner margin, extending from the middle of the fold to the tip of the wing and occupying nearly one-half of the breadth of it. Along the costa, about the middle of it, is a shining black stripe, which becomes narrower as it approaches the apical third of the wing. Cilia blackish. Hind wings shining, dark greenish black. Head and thorax black. Antennae black. Labial palpi, yellowish-orange."—B. H. WALDEN.

Shot-Gun Cartridges Injured by White Ants. Some paper shot-gun cartridges were sent to the laboratory, September 28, by the Winchester Repeating Arms Company of New Haven. These shells had been eaten, evidently by some insect, in much the same manner as another lot received in 1910 which had been injured by ants. (See Report of this Station for 1909-1910, page 698.) The present shipment was returned from a dealer in Wichita, Kansas. In some cases the shells were eaten so that the powder and shot rattled out into the box. An examination of this material revealed the presence of a few dead and immature white ants, probably *Leucotermes flavipes* Kollar, a common and destructive species in the more northern latitudes where white ants are found. This species is native to the United States and often breeds in old logs, stumps, posts, or any timber near the ground. It frequently tunnels in the construction timbers of trestles, bridges and buildings, sometimes seriously weakening

* Proceedings Entomological Society of Philadelphia, Vol. ii, page 423, 1864.

them. The termites probably were tunneling where the cartridges were stored and, not realizing their dangerous character, ate into the shells.

A Worm Reported from Milk. A Hartford dairyman brought to the office on March 18 a whitish larva which was alleged to have been found in milk by one of his customers. This proved to be a full grown larva of the cadelle, *Tenebrioides mauritanicus* Linn. It is about three-fourths of an inch long, whitish, with head and anal segment dark brown; there are also brown dorsal markings on the three thoracic segments. This insect feeds upon all kinds of stored vegetable foods and has even been reported from milk,* but may have occurred there accidentally. Its presence should not necessarily be considered as evidence that the milk was adulterated with farinaceous material. In the Hartford case, however, the customer admitted that the bottle had been opened and that milk, sugar, and barley flour had been used in the preparation for a patient. In straining, the larva was found upon the strainer. The flour was sifted, and no more worms were found. It was thought that this one came from the milk. The habits of this species lead us to believe that, though the larva may have fallen into the milk, it is even more probable that it was in the barley flour or the sugar.

Twigs Girdled by the Giant Hornet. On June 17, some small hard wood twigs, which had been girdled, were received from Stamford. This appeared to be the work of the giant hornet, *Vespa crabro* Linn., and our opinion was later confirmed by Dr. E. P. Felt, to whom the sample was submitted. On November 7, apple twigs which had been similarly injured were received from Greenwich, and this injury had been followed by the woolly aphis. Dr. Felt† states that this insect has attracted considerable attention during the last few years by gnawing the bark from the living twigs of various trees, birch being attacked oftener perhaps than other kinds. This hornet is a native of Europe, but has been collected many times in Connecticut in recent years at New Haven, Hamden, Darien, and Plantsville. It was first noticed in the vicinity of New York City more than twenty years ago,

* Insect Life, Vol. i, page 112, 1888.

† Thirtieth Report of New York State Entomologist, page 71, 1915.

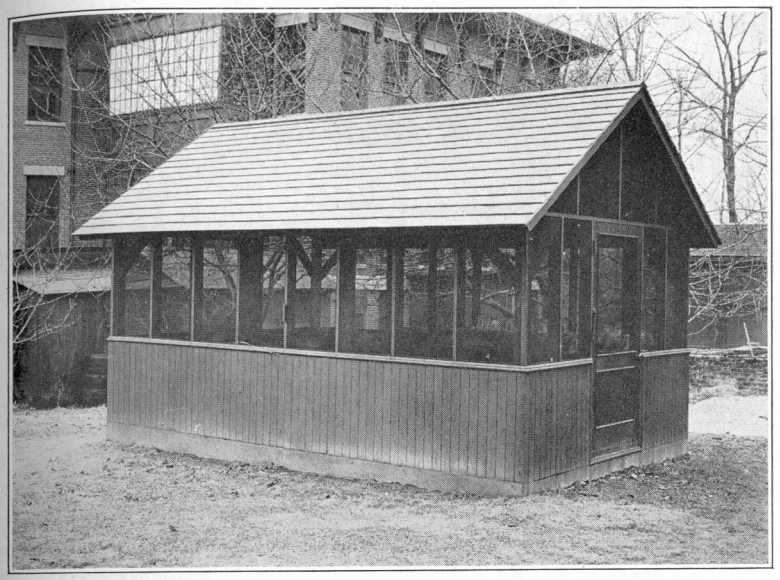
and has now spread into southern Connecticut and throughout New Jersey. In Europe this hornet is recorded as stripping the bark from the twigs of ash, alder, elm, linden, lilac, oak, larch, horse chestnut, willows, and poplars. Though this injury is usually slight and needs no control measures, in case of choice specimen trees and shrubs grown for ornament it may be advisable to coat the bark with lead arsenate, using one pound in ten gallons of water.

The Hickory Gall Aphid. Each year the compound leaves of various species of hickory begin to fall in June. If the stems are covered with galls, as shown on plate XV, a, it is an indication that the cause of dropping is due to the hickory gall aphid, *Phylloxera caryæcaulis* Fitch. The work of this insect is always evident in New Haven, and during the past season it was also received from Middlebury and Darien. The galls occur on the new shoots and leaf stems in June, and are bullet-shaped or pointed-globular and are sessile on the stems, which are usually more or less deformed. The galls vary from less than one-fourth to an inch or more in diameter, though usually between one-fourth and one-half inch. Those growing singly are the largest, but when crowded they are often confluent and are much smaller. At the time the leaves fall the galls are open at the point and blackened inside. Earlier these galls are nearly filled with immature aphids. Apparently the winter is passed in the egg stage, and there is only one gall-producing brood each season. These galls can form only when the tree is making its season's growth. Several varieties have been described, but these varieties are at least in part due to the particular species of hickory on which they occur and not to the insects responsible for the galls. Sometimes many leaves fall, and it seems as though much injury must result, but certain trees on the Station grounds are attacked each year, and though a portion of the leaves and some of the new shoots drop, some are not infested, and some only slightly infested, and these remain upon the trees. The vigor of these trees does not seem to be greatly impaired. Requests for remedies are constantly received, and though not supported by any records of evidence, it is possible that if sprayed with kerosene emulsion or nicotine solution just as the buds are breaking open in the spring, choice shade trees may be protected from attack.

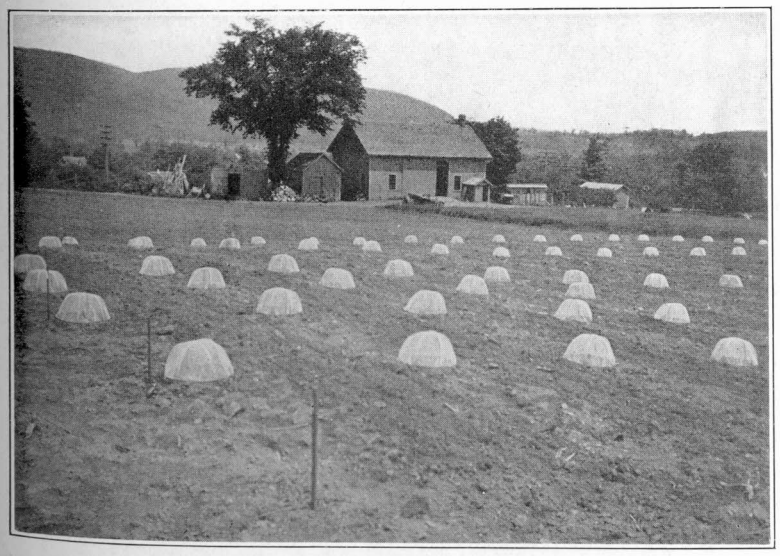
Curious Galls on Grape-Vines. Each year we receive a number of specimens of galls from grape vines with a request for information about the cause and seriousness of the trouble. The commonest gall on grape is known as the grape vine tomato gall, *Lasioptera vitis* Osten Sacken, and several specimens were sent to the office during the summer from New Haven, North Haven, and Meriden. This gall is an irregular, watery thickening or swelling, usually occurring on the new shoots, sometimes involving the stem and often the leaves, petioles, and the tendrils. These swellings are usually red, sometimes green, and they are often confluent. Their appearance is shown on plate XVI, a. Of course, these galls are conspicuous and affect the growth of the shoot on which they occur. But usually only part of the shoots are affected and the vine makes ample growth in spite of them.

A similar, though more regular, and usually larger, gall is found on the stems of wild grapes. This is the grape vine apple gall, *Schizomyia pomum* Walsh and Riley, formerly known as *Lasioptera vitis-pomum*. On August 16, a specimen of this gall was received from Meriden. This gall is formed from a bud and is borne sessile on the side of the stem. In shape it resembles a small peach, the end being pointed, and it is about five-eighths of an inch in length. It is usually green or reddish, and is much more common on wild grapes than upon the cultivated varieties.

There is no treatment which can be recommended to prevent the formation of these galls. The parent two-winged flies lay the eggs on or in the succulent tissues, the galls grow and contain cells in which the larvae develop. The only known means of control is to clip off and burn the infested tips.



a. New out-door insectary.

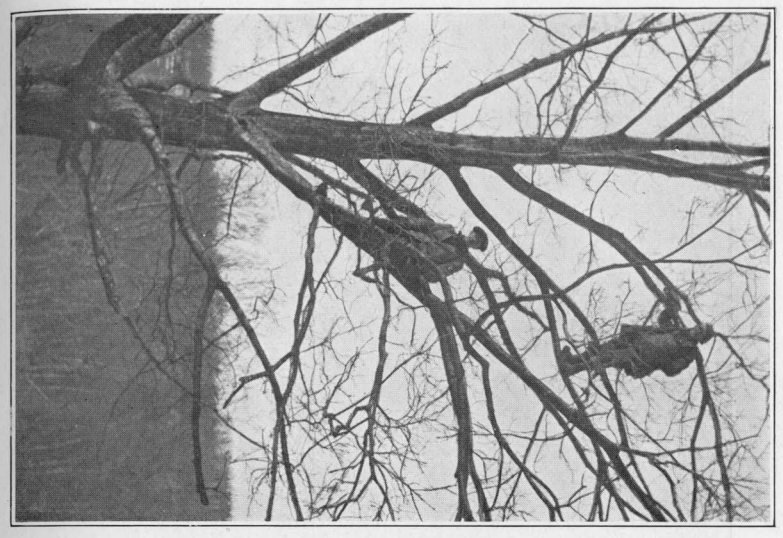


b. View at farm showing protectors over cucumber plants.

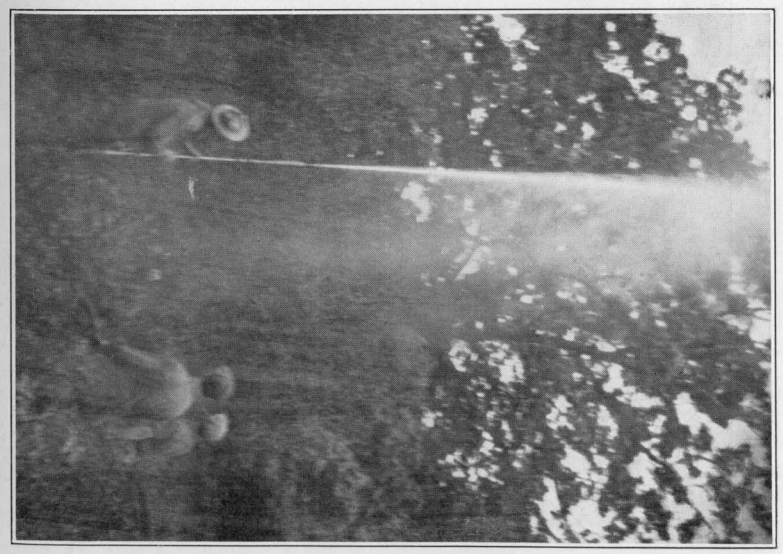
NEW INSECTARY, AND VEGETABLE INSECT EXPERIMENTS.

a. The westernmost infestation, Ashford.

b. Woodland infestation, No. 18, Pomfret; 304 egg-clusters were found here, and 4000 gallons of spray mixture used.

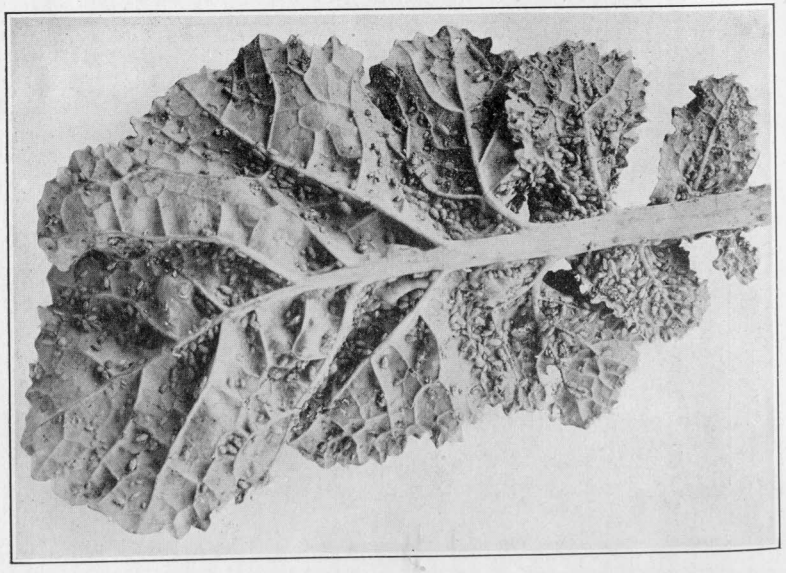


a. Creosoting egg-masses, infestation No. 1, Brooklyn.



b. Spraying woodland trees, Thompson.

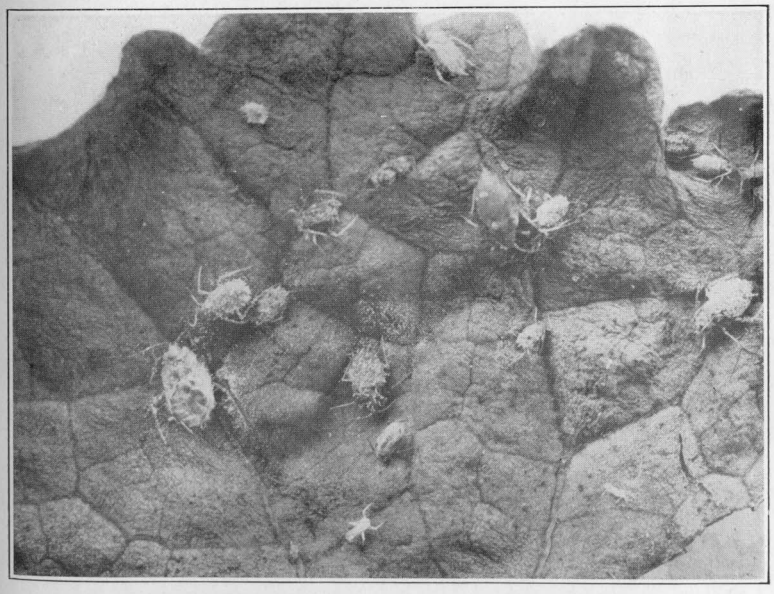
a. Spraying woodland trees, gipsy moth work, Thompson.



b. Turnip leaf infested with aphids, natural size.

GIPSY MOTH WORK AND TURNIP APHID.

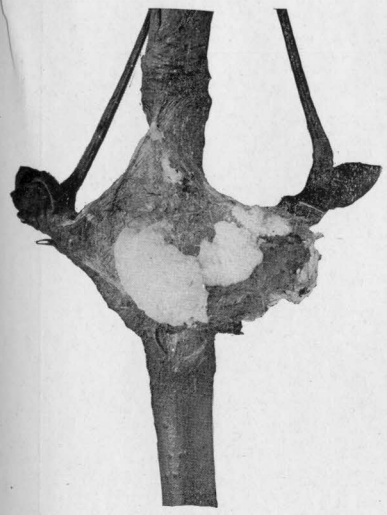
a. Turnip field. White egg turnips at right had been killed by aphids; rutabagas at left were beginning to show injury.



b. Aphids killed by fungus, enlarged six times.

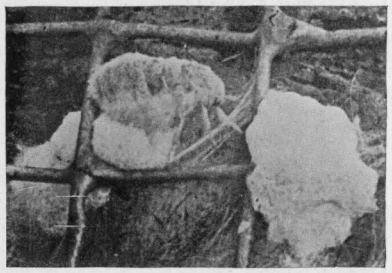
TURNIP APHID.

White-marked tussock moth. Cocoons and egg-masses.

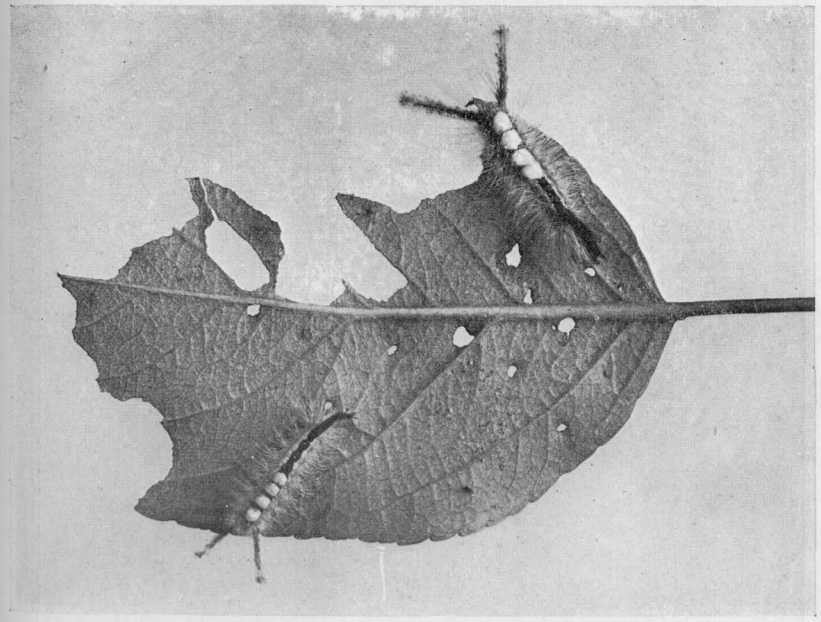


a. Egg-masses.

b. Male moth.

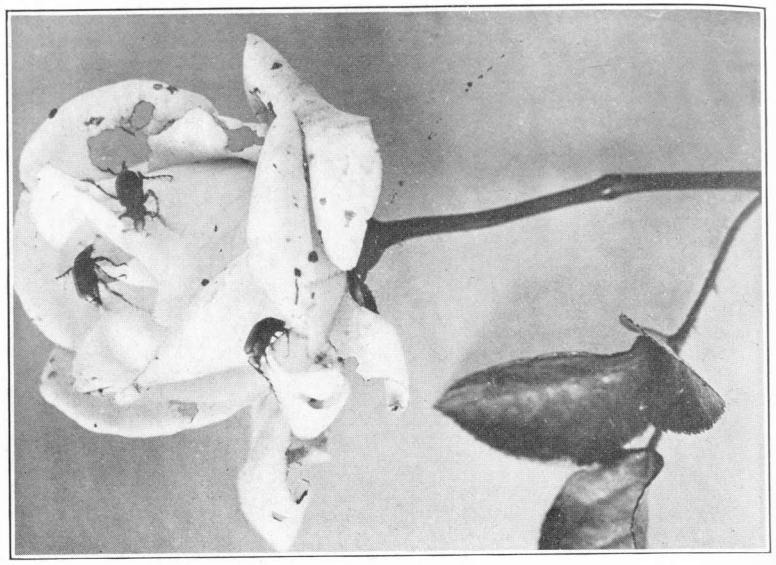


c. Female moth and egg-masses.

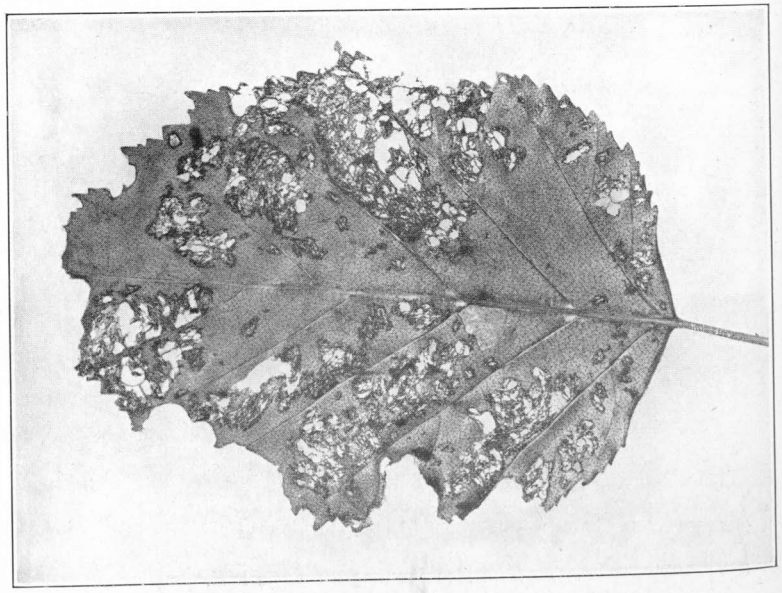


d. Caterpillars feeding on apple leaf.

WHITE-MARKED TUSSOCK MOTH, ALL NATURAL SIZE.

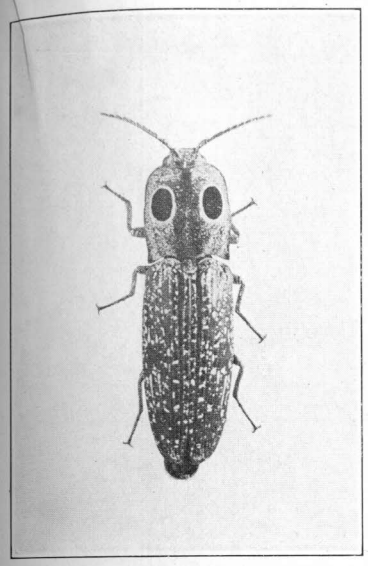


a. Adult beetles injuring rose, natural size.

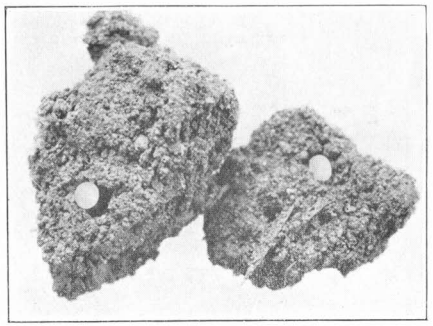


b. Birch leaf eaten by beetles.

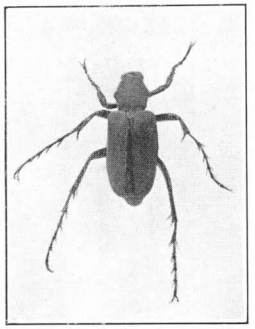
WORK OF THE ROSE CHAFER



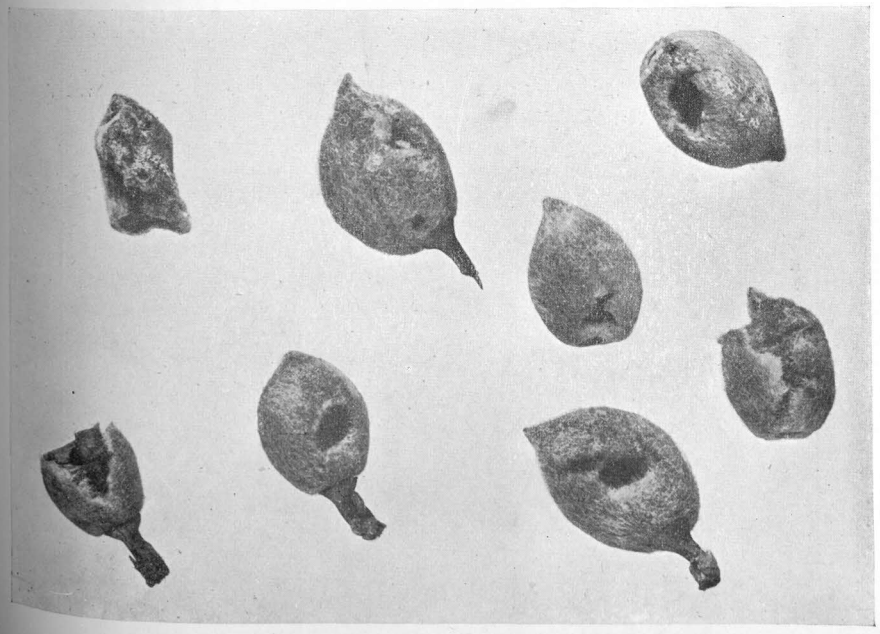
a. Eyed elater, *Alaus oculatus* Linn., natural size.



b. Eggs of rose chafer, two and one-half times enlarged.

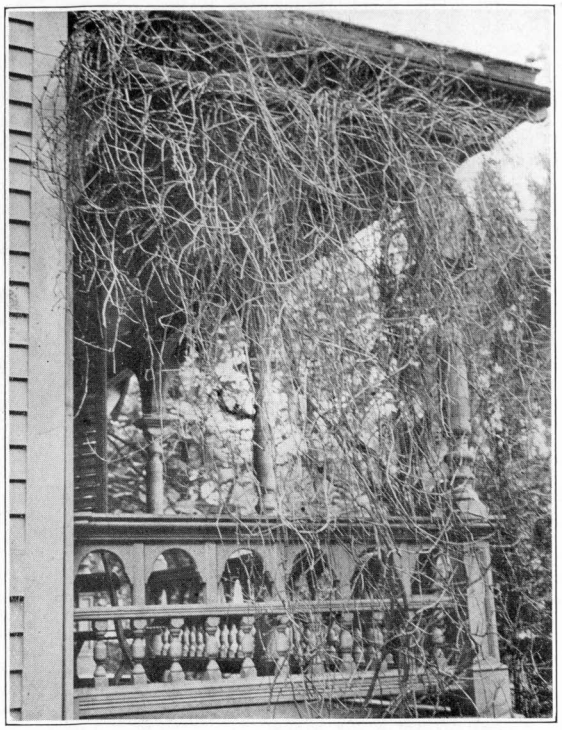


c. Rose chafer, twice natural size.

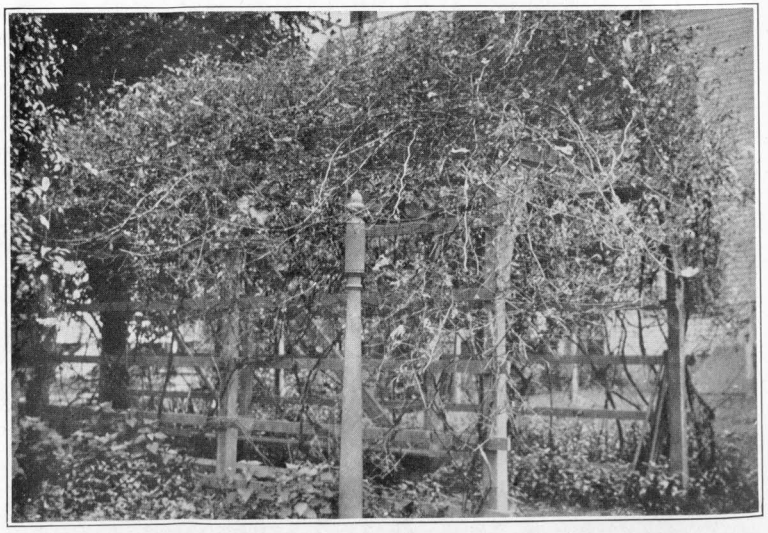


d. Peaches eaten by the rose chafer.

WORK OF ROSE CHAFER, AND EYED ELATER.

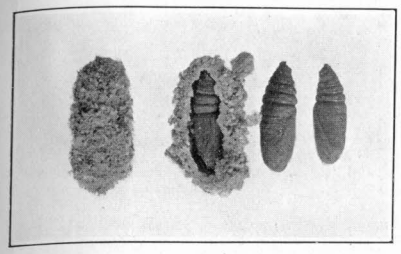


a. Virginia creeper stripped by larvae.

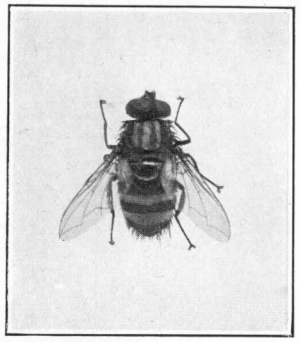


b. Grape-vines defoliated by the larvae.

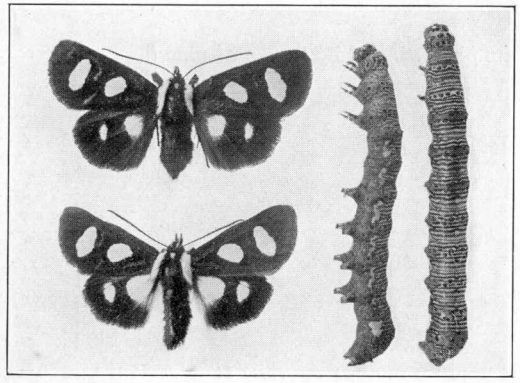
WORK OF THE EIGHT-SPOTTED FORESTER.



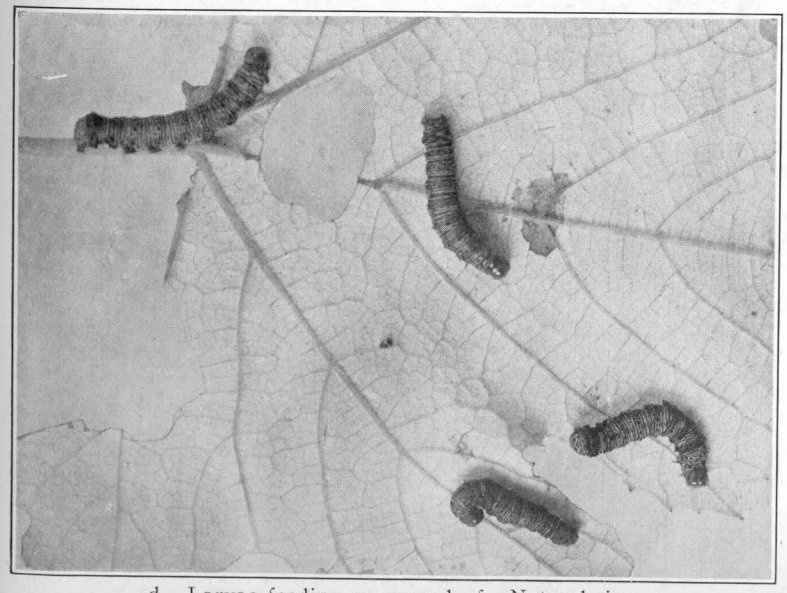
a. Pupae, natural size.



b. Tachinid fly, *Winthemia quadripustulata* Fabr. Twice natural size.

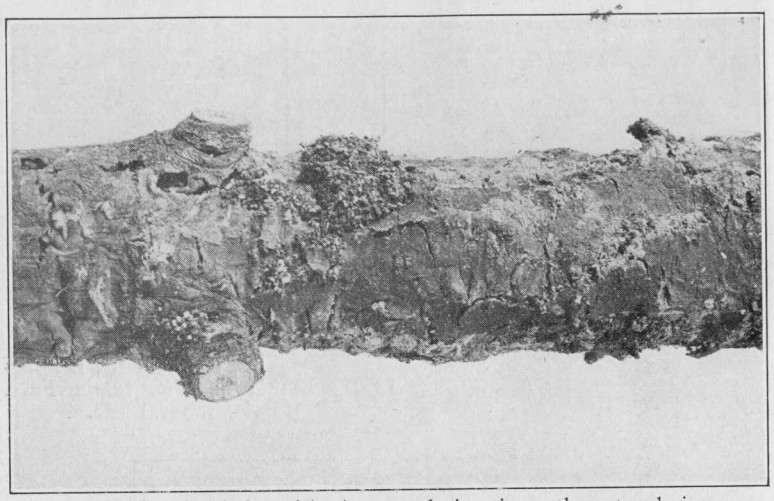


c. Adults and larvae, natural size. Female at top.

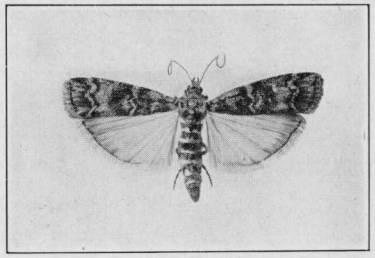


d. Larvae feeding on grape leaf. Natural size.

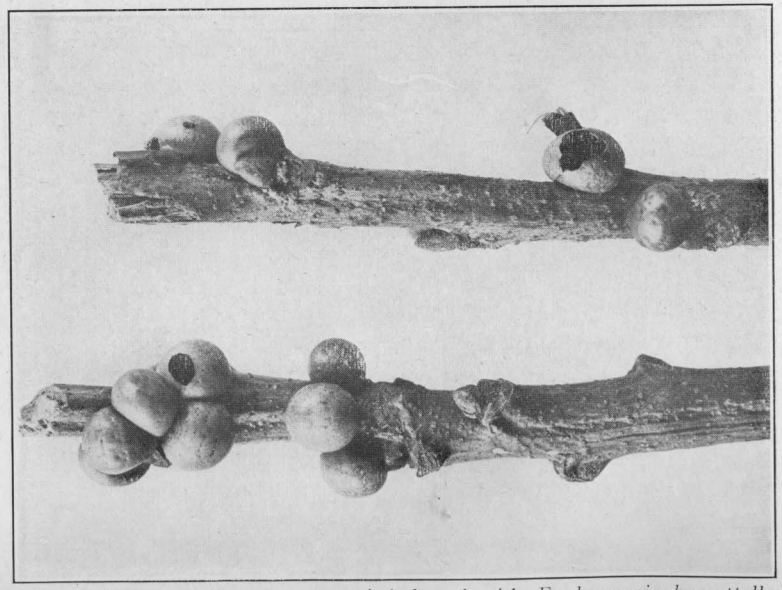
EIGHT-SPOTTED FORESTER.



a. White pine infested by larvae of pine tip moth, natural size.

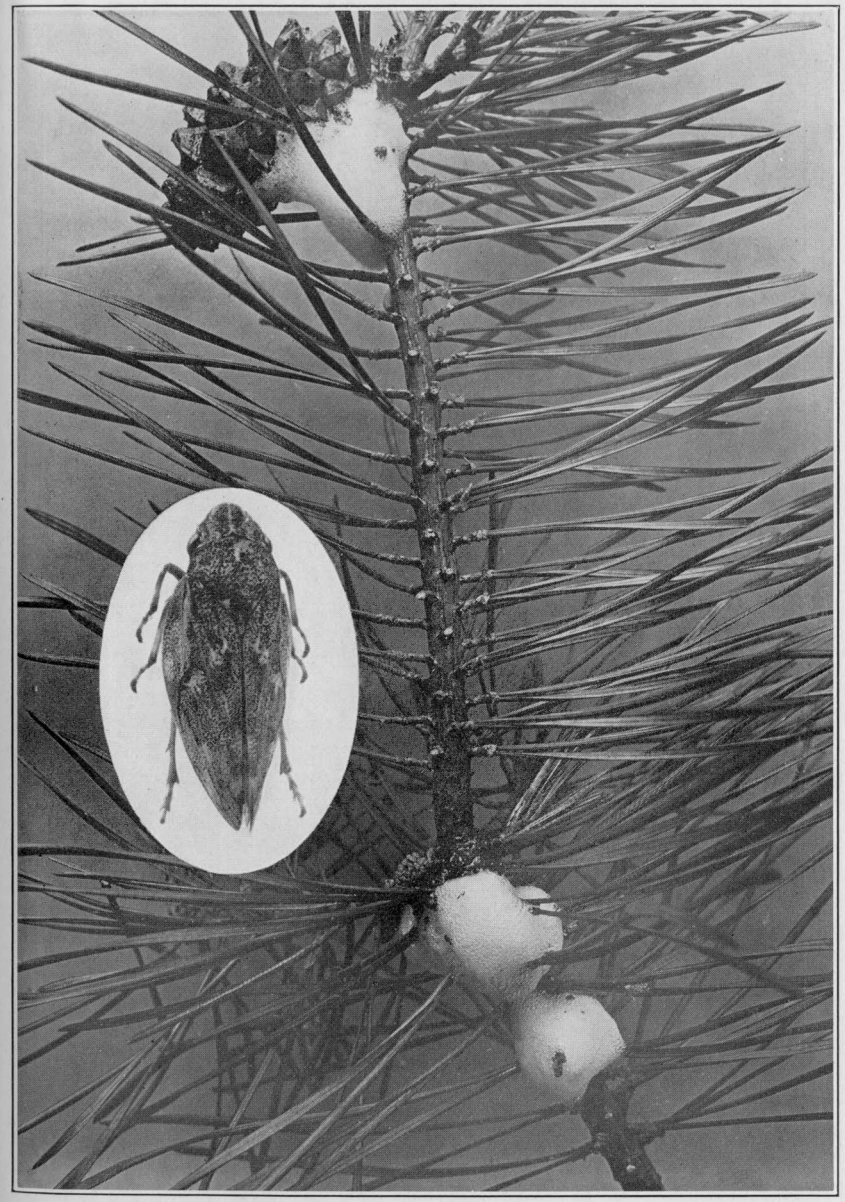


b. Adult of pine tip moth, *Pinipestis zimmermani* Grote. Natural size.



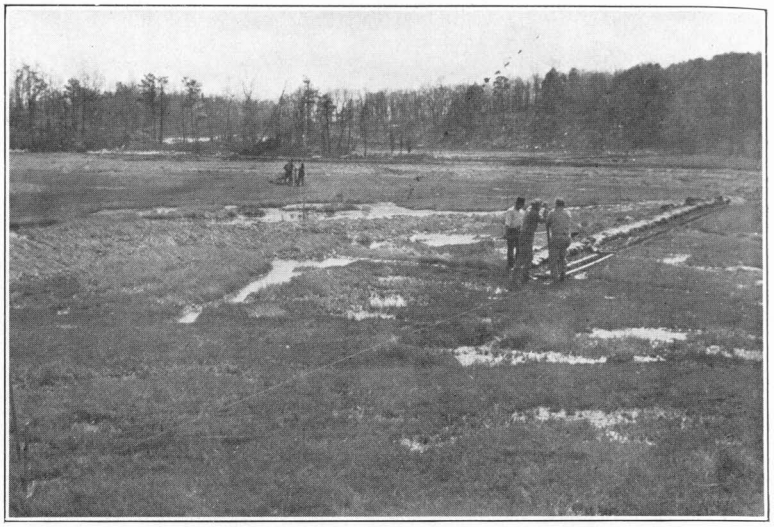
c. Scale-insect, *Kermes sassceri,* infested with *Euclemensia bassettella* Clem. Twice natural size.

PINE TIP MOTH, AND INFESTED SCALE-INSECT.

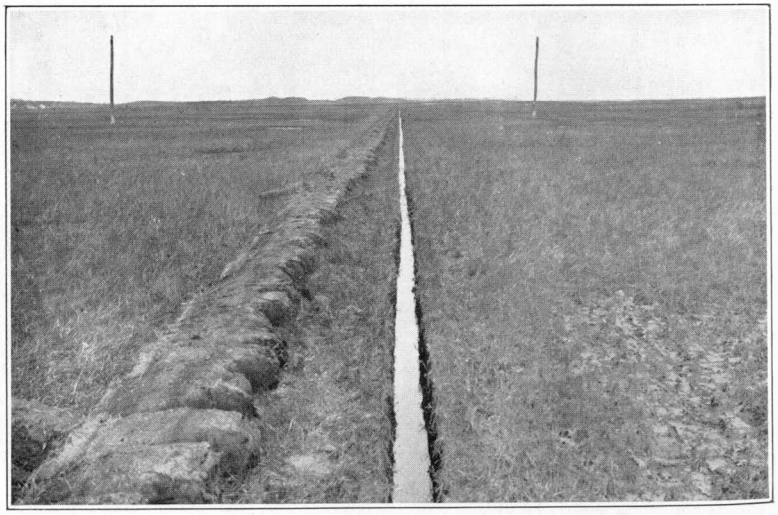


The froth masses on Scotch pine are natural size. The insert shows the adult insect, four times enlarged.

PARALLEL SPITTLE INSECT.

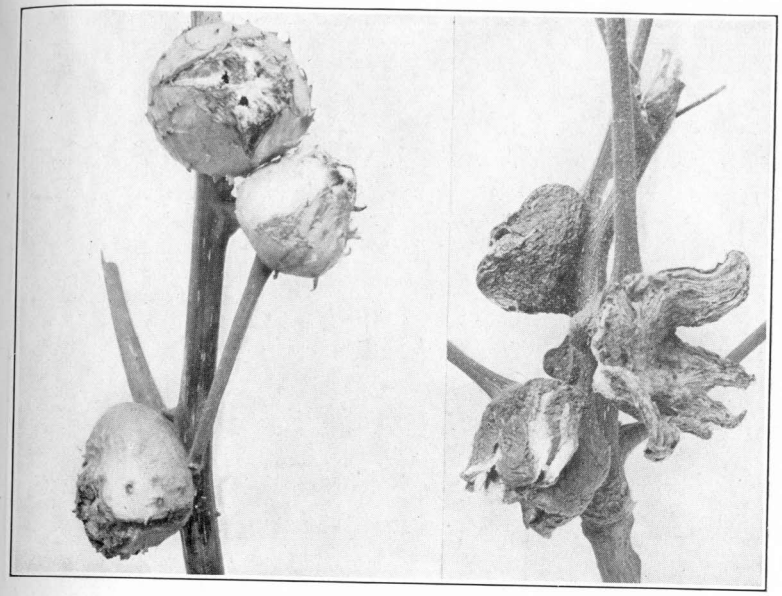


a. Ditching gangs at work, near Stony Creek.

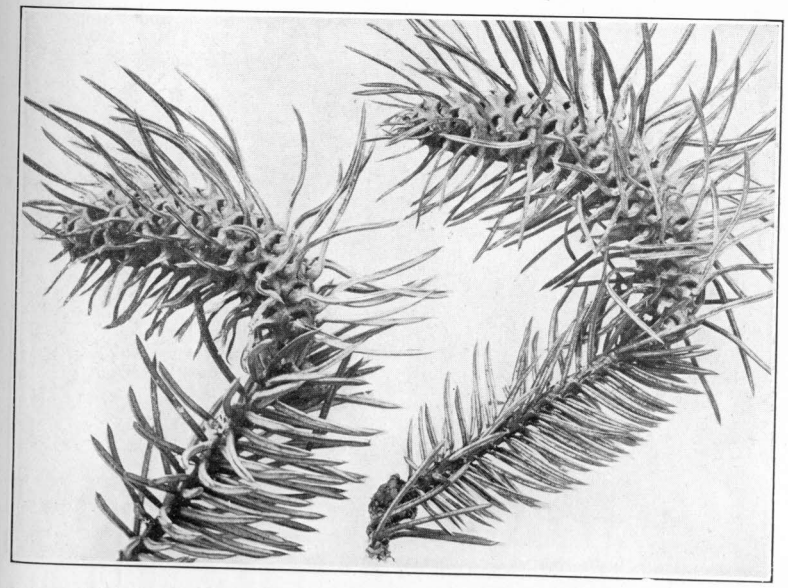


b. View on Hammonasset Marsh, Madison, showing ditch.

ANTI-MOSQUITO WORK.



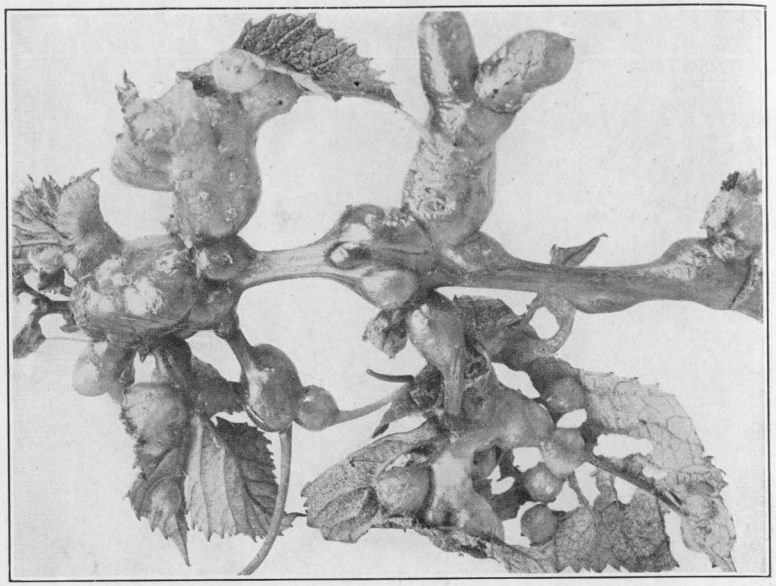
a. Galls of hickory gall aphid, natural size. Typical *Phylloxera caryæcaulis* at right, var. *spinosa* at left.



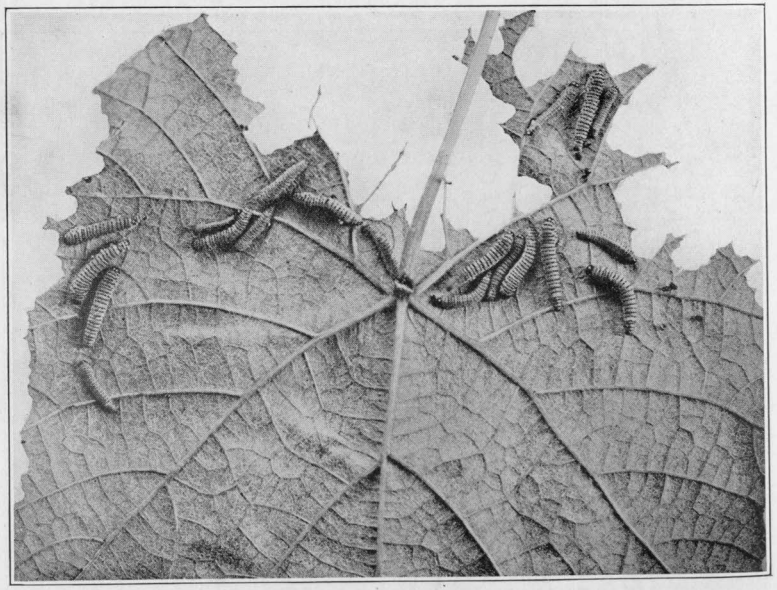
b. Galls of aphid, *Chermes cooleyi* Gillette, natural size.

HICKORY AND SPRUCE GALLS

PLATE XVI.



a. Grape-vine tomato gall, *Lasioptera vitis* O. S. Natural size.



b. Larvae of the grape-vine sawfly, *Erythraspides pygmæus* Say. Natural size.

GRAPE GALLS AND GRAPE SAWFLY.

PART III.

Commercial Feeding Stuffs.

By John Phillips Street.*

Under the Connecticut statutes the term "concentrated commercial feeding stuff" covers practically all feeds excepting hay and straw, whole seeds, unmixed meal made directly from any of the cereals or from buckwheat, and feed ground from whole grain and sold directly from manufacturer to consumer.

Section 4592 requires that every lot or parcel of concentrated commercial feeding stuff shall bear a statement giving the name and address of the manufacturer or importer, the number of net pounds in the package, the name of the article, and the percentages of protein and fat contained in it.

No registration of feeds or payment of analysis or license fees is required.

The penalty for violation of the statute is not more than $100 fine for the first offense and not more than $200 for each subsequent offense.

The law authorizes this station to take samples from any manufacturer or dealer, in a prescribed manner, and requires the station to analyze annually at least one sample of each brand which it has collected, and to publish these analyses "together with such additional information in relation to the character, composition and use thereof as may be of importance."

Inspection of 1916.

In compliance with the above requirements the following report has been prepared. During the fall of 1916 the station sampling agent visited 54 towns and villages of this state and collected 203 sample of feeds. The results of the examination of these sam-

* The chemical analyses here reported were made by E. M. Bailey, C. B. Morison and C. H. Shepard.

ples are here discussed and the chemical analyses are given in Table V.

The analyses of 56 samples sent by individuals are also separately reported. The analyses of 676 samples of ensilage corn, soy bean fodder, and corn grain grown in connection with experimental work will be reported in another place.

The official samples may be grouped as follows:

19	Cotton seed meal
7	Linseed meal, old process
15	Wheat bran
16	Wheat mixed feed
10	Wheat middlings
1	Red dog flour
2	Rye feed
3	Rye middlings
2	Buckwheat middlings
1	Corn gluten meal
8	Corn gluten feed
17	Hominy feed
3	Dried brewers' grains
1	Malt sprouts
7	Dried distillers' grains
4	Dried beet pulp
1	Wheat bran and corn cob feed
2	Corn and oat feeds
64	Horse, dairy and stock feeds
20	Poultry feeds
203	Total

Comments on Analyses.

The only brand offered for sale without the guaranties required by law was **8557**, *Hardy's Hominy Feed*; this, however, was of average quality.

Of the 203 official samples 33 did not meet their guaranties in some particular; 9 in protein, 19 in fat and 5 in both protein and fat. Sixteen per cent of the brands showed deficiencies this year as compared with 20 per cent in 1915 and 10 per cent in 1914.

Table I shows the individual brands which failed to satisfy their guaranties.

Table I.—Feeds Below Guaranty.*

		Deficiency in Protein. %	Deficiency in Fat. %
8445	Bull Brand Cotton Seed Meal	3.37	....
8597	Danish Brand Cotton Seed Meal	1.00	....
8577	National Feed Co.'s Cotton Seed Meal	3.50	....
8617	Puritan Cotton Seed Meal	4.25	....
8529	American Red Tag Cotton Seed Meal	....	1.42
8544	American Red Tag Cotton Seed Meal	1.70	1.51
8556	American Red Tag Cotton Seed Meal	1.30	....
8574	Number 7 Cotton Seed Meal	1.25	....

		Deficiency in Protein. %	Deficiency in Fat. %
8581	Moon's Mixed Feed	....	1.22
8488	Winona Wheat Middlings	....	0.50
8607	Quinebaug Buckwheat Middlings	8.81	1.91
8485	Bufceco Hominy Feed	....	0.42
8531	Plymouth Hominy Feed	....	2.10
8628	American Malt. Co.'s Malt Sprouts	....	0.86
8565	Korn-Oato Feed	....	0.94
8589	Pennant Stock Feed	....	1.10
8564	Blatchford's Pig Meal	....	0.51
8468	Bufceco Horse Feed	....	0.35
8502	Iroquois Dairy Feed	....	0.92
8493	Anchor Dairy Feed	4.44	0.99
8480	Bonnie Horse Feed	1.44	0.46
8455	Badger Stock Feed	1.31	....
8442	Peerless Horse Feed	....	0.52
8499	Park and Pollard's Calf Meal	....	0.97
8452	Tom Boy Horse Feed	....	0.62
8467	Mogol Molasses Feed	1.25	....
8592	Ryde's Cream Calf Meal	....	0.36
8464	Biles Ready Dairy Ration	....	0.67
8500	Iroquois Poultry Mash	....	0.40
8608	Wirthmore Growing Feed	1.00	0.88
8461	Wirthmore Poultry Mash	....	1.14
8491	Blue Ribbon Laying Mash	1.12	....
8466	Vincent Bros. XXXX Mash	....	0.32

* Deficiencies of less than 1.00 per cent protein and 0.25 per cent fat are ignored in this tabulation.

Cotton seed meal averaged over 1.5 per cent less protein than in 1915 with the price $8 per ton higher. Compared with 1914 we find a decrease of 2.5 per cent protein with the price $14 higher. The quality of this feed in our markets is growing poorer year by year, due chiefly to a greater admixture of hulls. The average crude fiber, an index of the amount of hulls present, found in this product since 1910 has been as follows:

1910	8.28	1914	9.73
1911	8.56	1915	10.69
1912	8.23	1916	12.42
1913	9.97		

In fact, five of the samples examined this year, and sold as Cotton Seed Meal, are in reality Cotton Seed Feed, mixtures of cotton seed meal and cotton seed hulls with less than 36 per

cent of protein. Two samples of the *Danish* brand, one of the *National Feed Co.'s,* one of the *Puritan* brand and the *Union Seed and Fertilizer Co.'s Number 7* fall into this classification.

Seven of the 19 samples were below guaranty in protein and two in fat, the protein shortage ranging from 1.00 to 4.25 per cent. The samples deficient in protein were as follows:

8445	Bull Brand	3.37
8597	Danish Brand	1.00
8577	National Feed Co.	3.50
8617	Puritan Brand	4.25
8544	American Red Tag Brand	1.70
8556	American Red Tag Brand	1.30
8557	Union Seed and Fert. Co.'s Number 7	1.25

We have frequently called attention in the past to the discrepancies in the prices of feeds. This is well illustrated this year by these meals. The brand containing the highest protein, 44.25 per cent, sold for $46 per ton, while that containing the least protein, 31.75, sold for $47 per ton, or $1 per ton higher.

Linseed Meal, Old Process. The seven samples satisfied their guaranties. The protein in these averaged over one per cent less than last year with the price $4.50 higher. Compared with 1914 we find that feed of about the same quality this year sold on the average for $10.50 higher.

Wheat Products. Aside from *Moon's Mixed Feed* and *Winona Wheat Middlings,* which showed respective deficiencies in fat of 1.22 and 0.50 per cent, these samples require no special comment.

Rye Products. The five samples satisfied their guaranties.

Buckwheat Middlings. The two products sold under this name differed greatly in composition. The one contained 25.00 per cent protein and 3.66 per cent fiber, the other 20.94 and 21.74 per cent, respectively.

Corn Gluten Meal. The single sample satisfied its guaranty. However, it contained 4.32 per cent less protein than last year and cost $12.80 more per ton.

Corn Gluten Feed. The eight samples ranged in protein from 22.44 to 28.94 per cent, the selling price of the lower-grade product being one dollar higher than that of the high-grade. Like most of the feeds gluten feed shows a much higher

selling price than in previous years. In 1914 the average ton price was $33.54, in 1915 $30.17, while this year it was $41.63.

Hominy Feed. Two of the 17 samples failed to satisfy their guaranties, the *Bufceco* and *Plymouth* brands being deficient in fat by 0.42 and 2.10 per cent, respectively. On the average the samples showed about the same protein as last year with over one per cent less fat, while the selling price was $13 higher per ton.

Dried Brewers' Grains. The three samples examined satisfied their guaranties and were high-grade products. They contained 2.50 per cent less protein than last year with the price $1.20 per ton higher. High prices do not appear to have attacked this feed, and it continues to be the cheapest protein feed on the market.

Malt Sprouts. The single sample was deficient in fat. A price of $37 per ton is high for this feed with dried brewers' grains selling at $31.

Dried Distillers' Grains. The seven samples satisfied their guaranties. They showed a wide range in composition, as usual, protein from 13.25 to 32.38 per cent and fat from 5.98 to 13.26 per cent. While the higher grades of this feed are relatively cheap they are more expensive feeds as a rule than dried brewers' grains. A rye distillers' grains with 13.25 per cent protein at $30 does not appear to be an economical purchase with dried brewers' grains containing 27.36 per cent protein selling at $31.

Dried Beet Pulp. The five samples satisfied their guaranties. The cost was $6.50 per ton higher than in 1915.

Wheat Bran and Corn Cob Meal. This sample contained 6.14 per cent less protein, 1.90 per cent less fat and 6.70 per cent more fiber than average wheat bran, and the price was 87 cents per ton higher. No feeder is warranted in paying such a price for a feed of this character.

Corn and Oat Feeds. One of the two samples failed to meet its fat guaranty by 0.94 per cent. The composition of this sample shows the use of excessive oat hulls.

Proprietary Horse, Dairy and Stock Feeds. Of the 64 samples of this class of feeds, 18 failed to meet their guaranties; 2 were deficient in protein, 14 in fat and 2 in both protein and fat. *Anchor Dairy Feed, Bonnie Horse Feed, Badger Stock*

and *Mogol Molasses Feed* showed protein deficiencies of 4.44, 1.44, 1.31 and 1.25 per cent, respectively.

Again we call attention to the fact that the official method for determining ether extract (fat) does not always give correct results in feeds of this class when molasses is present. As we are obliged by law to use the official method, the results in Table V were obtained by that method. Nevertheless, we have not included among the deficient samples those which yielded the guaranteed amount of fat when tested by the modified method published in our 1913 report. The following tabulation shows the results obtained by the two methods:

TABLE II.—FAT IN MOLASSES FEEDS.

	Official Method.	Modified Method.
Arcady Dairy Feed	3.45	3.12
Iroquois Dairy Feed	3.08	2.67
Clover Leaf Dairy Feed	4.28	4.08
Corno Sweet Feed	1.75	2.34
Hobby Horse Feed	1.17	1.76
Anchor Dairy Feed	1.68	2.51
Anchor Horse Feed	4.00	3.47
Hamlin's Horse, Mule and Dairy Feed	3.17	3.40
Algrane Horse Feed	4.00	3.37
New England Stock Feed	4.73	3.97
Badger Horse Feed	2.39	2.19
Badger Stock Feed	4.45	3.90
Badger Stock Feed	4.97	4.38
Blue Top Horse Feed	1.64	1.77
Cream City Horse Feed	1.84	1.97
Cream-O-Lene Dairy Ration	5.35	4.89
Domino Horse Feed	2.75	2.23
Domino Justice Creamery Feed	5.73	4.82
Fidelity Stock Feed	3.93	3.24
Peerless Horse Feed	1.08	1.48
Park and Pollard's Horse Feed	1.21	1.80
Peters King Corn	1.23	1.34
Tom Boy Horse Feed	0.74	1.38
Green Cross Horse Feed	2.30	2.28
Mogol Molasses Feed	2.34	2.09
Purina Feed with Molasses	2.24	2.16
Purina Feed with Molasses	2.20	2.15
Colonel's Ration	3.14	2.79
Ti-O-Ga Dairy Feed	7.35	6.89
Ti-O-Ga Dairy Feed	7.13	6.54
Xtra Vim Feed	0.45	0.76

The differences between the two methods are not as striking this year as usual, only 11 of the 31 samples showing higher results by the modified method, ranging from 0.11 to 0.85 per cent. The higher results secured by the official method are doubtless due to contamination of the ether extract with substances soluble in ether but not of a fatty nature. Apparently these substances are soluble in water as well as ether and do not appear in the results secured by the modified method. It is believed that the latter more truly represent the actual fat content of the feeds.

Many of these proprietary feeds are sold at excessive prices when their composition is considered, and furthermore there is little relation between cost and feeding value. We find brands containing from 9.25 to 24.69 per cent protein selling for $36 per ton, brands with 7.50 to 25.25 protein at $38, brands with 4.38 to 13.81 protein at $40, and brands with 9.38 to 27.31 protein at $42; one brand containing 11.88 protein sold at $45 and another containing 9.25 per cent at $48 per ton.

There is no mystery as to the components of these feeds (see below). The higher-grade feeds contain excellent feeding stuffs, but those of low-grade, against which our criticism is chiefly directed, are usually made up of very ordinary material indeed. But even with the high-grade mixtures of this class it is believed that the feeder could purchase staple feeds and mix his own rations for considerably less than he must pay for these ready mixed rations.

Proprietary Poultry Feeds. Of the 20 samples 2 were deficient in protein and 3 in fat. *Wirthmore Growing Feed* was 1.00 per cent deficient in protein, and 0.88 per cent in fat, *Wirthmore Poultry Mash* 1.14 per cent in fat and *Blue Ribbon Laying Mash* 1.12 per cent in protein.

CERTIFIED COMPOSITION OF PROPRIETARY FEEDS.

This state requires no statement of the components of the feeds sold in our markets. Many of them, however, bear such information on the tags, and the following is a summary of these statements:

Portage Stock Feed. Either white or yellow shelled corn, barley, oat shorts, oat hulls, oat middlings and ½ per cent of salt.

Arcady Dairy Feed. Malt sprouts, dried brewers' grains, cotton seed meal, molasses, clipped oat by-products, ground grain screenings and salt.

Pennant Stock Feed. White hominy and oat by-products.

Blatchford's Calf Meal. Locust bean meal, unpressed flax seed, wheat flour, barley meal, ground beans and peas, rice polish, old process oil meal, cocoa shell meal, cocoanut meal, recleaned cotton seed meal, fenugreek, dried milk, anise and salt.

Blatchford's Pig Meal. Oil meal, oat meal, wheat flour, barley meal, cotton seed meal, cocoa shell meal, bean meal, crushed flax seed, fenugreek and salt.

Bufceco Chop Feed. Ground corn, oats and barley, hominy feed, oat shorts and oat hulls.

Bufceco Creamery Feed. Ground corn, wheat bran and middlings, hominy feed, corn gluten feed, cotton seed meal, oat by-products and ½ per cent of salt.

Bufceco Horse Feed. Ground oats, corn and barley, wheat middlings, hominy feed, oat shorts, oat middlings, oat hulls, linseed meal and corn gluten feed.

Iroquois Dairy Feed. Ground corn, corn gluten feed, cotton seed meal, ground grain screenings, molasses and ½ per cent of salt.

Unicorn Dairy Ration. Corn distillers' grains, cotton seed meal, linseed meal, hominy meal, malt sprouts, gluten feed, corn starch by-products with corn bran, barley feed, brewers' grains and wheat bran.

Clover Leaf Dairy Feed. Cotton seed meal, corn gluten feed, mixed broken grains (wheat, corn, barley, flax, speltz), ground grain screenings, cocoa shells, clipped oat by-products, molasses and ½ per cent of salt.

Corno Stock Feed. Oat feed and hominy feed.

Corno Sweet Feed. Whole oats, ground alfalfa, cracked corn, cotton seed meal and molasses.

Wirthmore Stock Feed. Ground barley, ground oats, ground hominy, ground corn, oat meal mill by-products and ½ per cent of salt.

Crosby's Quality Feed Ready Ration. Distillers' grains, cotton seed meal, oil meal, malt sprouts, wheat bran, wheat middlings, hominy feed and ½ per cent of salt.

Hobby Horse Feed. Corn, oats, barley, alfalfa meal and molasses.

White Cross Stock Feed. Ground oats, ground barley, corn feed meal, wheat meal, ground corn bran, cotton seed meal and ¼ per cent of salt.

Anchor Dairy Feed. Cotton seed meal, corn gluten feed, oil meal, malt sprouts, dried brewers' grains, corn meal, corn bran, ground grain screenings, clipped oat by-products, wheat middlings, molasses and ¾ per cent of salt.

Anchor Horse Feed. Crushed and ground oats, ground and cracked corn, corn bran, wheat bran, crushed barley and molasses.

Globe No. 1 Chop Feed. Ground corn, kaffir and oats, oat hulls, flour middlings and ½ per cent of salt.

Grandin's Stock Feed. Hominy feed, oat meal mill by-products and salt.

Hamlin's Horse, Mule and Dairy Feed. Crushed flaxseed meal, old process oil meal, alfalfa meal, dried brewers' grains, dried distillers' grains, cane syrup and ½ per cent of salt.

Haskell's Stock Feed. Ground corn, ground oats, hominy feed, oat hulls, oat shorts and salt.

Algrane Horse Feed. Oat hulls, crushed oats, wheat middlings, molasses, oat shorts, hominy feed, ground grain screenings, ground corn, corn gluten feed and ½ per cent of salt.

New England Stock Feed. Ground corn, ground oats, ground grain screenings, hominy feed, oat hulls, wheat middlings, oat shorts, molasses and ½ per cent of salt.

Badger Horse Feed. Corn, oats, alfalfa, molasses and salt.

Badger Stock Feed. Hominy feed, maizo corn oil meal, maizo red dog flour, oat meal mill by-products and salt.

Blue Top Horse Feed. Corn, oats, alfalfa meal, salt and molasses.

Cream City Horse Feed. Alfalfa meal, molasses, corn, oats and salt.

Larro Feed. Cotton seed meal, corn gluten feed, dried distillers' grains, dried beet pulp, wheat bran and middlings and ¾ per cent of salt.

Palmo Meal. Peanut meats and hulls and palm oil.

M. and S. Stock Feed. Ground oat hulls and white hominy feed.

Cream-O-Lene Dairy Ration. Cotton seed meal, corn gluten feed, oil meal, wheat middlings, corn distillers' grains, corn feed meal, clipped oat by-products, malt sprouts, brewers' grains, ground wheat screenings, molasses and ¾ per cent of salt.

Domino Justice Creamery Feed. Cotton seed meal, corn gluten feed, oil meal, wheat middlings, corn distillers' grains, corn feed meal, clipped oat by-products, malt sprouts, dried brewers' grains, ground wheat screenings and ¾ per cent of salt.

Peerless Horse Feed. Corn, oats, alfalfa meal and molasses.

Stevens 44 Dairy Ration. Linseed meal, cotton seed meal, wheat bran, corn gluten feed, cocoanut oil meal, pea meal, distillers' grains, dried brewers' grains, ground barley, wheat middlings, hominy meal, buckwheat middlings, corn meal and salt.

Park and Pollard's Calf Meal. Flax seed, beans, lentils, wheat flour, cotton seed meal, locust beans, cocoa meal, anise, fenugreek and a trace of salt.

Park and Pollard's Horse Feed. Alfalfa, corn, oats, molasses and salt.

Park and Pollard's Stock Feed. Corn meal, hominy feed and oat feed.

Peters King Corn. Corn, oats, alfalfa and molasses.

Iowa Stock Feed. Wheat middlings, corn meal, hominy feed, dried brewers' grains, oat meal mill by-products, and 1 per cent of table salt.

Tom Boy Horse Feed. Cracked corn, whole oats, alfalfa meal, oat meal mill by-products, cotton seed meal and molasses.

Boss Feed. Ground corn, hominy feed, oat meal by-products and ½ per cent of salt.

Green Cross Horse Feed with Molasses. Alfalfa meal, ground corn, crushed oats, cotton seed meal, oat meal mill by-products and molasses.

Mogol Mixed Molasses Feed. Corn, oats, alfalfa meal, cotton seed meal, oat middlings, oat hulls and molasses.

Schumacher's Calf Meal. Ground corn, hominy feed, ground barley, wheat flour, wheat middlings, cotton seed meal, oat meal mill by-products, ground puffed rice and wheat, and ½ per cent of salt.

Schumacher's Special Horse Feed. Ground corn, crushed oats, oat meal mill by-products and ½ per cent of salt.

Victor Feed. Ground corn, hominy feed, oat meal mill by-products and ½ per cent of salt.

Purina Feed with Molasses. Corn, oats, alfalfa, molasses and 1 per cent of salt.

Ryde's Cream Calf Meal. Carob bean, flaxseed, wheat flour, cotton seed meal, beans, lentils, fenugreek, anise, cocoa meal and salt.

Yellow Tag Stock Feed. Ground barley, ground hominy, ground corn, oat meal mill by-products and ½ per cent of salt.

Colonel's Ration. Alfalfa meal, cane molasses, wheat middlings, corn feed meal, dried brewers' grains, wheat bran, oil meal, hominy feed and salt.

Biles Ready Ration (Union Grains). Distillers' grains, cotton seed meal, old processes oil meal, wheat middlings and bran, hominy meal, dried brewers' grains, malt sprouts and ½ per cent of salt.

Xtra Vim Feed. Cane molasses and sphagnum moss.

Bufceco Poultry Mash. Ground corn, wheat bran and middlings, hominy feed, corn gluten feed, oat middlings and rolled oats.

Iroquois Poultry Mash. Ground corn, wheat bran, wheat middlings, corn gluten feed and alfalfa meal.

Wirthmore Poultry Mash. Ground oats and barley, gluten feed, alfalfa meal, wheat bran, ground corn, beef scrap, fish meal, wheat middlings and ¾ per cent of salt.

Globe Egg Mash. Alfalfa meal, bran, middlings, wheat meal, corn feed meal, ground corn bran, oil cake, meat scrap and ½ per cent of salt.

Queen Poultry Mash. Alfalfa meal, wheat bran, wheat feed meal, corn bran, corn feed meal, beef scrap, linseed cake and salt.

Blue Ribbon Laying Mash. Wheat bran and middlings, wheat flour, ground oats, corn meal, gluten feed, pea meal, alfalfa, linseed meal, fish scrap, meat meal and ground bone.

H. O. Dry Poultry Mash. Oat middlings, corn gluten feed, wheat middlings, rolled oats, alfalfa meal, ground corn, hominy feed, cracked wheat and wheat bran.

H. O. Poultry Feed. Ground corn, corn gluten feed, wheat middlings, oat middlings, wheat bran, hominy feed, rolled oats, ground peas, ground grain screenings and molasses.

M. and S. Dry Mash Feed. Bran, middlings, gluten, corn meal, beef scrap, alfalfa meal and hominy.

Domino Laying Mash. Linseed meal, ground oats, wheat flour, wheat bran and middlings, corn feed meal, corn gluten feed, alfalfa meal, ground bone and meat scrap.

Park and Pollard's Growing Feed. Ground corn, wheat, barley, oats, meat, bone, alfalfa, kaffir corn, wheat bran and middlings, buckwheat, beet pulp, calcium carbonate and salt.

Park and Pollard's Lay or Bust Dry Mash. Wheat bran and middlings, ground corn, wheat, oats, barley, kaffir corn, buckwheat, alfalfa, fish, meat, bone, beet pulp, calcium carbonate and salt.

Schumacher's Poultry Mash. Meat scraps, oat meal, wheat bran, alfalfa, corn feed meal, corn gluten feed, ground grain screenings.

Purina Chicken Chowder Feed. Wheat middlings, wheat bran, corn meal, salt, alfalfa meal, linseed meal, granulated meat.

Crude Fiber Guaranties.

While this state requires no guaranty of crude fiber in feeding stuffs, the general Food and Drug Law, which also applies to this class of material, requires that any statement made on the label must not be false or misleading. If, therefore, a manufacturer makes a claim as to the amount of fiber present this claim must be correct or the feeding stuff is misbranded under the law.

Of the 82 brands in which fiber was guaranteed, 25, or 30 per cent, exceeded the guaranty by more than one per cent. These brands were as follows:

Table III.—Fiber Guaranty Exceeded by More Than One Per Cent.

No.	*Brand.*	*Excess.*	*No.*	*Brand.*	*Excess.*
8445	Bull Cotton Seed Meal ..	3.49	8463	Portage Stock Feed	2.16
8568	Bull Cotton Seed Meal ..	2.12	8441	Bufceco Chop Feed	1.78
8465	Danish Cotton Seed Meal	1.60	8501	Bufceco Creamery Feed..	3.87
8597	Danish Cotton Seed Meal	1.28	8468	Bufceco Horse Feed	1.11
8550	Dixie Cotton Seed Meal..	2.75	8502	Iroquois Dairy Feed	2.29
8510	Forfat Cotton Seed Meal	5.88	8620	Corno Stock Feed	2.82
8583	Canary Cotton Seed Meal	3.87	8426	Crosby's Ready Ration ..	1.52
8529	American Red Tag Cotton Seed Meal	3.09	8493	Anchor Dairy Feed	1.37
			8442	Peerless Horse Feed	1.75
8544	American Red Tag Cotton Seed Meal	3.29	8585	Yellow Tag Stock Feed..	2.54
			8440	Bufceco Poultry Mash ..	1.20
8528	Continental Gluten Feed..	3.19	8484	H. D. Poultry Mash	2.13
8542	Eagle E D Distillers' Grains	3.75	8610	Dove Cotton Seed Meal..	1.21
			8613	Sunset Cotton Seed Meal	2.21

The Costs of the Feeds.

The selling prices of most classes of feeding stuffs have made great advances during recent years, and unfortunately in certain feeds, especially cotton seed meal, this increase in price has been accompanied by a decided falling off in quality. The following tabulation shows the average retail selling prices of certain standard feeds during the past five years compared with the average of the five years preceding. These prices in all cases represent the retail prices per ton quoted to our agent in the fall months of the respective years, and are therefore fairly comparable.

Table IV.—Retail Prices of Feeding Stuffs, 1907-1916.

Feed	1907–11	1912	1913	1914	1915	1916	Per cent Increase 1916 over 1907–11
Cotton Seed Meal	$33.40	$33.12	$35.45	$32.81	$38.83	$46.95	41
Linseed Meal, o. p.	38.02	39.00	36.80	37.06	43.17	47.86	26
Wheat Bran	28.73	27.85	.....	.....	26.92	34.13	19
Wheat Feed	30.38	30.23	.....	.....	29.95	37.72	24
Wheat Middlings	31.23	31.48	.....	.....	30.18	37.95	22
Gluten Meal	.....	.....	38.00	38.00	37.20	50.00	33
Gluten Feed	31.53	30.75	31.78	33.54	30.18	41.63	32
Hominy Feed	33.28	30.33	32.78	32.20	31.50	44.48	34
Dried Brewers' Grains	28.77	29.75	28.57	29.60	29.80	31.00	8
Malt Sprouts	25.74	28.00	26.00	27.00	.....	37.00	36
Dried Distillers' Grains, h. g.	32.12	34.67	34.75	35.60	35.47	39.60	23
Dried Distillers' Grains, l. g.	29.33	.....	25.00	.....	27.00	32.50	11
Dried Beet Pulp	28.00	29.00	29.60	29.71	28.30	34.75	23
Corn and Oats	33.86	32.50	35.00	35.67	31.33	49.00	45

The conditions shown by the above table are startling indeed. The fourteen feeds listed show increases in price, compared with the five years preceding 1912, of from 8 to 45 per cent, or an average increase of 27 per cent. In view of these inflated prices no feeder of farm animals can afford to buy his feeds in the usual haphazard manner. He must give the most careful consideration not only to the composition of the feed but to its price

as well. Just as in the case of commercial fertilizers during the past two seasons no farmer was justified in buying potash salts at the ruling war prices, so to-day the prices of certain feeds exclude those feeds from use by feeders who wish to make a success of the dairying business.

The table clearly shows that in spite of its high feeding value and general desirability as an ingredient of the ration, dried brewers' grains has shown the effect of high prices less than any other of the standard feeds, its increase in price over 1907-11 being only 8 per cent, compared, for instance, with 41 per cent for cotton seed meal, 32 per cent for gluten feed, 34 per cent for hominy feed and 45 per cent for provender. Here certainly is an opportunity for the feeder to practice economy in his purchase of feeds, as many feeding experiments have shown that dried brewers' grains may well be substituted for at least a part of the grain in the dairy ration, and for a part of the oats in a ration for horses. Just so long as the feeder will pay $47 for cotton seed meal, $42 for gluten feed, $45 for hominy feed or $49 for corn and oats, when dried brewers' grains, containing 27 per cent protein, 7 per cent fat and 42 per cent carbohydrates, may be secured for $31, just so long will failure in the dairy business cease to be a mystery.

The absurdities in the prices of many of the proprietary stock feeds are even more striking and have been referred to on an earlier page.

Unofficial Samples.

Fifty-six samples sent by individuals have been analyzed. The station is responsible for the accuracy of the analysis, but not for the sampling, of these feeds:

Cotton Seed Meal. Fifteen samples were analyzed, the descriptions following:

American Red Tag, Union Seed and Fertilizer Co., Clarksdale, Miss.; **7350,** sent by S. J. Orr, West Suffield.

Bull Brand, Humphreys, Godwin Co., Memphis, Tenn.; **7214,** sent by Rockville Milling Co., Rockville.

Dixie Brand, Humphreys, Godwin Co., Memphis, Tenn.; **7486, 7487, 7351** and **7352,** sent by S. J. Orr, West Suffield; **7015,** sent by C. H. Fairty Co., New Canaan.

Unknown brands, Humphreys, Godwin Co., Memphis, Tenn.; **7671,** sent by R. E. Hyde, Ellington; **7218,** sent by Samuel Roodner, South Norwalk; **7193,** sent by The Coles Co., Middletown.

Dove Brand, F. W. Brode & Co., Memphis, Tenn.; **8710,** sent by Thomas Holt, Southington.

Good Luck Brand, S. P. Davis, Little Rock, Ark.; **7488,** sent by S. J. Orr, West Suffield.

Milko Brand, H. F. H. Eberts, Little Rock, Ark.; **8718,** sent by Meech and Stoddard, Middletown.

Cyclone Cattle Feed, **8701,** sold by Willimantic Grain Co., Willimantic, sent by Saul Wachtel, Chestnut Hill. Sold by dealer for cotton seed meal with guaranty of 36 per cent protein, but tags on bags guaranteed 20 per cent protein. The material is in reality cotton seed feed.

7240, sold by C. L. Montgomery & Son, Memphis, Tenn.; sent by The Coles Co., Middletown.

Four of the 15 samples were deficient in protein from 2.25 to 4.94 per cent, and another sample without guaranty, **7193,** was a low-grade product.

PROTEIN CONTENT OF COTTON SEED MEALS.

No.	Found.	Guaranteed.	No.	Found.	Guaranteed.	No.	Found.	Guaranteed.
7350	38.69	38.55	7352	40.81	38.62	8710	39.44	38.63
7214	38.75	41.00	7015	38.19	38.62	7488	40.69	41.00
7486	41.06	38.62	7671	42.13	38.62	8718	38.88	38.62
7487	42.25	38.62	7218	38.25	41.00	8701	31.06	36.00
7351	41.13	38.62	7193	36.69	.....	7240	36.13	38.50

Cocoanut Meal. **6997,** sent by W. J. Southey, Bridgeport, contained 26.50 per cent protein; another sample, **8234,** sent by C. M. Jarvis, Berlin, had the following composition:

Water	11.88	Fiber	7.76
Ash	6.23	Nitrogen-free extract	40.53
Protein (N x 6.25)	23.75	Fat	9.85

Wheat Bran. **7210** and **7211,** sent by W. J. Prann, Centerbrook, contained 13.94 and 14.19 per cent protein, respectively.

Salvage Wheat. **7221,** sent by C. M. Jarvis, Berlin; cost 90 cents per bushel. It had the following composition:

Water	9.34	Fiber	2.60
Ash	2.55	Nitrogen-free extract	67.81
Protein (N x 6.25)	15.94	Fat	1.76

Cracked Corn. **7756** (coarse) and **7755** (fine) contained 9.44 and 10.38 per cent protein, respectively.

Gluten Feed. **7839,** sent by E. M. Tomlinson, Oronoque, **8239,** sent by Carl Johnson, Bethany, and **8233,** sent by Abner Hendee Co., New Haven, contained 26.18, 24.56 and 25.59 per cent protein, respectively.

Hominy Feed. **7227** and **7228,** sent by R. F. Porter, Amston, contained 10.25 and 12.12 per cent protein, respectively.

Distillers' Grains. **7216,** *Hector's Distillers' Grains,* sent by G. C. White, Storrs, and guaranteed 46.5 protein and fat (on the bags 30 per cent protein and 10 per cent fat) contained 31.25 per cent protein and 12.83 per cent fat. This is a high-grade product. *3D Distillers' Grains,* **7257,** sent by J. G. French, Vernon, contained 26.50 per cent protein; it likewise is a high-grade grains.

Proprietary Stock Feeds. Holstein Feed, **8696,** sent by S. C. Ingersoll, Stamford, contained 11.06 per cent protein. **8254,** sent by C. A. Cowles, Plantsville, and claimed to be three-fifths hominy and two-fifths oat feed, contained 8.23 per cent water, 8.69 protein, 12.93 fiber and 5.40 fat.

Tioga Feed. **8717,** sent by F. E. Fowler, Guilford, had the following composition:

Water	6.83	Fiber	9.61
Ash	5.04	Nitrogen-free extract	51.78
Protein (N x 6.25)	19.81	Fat	6.93

Proprietary Poultry Feed. Chicken Chowder Feed, **7668,** sent by C. B. Raub, New London. The purchaser suspected the feed to have caused the death of a number of his chicks. A partial analysis showed 7.46 per cent ash containing 0.99 per cent common salt.

Alfalfa Meal. **7255** and **7256**, sent by Hartford Hay and Grain Co., Hartford, contained 15.31 and 17.00 per cent protein, respectively.

Meat Muscle. **7559** and **7559a** contained 76.13 and 80.00 per cent protein, respectively.

Meat Scrap, etc. **8708**, *Shay's Beef Scrap,* sent by C. C. Hewitt, Uncasville; **7232**, *Meat Scraps,* **7233**, *Bone and Meat Meal,* **7234**, *Cracked Bone,* **7235**, *Digester Tankage* and **7231**, *Ground Bone,* all sold by Springfield Rendering Co., Springfield, Mass., and sent by C. M. Jarvis, Berlin. These had the following composition:

	8708	7232	7233	7234	7235	7231
Protein (N x 6.25)	46.56	49.31	44.44	26.56	43.31	17.63
Phosphoric acid	12.93	12.15	15.19	24.54	15.47	25.26
Fat	.....	10.13	8.98	.....	7.85	.....

Beans. **8255** (marketable) and **8256** (culls) sent by C. M. Jarvis, Berlin, had the following composition:

	8255	8256
Water	10.74	10.85
Ash	3.32	3.84
Protein (N x 6.25)	24.00	24.50
Fiber	3.08	3.52
Nitrogen-free extract	57.39	55.77
Fat	1.47	1.52

Cracker Food. **7248**, sent by F. E. Rogers, New Haven, and suspected of having caused the death of a number of pigs and chickens. No poison was detected.

Bread Crumbs. **7220**, sent by F. M. Peasley, Cheshire, contained 11.00 per cent protein and 0.25 per cent fat.

Miscellaneous Feeds. **7272** and **8681**, sent by C. M. Jarvis, Berlin, had the following composition:

	7272	8681
Water	6.16	5.82
Ash	5.13	5.39
Protein (N x 6.25)	12.38	6.63
Fiber	15.93	23.53
Nitrogen-free extract	54.73	55.55
Fat	5.67	3.08

7031, sent by F. C. Bushnell, New Haven, contained 9.63 per cent protein: **6996**, sent by W. J. Southey, Bridgeport, contained 12.81 per cent protein; **7441**, sent by L. W. Robinson, Columbia, contained 12.47 per cent protein; **8734** and **8735**, sent by A. W. Close, Stamford, contained 18.13 and 18.44 per cent protein, respectively.

7238, sent by O. T. Adams, Seymour and **8411**, sent by M. J. Trowbridge, Bethel, were suspected of having caused the death of calves and chickens respectively. No poison, smut or mould was found in the samples.

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

SAMPLED IN 1916.

Station No.	Brand.	Retail Dealer.	Water.	Ash.	Protein. (N x 6.25)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	Price per ton.
			Pounds per Hundred.						
	OIL SEED PRODUCTS.								
	Cotton Seed Meal.								
8427	Prime. Ames-Burns Co., Jamestown, N. Y.	*East Haven:* F. A. Forbes	8.51	6.11	39.25	9.78	29.25	7.10	$48.00
8610	Dove. F. W. Brode & Co., Memphis, Tenn.	*Danielson:* Young Bros. Co.	7.88	6.07	37.63	11.21	30.26	6.95	48.00
8624	Buckeye. Buckeye Cotton Oil Co., Cincinnati, O.	*Granby:* E. H. Rollins	7.91	5.58	44.25	11.89	24.43	5.94	46.00
8445	Bull. Humphreys, Godwin Co., Memphis, Tenn.	*No. Haven:* Coöperative Feed Co.	8.75	5.69	37.63	11.49	29.16	7.28	48.00
8568	Bull. Humphreys, Godwin Co., Memphis, Tenn.	*New Haven:* Crittenden-Benham Co.	7.60	6.42	41.13	10.12	27.91	6.82	50.00
8465	Danish. Humphreys, Godwin Co., Memphis, Tenn.	*Plantsville:* C. A. Cowles	7.94	5.91	35.63	13.60	31.82	5.10	47.00
8524	Danish. Humphreys, Godwin Co., Memphis, Tenn.	*Torrington:* F. L. Wadhams & Sons	8.10	5.43	36.75	12.85	29.63	7.24	45.00
8597	Danish. Humphreys, Godwin Co., Memphis, Tenn.	*Yantic:* A. R. Manning	8.33	6.03	35.00	13.28	31.41	5.95	45.00
8550	Dixie. Humphreys, Godwin Co., Memphis, Tenn.	*Thompsonville:* Geo. S. Phelps & Co.	7.60	5.97	40.13	10.75	28.31	7.24	48.00
8510	Forfat. Humphreys, Godwin Co., Memphis, Tenn.	*Plainville:* Eaton Bros.	6.07	5.78	38.25	13.88	29.19	6.83	48.00
8583	Canary. C. L. Montgomery & Co., Memphis, Tenn.	*New London:* I. N. Bragaw	8.71	5.98	37.44	11.87	28.87	7.13	49.00
8577	Prime. National Feed Co., St. Louis, Mo.	*Hartford:* Loydon, Northam & Loydon	7.27	5.79	35.00	13.02	32.24	6.68	46.00
8617	Puritan. J. E. Soper Co., Boston, Mass.	*Willimantic:* Willimantic Grain Co.	7.22	5.29	31.75	15.26	33.79	6.69	47.00
8613	Sunset. Texas Cake & Linter Co., Dallas, Tex.	*Putnam:* Bosworth Bros.	7.74	5.21	41.38	12.21	27.48	5.98	52.00
8529	American Red Tag. Union Seed & Fert. Co., Argenta, Ark.	*Winsted:* Leonard Grain Co.	7.80	5.10	38.25	14.59	28.68	5.58	42.00
8534	American Red Tag. Union Seed & Fert. Co., Grenada, Miss.	*Winsted:* E. Manchester & Sons	9.18	5.89	38.56	12.11	27.92	6.34	43.00
8544	American Red Tag. Union Seed & Fert. Co., Argenta, Ark.	*Rockville:* Edward White	7.87	5.11	36.88	14.79	29.86	5.49	45.00
8556	American Red Tag. Union Seed & Fert. Co., Memphis, Tenn.	*Middlefield:* Middlefield Grain & Coal Co.	7.11	6.29	37.25	11.47	29.77	8.11	48.00
8574	Number 7. Union Seed & Fert. Co., New York	*Hartford:* G. M. White & Co.	8.20	5.94	34.75	11.73	31.53	7.85	47.00
		Average guaranty	....	....	....	**38.16**	....	....	**6.00**	....
		Average of these 19 analyses	....	**7.88**	**5.77**	**37.73**	**12.42**	**29.55**	**6.65**	**46.95**
		Average digestible	....	....	....	**31.7**	**4.6**	**22.2**	**6.3**	....
	Linseed Meal, Old Process.								
8555	American Linseed Co., Buffalo, N. Y.	*Middlefield:* Middlefield Grain & Coal Co.	8.81	5.15	37.44	7.24	35.36	6.00	48.00
8536	Amco. American Milling Co., Peoria, Ill.	*Canaan:* Ives & Pierce	9.10	5.76	30.19	9.48	38.31	7.16	48.00
8436	Archer Daniels Linseed Co., Buffalo, N. Y.	*Hamden:* I. W. Beers	10.00	5.08	36.50	7.35	34.09	6.98	48.00
8449	Midland Linseed Products Co., Minneapolis, Minn.	*Wallingford:* E. E. Hall	9.60	4.81	34.25	7.10	35.73	8.51	48.00
8474	Spencer Kellogg & Sons, Buffalo, N. Y.	*New Canaan:* C. H. Fairty Co.	8.52	4.96	37.19	7.08	36.01	6.24	48.00
8527	Toledo Seed & Oil Co., Toledo, O.	*Torrington:* F. L. Wadhams & Sons	9.43	6.10	29.31	8.88	40.59	5.69	48.00
8511	Bonnie. Traders & Producers Supply Co., Buffalo, N. Y.	*Bristol:* Eaton Bros.	8.20	5.45	34.06	7.45	36.95	7.89	47.00
		Average guaranty	....	....	**32.29**	....	....	**5.29**	....
		Average of these 7 analyses	....	**9.09**	**5.33**	**34.13**	**7.80**	**36.72**	**6.92**	**47.86**
		Average digestible	....	....	....	**30.4**	**4.4**	**28.6**	**6.2**	....

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
	WHEAT PRODUCTS.	
	Wheat Bran.	
8554	Dudley. Chas. M. Cox Co., Boston, Mass.	*Suffield:* Spencer Bros.
8507	Monogram. Chas. M. Cox Co., Boston, Mass.	*West Cheshire:* G. W. Thorpe
8443	Monogram. Chas. M. Cox Co., Boston, Mass.	*No. Haven:* Coöperative Feed Co.
8478	Choice. Hecker-Jones-Jewell Mill. Co., Buffalo, N. Y.	*Stamford:* W. L. Crabb
8458	Anchor. Kemfer Mill & Elev. Co., Kansas City, Mo.	*Meriden:* A. Grulich
8612	Lucky. Federal Milling Co., Lockport, N. Y.	*Putnam:* Bosworth Bros.
8504	Maple Leaf. Maple Leaf Milling Co., Toronto, Can.	*West Cheshire:* G. W. Thorpe
8447	Choice. Niagara Falls Mill. Co., Niagara Falls, N. Y.	*Wallingford:* E. E. Hall
8432	Pillsbury Co., Minneapolis, Minn.	*Guilford:* Morse & Landon
8626	Quaker City. Quaker City Flour Mills Co., Philadelphia, Pa.	*New Haven:* R. G. Davis & Sons
8548	Bell Cow. Quaker Oats Co., Chicago, Ill.	*Somers:* W. C. Pease
8552	Pure. Southwestern Mill. Co., Kansas City, Mo.	*Thompsonville:* Geo. S. Phelps & Co.
8532	David Stott Flour Mills, Detroit, Mich.	*Winsted:* E. Manchester & Sons
8519	Angelus. Thompson Milling Co., Lockport, N. Y.	*Torrington:* D. L. Talcott
8598	George Urban Mill Co., Buffalo, N. Y.	*Yantic:* A. R. Manning
		Average guaranty
		Average of these 15 analyses..
		Average digestible
	Wheat Feed (Mixed Feed).	
8603	Bailey Fancy. E. W. Bailey Co., Montpelier, Vt.	*Norwich:* Chas. Slosberg
8535	White Satin. Barber Mill. Co., Minneapolis, Minn.	*Canaan:* Ives & Pierce
8490	Winona. Bay State Milling Co., Winona, Minn.	*Danbury:* F. C. Benjamin
8517	Boston. Duluth Superior Mills, Duluth, Minn.	*Torrington:* D. L. Talcott
8495	Globe Dairy Feed. Globe Elevator Co., Buffalo, N. Y.	*New Milford:* Geo. E. Ackley Co.
8525	Mainspring. Harter Milling Co., Toledo, O.	*Torrington:* F. L. Wadhams & Sons
8541	Hecker-Jones-Jewell Mill. Co., Buffalo, N. Y.	*New Hartford:* Wallace Case
8581	Geo. O. Moon & Co., Binghamton, N. Y.	*Hartford:* Loydon, Northam & Loydon
8486	Fancy. Pillsbury Co., Minneapolis, Minn.	*Danbury:* H. E. Meeker
8591	Buckeye. Quaker Oats Co., Chicago, Ill.	*Westerly, R. I.:* C. W. Campbell Co.
8437	Occident. Russell Miller Mill. Co., Minneapolis, Minn.	*Hamden:* I. W. Beers
8438	Gold Mine. Sheffield King Mill. Co., Minneapolis, Minn.	*Ansonia:* Ansonia Flour & Grain Co.
8558	Try-Me. Sparks Milling Co., Alton, Ill.	*Middletown:* Meech & Stoddard
8526	Honest. David Stott Flour Mills, Detroit, Mich.	*Torrington:* F. L. Wadhams & Sons

SAMPLED IN 1916—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	
8554	8.88	5.87	15.06	11.00	53.59	5.60	$36.00
8507	8.46	5.78	15.06	10.71	54.44	5.55	38.00
8443	9.33	6.21	15.13	10.88	52.97	5.48	34.00
8478	8.57	6.69	15.13	9.78	54.75	5.08	33.00
8458	8.94	7.02	17.44	9.64	52.87	4.09	35.00
8612	9.25	6.85	14.88	9.55	55.01	4.46	35.00
8504	9.05	4.48	15.31	8.81	57.31	5.04	36.00
8447	8.40	6.97	15.63	9.79	54.29	4.92	33.00
8432	9.69	5.89	14.50	10.61	54.37	4.94	34.00
8626	8.50	6.40	14.63	8.89	56.89	4.69	36.00
8548	9.09	4.88	16.50	8.56	55.32	5.65	34.00
8552	8.61	7.07	17.00	9.15	53.70	4.47	34.00
8532	8.15	5.83	15.13	9.82	56.30	4.77	34.00
8519	8.45	6.47	13.75	10.05	56.46	4.82	34.00
8598	8.30	5.73	15.63	8.95	55.84	5.55	36.00
....	....	....	**14.22**	....	....	**3.82**	....
....	**8.78**	**6.14**	**15.39**	**9.75**	**54.94**	**5.01**	**34.80**
....	....	....	**11.7**	**4.2**	**40.7**	**4.2**	....
8603	8.85	5.77	15.13	7.87	57.50	4.88	38.00
8535	9.61	4.55	16.25	7.51	57.10	4.98	40.00
8490	10.40	4.08	16.25	6.02	58.90	4.35	37.50
8517	9.13	4.79	15.13	8.51	56.79	5.65	37.00
8495	8.90	4.87	15.25	7.94	58.27	4.77	36.00
8525	9.50	4.86	15.94	8.33	55.97	5.40	38.00
8541	9.77	5.39	16.56	7.68	55.21	5.39	36.00
8581	8.90	5.14	15.50	7.96	57.72	4.78	37.00
8486	9.55	4.11	15.94	6.15	60.01	4.24	36.00
8591	9.16	4.94	16.13	7.49	56.98	5.30	37.00
8437	9.70	4.60	14.75	8.25	57.28	5.42	39.00
8438	9.74	5.14	15.75	8.07	56.25	5.05	38.00
8558	9.25	5.74	18.44	7.10	55.25	4.22	38.00
8526	9.63	4.96	14.88	7.90	57.60	5.03	38.00

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
	WHEAT PRODUCTS—*Continued.*	
	Wheat Feed (Mixed Feed)—Continued.	
8496	Farmers Favorite. Valley City Mill. Co., Grand Rapids, Mich.	*Newtown:* Newtown Coal & Grain Co.
8619	Waggoner-Gates Mill. Co., Independence, Mo.	*Willimantic:* Willimantic Grain Co.
		Average guaranty
		Average of these 16 analyses
		Average digestible
	Wheat Middlings.	
8488	Winona. Bay State Milling Co., Winona, Minn.	*Danbury:* F. C. Benjamin
8433	Best of All. Great Northern Flour Mills Co., St. Cloud, Minn.	*Branford:* S. V. Osborn
8546	Flour. Madelia Roller Mills, Madelia, Minn.	*Rockville:* Edward White
8543	Choice. Niagara Falls Mill. Co., Niagara Falls, N. Y.	*Rockville:* Edward White
8513	Standard. Northwestern Cons. Mill. Co., Minneapolis, Minn.	*Bristol:* Eaton Bros.
8600	B. Pillsbury Co., Minneapolis, Minn.	*Colchester:* M. Klingon
8515	Thompson Milling Co., Lockport, N. Y.	*Bristol:* Goodsell Bros.
8609	Geo. Urban Milling Co., Buffalo, N. Y.	*Danielson:* Young Bros. Co.
8508	Standard. Washburn-Crosby Co., Minneapolis, Minn.	*Southington:* Southington Lumber & Feed Co.
8584	Western Canada Flour Mills Co.	*New London:* I. N. Bragaw
		Average guaranty
		Average of these 10 analyses
		Average digestible
	Red Dog Flour.	
8602	Choice. Rush City Mill. Co., Rush City, Minn.	*Colchester:* M. Klingon
		Guaranty
		Digestible
	RYE PRODUCTS.	
8518	Middlings. Bay State Milling Co., Winona, Minn.	*Torrington:* D. L. Talcott
8428	Feed. Boutwell Mill. & Grain Co., Troy, N. Y.	*East Haven:* F. A. Forbes
8448	Irving Mills Feed. Van Vechten Mill. Co., Rochester, N. Y.	*Wallingford:* E. E. Hall
8575	Choice Middlings. Miner-Hillard Mill. Co., Wilkes Barre, Pa.	*Hartford:* G. M. White & Co.
8616	Choice Middlings. Miner-Hillard Mill. Co., Wilkes Barre, Pa.	*Willimantic:* Willimantic Grain Co.
	BUCKWHEAT PRODUCTS.	
8615	Middlings. C. G. Lawton, Brooklyn	Miller
8607	Middlings. Quinebaug Grist Mill, Danielson	Miller
	MAIZE PRODUCTS.	
	Corn Gluten Meal.	
8593	Diamond. Corn Products Ref. Co., New York	*Westerly, R. I.:* C. W. Campbell Co.
		Guaranty
		Digestible

SAMPLED IN 1916—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	
8496	8.76	5.40	15.63	7.19	58.02	5.00	$40.00
8619	8.33	5.58	16.81	6.79	57.78	4.71	37.00
....	....	....	14.94	....	....	4.37	....
....	9.32	4.99	15.90	7.55	57.29	4.95	37.66
....	....	....	12.2	2.8	43.5	4.3	....
8488	9.48	3.82	16.50	6.34	59.36	4.50	35.50
8433	10.47	4.77	16.81	7.05	55.82	5.08	38.00
8546	10.25	4.13	16.94	5.60	57.94	5.14	37.00
8543	9.25	5.08	16.75	8.02	55.42	5.48	37.00
8513	9.18	4.71	15.63	8.37	55.76	6.35	40.00
8600	9.82	5.08	15.94	9.21	54.30	5.65	37.00
8515	9.14	4.50	13.75	6.72	60.99	4.90	44.00
8609	9.36	4.58	16.25	8.06	56.05	5.70	37.00
8508	10.03	4.58	17.00	6.88	56.50	5.01	36.00
8584	10.20	3.97	17.19	5.97	56.81	5.86	38.00
....	....	....	14.58	....	....	4.20	....
....	9.72	4.52	16.28	7.22	56.90	5.37	37.95
....	....	....	12.5	2.2	44.4	4.7	....
8602	12.18	2.27	14.56	2.09	65.60	3.30	45.00
....	....	....	15.00	....	....	3.50	....
....	....	....	12.8	0.8	57.7	2.8	....
8518	9.10	3.66	17.13	4.17	62.63	3.31	37.00
8428	10.86	3.80	15.13	4.47	62.49	3.25	34.00
8448	10.23	3.75	15.13	4.11	63.39	3.39	34.00
8575	10.44	3.42	15.88	3.58	63.64	3.04	38.00
8616	10.08	3.50	18.44	3.68	61.25	3.05	40.00
8615	11.70	4.23	25.00	3.66	49.39	6.02	40.00
8607	10.96	3.93	20.94	21.74	36.84	5.59	40.00
8593	9.35	0.65	40.06	1.08	47.21	1.65	50.00
....	....	....	40.00	....	....	1.50	....
....	....	....	34.1	5.94	42.5	1.5	....

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
	MAIZE PRODUCTS—*Continued.*	
	Corn Gluten Feed.	
8435	Buffalo. Corn Products Ref. Co., New York ...	*Branford:* S. V. Osborn .....
8505	Buffalo. Corn Products Ref. Co., New York ...	*West Cheshire:* G. W. Thorpe
		Average guaranty .....
		Average of these 2 analyses ..
		Average digestible .....
8596	Clinton. Clinton Sugar Ref. Co., Clinton, Ia. ..	*Yantic:* A. R. Manning .....
		Guaranty .....
		Digestible .....
8430	*Crescent. Corn Products Ref. Co., New York	*Guilford:* Morse & Landon ..
		Guaranty .....
		Digestible .....
8439	Globe. Corn Products Ref. Co., New York	*Ansonia:* Flour & Grain Co...
8497	Globe. Corn Products Ref. Co., New York	*Derby:* Peterson & Hendee ..
		Average guaranty .....
		Average of these 2 analyses ..
		Average digestible .....
8571	K. K. K. J. C. Hubinger Bros. Co., Keokuk, Ia.	*New Haven:* Crittenden-Benham Co. .....
		Guaranty .....
		Digestible .....
8582	Union. Union Starch & Ref. Co., Edinburg, Ind	*New London:* I. N. Bragaw..
		Guaranty .....
		Digestible .....
	Hominy Feed.	
8621	Homco. American Hominy Co., Indianapolis Ind.	*So. Coventry:* E. W. Latimer
		Guaranty .....
8599	Cooked. Baltimore Pearl Hominy Co., Baltimore, Md.	*Colchester:* M. Klingon .....
		Guaranty .....
8549	Spring Garden. Baltimore Pearl Hominy Co. Baltimore, Md.	*Thompsonville:* Geo. S. Phelps & Co. .....
8446	Spring Garden. Baltimore Pearl Hominy Co. Baltimore, Md.	*No. Haven:* Coöperative Feed Co. .....
		Guaranty .....
8434	Bufceco. Buffalo Cereal Co., Buffalo, N. Y. ...	*Branford:* S. V. Osborn .....
8485	Bufceco. Buffalo Cereal Co., Buffalo, N. Y. ...	*Danbury:* H. E. Meeker .....
		Guaranty .....
8553	Paragon. Chas. M. Cox Co., Boston, Mass.	*Thompsonville:* Geo. S. Phelps & Co. .....
		Guaranty .....
8545	Emco. Evans Milling Co., Indianapolis, Ind. ...	*Rockville:* Edward White ...
		Guaranty .....
8557	*R. J. Hardy, Boston, Mass.	*Middlefield:* Grain & Coal Co.
8512	Badger. Chas. A. Krause Mill. Co., Milwaukee, Wis.	*Bristol:* Eaton Bros. .....
		Guaranty .....
8503	Steam Cooked. Miner-Hillard Mill. Co., Wilkes Barre, Pa.	*West Cheshire:* G. W. Thorpe
8588	Steam Cooked. Miner-Hillard Mill. Co., Wilkes Barre. Pa.	*Mystic:* Mystic Grain Co. ....

* Statement of dealer.

SAMPLED IN 1916—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	
8435	8.30	3.79	25.31	7.29	52.71	2.60	$40.00
8505	8.28	3.80	27.19	7.97	50.81	1.95	43.00
....	....	....	23.00	....	....	1.00	....
....	8.29	3.80	26.25	7.63	51.76	2.27	41.50
....	....	....	22.3	5.8	45.5	1.9	....
8596	8.15	1.88	26.31	7.11	52.50	4.05	43.00
....	....	....	23.00	....	....	3.00	....
....	....	....	22.4	5.4	46.2	3.4	....
8430	9.16	4.90	26.38	7.43	47.63	4.50	38.00
....	....	....	23.00	....	....	1.00	....
....	....	....	22.4	5.6	41.9	3.8	....
8439	7.13	3.53	27.38	6.89	53.69	1.38	42.00
8497	9.80	3.37	28.94	6.84	49.50	1.55	42.00
....	....	....	23.00	....	....	1.00	....
....	8.46	3.45	28.16	6.87	51.59	1.47	42.00
....	....	....	23.9	5.2	45.4	1.3	....
8571	9.81	1.28	22.44	6.30	57.07	3.10	43.00
....	....	....	23.00	....	....	2.40	....
....	....	....	19.1	4.8	50.2	2.6	....
8582	10.07	2.16	24.38	6.14	53.90	3.35	42.00
....	....	....	23.00	....	....	3.00	....
....	....	....	20.7	4.7	47.4	2.9	....
8621	8.10	2.35	10.94	4.84	66.77	7.00	46.00
....	....	....	10.00	....	....	6.00	....
8599	9.28	7.11	16.81	3.84	55.36	7.60	44.00
....	....	....	14.00	....	....	7.00	....
8549	10.14	2.85	11.25	5.08	64.42	6.26	46.00
8446	9.12	3.16	11.69	4.80	64.79	6.44	44.00
....	....	....	10.00	....	....	6.00	....
8434	11.16	2.70	11.25	4.79	64.27	5.83	42.00
8485	9.10	2.65	11.25	4.69	66.73	5.58	46.00
....	....	....	10.00	....	....	6.00	....
8553	8.35	2.72	11.38	5.24	64.28	8.03	46.00
....	....	....	9.50	....	....	7.50	....
8545	8.35	2.66	11.56	5.23	64.20	8.00	44.00
....	....	....	10.00	....	....	7.50	....
8557	8.25	2.67	11.25	5.40	66.16	6.27	46.00
8512	8.33	3.45	12.00	3.94	65.55	6.73	46.00
....	....	....	10.00	....	....	6.00	....
8503	9.09	2.42	10.75	4.53	67.73	5.48	46.00
8588	10.13	2.55	10.63	3.98	67.12	5.59	46.00

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
	MAIZE PRODUCTS—*Continued.*	
	Hominy Feed—Continued.	
8606	Steam Cooked. Miner-Hillard Mill. Co., Wilkes Barre, Pa.	*Moosup:* T. E. Main & Sons
		Average guaranty
8578	Mystic Milling Co., Sioux City, Ia.	*Hartford:* Loydon, Northam & Loydon
		Guaranty
8531	Plymouth. Plymouth Milling Co., Lemars, Ia.	*Winsted:* E. Manchester & Sons
		Guaranty
8431	Blue Ribbon. J. E. Soper Co., Boston, Mass.	*Guilford:* Morse & Landon
		Guaranty
8476	Acme. Suffern-Hunt Mills, Decatur, Ill.	*Stamford:* W. L. Crabb
		Guaranty
		Average guaranty of all
		Average of these 17 analyses
		Average digestible
	BREWERY AND DISTILLERY PRODUCTS.	
	Dried Brewers' Grains.	
8479	M. F. Baringer, Philadelphia, Pa.	*Stamford:* W. L. Crabb
		Guaranty
8462	Bull. Farmers Feed Co., New York	*Plantsville:* C. A. Cowles
		Guaranty
8444	Crown. Milwaukee Grain & Feed Co., Milwaukee, Wis.	*No. Haven:* Coöperative Feed Co.
		Guaranty
		Average of these 3 analyses
		Average digestible
	Malt Sprouts.	
8628	Standard. American Malting Co., Buffalo, N. Y.	*New Haven:* R. G. Davis & Sons
		Guaranty
		Digestible
	Dried Distillers' Grains.	
8450	Ajax Flakes. Ajax Mill. & Feed Co., New York	*Wallingford:* E. E. Hall
		Guaranty
		Digestible
8528	Continental Gluten Feed. Continental Cereal Co., Peoria, Ill.	*Winsted:* Leonard Grain Co.
		Guaranty
		Digestible
8542	Eagle 3 D. The Dewey Bros. Co., Blanchester, O.	*Rockville:* Edward White
		Guaranty
		Digestible
8481	Dried Grains. The Fleischman Co., Peekskill, N. Y.	*So. Norwalk:* S. Roodner
		Guaranty
		Digestible
8604	Rye. Dwight E. Hamlin, Pittsburgh, Pa.	*Norwich:* Chas. Slosberg
		Guaranty
		Digestible
8521	Brownie. Larrowe Milling Co., Detroit, Mich.	*Torrington:* F. U. Wadhams
		Guaranty
		Digestible

SAMPLED IN 1916—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	
8606	9.50	2.36	11.06	4.31	67.59	5.18	$43.00
....	....	....	10.00	....	....	4.33	....
8578	9.91	2.52	11.38	4.03	64.48	7.68	48.00
....	....	....	11.00	....	....	6.50	....
8531	8.88	2.20	9.88	5.09	67.55	6.40	44.00
....	....	....	10.00	....	....	8.50	....
8431	9.21	2.22	10.63	4.89	66.52	6.53	43.00
....	....	....	10.00	....	....	6.00	....
8476	8.68	2.62	10.63	4.63	65.42	8.02	45.00
....	....	....	10.00	....	....	7.00	....
....	....	....	10.28	....	....	6.19	....
....	9.15	2.89	11.43	4.67	65.23	6.62	45.00
....	....	....	7.5	3.5	58.8	6.0	....
8479	6.72	3.18	27.38	12.19	43.74	6.79	31.00
....	....	....	25.00	....	....	6.00	....
8462	6.40	3.19	28.31	12.90	42.00	7.20	30.00
....	....	....	27.00	....	....	6.00	....
8444	7.95	3.18	26.38	14.26	41.11	7.12	32.00
....	....	....	26.00	....	....	6.00	....
....	7.02	3.18	27.36	13.12	42.28	7.04	31.00
....	....	....	22.2	6.4	24.1	6.3	....
8628	9.38	5.22	26.25	11.64	46.21	1.30	37.00
....	....	....	23.80	....	....	2.16	....
....	....	....	20.2	1.0	37.0	1.1	....
8450	5.53	2.81	29.38	11.29	39.69	11.30	41.00
....	....	....	30.00	....	....	10.00	....
....	....	....	21.4	10.7	32.1	10.7	....
8528	6.41	3.10	28.88	10.19	41.54	9.88	42.00
....	....	....	29.00	....	....	10.00	....
....	....	....	21.1	9.7	33.6	9.4	....
8542	6.49	1.53	32.38	11.75	34.59	13.26	37.00
....	....	....	30.00	....	....	10.00	....
....	....	....	23.6	11.2	28.0	12.6	....
8481	6.15	2.26	21.31	15.45	47.14	7.69	35.00
....	....	....	20.00	....	....	7.00	....
....	....	....	15.6	14.7	38.2	7.3	....
8604	7.93	2.14	13.25	15.28	55.42	5.98	30.00
....	....	....	14.00	....	....	6.00	....
....	....	....	9.7	14.5	44.9	5.7	....
8521	7.30	4.38	28.38	7.23	40.24	12.47	43.00
....	....	....	26.00	....	....	7.00	....
....	....	....	20.7	6.9	32.6	11.9	....

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
	BREWERY AND DISTILLERY PRODUCTS—*Continued.*	
	Dried Distillers' Grains—Continued.	
8472	Fourex. Ubiko Milling Co., Cincinnati, O.	*Norwalk:* Holmes, Keeler & Kent Co. .....
		Guaranty .....
		Digestible .....
	MISCELLANEOUS FEEDS.	
	Dried Beet Pulp.	
8522	*Michigan Sugar Co., Alma, Mich.	*Torrington:* F. U. Wadhams
8567	*Michigan Sugar Co., Caro, Mich.	*New Britain:* C. W. Lines Co.
8625	Charles Pope, Chicago, Ill.	*New Haven:* R. G. Davis & Sons .....
8530	*West Bay City Sugar Co., Bay City, Mich.	*Winsted:* E. Manchester & Sons .....
		Guaranty .....
		Average of these 4 analyses ..
		Average digestible .....
	PROPRIETARY MIXED FEEDS.	
	Wheat Bran and Corn Cob Feed.	
8563	Sterling Feed. Indiana Mill. Co., Terre Haute, Ind.	*Middletown:* Meech & Stoddard .....
		Guaranty .....
		Digestible .....
	Corn and Oats.	
8586	Nobotheration Provender. C. W. Campbell Co., Westerly, R. I.	*Mystic:* J. L. Manning & Co.
		Guaranty .....
8565	Korn-Oato Feed. Meech & Stoddard, Middletown	Manufacturer .....
		Guaranty .....
	Horse, Dairy and Stock Feeds.	
8463	Portage Stock Feed. Akron Feed & Mill. Co., Akron, O.	*Plantsville:* C. A. Cowles ....
		Guaranty .....
8456	Arcady Dairy Feed. Arcady Farms Mill. Co., Rondout, Ill.	*Meriden:* A. Grulich .....
		Guaranty .....
8589	Pennant Stock Feed. E. W. Bailey & Co., Swanton, Vt.	*Mystic:* Mystic Grain Co. ...
		Guaranty .....
8560	Blatchford's Calf Meal. Blatchford's Calf Meal Factory, Waukegan, Ill.	*Middletown:* Meech & Stoddard .....
		Guaranty .....
8564	Blatchford's Pig Meal. Blatchford's Calf Meal Factory, Waukegan, Ill.	*Middletown:* Meech & Stoddard .....
		Guaranty .....
8441	Bufceco Chop Feed. Buffalo Cereal Co., Buffalo, N. Y.	*Shelton:* Ansonia Flour & Grain Co. .....
		Guaranty .....
8501	Bufceco Creamery Feed. Buffalo Cereal Co., Buffalo, N. Y.	*Thomaston:* L. E. Blackmer..
		Guaranty .....
8468	Bufceco Horse Feed. Buffalo Cereal Co., Buffalo, N. Y.	*Norwalk:* Brower & Malone..
		Guaranty .....
8502	Iroquois Dairy Feed. Buffalo Cereal Co., Buffalo, N. Y.	*Thomaston:* L. E. Blackmer..
		Guaranty .....

* Sold by The Larrowe Milling Co., Detroit, Mich.

SAMPLED IN 1916—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	
8472	7.01	1.99	30.25	10.44	38.54	11.77	$35.00
....	....	....	**31.00**	....	....	**12.00**	....
....	....	....	**22.1**	**9.9**	**31.2**	**11.2**	....
8522	6.97	3.52	9.00	18.95	60.88	0.68	35.00
8567	5.80	3.10	9.94	19.14	61.45	0.57	34.00
8625	6.17	5.66	9.50	20.71	57.17	0.79	37.00
8530	5.93	3.97	9.38	19.32	61.00	0.40	33.00
....	....	....	**8.00**	....	....	**0.50**	....
....	**6.22**	**4.06**	**9.46**	**19.53**	**60.12**	**0.61**	**34.75**
....	....	....	**4.9**	**16.2**	**49.9**	....	....
8563	7.55	3.78	9.25	16.45	59.86	3.11	35.00
....	....	....	**10.00**	....	....	**3.00**	....
....	....	....	**5.8**	**4.6**	**42.5**	**2.9**	....
8586	10.38	2.06	10.00	4.07	69.49	4.00	49.00
....	....	....	**8.00**	....	....	**3.00**	....
8565	7.93	5.44	7.44	12.55	64.58	2.06	38.00
....	....	....	**7.00**	....	....	**3.00**	....
8463	7.44	5.51	8.44	12.16	61.45	5.00	37.00
....	....	....	**10.00**	....	....	**4.00**	....
8456	11.44	9.20	15.50	13.65	46.76	3.45	37.00
....	....	....	**16.00**	....	....	**3.50**	....
8589	8.29	2.98	9.38	9.32	64.63	5.40	42.00
....	....	....	**10.00**	....	....	**6.50**	....
8560	9.85	5.79	25.00	7.17	45.33	6.86	70.00
....	....	....	**24.00**	....	....	**5.00**	....
8564	9.13	4.95	18.56	6.77	56.10	4.49	65.00
....	....	....	**18.00**	....	....	**5.00**	....
8441	8.35	3.64	8.75	11.78	62.48	5.00	38.00
....	....	....	**8.00**	....	....	**4.00**	....
8501	7.90	5.24	19.69	11.87	50.63	4.67	43.00
....	....	....	**18.00**	....	....	**4.00**	....
8468	8.84	3.46	11.06	9.11	63.88	3.65	40.00
....	....	....	**11.00**	....	....	**4.00**	....
8502	9.56	8.67	18.44	11.29	48.96	3.08	38.00
....	....	....	**17.00**	....	....	**4.00**	....

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
	PROPRIETARY MIXED FEEDS—*Continued.*	
	Horse, Dairy and Stock Feeds—Continued.	
8594	Nobotheration Dairy Feed. C. W. Campbell Co., Westerly, R. I.	Manufacturer Guaranty
8489	Unicorn Dairy Ration. Chapin & Co., Hammond, Ind.	*Danbury:* F. C. Benjamin Guaranty
8547	Clover Leaf Dairy Feed. Clover Leaf Mill. Co., Buffalo, N. Y.	*Somers:* W. C. Pease Guaranty
8620	Corno Stock Feed. Corno Mills Co., St. Louis, Mo.	*Willimantic:* Willimantic Grain Co. Guaranty
8618	Corno Sweet Feed. Corno Mills Co., St. Louis, Mo.	*Willimantic:* Willimantic Grain Co. Guaranty
8551	Wirthmore Stock Feed. Chas. M. Cox Co., Boston, Mass.	*Thompsonville:* Geo. S. Phelps & Co. Guaranty
8426	Crosby's Quality Feed Ready Ration. E. Crosby & Co., Brattleboro, Vt.	*East Haven:* F. A. Forbes Guaranty
8580	Hobby Horse Feed. Albert Dickinson Co., Chicago, Ill.	*Hartford:* Loydon, Northam & Loydon Guaranty
8579	White Cross Stock Feed. Albert Dickinson Co., Chicago, Ill.	*Hartford:* Loydon, Northam & Loydon Guaranty
8493	Anchor Dairy Feed. Globe Elevator Co., Buffalo, N. Y.	*New Milford:* Geo. T. Soule Guaranty
8494	Anchor Horse Feed. Globe Elevator Co., Buffalo, N. Y.	*New Milford:* Geo. T. Soule Guaranty
8492	No. 1 Chop Feed. Globe Elevator Co., Buffalo, N. Y.	*New Milford:* Geo. T. Soule Guaranty
8470	Grandin's Stock Feed. D. H. Grandin Milling Co., Jamestown, N. Y.	*Norwalk:* Holmes, Keeler & Kent Co. Guaranty
8506	Horse, Mule & Dairy Feed. Dwight Hamlin & Co., Pittsburgh, Pa.	*West Cheshire:* G. W. Thorpe Guaranty
8601	Haskell's Stock Feed. W. H. Haskell, Toledo, O.	*Colchester:* M. Klingon Guaranty
8566	Algrane Horse Feed. H. O. Co., Buffalo, N. Y.	*New Britain:* C. W. Lines Co. Guaranty
8590	New England Stock Feed. H. O. Co., Buffalo, N. Y.	*Westerly, R. I.:* C. W. Campbell Co. Guaranty
8480	Bonnie Horse Feed. Holmes, Keeler & Kent Co., So. Norwalk	Manufacturer Guaranty
8523	Badger Horse Feed. C. A. Krause Mill. Co., Milwaukee, Wis.	*Torrington:* F. U. Wadhams Guaranty
8455	Badger Stock Feed. C. A. Krause Mill. Co., Milwaukee, Wis.	*Meriden:* A. Grulich
8520	Badger Stock Feed. C. A. Krause Mill. Co., Milwaukee, Wis.	*Torrington:* F. U. Wadhams Guaranty

SAMPLED IN 1916—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	
8594	8.59	3.72	22.94	8.23	50.54	5.98	$44.00
....	....	....	**22.00**	....	....	**5.50**	....
8489	7.28	5.55	27.31	10.76	41.91	7.19	41.50
....	....	....	**26.00**	....	....	**5.00**	....
8547	9.65	8.15	16.50	12.86	48.56	4.28	30.00
....	....	....	**13.50**	....	....	**4.00**	....
8620	7.18	3.75	10.81	12.82	59.50	5.94	40.00
....	....	....	**9.90**	....	....	**3.50**	....
8618	8.65	4.92	13.81	15.37	55.50	1.75	40.00
....	....	....	**10.00**	....	....	**2.50**	....
8551	7.73	3.48	10.50	9.56	62.05	6.68	42.00
....	....	....	**9.00**	....	....	**4.00**	....
8426	7.55	3.99	25.75	10.52	44.37	7.82	42.00
....	....	....	**25.00**	....	....	**7.00**	....
8580	8.75	7.34	12.75	15.80	54.19	1.17	44.00
....	....	....	**9.00**	....	....	**1.50**	....
8579	9.19	2.40	10.25	5.06	68.03	5.07	42.00
....	....	....	**10.00**	....	....	**3.50**	....
8493	9.05	6.69	11.56	10.37	60.65	1.68	35.00
....	....	....	**16.00**	....	....	**3.50**	....
8494	9.72	3.24	9.25	7.01	66.78	4.00	48.00
....	....	....	**9.00**	....	....	**3.00**	....
8492	7.24	4.36	10.75	9.81	61.51	6.33	40.00
....	....	....	**7.00**	....	....	**3.00**	....
8470	8.38	3.63	9.63	8.65	63.36	6.35	40.00
....	....	....	**8.50**	....	....	**4.00**	....
8506	8.52	5.71	14.44	12.33	55.83	3.17	41.00
....	....	....	**14.00**	....	....	**3.50**	....
8601	8.66	3.21	9.69	7.30	64.29	6.85	40.00
....	....	....	**9.00**	....	....	**6.00**	....
8566	8.12	5.76	11.38	11.46	59.28	4.00	29.00
....	....	....	**11.00**	....	....	**4.00**	....
8590	7.59	4.96	10.31	10.46	61.95	4.73	41.00
....	....	....	**9.00**	....	....	**4.00**	....
8480	8.59	3.44	11.56	10.49	62.38	3.54	40.00
....	....	....	**13.00**	....	....	**4.00**	....
8523	10.08	7.07	11.44	12.87	56.15	2.39	42.00
....	....	....	**10.00**	....	....	**2.00**	....
8455	8.44	4.53	8.69	13.67	60.22	4.45	40.00
8520	9.21	4.24	9.38	12.48	59.72	4.97	40.00
....	....	....	**10.00**	....	....	**4.25**	....

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
	PROPRIETARY MIXED FEEDS—*Continued.*	
	Horse, Dairy and Stock Feeds—Continued.	
8457	Blue Top Horse Feed. C. A. Krause Mill. Co., Milwaukee, Wis.	*Meriden:* A. Grulich Guaranty
8595	Cream City Horse Feed. C. A. Krause Mill. Co., Milwaukee, Wis.	*Yantic:* A. R. Manning Guaranty
8460	Larro Feed. Larrowe Milling Co., Detroit, Mich.	*Meriden:* Grain & Feed Co. Guaranty
8429	Palmo Meal. The Meader Atlas Co., New York	*East Haven:* F. A. Forbes Guaranty
8559	M. & S. Stock Feed. Meech & Stoddard, Middletown	Manufacturer Guaranty
8538	Cream-O-Lene Dairy Ration. Nowak Mfg. Corp., Buffalo, N. Y.	*Norfolk:* A. P. Curtis Guaranty
8540	Domino Horse Feed. Nowak Mfg. Corp., Buffalo, N. Y.	*Norfolk:* A. P. Curtis Guaranty
8539	Domino Justice Creamery Feed. Nowak Mfg. Corp., Buffalo, N. Y.	*Norfolk:* A. P. Curtis Guaranty
8537	Fidelity Stock Feed. Nowak Mfg. Corp., Buffalo, N. Y.	*Norfolk:* A. P. Curtis Guaranty
8442	Peerless Horse Feed. Omaha Alfalfa Mill. Co., Omaha, Neb.	*Bridgeport:* Berkshire Mills Guaranty
8451	Stevens 44 Dairy Ration. Oswego Milling Co., Oswego, N. Y.	*Wallingford:* Gallagher Bros.
8622	Stevens 44 Dairy Ration. Oswego Milling Co., Oswego, N. Y. Park & Pollard Co., Boston	*Granby:* E. H. Rollins Guaranty
8499	Calf Meal. Park & Pollard Co., Boston, Mass.	*Waterbury:* Spencer Grain Co. Guaranty
8498	Horse Feed. Park & Pollard Co., Boston, Mass.	*Waterbury:* H. S. Coe & Co. Guaranty
8561	Stock Feed. Park & Pollard Co., Boston, Mass.	*Bridgeport:* Standard Feed Co. Guaranty
8487	Peters King Corn. Peters Mill. Co., Omaha, Neb.	*Danbury:* H. E. Meeker Guaranty
8453	Iowa Stock Feed. Purity Oats Co., Davenport, Ia.	*Wallingford:* Gallagher Bros. Guaranty
8452	Tom Boy Horse Feed. Purity Oats Co., Davenport, Ia.	*Wallingford:* Gallagher Bros. Guaranty
8569	Boss Feed. Quaker Oats Co., Chicago, Ill.	*New Haven:* Crittenden-Benham Co. Guaranty
8477	Green Cross Horse Feed. Quaker Oats Co., Chicago, Ill.	*Stamford:* W. L. Crabb Guaranty
8467	Mogol Molasses Feed. Quaker Oats Co., Chicago, Ill.	Guaranty
8454	Schumacher's Calf Meal. Quaker Oats Co., Chicago, Ill.	*Wallingford:* Gallagher Bros. Guaranty
8475	Schumacher's Feed. Quaker Oats Co., Chicago, Ill.	*New Canaan:* C. H. Fairty Co. Guaranty
8623	Schumacher's Special Horse Feed. Quaker Oats Co., Chicago, Ill.	*Granby:* E. H. Rollins Guaranty

SAMPLED IN 1916—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	
8457	11.37	7.62	11.38	14.48	53.51	1.64	$38.00
....	....	....	10.00	....	....	1.00	....
8595	9.23	7.25	11.00	14.81	55.87	1.84	40.00
....	....	....	10.00	....	....	1.50	....
8460	8.23	5.11	19.81	11.76	50.94	4.15	42.00
....	....	....	20.00	....	....	3.00	....
8429	7.68	10.07	6.63	49.65	17.59	8.38	23.00
....	....	....	7.00	....	....	7.00	....
8559	8.27	4.78	9.06	10.33	63.30	4.26	40.00
....	....	....	9.00	....	....	3.00	....
8538	9.09	7.02	21.81	11.13	45.60	5.35	38.00
....	....	....	20.00	....	....	4.00	....
8540	8.66	7.48	10.00	17.65	53.46	2.75	41.00
....	....	....	9.00	....	....	2.00	....
8539	7.67	7.43	22.63	11.54	45.00	5.73	39.00
....	....	....	22.00	....	....	4.00	....
8537	6.99	6.08	7.50	14.42	61.08	3.93	38.00
....	....	....	8.00	....	....	3.00	....
8442	10.83	7.12	11.44	13.75	55.78	1.08	37.00
....	....	....	10.00	....	....	2.00	....
8451	8.38	4.78	24.69	11.13	44.37	6.65	36.00
8622	6.57	4.15	24.44	11.54	46.88	6.42	43.00
....	....	....	24.00	....	....	5.00	....
8499	10.25	5.58	25.00	6.52	48.62	4.03	70.00
....	....	....	25.00	....	....	5.00	....
8498	10.00	7.18	11.25	12.48	57.88	1.21	42.00
....	....	....	9.00	....	....	1.50	....
8561	8.84	4.02	10.50	10.02	60.62	6.00	44.00
....	....	....	9.00	....	....	1.50	....
8487	8.81	8.04	11.88	19.26	50.78	1.23	45.00
....	....	....	9.00	....	....	1.50	....
8453	9.44	4.44	9.63	10.70	61.33	4.46	38.00
....	....	....	10.00	....	....	4.00	....
8452	9.63	6.72	10.88	16.04	55.99	0.74	38.00
....	....	....	9.00	....	....	2.00	....
8569	8.34	3.84	9.00	10.64	64.53	3.65	40.00
....	....	....	8.00	....	....	3.00	....
8477	8.78	5.41	9.25	13.93	60.33	2.30	36.00
....	....	....	10.00	....	....	2.50	....
8467	8.75	5.87	8.75	15.73	58.56	2.34	44.00
....	....	....	10.00	....	....	2.50	....
8454	9.06	4.45	18.44	2.86	56.37	8.82	60.00
....	....	....	19.00	....	....	8.00	....
8475	7.89	3.87	11.56	9.75	63.20	3.73	40.00
....	....	....	10.00	....	....	3.25	....
8623	9.08	2.40	9.75	6.68	68.31	3.78	43.00
....	....	....	9.25	....	....	3.25	....

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
	PROPRIETARY MIXED FEEDS—*Continued.*	
	Horse, Dairy and Stock Feeds—Continued.	
8570	Victor Feed. Quaker Oats Co., Chicago, Ill.	*New Haven:* Crittenden-Benham Co. .....
		Guaranty .....
8483	Purina Feed with Molasses. Ralston Purina Co., St. Louis, Mo.	*So. Norwalk:* S. Roodner ...
8572	Purina Feed with Molasses. Ralston Purina Co., St. Louis, Mo.	*New Haven:* Crittenden-Benham Co. .....
		Guaranty .....
8592	Ryde's Cream Calf Meal. Ryde & Co., Chicago, Ill.	*Westerly, R. I.:* C. W. Campbell Co. .....
		Guaranty .....
8585	Yellow Tag Stock Food. P. Schwartz Co., New London	Manufacturer .....
		Guaranty .....
8605	Colonel's Ration. Tioga Mill & Elev. Co., Waverly, N. Y.	*Jewett City:* Jewett City Grain Co. .....
		Guaranty .....
8471	Ti-O-Ga Dairy Feed, Red Brand. Tioga Mill & Elev. Co., Waverly, N. Y.	*Norwalk:* Holmes, Keeler & Kent Co. .....
8614	Ti-O-Ga Dairy Feed, Red Brand. Tioga Mill & Elev. Co., Waverly, N. Y.	*Putnam:* F. M. Cole .....
		Guaranty .....
8464	Biles Ready Ration (Union Grains). The Ubiko Mill Co., Cincinnati, O.	*Plantsville:* C. A. Cowles ....
		Guaranty .....
8533	Xtra-Vim Feed. Xtravim Molasses Feed Co., Boston, Mass.	*Winsted:* E. Manchester & Sons .....
		Guaranty .....
	POULTRY FEEDS.	
8440	Bufceco Poultry Mash. Buffalo Cereal Co., Buffalo, N. Y.	*Shelton:* Ansonia Flour & Grain Co. .....
		Guaranty .....
8500	Iroquois Poultry Mash. Buffalo Cereal Co., Buffalo, N. Y.	*Thomaston:* L. E. Blackmer..
		Guaranty .....
8608	Wirthmore Growing Feed. Chas. M. Cox Co., Boston, Mass.	*Danielson:* Quinebaug Mills..
		Guaranty .....
8461	Wirthmore Poultry Mash. Chas. M. Cox Co., Boston, Mass.	*Meriden:* Grain & Feed Co...
		Guaranty .....
8627	Globe Egg Mash. Albert Dickinson Co., Chicago, Ill.	*New Haven:* R. G. Davis & Sons .....
		Guaranty .....
8576	Queen Poultry Mash. Albert Dickinson Co., Chicago, Ill.	*Hartford:* Loydon, Northam & Loydon .....
		Guaranty .....
8491	Blue Ribbon Laying Mash. Globe Elevator Co., Buffalo, N. Y.	*Brookfield:* C. R. Dubia .....
		Guaranty .....
8484	H. O. Dry Poultry Mash. The H. O. Co., Buffalo, N. Y.	*Ridgefield:* S. D. Keeler ....
		Guaranty .....
8473	Bonnie Dry Mash. Holmes, Keeler & Kent Co., Norwalk	Manufacturer .....
		Guaranty .....
8509	H. O. Poultry Feed. The H. O. Co., Buffalo, N. Y.	*Plainville:* Eaton Bros. .....
		Guaranty .....

SAMPLED IN 1916—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	
8570	8.20	3.95	9.06	11.12	64.24	3.43	$40.00
....	....	....	**8.00**	....	....	**3.00**	....
8483	10.48	6.37	9.69	12.12	59.10	2.24	40.00
8572	10.49	6.21	9.25	10.86	60.99	2.20	45.00
....	....	....	**9.30**	....	....	**1.70**	....
8592	10.13	5.20	25.69	5.27	49.07	4.64	70.00
....	....	....	**25.00**	....	....	**5.00**	....
8585	6.80	5.70	9.00	12.04	61.35	5.11	40.00
....	....	....	**9.00**	....	....	**4.00**	....
8605	9.38	5.99	14.13	12.31	55.05	3.14	36.00
....	....	....	**12.00**	....	....	**2.50**	....
8471	6.98	4.56	27.00	10.81	43.30	7.35	42.00
8614	7.79	4.45	24.75	10.73	45.15	7.13	42.00
....	....	....	**23.00**	....	....	**3.25**	....
8464	8.06	5.28	25.25	9.32	45.76	6.33	38.00
....	....	....	**24.00**	....	....	**7.00**	....
8533	23.67	5.16	4.38	5.66	60.68	0.45	40.00
....	....	....	**4.50**	....	....	**0.60**	....
8440	9.14	3.80	16.19	6.20	59.77	4.90	51.00
....	....	....	**15.00**	....	....	**4.00**	....
8500	9.25	3.99	15.25	8.76	59.15	3.60	55.00
....	....	....	**14.00**	....	....	**4.00**	....
8608	10.83	4.86	14.00	4.31	62.38	3.62	51.00
....	....	....	**15.00**	....	....	**4.50**	....
8461	9.59	6.47	19.50	7.50	54.08	2.86	50.00
....	....	....	**17.00**	....	....	**4.00**	....
8627	8.90	5.45	16.75	7.01	57.29	4.60	51.00
....	....	....	**15.00**	....	....	**3.00**	....
8576	9.43	6.58	12.44	6.00	62.11	3.44	54.00
....	....	....	**11.00**	....	....	**2.50**	....
8491	9.35	7.10	18.88	7.65	53.22	3.80	46.00
....	....	....	**20.00**	....	....	**3.00**	....
8484	8.51	4.99	18.75	11.13	53.08	3.54	46.00
....	....	....	**18.00**	....	....	**3.50**	....
8473	9.29	8.80	18.75	9.13	49.99	4.04	48.00
....	....	....	**16.00**	....	....	**4.00**	....
8509	8.73	4.06	16.69	6.44	59.55	4.53	44.00
....	....	....	**17.00**	....	....	**4.50**	....

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
	POULTRY FEEDS—*Continued.*	
8562	M. & S. Dry Mash Feed. Meech & Stoddard, Middletown	Manufacturer Guaranty
8459	Mystic Laying Mash. Mystic Mill. & Feed Co., Rochester, N. Y.	*Meriden:* Grain & Feed Co. Guaranty
8516	Domino Laying Mash. Nowak Milling Corp., Buffalo, N. Y.	*Torrington:* D. L. Talcott Guaranty
8587	Growing Feed. Park & Pollard Co., Boston, Mass.	*Mystic:* J. L. Manning & Co. Guaranty
8514	Lay or Bust Dry Mash. Park & Pollard Co., Boston, Mass.	*Bristol:* Goodsell Bros. Guaranty
8573	Platco Laying Mash. Frank S. Platt Co., New Haven	Manufacturer Guaranty
8611	Schumacher's Poultry Mash. Quaker Oats Co., Chicago, Ill.	*Putnam:* F. M. Cole Guaranty
8482	Purina Chicken Chowder Feed. Ralston Purina Co., St. Louis, Mo.	*So. Norwalk:* S. Roodner Guaranty
8469	Ti-O-Ga Dry Mash. Tioga Mill & Elev. Co., Waverly, N. Y.	*Norwalk:* Holmes, Keeler & Kent Co. Guaranty
8466	V-B XXXX Mash. Vincent Bros. Co., Bridgeport	*Bridgeport:* Vincent Bros. Co. Guaranty

SAMPLED IN 1916—*Concluded.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	
8562	9.18	6.62	16.31	7.03	57.14	3.72	$50.00
....	....	....	**12.00**	....	....	**3.00**	....
8459	9.37	5.40	24.38	6.62	49.96	4.27	50.00
....	....	....	**23.00**	....	....	**4.00**	....
8516	8.15	13.16	20.50	7.74	45.02	5.43	50.00
....	....	....	**20.00**	....	....	**3.00**	....
8587	9.33	8.92	16.50	6.07	54.98	4.20	52.00
....	....	....	**10.00**	....	....	**1.50**	....
8514	8.15	9.77	18.00	10.64	49.51	3.93	51.00
....	....	....	**18.00**	....	....	**1.50**	....
8573	8.38	17.60	19.51	5.39	43.69	5.43	50.00
....	....	....	**20.30**	....	....	**5.54**	....
8611	9.05	4.86	21.38	7.71	51.92	5.08	48.00
....	....	....	**17.50**	....	....	**4.00**	....
8482	9.02	7.36	19.50	7.84	52.18	4.10	50.00
....	....	....	**17.00**	....	....	**3.00**	....
8469	8.93	16.37	13.75	5.35	51.60	4.00	50.00
....	....	....	**12.00**	....	....	**2.00**	....
8466	8.93	7.83	20.75	11.04	46.87	4.58	50.00
....	....	....	**21.50**	....	....	**4.90**	....

Digestibility of Feeding Stuffs by Ruminants.

Table VI shows the digestion coefficients, or percentages of the food elements which are digestible by neat cattle (Feeds and Feeding, by Henry and Morrison, 1915, page 647 *et seq.*).

Some of these figures are the result of only a very few tests, and all of them represent short periods of feeding and must be regarded as showing comparative digestibility of the feeds only very roughly. Like chemical composition, statement of the digestibility of a feed is only a single "pointer" to the feeder; helpful, if it is not over-valued.

Table VI.—Digestion Coefficients.

	Protein.	Fiber.	Carbohydrates.	Fat.
Cotton Seed Meal	84	37	75	95
Linseed Meal (old process)	89	57	78	89
Wheat Bran	76	43	74	62
Wheat Feed	77	36	76	87
Wheat Middlings	77	30	78	88
Red Dog Flour	88	36	88	86
Corn Gluten Meal	85	55	90	93
Corn Gluten Feed	85	76	88	85
Hominy Feed	66	76	90	91
Dried Brewers' Grains	81	49	57	89
Malt Sprouts	77	87	80	85
Dried Distillers' Grains	73	95	81	95
Dried Beet Pulp	52	83	83	..
Wheat Bran and Corn Cob Feed	63	28	71	92

PART IV.

Twenty-first Report on Food Products and Ninth Report on Drug Products, 1916.

By John Phillips Street.*

Of the 401 samples collected by the station agent, 55 were adulterated, misbranded or below standard, exclusive of the 38 proprietary medicines; one-half of these adulterations were found in the ground peppers. The Dairy and Food Commissioner submitted to the laboratory 886 samples, chiefly butter, milk, coffee, ketchup and drug products. Of these 311 were adulterated, misbranded or below standard, and 42 were legally labeled compounds. Besides the above, 82 samples have been examined for city and health officials and private individuals. In all 1,369 samples were analyzed, of which 392 were adulterated, misbranded or below standard (exclusive of proprietary medicines).

The Station's own examinations of foods and drugs have been somewhat limited because of the work required for the Dairy and Food Commissioner. Because of these interruptions the analyses of nearly 150 foods and drugs, which had been collected by the Station, remain unexamined. The number of samples analyzed is no measure of the amount of work performed; for instance, the 53 samples of drugs taken from the stocks of physicians have required more time for their analysis than would 1,500 samples of milk or 2,400 samples of butter. The inspection of food products to-day requires more than a simple routine

* The analytical work herein reported was done mainly by the writer's assistants, E. M. Bailey, C. B. Morison and C. E. Shepard. Especial credit is due to Messrs. Bailey and Morison for their very excellent work in connection with the difficult analysis of the drugs from physicians' stocks.

examination, and each year we find the analysis of these products more difficult, more exacting, and naturally more time-consuming.

Since 1896 the Station has struggled along on the meager annual appropriation of $2,500 for food and drug analysis (a sum probably smaller than is appropriated in any other state where any real attempt is made to inspect these products). An increased force of chemists and increased revenue are absolutely essential if the Station is to continue in a satisfactory manner the important work it has done in this connection for the past twenty-one years.

I. FOOD PRODUCTS.

HYGIENIC COFFEE.

Last year four brands of so-called hygienic coffees were examined, and this year five additional brands were analyzed. All of these analyses, together with that of a sample of commercial Java coffee, are given in Table I for purposes of comparison.

The new brands were as follows:

8004. *Dekofa,* Merck and Co.; New York (Dist.) "A genuine coffee from which the stimulating drug caffeine has been

TABLE I:—

Station No.	Brand.	Water.	Solids soluble in cold water.	Petroleum ether extract.	Ash.			
					Total.	Water-soluble.	Water-insoluble.	Acid-insoluble.
6334	Commercial Java Coffee,.....	5.62	23.01	16.57	4.27	3.29	0.98	0.03
5040	Kaffee Hag,.....	5.42	22.60	16.38	4.57	3.65	0.92	0.02
6333	G. Washington Prepared Coffee,.....	8.58	90.30	0.26	16.68	13.36	3.32	0.02
6335	Café des Invalides,.....	5.03	27.53	13.68	5.04	4.03	1.01	0.09
6336	Richelieu Vacuum Improved Coffee,.	4.57	22.41	16.43	4.21	3.31	0.90	0.03
8004	Dekofa,.....	6.25	20.55	13.10	4.38	3.60	0.78	0.02
8261	Cafab Certified Coffee, 25	6.65	16.90	16.32	3.42	2.47	0.95	0.03
8262	" " " 30	6.46	16.48	16.04	2.95	2.10	0.85	0.01
8260	" " " 35	6.62	17.80	16.04	3.27	2.42	0.85	0.03
8259	Hübner's Health Coffee,.....	6.17	13.58	16.60	1.65	1.05	0.60	0.03
8258	Pura Café Presque sans Caffeine,....	6.95	16.55	15.01	3.10	2.23	0.87	0.01

largely removed." "Is the H. A. G. Kaffee of the European market."

8261. *Cafab Certified Coffee 25,* Cafab Products Co.; New York. "From which large per cent of the caffein has been removed." On the label the words "about 90" have been partially obliterated and the word "large" substituted.

8262. *Cafab Certified Coffee 30,* Cafab Products Co.; New York. Same labeling as 8261.

8260. *Cafab Certified Coffee 35,* Cafab Products Co.; New York. Same labeling as 8261.

8259. *Hübner's Health Coffee,* Hübner's Health Coffee Co.; New York. "Between 80 and 90 per cent of caffeine is extracted. A small percentage of caffetannic acid and other ingredients are also removed."

8258. *Pura Café Presque sans Caffeine,* Acker, Merrall and Condit Co.; New York. "Coffee from which the greatest part of the caffeine and tanic (*sic*) acid has been extracted."

The analyses show a very diverse series of products containing from 0.03 to 4.96 per cent caffein and from 6.52 to 48.04 per cent of caffetannic acid. The brands may be classified into five quite distinct groups:

HYGIENIC COFFEES.

*Alkalinity of ash.		Phosphoric acid.		Potash.	Chlorin.	Nitrogen.	Caffein.		Caffetannic acid.	Reducing sugars, as dextrose.	Sucrose, from increase after inversion.	Carbohydrates insoluble in 95% alcohol and convertible by diastase.
Water-soluble.	Water-insoluble.	Water-soluble.	Water-insoluble.				From residue.	From nitrogen in residue.				
4.09	2.08	0.12	0.32	2.01	0.01	2.22	1.22	1.20	11.37	0.98	0.73	6.75
4.55	2.26	0.06	0.32	2.29	0.06	1.92	0.04	0.03	11.47	0.72	1.01	6.56
18.34	7.40	0.40	1.23	8.92	0.09	3.42	5.11	4.96	48.04	4.04	2.06	13.50
3.90	2.30	0.17	0.29	2.09	0.49	2.31	1.00	0.97	11.56	2.70	2.57	7.25
4.07	2.10	0.15	0.29	2.07	0.01	2.32	1.18	1.15	11.82	1.11	0.80	5.00
4.25	1.50	0.17	0.24	2.09	0.05	1.74	0.05	0.03	12.89	0.24	0.68	4.31
2.80	1.35	0.13	0.25	1.43	0.03	2.30	0.74	0.61	8.98	0.40	0.34	3.43
2.40	1.40	0.15	0.28	1.30	0.03	2.10	0.61	0.52	9.59	0.68	0.38	4.11
2.75	1.40	0.10	0.33	1.43	0 03	2.20	0.70	0.59	9.38	0.40	0.60	3.99
1.00	1.05	0.13	0.18	0.67	0.03	2.00	0.48	0.38	6.52	0.40	0.64	5.43
2.45	1.35	0.14	0.28	1.36	0.03	2.22	0.66	0.57	9.62	0.88	0.19	3.77

*CC $\frac{N}{10}$ HCl per gram of coffee.

1. *G. Washington Prepared Coffee.* This product is completely soluble in water, and is a coffee extract concentrated about four times. Accordingly only about one-fourth as much of this would be used in making a cup of coffee as would be necessary in the other brands. On this basis we find about the usual content of caffein and caffetannic acid found in ordinary coffee, an almost complete absence of petroleum ether extract (fat), as would be expected, and considerably less nitrogen and water-insoluble carbohydrates than found in normal coffee.

2. *Kaffee Hag* and *Dekofa* (names for the same product) in which the caffein has been largely eliminated as claimed. The water-soluble solids, the caffetannic acid and the other ingredients show little variation from ordinary coffee.

3. *Richelieu Vacuum Coffee,* which shows scarcely any variation from the composition of normal coffee, there being practically no reduction in caffein or caffetannic acid.

4. *Café des Invalides,* which contains about 80 per cent as much caffein as normal coffee, due to dilution with chicory and possibly other vegetable products. This addition has affected the content of caffetannic acid but little, but has caused an increase in water-soluble solids and a very marked increase in chlorin.

5. The three *Cafab* samples, *Hübner's Health Coffee* and *Pura Café,* in which there has been a considerable reduction in both caffein and caffetannic acid. The partial removal of these ingredients apparently has had a serious effect on the other constituents of these coffees. While in the sample of commercial coffee 23.01 per cent of the solids was soluble in water, in these we find only from 13.58 to 17.80 per cent; the water-soluble ash, potash and carbohydrates likewise are all very much lower than in normal coffee. This is particularly striking in the *Hübner* brand, which contains only 59 per cent of the water-soluble solids, 32 per cent of the water-soluble ash, 33 per cent of the potash and 76 per cent of the carbohydrates found in ordinary coffee. In other words, in removing a part of the caffein and caffetannic acid the leaching process has also removed much of the food material of the coffee.

The coffees of the first four classes (excepting *Dekofa*) were discussed in detail in our last report. The present discussion will be confined to the new analyses.

Dekofa. As already stated, this is the European brand corresponding to the *Kaffee Hag* of the American market. Its composition in general agrees closely with that of *Kaffee Hag,* but we find somewhat less soluble solids, petroleum ether extract and carbohydrates. The claim that the "caffeine has been largely removed" is strictly correct.

Cafab Certified Coffee. The three brands may be considered together as they differ but little in composition. Their labels clearly show that originally the false claim was made that "about 90 per cent of the caffein has been removed." This was later modified to read "large per cent," etc. Our analyses show that the modified statement is approximately correct, as from 50 to 60 per cent of the caffein has been removed. With this removal nearly one-fourth of the soluble solids, about one-third of the potash, and from two-fifths to one-half of the carbohydrates have also disappeared, and the strength of the coffee decoction made from these brands would be just that much weaker than ordinary coffee.

Hübner's Health Coffee. This brand claims the removal of from 80 to 90 per cent of the caffein, as well as a small percentage of caffetannic acid and other ingredients. Instead of an 80 to 90 per cent removal of caffein we find but 68 per cent. About 40 per cent of the caffetannic acid also is removed. The serious feature, however, in connection with this brand is that in the process employed much of the real substance of the coffee is also taken away. About two-fifths of the soluble solids, about seven-tenths of the water-soluble ash, one-fourth of the phosphoric acid, two-thirds of the potash and about one-fourth of the carbohydrates have been removed with the caffein and caffetannic acid. In other words, this is a partially leached coffee.

Pura Café. The claim "Presque sans Caffeine" ("almost without caffein") is not substantiated by our analysis, as we find about one-half the normal amount present. The same leaching effect is apparent as in the *Cafab* and *Hübner* brands. In fact the analyses of the *Cafab* and *Pura* coffees are almost the same. The claim that all of the strength of the coffee remains is untrue, as the coffee has only about three-fourths the strength of the ordinary product.

Analytical Note. The point has often been raised that in the determination of caffein the direct weighing of the residue may give too high results, and that accordingly nitrogen should be determined in this residue and the caffein percentage calculated therefrom. Our experience last year where carbon tetrachlorid was used as the solvent showed only trifling differences

between the results by the direct and indirect methods, ranging from 0.01 to 0.05 per cent. This year we had considerable difficulty in completely extracting the caffein with carbon tetrachlorid and we were obliged to resort to chloroform. Using this solvent the direct method gives too high results and the only accurate method when chloroform is used is to determine the nitrogen in the residue and from this value calculate the caffein. The direct method this year gave results from 0.09 to 0.13 per cent too high.

CREAM OF TARTAR.

Thirty-two samples of cream of tartar were examined. Thirty-one of these were genuine without adulteration, while one was labeled as "Cream Tartar Substitute." The tests for heavy metals and arsenic were negative in all cases, except in one where a trace of iron was present.

Cream of tartar has been inspected eight times in this laboratory, and the following tabulation shows the very great improvement in its purity from 1896 to the present time.

Year.	Number of Samples.	Number Pure.	Number Adulterated.	Number Compound.	Adulteration %.
1896	103	72	31	0	30
1900	48	33	15	0	31
1901	43	34	9	0	21
1904	91	72	19	0	21
1905	19	17	1	1	5
1906	73	67	6	0	8
1907	30	28	2	0	7
1916	32	31	0	1	0

Sixteen of the samples were sold in labeled containers, the other fifteen in bulk. The following manufacturers were represented in the labeled brands:

Acker, Merrall & Condit Co.
Austin, Nichols & Co. (2)
Bennett, Simpson & Co.
E. R. Durkee & Co.
B. Fisher & Co.
J. H. Folkins Co.
Grand Union Tea Co.
Great Atl. & Pac. Tea Co.
Miner, Read & Tullock.
The Mohican Co. (2)
D. & L. Slade Co.
James P. Smith & Co.
Stickney & Poor Spice Co.
Union Pacific Tea Co.

The net weight stated on the package goods was correct in all cases. One bulk sample, however, bought for 4 oz. from D. M. Welch and Son, New Haven, contained only 2 oz. The usual wide variations in price were shown. Four oz. packages cost from 5 to 20 cents, and two oz. from 10 to 13 cents.

CREAM OF TARTAR SUBSTITUTE.

7987. *Revere Cream Tartar Substitute,* Revere Mills, Boston. "Contains acid phosphate of calcium, sodic alumina sulphate, bicarbonate of soda and corn starch."

The following analytical data were obtained:

Soda	6.79	Potash	0.16
Alumina	7.37	Iron oxid	0.23
Phosphoric anhydrid	12.91	Starch	18.74
Sulphuric anhydrid	21.36	Carbon dioxid	present
Lime	4.36	Arsenic	none

This substitute cost 10 cents per 4 oz.; compared with an average of 14 cents for the genuine product.

DIABETIC FOODS.

Few new brands of this class of foods have appeared on the market during the past year. The 22 analyses herewith reported represent chiefly further analyses of brands previously examined in this laboratory. Uniformity in composition from year to year is a desirable characteristic of such foods, and until the manufacturers can secure such uniformity, the use of these foods by dietitians will be attended with much uncertainty.

The brands examined were as follows:

7237. *Christian's Imported Protoid Nuts,* Christian's Natural Food Co.; Kenilworth, N. J. "Protein 35, fat 45, carbohydrates 10; 2800 calories per pound."

5579. *Akoll Biscuits,* Huntley and Palmer, Reading, Engl.

7277. *Roman Meal,* sold by S. S. Pierce Co., Boston.

Made by The Kellogg Food Co., Battle Creek, Mich.

7498. *20% Gluten Meal.* "Moisture 5-10, gluten 20-30, carbohydrates (starch) 65-70, fats 1-2, ash 1-2, cellulose and undetermined 1-2, protein factor 5.7."

7496. *40% Gluten Flour.* "Moisture 5-10, gluten 40-45, carbohydrates 40-45, fats 0.2-0.5, ash 0.5-1, cellulose and undetermined 1-3."

7497. *40% Gluten Meal.* "Moisture 5-10, gluten 40-45, carbohydrates (starch) 40-45, fats 0.2-0.5, ash 1-2, cellulose and undetermined 1-2, protein factor 5.7."

7499. *Pure Gluten Meal.* "Moisture 5-10, protein 75-80, carbohydrates (starch) 0-5, fats 0.25-0.7, ash 1-2, cellulose and undetermined 1-3, protein factor 5.7."

7495. *40% Gluten Biscuit.*

7494. *Pure Gluten Biscuit.* "Moisture 5-10, protein 75-80, carbohydrates (starch) 0-5, fats 0.25-0.7, ash 1-2, cellulose and undetermined 2.4-3, protein factor 5.7."

Made by Loeb's Diabetic Food Bakery, New York City.

8412. *Genuine Gluten Bread.* "For Diabetes, Dyspepsia, Constipation, Obesity."

8420. *Gluten Luft Bread.* "The best Bread for Diabetes, Dyspepsia, Weak Stomach. More nourishing than meat."

8413. *Pure Gluten Flour.*

8414. *Diabetic Bread Sticks.*

8415. *Gluten Noodles.*

8416. *Diabetic Sponge Cookies.* "Guaranteed to be without Flour or Sugar."

8417. *Diabetic Almond Macaroons.*

8418, 7030. *Diabetic Butter Cookies.*

8419. *Diabetic Lady Fingers.* "Guaranteed to be without Flour or Sugar."

8421. *Gluten Cracker Meal.* "Made from Pure Gluten Flour and Eggs."

8422. *Gluten Almond Zwieback.*

8423. *Gluten Zwieback.*

Christian's Imported Protoid Nuts have the composition of pine nuts, and are a very nutritious, starch-free food.

Akoll Biscuits. The present analysis agrees closely with those made by us in 1912 and 1913, showing the preparation to be practically starch-free and with high percentages of protein and fat.

Roman Meal. This sample was sent by a diabetic to learn whether its use was safe. We do not know whether it is recommended by the manufacturer for the use of diabetics, but certainly a food containing 37.35 per cent of starch is inappropriate for a *strict* diabetic dietary.

Kellogg Preparations. These samples require special comment. Inasmuch as the analyses given by the Company on the labels are based on the protein factor 5.7, the samples will be discussed on that basis. *Pure Gluten Biscuit* contains less protein than is claimed. It also contains more starch than one might expect from the Company's analysis. The Company makes the

TABLE II:—DIABETIC FOODS.

Station No.	Brand.	Water.	Ash.	Protein (N x 6.25).	Fiber.	Nitrogen-free extract.	Fat.	Starch.
7237	Christian's Imported Protoid Nuts	4.23	4.27	37.63	5.65		48.22	Trace.
5579	Akoll Biscuits	7.97	3.43	53.56	0.49	6.22	28.33	Trace.
7498	Kellogg's 20% Gluten Meal	7.65	1.22	27.06[1]	0.12	63.03	0.92	51.24
7496	" 40% Gluten Flour	8.62	0.89	36.88[2]	0.08	52.10	1.43	48.04
7497	" 40% Gluten Meal	7.30	1.36	45.56[3]	0.10	44.57	1.11	36.59
7499	" Pure Gluten Meal	4.60	0.96	84.19[4]	0.08	9.36	0.81	6.77
7494	" Pure Gluten Biscuit	8.30	2.04	81.00[5]	0.12	7.71	0.83	4.02
7495	" 40% Gluten Biscuit	8.50	1.48	45.13[6]	0.08	43.83	0.98	36.98
8412	Loeb's Genuine Gluten Bread	27.72	1.51	35.40	0.21	34.99	0.17	26.37
8420	" Gluten Luft Bread	7.05	1.20	44.50	0.18	37.29	9.78	29.93
8413	" Pure Gluten Flour	8.85	0.51	47.81	0.13	41.69	1.01	35.78
8414	" Diabetic Bread Sticks	8.15	2.87	46.31	0.19	42.19	0.29	35.02
8415	" Gluten Noodles	9.25	0.69	45.19	0.15	43.69	1.03	33.19
8416	" Diabetic Sponge Cookies	5.82	3.49	44.63	0.23	8.66	37.17	1.91
8417	" Diabetic Almond Macaroons	4.55	4.01	34.25	1.72	10.46	45.01	Trace.
8418	" Diabetic Butter Cookies	6.14	2.22	39.31	0.15	37.25	14.93	32.18
7030	" " " "	4.07	2.86	31.38	0.35	39.05	22.29	30.66
8419	" Diabetic Lady Fingers	5.97	3.46	48.00	0.07	9.71	32.79	2.14
8421	" Gluten Cracker Meal	8.22	1.07	42.63	0.19	38.97	8.92	31.59
8422	" Gluten Almond Zwieback	8.04	1.97	44.00	0.33	39.56	6.10	33.10
8423	" Gluten Zwieback	8.27	2.34	45.44	0.20	41.06	2.39	35.72
7277	Roman Meal	8.54	3.68	13.31	4.98	66.06	3.43	37.35

[1] Using factor 5.7 protein = 24.68, nitrogen-free extract = 65.41
[2] " " " " = 33.63, " " = 55.35
[3] " " " " = 41.55, " " = 48.58
[4] " " " " = 76.78, " " = 16.77
[5] " " " " = 73.87, " " = 14.84
[6] " " " " = 41.15, " " = 47.81

error of confusing starch and carbohydrates. If the maximum figures of the Company's analysis are used, the starch and other carbohydrates would reach 8 per cent, whereas we find 14.84 per cent of total carbohydrates. The claim "Guaranteed to contain less than 5% of carbohydrates" is incorrect.

The following remarks in the Company's booklet under the caption "Vegetable Proteins" are exaggerated:

"Leading authorities are now agreed that meat, fish, eggs and other animal proteins are greatly inferior to vegetable proteins in diabetes, often increasing the sugar output, and the dangerous acidosis which leads to diabetic coma. . . . . After many years of experimentation we have succeeded in perfecting a process whereby the carbohydrates are excluded."

In this connection Von Noorden, whom the Company constantly quotes to suit its own purpose, says:

"In the slightest form [of diabetes], the influence of meat albumins is not great, and it is difficult to demonstrate the reaction of the patient to different forms of albumin. It may be necessary to add more albumin than the patient can actually take before the glycosuric indication is reached. . . . . Once a medium amount of albumin is exceeded, say 70-80 grams, the glycosuria increases, no matter what the type of albumin is."

No analysis of *40% Gluten Biscuit* is supplied by the Company, but no criticism can be made against the use of this name. The Company, however, claims that it is "Best for Diabetics," which is not true. Here as in the case of *40% Gluten Flour* the label states "A Good Gluten flour is made by the Battle Creek Sanitarium Co., Mich.," *Dr. Wm. Osler in Practice of Medicine.* "Of Gluten Foods many are unpalatable, others are frauds." We have no way of knowing to which gluten flour of the Company Dr. Osler had reference. Its *Pure Gluten Meal* might properly be called a "good gluten flour," but the *40% Gluten Flour* is no better, and no worse, than the average gluten flour on the market. The quotation from Osler gives an entirely false impression.

The analysis of *40% Gluten Flour* shows 6.37 per cent less protein than the Company's minimum and 10.35 per cent more carbohydrates than its maximum. In past years we have found this brand to vary from 35.0 to 42.9 per cent of protein (factor 5.7). It is true that in the case of this brand the Company fails to state the protein factor used, but even using 6.25 the protein would be only 36.88, 3.12 per cent below the minimum guaranty. The following statement, as applied to a food containing over 48 per cent of starch, does not seem tenable: "This food is of special service in cases of Glycosuria, and in the milder forms of Diabetes." With this brand the Company again uses the misleading quotation from Osler noted above.

The composition claimed for *40% Gluten Meal* is justified by our analysis. The following statement, however, is objectionable: "Prepared with great care from a good grade of Spring Wheat, by our special process, which preserves the natural food properties of the product." The Company evidently tries to carry water on both shoulders, on the one hand claiming the reduction in starch content, while on the other claiming the preservation of "the natural food properties."

The Company's analysis of *20% Gluten Meal* is confirmed. As the Company claims directly that this is "Not a Diabetic Food" any criticism of its use for that purpose is disarmed as far as the Company is concerned. However, exception again must be taken to the statement that "the natural properties of the product" are preserved.

The minimum protein claim for *Pure Gluten Meal* is justified. Here again the Company confuses carbohydrates and starch, and the food instead of containing from "0-5 per cent of carbohydrates (starch)" actually contains 16.77 per cent of carbohydrates with 6.77 per cent of starch. Once more the statement referring to "the natural food properties" is untrue, especially when applied to a wheat product deprived of most of its starch.

The inclusion on the label of the direction "Write for a copy of Diabetic Foods and How to Use Them" is a more or less direct invitation to self-treatment. In justice to the Company, however, it should be noted that on the labels of three of these preparations the following warnings are given:—"Every person suffering from diabetes should be under the care of an experienced physician," and on two of these also appear these words: "persons suffering from diabetes should use this food only on the advice of a physician."

Loeb's Preparations. The claim that *Loeb's Gluten Luft Bread* is "the best Bread for Diabetes" is open to serious objection. While as a rule the Loeb preparations agree quite satisfactorily with the composition claimed for them, individual products show far too wide variations in their composition from year to year. In some cases, such as *Gluten Luft Bread, Gluten Cracker Meal* and *Pure Gluten Flour,* the manufacturer has been quite successful in increasing the protein content and reducing the carbohydrates. In others, such as *Gluten Zwieback* and *Gluten Almond Zwieback,* there has been a very material reduction in fat with a corresponding increase in starch. Such variations as these emphasize the necessity of manufacturers standardizing their products more accurately, if they expect intelligent dietitians to use them.

The following tabulation shows the variations in composition of certain of the Loeb products in the past four years:

Year.		Protein.	Fat.	Carbohydrates.	Starch.
1913	Gluten Cracker Meal	27.8	7.7	53.5	40.2
1916	" " "	42.6	8.9	39.0	31.6
1913	Pure Gluten Flour	40.3	2.4	46.3	39.6
1916	" " "	47.8	1.0	41.7	35.8
1913	Genuine Gluten Bread	10.4	2.6	53.7	44.2
1913	" " "	25.8	2.7	27.8	23.9
1914	" " "	38.8	4.1	25.7	19.2
1916	" " "	35.4	0.2	35.0	26.4
1913	Gluten Luft Bread	27.9	9.2	54.2	44.1
1913	" " "	34.1	8.7	47.4	40.1
1914	" " "	52.4	13.2	26.0	22.9
1916	" " "	44.5	9.8	37.3	29.9
1914	Diabetic Bread Sticks	50.4	3.4	34.5	24.6
1916	" " "	46.3	0.3	42.2	35.0
1915	Gluten Zwieback	46.7	13.5	29.8	23.4
1916	" "	45.4	2.4	41.1	35.7
1913	Gluten Almond Zwieback	42.6	20.6	26.0	19.1
1916	" " "	44.0	6.1	39.6	33.1

CONDENSED MILK.

The new standards for condensed milks proposed by the Federal Committee on Food Definitions and Standards, and recently adopted by the organizations represented in that committee, are as follows:

"Condensed milk, evaporated milk, concentrated milk, is the product resulting from the evaporation of a considerable portion of the water from the whole, fresh, clean, lacteal secretion obtained by the complete milking of one or more healthy cows, properly fed and kept, excluding that obtained within fifteen days before and ten days after calving, and contains, all tolerances being allowed for, not less than 25.5 per cent of total solids, and not less than 7.8 per cent of milk fat."

"Sweetened condensed milk is the product resulting from the evaporation of a considerable portion of the water from milk to which sugar (sucrose) has been added. It contains, all tolerances being allowed for, not less than 28 per cent of total milk solids, and not less than 8 per cent of milk fat."

"Condensed skimmed milk, evaporated skimmed milk, concentrated skimmed milk, is the product resulting from the evaporation of a considerable portion of the water from skimmed milk, and contains, all tolerances being allowed for, not less than 20 per cent of milk solids."

"Sweetened condensed skimmed milk, sweetened evaporated skimmed milk, sweetened concentrated skimmed milk, is the product resulting from the evaporation of a considerable portion of the water from skimmed milk to which sugar (sucrose) has been added. It contains, all tolerances being allowed for, not less than 28 per cent of milk solids."

The above standards for both sweetened and unsweetened condensed milk are somewhat different from those hitherto official. In the unsweetened product the required solids have been reduced from 28 to 25.5 per cent, while the fat has been raised from 7.75 to 7.8 per cent. The phrase, "all tolerances being allowed for," in the standards makes the fat requirement considerably higher than would appear from a casual reading of the standard, as under the new standard the product must contain at least 7.8 per cent irrespective of any possible errors of analysis, which in some cases may amount to as much as 0.2 per cent. In the sweetened condensed milk standard no change is made in the solids, but the fat requirement is raised from 7.75 to 8 per cent.

The examination of condensed milk this year was undertaken chiefly to determine to what degree the manufacturers were complying with the new standards. The inspection included 18 samples of unsweetened, 21 of sweetened and 4 of sweetened condensed skimmed milk. The unsweetened and sweetened varieties have each been inspected by us twice before, and the following table shows the average composition of the samples in our three inspections.

	Unsweetened.			Sweetened.		
	1906	1909	1916	1904	1909	1916
Net weight, oz.	11.6	14.6	15.9	14.0	14.2	13.3
Cost per can, cents	8.5	10.2	9.4	10.3	10.8	11.4
Cost per pound, cents	11.7	11.2	9.4	11.8	12.3	13.7
In original material.						
Water	71.85	71.87	73.27	26.08	26.68	26.29
Total solids	28.15	28.13	26.73	73.92	73.32	73.71
Cane sugar	.....	.....	.....	40.32	40.05	40.57
Milk solids	28.15	28.13	26.73	33.60	33.27	33.14
Ash	1.68	1.55	1.55	1.90	7.73	1.80
Protein	7.75	7.57	6.92	8.77	8.30	7.90
Milk sugar	11.03	10.34	10.10	14.07	13.88	14.43
Fat	7.69	8.67	8.16	8.86	9.36	9.01
In the milk solids.						
Ash	5.97	5.81	5.80	5.68	5.23	5.43
Protein	27.53	26.91	25.89	26.17	25.09	23.84
Milk sugar	39.18	36.76	37.78	41.76	41.37	43.54
Fat	27.32	30.82	30.53	26.39	28.31	27.19

This comparison shows that the manufacturers are now supplying considerably more of the unsweetened milk in their packages at a correspondingly lower cost per pound; with the sweetened

TABLE III:—

Station No.	Brand and Manufacturer.	Price per Can.	Net Weight. Claimed.	Net Weight. Found.
		cts.	oz.	oz.
7990	Armour's Veribest. Armour & Co., Chicago	10	16	15.9
7954	Peerless Brand. Borden's Condensed Milk Co., New York.	10	16	16.0
7973	Beauty Brand. Delavan Condensed Milk Co., Chicago	10	16	16.4
8088	A. & P. Brand. Great Atl. & Pac. Tea Co., Jersey City, N. J.	10	16	16.0
7972	Our Pet Brand. Helvetia Milk Cond. Co., Highland, Ill.	10	16	16.2
8092	Honor Brand. Highland Milk Cond. Co., Elkland, Pa.	5	6	6.1
8092	Honor Brand. Highland Milk Cond. Co., Elkland, Pa.	5	6	6.2
8026	Hires Gold Brand. Hires Cond. Milk Co., Philadelphia, Pa.	10	16	15.9
7978	Wilson's. Indiana Cond. Milk Co., Sheridan, Ind.	9	16	16.4
8002	Gold Cross. Mohawk Cond. Milk Co., New York	9	16	16.1
7946	Supreme. Morris and Co., Chicago	8	16	16.0
7974	Globe. National Cond. Milk Co., Chicago	10	16	15.9
7979	Carnation. Pacific Coast Cond. Milk Co., Seattle, Wash.,	9	16	15.9
8041	Belle Brook Brand. Seminole Cond. Milk Co., Holland Patent, N. Y.	9	15	15.3
8040	Lake View Brand. Seminole Cond. Milk Co., Holland Patent, N. Y.	8	15.5	15.3
7945	Van Camp's. The Van Camp Packing Co., Indianapolis, Ind.	10	16	16.0
7953	Lion Brand. Wisconsin Cond. Milk Co., Burlington, Wis.	10	16	15.6
7992	Mohican Brand. Wisconsin Cond. Milk Co., Burlington, Wis.	9	16	16.1
	Average.	*9.4	*15.9	*15.9

*Excluding 8092.

milks the reverse is true. The average composition of the unsweetened milks examined this year shows 1.4 per cent less milk solids than in 1909, the solids-not-fat showing a greater decline than the fat. The fat content this year is about the average of that found in 1906 and 1909. The fat in the milk solids is almost the same as in 1909, and considerably higher than in 1906. The ratio of protein to fat is a useful indication of the quality of the original milk used, a whole milk of good quality usually showing considerably more fat than protein. These ratios were 0.99, 1.15 and 1.18 for the three years, respectively. The original milk used in these unsweetened milks appeared to be of good quality and compares very favorably with that found in our 1909 inspection; this will be considered in more detail in a later paragraph.

UNSWEETENED CONDENSED MILK.

In Material as Sold. Water.	Solids.	Ash.	Protein (N x 6.38).	Milk Sugar.	Fat.	In Milk Solids. Ash.	Protein.	Milk Sugar.	Fat.
74.57	25.43	1.58	6.38	9.80	7.67	6.21	25.09	38.54	30.16
73.72	26.28	1.39	6.64	9.82	8.43	5.29	25.27	37.37	32.07
74.04	25.96	1.53	6.83	9.49	8.11	5.89	26.31	36.56	31.24
74.07	25.93	1.50	6.57	9.85	8.01	5.78	25.34	37.99	30.89
71.82	28.18	1.69	7.53	10.63	8.33	6.00	26.72	37.72	29.56
71.29	28.71	1.48	7.08	11.39	8.76	5.16	24.66	39.67	30.51
71.95	28.05	1.53	7.08	10.54	8.90	5.45	25.24	37.58	31.73
73.72	26.28	1.52	7.27	9.59	7.90	5.79	27.66	36.49	30.06
73.45	26.55	1.51	7.91	8.55	8.58	5.69	29.80	32.20	32.31
72.72	27.28	1.75	7.91	9.58	8.04	6.41	29.00	35.12	29.47
73.05	26.95	1.60	6.51	10.73	8.11	5.94	24.16	39.81	30.09
72.60	27.40	1.57	7.02	10.84	7.97	5.73	25.62	39.56	29.09
73.75	26.25	1.49	6.76	9.89	8.11	5.68	25.75	37.68	30.89
72.94	27.06	1.62	6.57	10.83	8.04	5.99	24.28	40.02	29.71
73.83	26.17	1.60	6.44	10.08	8.05	6.11	24.61	38.52	30.76
72.90	27.10	1.69	6.76	10.65	8.00	6.25	24.94	39.29	29.52
74.48	25.52	1.45	6.70	9.38	7.99	5.68	26.25	36.76	31.31
73.89	26.11	1.37	6.57	10.24	7.93	5.25	25.16	39.22	30.37
73.27	**26.73**	**1.55**	**6.92**	**10.10**	**8.16**	**5.80**	**25.89**	**37.78**	**30.53**

The milk solids found in the sweetened milks this year is almost the same as found in 1909. There is, however, a slight decrease in fat of 0.35 per cent, amounting to 1.12 per cent decrease when calculated on the basis of milk solids. The protein-fat ratio is 1.14 compared with 1.01 in 1904 and 1.13 in 1909. The milk used in the sweetened milks apparently is not of as high grade as that used in the unsweetened, as on the average the milk solids and fat in the former are 23.84 and 27.19 per cent compared with 25.89 and 30.53 per cent in the unsweetened milks.

The composition of a condensed milk depends not only upon the quality of the milk condensed but also on the amount of this condensation, the concentration being carried much further in the sweetened than in the unsweetened milks. Various methods

TABLE IV.—

Station No.	Brand and Manufacturer.	Price per Can.	Net Weight. Claimed.	Net Weight. Found.
		cts.	oz.	oz.
7950	Canada First. Aylmer Cond. Milk Co., Aylmer, Ont.	10	14	13.8
7951	Swiss Milk Berna. Berna Milk Co., Thonne, Switz	10	14	13.9
8035	Swiss Milk. Bernese Alps Milk Co., Stalden, Switz.	14	15	14.6
7952	Baby Brand. Borden's Cond. Milk Co., New York	18	12	12.3
7926	Challenge Brand. Borden's Cond. Milk Co., New York	12	12.5	12.4
8008	Daisy Brand. Borden's Cond. Milk Co., New York	10	14	15.1
8078	Defiance Brand. Borden's Cond. Milk Co., New York	13	12.5	12.6
7975	Dime Brand. Borden's Cond. Milk Co., New York	10	11	11.1
8073	Dixie Brand. Borden's Cond. Milk Co., New York	10	11	11.1
7976	Eagle Brand. Borden's Cond. Milk Co., New York	15	15.5	15.4
7936	Magnolia Brand. Borden's Cond. Milk Co., New York	10	14	14.0
8020	Benefit Brand. Direct Importing Co., Boston	11	14	14.0
8013	Milkman Brand. Holland Food Corporation, New York	11	14	14.1
8072	Kitten Brand. Hudson Cond. Milk Co., New York	12	12.5	12.3
7934	Libby's. Libby, McNeil & Libby, Chicago	10	11	11.2
8027	Gold Medal. Mohawk Cond. Milk Co., New York	11	14	14.0
7937	Sweet Clover Brand. Mohawk Cond. Milk Co., New York	12	14	13.7
8038	Butler's Brand. Seminole Cond. Milk Co., Holland Patent, N. Y.	10	12	12.7
8039	Essie Brand. Seminole Cond. Milk Co., Holland Patent, N. Y.	11	13	13.8
7927	Grandmother's A. & P. Wisconsin Cond. Milk Co., Burlington, Wis.	11	14	13.9
7928	Lion Brand. Wisconsin Cond. Milk Co., Burlington, Wis.	8	14	14.1
	Average.	**11.4**	**13.2**	**13.3**

SWEETENED CONDENSED

8024	Marvel Brand. M. Darlington's Sons, Pomeroy, Pa.	10	14.5	14.0
7989	Target Brand. Foster Packing Co., Chicago	10	14	14.3
8048	Square Brand. Hires Cond. Milk Co., Philadelphia, Pa.	10	12.6	12.7
7991	Van Troup Brand. South Holland Milk Corp., New York	8	14	14.0
	Average.	**9.5**	**13.8**	**13.8**

of calculation have been devised for determining this factor of condensation, but of course these yield only approximate results. In the following tables we have made this calculation based on 0.7 per cent of ash and 8.8 per cent of solids-not-fat in normal milk. The results secured by the two methods agree reasonably well, at any rate closely enough to warrant a judgment on the quality of the milk.

SWEETENED CONDENSED MILK.

In Material as Sold. Water.	Solids.	Cane Sugar.	Milk Solids.	Ash.	Protein (N x 6.38).	Milk Sugar.	Fat.	In Milk Solids. Ash.	Protein.	Milk Sugar.	Fat.
28.93	71.07	39.62	31.45	1.56	7.53	13.30	9.06	4.96	23.94	42.29	28.81
25.01	74.99	37.52	37.47	2.02	8.36	17.12	9.97	5.39	22.31	45.69	26.61
23.72	76.28	41.73	34.55	1.86	8.17	14.91	9.61	5.39	23.65	43.15	27.81
27.55	72.45	40.84	31.61	1.72	8.17	12.96	8.76	5.44	25.85	41.00	27.71
25.02	74.98	39.88	35.10	1.88	7.98	15.45	9.79	5.36	22.74	44.01	27.89
26.08	73.92	41.80	32.12	1.79	7.52	14.24	8.57	5.57	23.41	44.34	26.68
23.97	76.03	42.22	33.81	2.00	7.72	15.03	9.06	5.92	22.83	44.46	26.79
27.85	72.15	39.44	32.71	1.77	7.77	14.26	8.91	5.41	23.76	43.59	27.24
26.06	73.94	38.41	35.53	1.81	8.04	16.51	9.17	5.09	22.63	46.47	25.81
26.26	73.74	39.90	33.84	1.70	7.59	15.76	8.79	5.02	22.43	46.58	25.97
26.66	73.34	42.16	31.18	1.75	7.85	13.09	8.49	5.61	25.18	41.98	27.23
29.57	70.43	40.60	29.83	1.65	7.91	12.01	8.26	5.53	26.52	40.26	27.69
25.67	74.33	39.44	34.89	2.08	8.68	14.98	9.15	5.96	24.88	42.94	26.22
27.68	72.32	26.99	45.33	1.99	8.49	24.68	10.17	4.39	18.73	54.44	22.44
23.61	76.39	43.90	32.49	1.79	8.36	13.02	9.32	5.51	25.73	40.08	28.68
27.46	72.54	43.30	29.24	1.66	6.95	12.22	8.41	5.68	23.77	41.79	28.76
26.52	73.48	41.20	32.28	1.67	8.42	13.21	8.98	5.17	26.09	40.92	27.82
25.28	74.72	43.81	30.91	1.76	7.78	12.45	8.92	5.69	25.17	40.28	28.86
23.61	76.39	46.02	30.37	1.92	7.27	12.95	8.23	6.32	23.94	42.64	27.10
26.15	73.85	43.22	30.63	1.64	7.52	12.63	8.84	5.36	24.58	41.24	28.82
29.53	70.47	39.93	30.54	1.70	7.91	12.21	8.72	5.57	25.90	39.98	28.55
26.29	**73.71**	**40.57**	**33.14**	**1.80**	**7.90**	**14.43**	**9.01**	**5.43**	**23.84**	**43.54**	**27.19**

SKIMMED MILK.

28.60	71.40	48.22	23.18	1.86	8.29	12.36	0.67	8.03	35.76	53.32	2.89
26.32	73.68	38.63	35.05	1.90	8.74	23.37	1.04	5.42	24.93	66.67	2.97
28.34	71.66	47.45	24.21	1.71	8.36	13.28	0.86	7.06	34.53	54.85	3.56
29.80	70.20	37.83	32.37	2.19	9.57	20.00	0.61	6.77	29.56	61.78	1.89
28.26	**71.74**	**43.04**	**28.70**	**1.91**	**8.74**	**17.25**	**0.80**	**6.82**	**31.20**	**59.15**	**2.83**

The degree of condensation in the unsweetened milks ranges from 1.96 to 2.50 on the ash basis, and from 1.97 to 2.24 on the basis of solids-not-fat, the respective averages being 2.21 and 2.09. In the sweetened milks the corresponding condensation factors range from 3.69 to 5.08 and from 4.09 to 5.41, with averages of 4.32 and 4.56, respectively. These condensation factors, however, are of interest chiefly as a means for the

TABLE V.—DEGREE OF CONDENSATION.

SWEETENED.

Brand.	Times Condensed. Based on .7% ash.	Times Condensed. Based on 8.9% solids-not-fat.	Fat in Original Milk. Based on .7% ash.	Fat in Original Milk. Based on 8.9% solids-not-fat.	Protein-Fat Ratio.
Canada First	3.69	4.17	4.02	3.56	1.20
Swiss Milk Berna	4.63	4.95	3.45	3.22	1.19
Bernese Swiss Milk	4.56	4.81	3.62	3.43	1.18
Baby	4.16	4.34	3.56	3.41	1.07
Challenge	4.47	4.73	3.64	3.44	1.23
Daisy	4.40	4.55	3.35	3.24	1.14
Defiance	4.95	4.81	3.17	3.26	1.17
Dime	4.18	4.41	3.52	3.34	1.15
Dixie	4.21	4.81	3.54	3.10	1.14
Eagle	4.04	4.68	3.62	3.13	1.16
Magnolia	4.32	4.41	3.40	3.33	1.08
Benefit	3.97	4.14	3.50	3.43	1.04
Milkman	4.90	4.72	3.08	3.20	1.05
Kitten	3.89	5.41	3.58	3.57	1.20
Libby's	4.55	4.63	3.65	3.59	1.11
Gold Medal	4.08	4.13	3.63	3.59	1.21
Sweet Clover	4.07	4.46	3.75	3.43	1.07
Butler's	4.47	4.40	3.55	3.61	1.15
Essie	5.08	4.61	3.00	3.31	1.13
A. and P.	4.12	4.31	3.78	3.61	1.18
Lion	4.05	4.08	3.58	3.55	1.10
Average	4.32	4.56	3.51	3.32	1.14

TABLE VI.—DEGREE OF CONDENSATION.

UNSWEETENED.

Brand.	Times Condensed. Based on .7% ash	Times Condensed. Based on 8.9% solids-not-fat.	Fat in Original Milk. Based on .7% ash.	Fat in Original Milk. Based on 8.9% solids-not-fat.	Protein-Fat Ratio.
Armour's	2.26	2.00	3.39	3.84	1.20
Peerless	1.99	2.01	4.22	4.19	1.27
Beauty	2.19	2.01	3.70	4.03	1.19
A. and P.	2.14	2.01	3.74	3.99	1.22
Our Pet	2.41	2.22	3.46	3.75	1.11
Honor	2.11	2.24	4.15	3.92	1.24
Honor	2.19	2.15	4.06	4.14	1.26
Hires'	2.17	2.07	3.64	3.81	1.09
Wilson's	2.16	2.02	3.97	4.25	1.08
Gold Cross	2.50	2.16	3.22	3.72	1.02
Supreme	2.29	2.12	3.54	3.83	1.25
Globe	2.24	2.18	3.56	3.66	1.13
Carnation	2.13	2.04	3.81	3.98	1.20

Belle Brook	2.31	2.14	3.48	3.76	1.22
Lake View	2.29	2.04	3.51	3.95	1.25
Van Camp's	2.41	2.15	3.32	3.72	1.18
Lion	2.07	1.97	3.86	4.06	1.19
Mohican	1.96	2.04	4.05	3.89	1.21
Average	2.21	2.09	3.69	3.90	1.18

approximate calculation of the fat content of the original milk. Applying them to the unsweetened milks we find the original fat to range from 3.22 to 4.22 per cent on the ash basis, and from 3.72 to 4.25 on the basis of solids-not-fat, with respective averages of 3.69 and 3.90 per cent. In the sweetened milks the corresponding fat percentages range from 3.00 to 4.02 and from 2.57 to 3.61, with respective averages of 3.51 and 3.32.

On the whole the original milks used in the unsweetened brands appear to be of the quality of good average market milk. In the sweetened milks, however, the quality of the original milk is not always beyond suspicion.

With reference to the requirements of the standards only one of the unsweetened milks is deficient, **7990**, containing 0.07 per cent less solids and 0.13 per cent less fat than the standard requires. The milk solids in all the samples range from 25.43 to 28.71, and the fat from 7.67 to 8.90 per cent. Only three of the brands satisfy the older standard of 28 per cent milk solids.

All of the sweetened milks satisfy the standard, ranging from 29.24 to 45.33 per cent milk solids and from 8.26 to 10.17 per cent fat. In certain samples, particularly **8072**, an apparently abnormal percentage of milk sugar is shown, and the corresponding apparent deficiency of fat in the milk solids. The low cane sugar percentage found in this sample suggests a partial inversion of cane sugar during condensation, so that the method used for determining milk sugar in the finished product gives the sum of the lactose and of the invert sugar calculated as lactose. It is quite possible that inversion of cane sugar may increase in all the samples the calculated amount of lactose, and hence diminish the ratio of fat in the milk solids.

CLAIMS OF THE MANUFACTURERS.

In our inspection of 1909 attention was called to the very misleading directions for dilution then given on the labels of many condensed milks. By following these older directions an

extremely dilute product was obtained, which was quite unfit for the purposes indicated. From our tables it is apparent that none of the brands can be diluted with much more than 1.5 parts of water to one of the milk and still yield a product equalling standard milk in fat content. It is gratifying to notice a decided change for the better in the directions on many of the labels. A very common claim made this year by many of the brands is as follows:—"By adding one part of water to one part of the contents of this can a resulting milk product will be obtained which will not be below the legal standard for whole milk." This claim is correct as applied to all the brands of unsweetened milks examined this year. Such a diluted product will closely resemble market milk in composition. However, the same claim is made on the labels of nine brands of sweetened milk, and with these it is less tenable. To average composition of a sweetened milk thus diluted would show 36.85 solids, 20.28 cane sugar, 0.90 ash, 3.95 protein, 7.22 milk sugar and 4.50 per cent fat, a product very different from normal milk.

The *Essie Brand,* **8039,** makes the following claim:—"3 or 4 parts of water to one of condensed milk will make a rich milk." Giving the brand the full benefit of the lower dilution, 3 parts of water, such a diluted product would contain only 2.06 per cent fat, by no means "a rich milk."

It is in connection with the directions for infant feeding, however, that the severest criticism must be made as to the manufacturer's claims. The following table gives the composition of the food intended for infants of the ages specified when made according to the formulas recommended by the various manufacturers on the labels. Where alternative proportions are given, the greater concentration was used in the calculation, thus giving the manufacturer every advantage. In the table is also shown the average composition of mother's milk when the infants are from 5 to 6 and from 20 to 40 days old.

TABLE VII.—COMPOSITION OF MIXTURES FOR INFANT FEEDING PREPARED AS DIRECTED.

Age of Infant.	Prop. Milk to water.	Water.	Milk Solids.	Cane Sugar.	Ash.	Protein.	Milk Sugar.	Fat.
Our Pet, 1st week	½ tea. milk, ¼ tea. sugar, 1 oz. water	95.26	1.71	3.03	0.10	0.46	0.66	0.52
Wilson's, 1st week	½ tea. milk, ¼ tea. sugar, 1 oz. water	95.35	1.62	3.03	0.09	0.48	0.52	0.52
Bernese, " "	1 to 14	94.91	2.31	2.78	0.12	0.54	0.99	0.64
Eagle, " "	½ tea. milk, 1½ oz. water	95.08	2.26	2.66	0.11	0.51	1.05	0.59
Baby, " "	½ tea. milk, 1½ oz. water	95.17	2.11	2.72	0.11	0.54	0.86	0.58
Peerless, 1st month,	1 to 6 or 7	96.25	3.75	...	0.20	0.95	1.40	1.20
Globe, " "	1 to 6 or 7	96.09	3.91	...	0.22	1.00	1.55	1.14
Kitten, " "	1 to 13	94.83	3.24	1.93	0.14	0.61	1.76	0.73
Armour's, Not stated,	1 to 5 or 6	95.76	4.24	...	0.26	1.06	1.63	1.28
Hires', " "	1 to 4 or 6	94.74	5.26	...	0.30	1.45	1.92	1.50
Libby's, " "	1 to 7 or 14	90.45	4.06	5.49	0.22	1.05	1.63	1.17
Dime, " "	1 to 8 or 14	91.98	3.64	4.38	0.20	0.86	1.58	0.99
Berna, " "	1 to 14	95.00	2.50	2.50	0.13	0.56	1.14	0.66
Mother's milk, 5 to 6 days,		**87.91**	**12.09**	...	**0.30**	**1.83**	**5.83**	**3.26**
" " **20 to 40 days,**		**87.52**	**12.48**	...	**0.22**	**1.30**	**6.52**	**3.91**

It is evident from the table how deficient diets, prepared according to these directions, will be for the young child. In no case do the resultant mixtures even approximate the composition of human milk, the deficiencies in protein and fat being especially striking. In the sweetened milks cane sugar makes up from 30 to 60 per cent of the solids in the child's diet. The seriousness of the matter lies in the fact that many ignorant mothers, trusting to the manufacturer's directions, offer to their babies diets which by no possibility can maintain them or secure adequate growth.

CONDENSED SKIMMED MILK.

Four samples were examined, two of which, **8024** and **8048,** did not satisfy the standard's requirement of 28 per cent milk solids. Both **7989** and **7991** had a reddish tinge and their odor was disagreeable. (For analyses see Table IV.)

The average cost of the condensed skimmed milks was 9.5 cents per can, about the same as for unsweetened condensed milk and two cents less than that of sweetened condensed milk.

SKIM MILK POWDERS.

5580. *Borden's White Cross Skimilkris,* Borden's Condensed Milk Co., New York. "A dried, skimmed cow's milk in crystal form."

8681. *Soluble Dry Milk,* W. A. Randel and Co., Seymour, Conn. "It's cow's (separator skim) milk, dry."

	5580	8681
Water	2.90	3.37
Protein (N x 6.38)	35.73	34.45
Ash	8.30	8.10
Fat	1.93	1.46
Milk sugar	51.14	52.62

The analysis of these two products is very similar. In these days of high prices there is every reason to recommend foods of this kind, especially as their production represents a distinct conservation of our food resources. Too often fat is considered the only valuable constituent of milk, the value of the protein being almost entirely overlooked. At the present time skim milk is one of our cheapest sources of protein.

The sample of *Soluble Dry Milk* was sent in to us and we have not seen the label of the original package. Such a brand name for a skim milk product would of course be improper.

SPICES.

In the earlier inspections of food products in this state the spices as a rule were found to be quite seriously adulterated. Repeated inspections with the consequent publication of the results obtained gradually improved conditions until it was believed that the spices sold in Connecticut were as free from adulteration as those sold in any part of the country. The later inspections being so favorable, only a desultory examination of spices, except ginger, has been made here since 1907. In order to determine, therefore, whether equally favorable conditions still maintained in the state, a general inspection, including 205 samples, was made this year of the more commonly used spices, except ginger and cinnamon, sold in package form. An inspection of sage and thyme was also included in order to secure analytical data as an aid to the formulation of standards for these seasoning materials.

A summary of the results of the inspection in 1916 is given below:

	No. of Samples.	Standard.	Below Standard.	Purity. %
Allspice	24	21	3	88
Cloves	27	21	6	78
Mustard	30	30	0	100
Pepper, black	32	28	4	88
Pepper, cayenne	28	8	20	29
Pepper, white	28	24	4	86
Sage	20	..	..	..
Thyme	16	..	..	..

Before discussing the results of the present inspection it is of interest to compare present conditions with those found in earlier years. The following table shows the percentage purity found in the different years from 1896 to the present time:

Percentage Purity of Spices.

	'96	'97	'98	'01	'02	'04	'05	'06	'07	'08	'16
Allspice	..	54	81	63	97	71	..	98	84	..	88
Cinnamon	..	76	92	79	93	90	..	..	100	..	..
Cloves	..	54	65	76	86	78	..	..	82	..	78
Ginger	..	..	74	84	..	..	100	..	88	89	..
Mustard	22	..	69	55	..	..	88	84	94	..	100
Pepper, black	59	67	86	59	55	55	78	78	88	..	88
Pepper, cayenne	..	60	*100	85	65	65	..	59	..	..	29
Pepper, white	71	80	†92	76	47	47	75	87	96	..	86

The present inspection is fairly satisfactory except in the case of cayenne pepper, which makes the poorest showing noted in any of our inspections. It is of interest to note, however, that whereas in our earlier examinations of spices very frequently foreign matters were present and the spices were grossly adulterated, to-day such is rarely found to be the case. Microscopical examination showed one brand of cloves to contain excessive stems, three each of black and white pepper with excessive pepper shells, and one of cayenne pepper with cereal starch. In other words, of 169 samples only one contained material foreign to the spices in question. This is by far the best showing ever made for spices sold in this state.

A study of the individual spices will show in more detail the nature and amount of the adulteration observed.

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* Only 14 brands. † Only 13 brands.

TABLE VIII:—

Station No.	Manufacturer and Brand.
	Not found adulterated.
7141	Acker, Merrall and Condit, New York
6701	Austin, Nichols and Co., New York. Republic Brand
7057	Austin, Nichols and Co., New York. Sunbeam Brand
7045	The Wm. Boardman and Sons Co., Hartford
7147	James Butler, New York. Peerless Brand
7129	Andrew Davey, New York. Atlas Brand
7096	Davey Bros., Bridgeport
7087	Direct Importing Co., Boston. Benefit Brand
6742	E. R. Durkee and Co., New York. Gauntlet Brand
7124	East India Tea Co., So. Norwalk
6755	Grand Union Tea Co., Brooklyn, N. Y.
6737	Great Atl. and Pac. Tea Co., Jersey City, N. J. Red Front Brand
7062	Chas. G. Lincoln & Co., Hartford. Capitol Mills Brand
6748	Logan Bros. Co., New Haven. L. B. C. Brand
6685	The Mohican Co., New York. Mohican Brand
6759	Seeman Bros., New York. White Rose Brand
6705	The Shartenberg and Robinson Co., New Haven. Alliance Brand
6700	Stickney and Poor Spice Co., Boston, Mass.
7102	Union Pacific Tea Co., New York. Sovereign Brand
7093	Village Store Co., Bridgeport. Mardor Brand
7037	The Williams and Carleton Co., Hartford
	Adulterated or below standard.
7118	A. F. Beckmann and Co., New York. Crown Aster Brand
7165	The A. Colburn Co., Philadelphia, Pa.
7111	No manufacturer given (Sold by Erberle's Delicatessen, Bridgeport)

ALLSPICE.

U. S. Standard. "The dried fruit of *Pimenta pimenta,* and contains not less than 8 per cent of quercitannic acid, not more than 6 per cent of total ash, not more than 0.5 per cent of ash insoluble in hydrochloric acid, and not more than 25 per cent of crude fibre."

Twenty-one of the 24 samples fully satisfied this standard. **7118** contained an excess of total ash and acid-insoluble ash (sand), while **7165** and **7111** each contained a slight excess of crude fiber.

The following averages for the 21 brands show the liberality of the standard:

	Average.	Standard.
Ash, total	4.99	6
Ash, acid-insoluble	0.13	0.5
Crude fiber	22.14	25

ALLSPICE.

Cost per package.	Net Weight. Claimed.	Net Weight. Found.	Ash. Total.	Ash. Insoluble in acid.	Crude Fiber.	Microscopical Examination.
cts.	oz.	oz.				
10	4	4.2	4.63	0.06	21.60	o. k.
9	4	4.2	4.75	0.13	21.95	o. k.
10	3	3.1	5.15	0.18	22.80	o. k.
10	4	4.1	4.73	0.03	21.10	o. k.
12	4	4.0	5.12	0.07	23.53	o. k.
10	4	4.0	5.73	0.47	21.03	o. k.
10	3	3.2	4.13	0.00	19.60	o. k.
7	3	3.1	4.73	0.08	24.12	o. k.
13	3	3.2	4.56	0.02	23.18	o. k.
10	4	3.7	5.17	0.28	24.50	o. k.
10	2.5	2.8	5.12	0.04	22.53	o. k.
7	4	3.8	4.60	0.04	21.95	o. k.
10	4	3.8	4.75	0.05	22.28	o. k.
10	4	4.2	4.84	0.04	22.78	o. k.
10	4	4.2	5.96	0.50	20.93	o. k.
10	4	3.9	5.40	0.20	22.10	o. k.
8	4	3.7	4.97	0.17	23.08	o. k.
10	4	3.7	5.05	0.06	20.13	o. k.
10	2	2.5	4.53	0.05	21.40	o. k.
10	4	4.0	5.65	0.18	23.25	o. k.
10	4	4.0	5.18	0.03	21.03	o. k.
15	4	4.1	6.37	1.97	20.63	o. k.
15	..	7.7	5.05	0.31	25.06	o. k.
5	2	2.0	5.15	0.10	25.13	o. k.

All the samples but one, **7165**, bore the required statement of net weight. Three samples, **7124, 6705** and **6700,** showed a deficiency of 0.3 oz. in a 4 oz. package. The most popular sized package, 4 oz., sold at prices ranging from 7 to 15 cents.

CLOVES.

U. S. Standard. "The dried flower buds of *Caryophyllus aromaticus,* which contains not more than 5 per cent of clove stems, not less than 10 per cent of volatile ether extract, not less than 12 per cent of quercitannic acid, not more than 8 per cent of total ash, not more than 0.5 per cent of ash insoluble in hydrochloric acid, and not more than 10 per cent of crude fiber."

Twenty-one of the 27 samples fully satisfied this standard. Five brands, **7048, 7157, 7130, 6745** and **7152,** contained an

TABLE IX:—

Station No.	Manufacturer and Brand.
	Not found adulterated.
7137	Acker, Merrall and Condit Co., New York
7151	James Butler, New York. Peerless Brand
7176	Clark, Chapin and Bushnell, New York. Elite Brand
7101	Davey Bros., Bridgeport
7173	Lewis De Groff and Son, New York. Health Brand
7086	Direct Importing Co., Boston. Benefit Brand
6740	E. R. Durkee and Co., New York. Gauntlet Brand
7123	East India Tea Co., South Norwalk
7154	B. Fischer and Co., New York
6753	Grand Union Tea Co., Brooklyn, N. Y.
7068	The Great Atl. and Pac. Tea Co., Jersey City, N. J. Sultana Brand
7161	Edw. E. Hall and Son, New Haven. (Amboyna.)
7114	Francis H. Leggett and Co., New York. Premier Brand
7065	Chas. G. Lincoln and Co., Hartford. Capitol Mills Brand
7071	The Mohican Co., New York. Mohican Brand
7066	D. and L. Slade Co., Boston, Mass.
7056	Stickney and Poor Spice Co., Boston, Mass.
7104	Union Pacific Tea Co., New York. Sovereign Brand
7095	Village Store Co., Bridgeport. Mardor Brand
7038	The Williams and Carleton Co., Hartford
7110	No manufacturer given (Sold by Erberle's Delicatessen, Bridgeport)
	Adulterated or below standard.
7048	Austin, Nichols and Co., New York. Sunbeam Brand
7118	A. F. Beckmann and Co., New York. Crown Aster Brand
7157	Bennett, Simpson and Co., New York. (Amboyna.)
7130	Andrew Davey, New York. Atlas Brand
6745	Logan Bros. Co., New Haven. L.B.C. Brand
7152	Logan Bros. Co., New Haven. L.B.C. Brand

excess of acid-insoluble ash (sand), while **7118** contained an excess of fiber, due to excessive clove stems.

That the standard is unduly liberal as regards ash and volatile ether extract is shown by the average composition of the unadulterated samples:

	Average.	Standard.
Ash, total	6.44	8
Ash, acid-insoluble	0.35	0.5
Crude fiber	8.84	10
Volatile ether extract	17.57	10

CLOVES.

Cost per package.	Net weight. Claimed.	Net weight. Found.	Ash. Total.	Ash. Insoluble in acid.	Crude Fiber.	Volatile Ether Extract.	Microscopical Examination.
cts.	oz.	oz.					
15	4	4.0	6.12	0.34	8.98	19.51	o. k.
12	4	3.6	6.38	0.34	8.90	18.12	o. k.
15	4	4.8	6.31	0.23	8.80	18.74	o. k.
10	3	3.1	6.05	0.20	8.78	17.28	o. k.
10	2.7	2.6	6.44	0.36	9.80	17.43	o. k.
8	2	2.0	6.30	0.35	8.23	17.56	o. k.
10	3	3.2	6.34	0.42	7.33	18.87	o. k.
10	4	3.8	6.25	0.31	8.35	17.80	o. k.
10	2	2.0	7.08	0.35	9.53	17.40	o. k.
10	2.5	3.0	6.35	0.31	8.90	17.95	o. k.
10	4	3.8	6.48	0.38	9.55	16.92	o. k.
15	4	4.4	6.48	0.37	8.43	17.24	o. k.
10	4	4.1	6.38	0.48	8.65	17.76	o. k.
10	4	3.9	6.45	0.38	9.03	16.72	o. k.
10	4	4.2	6.60	0.40	9.08	17.15	o. k.
10	4	3.9	6.68	0.30	9.03	16.62	o. k.
10	4	4.2	6.53	0.35	9.15	16.85	o. k.
10	2	3.0	6.38	0.33	8.03	18.21	o. k.
10	4	4.0	6.30	0.45	8.53	18.90	o. k.
13	4	4.0	6.73	0.40	9.05	16.35	o. k.
5	2	2.0	6.58	0.25	9.58	15.66	o. k.
15	4	4.1	6.55	0.70	7.90	18.49	o. k.
15	4	4.1	6.95	0.28	10.53	14.51	excess of stems
15	4	4.1	6.94	0.75	9.33	18.96	o. k.
10	4	3.7	6.68	0.54	9.45	16.81	o. k.
13	4	4.7	6.94	0.51	9.18	16.39	o. k.
13	4	4.1	6.83	0.53	9.45	17.75	o. k.

All the brands bore a statement of net weight, two brands, **7151** and **7130**, showing respective deficiencies of 0.4 and 0.3 oz. in 4 oz. packages. The price of the 4 oz. packages ranged from 10 to 15 cents, that of the 2 oz. from 5 to 10 cents.

MUSTARD.

U. S. Standard. "A powder made from mustard seed, with or without the removal of the hulls and a portion of the fixed oil, and contains not more than 2.5 per cent of starch and not more than 8 per cent of total ash."

TABLE X:—

Station No.	Manufacturer and Brand.
	Not found adulterated.
7139	Acker, Merrall and Condit Co., New York
7174	Austin, Nichols and Co., New York. Republic Brand
7149	James Butler, New York. Peerless Brand
7076	Clark, Chapin and Bushnell, New York. Elite Brand
6697	J. and J. Colman, London. Double Superfine
7128	Andrew Davey, New York. Atlas Brand
7097	Davey Bros., Bridgeport
7172	Lewis De Groff and Son, New York. Health Brand
7090	Direct Importing Co., Boston, Mass. Benefit Brand
6744	E. R. Durkee and Co., New York. Gauntlet Brand
7122	East India Tea Co., South Norwalk
7181	B. Fischer and Co., New York. English Style
7153	B. Fischer and Co., New York. Strictly Pure
7169	Edwin J. Gillies and Co., New York. Tiger Head Brand
6756	Grand Union Tea Co., Brooklyn, N. Y.
6714	Great Atl. and Pac. Tea Co., Jersey City, N. J. Red Front Brand
7163	Edw. E. Hall and Son, New Haven. English
7080	Howland's, Bridgeport. Howco Brand
7041	The E. S. Kibbe Co., Hartford
7156	Francis H. Leggett and Co., New York. Premier Brand
7060	Chas. G. Lincoln and Co., Hartford. Capitol Mills Brand
7074	Lincoln, Seyms and Co., Hartford. Union Club Brand
6750	Logan Bros. Co., New Haven. L.B.C. Brand
6687	The Mohican Co., New York. Mohican Brand
7126	Seeman Bros., New York. White Rose Brand
7034	D. and L. Slade Co., Boston, Mass.
7106	Union Pacific Tea Co., New York. Sovereign Brand
6693	James Van Dyck Co., New York. Ambassador Brand
7094	Village Store Co., Bridgeport. Mardor Brand
7039	The Williams and Carleton Co., Hartford

* No artificial color in any of the samples.
† Contained traces of charlock.

All of the 30 samples satisfied this standard. Nine of the samples contained traces of charlock, but this was deemed an accidental, rather than an intentional, adulteration.

Again the extreme liberality of the standard is shown when it is compared with the average composition of these commercial brands. Of the 30 samples only three show over one per cent of starch, while the standard permits 2.5 per cent.

MUSTARD.*

Cost per package.	Net Weight. Claimed.	Net Weight. Found.	Ash.	Starch.	Microscopical Examination.
cts.	oz.	oz.			
15	4	4.0	5.74	0.17	o. k.
8	3.2	3.5	5.16	0.84	†
12	4	4.1	5.41	0.73	†
10	4	4.2	5.28	0.28	o. k.
16	4	4.1	4.60	0.11	o. k.
10	4	4.3	5.47	0.37	†
10	3	3.6	4.78	0.68	†
10	4	4.0	5.34	0.56	o. k.
7	4	4.0	7.63	1.95	o. k.
10	3	3.4	4.82	0.45	o. k.
10	4	3.9	4.38	0.68	o. k.
5	1.75	2.0	4.49	0.56	†
10	2	2.2	5.93	0.56	o. k.
10	4	4.1	5.06	0.73	o. k.
10	2.75	2.8	5.41	0.11	o. k.
7	4	4.0	5.55	1.29	o. k.
15	4	3.8	4.33	trace	o. k.
10	4	4.1	5.08	0.11	o. k.
10	4	4.2	5.70	0.60	o. k.
10	4	4.1	4.83	0.17	o. k.
10	4	3.8	5.98	0.58	o. k.
10	4	4.1	5.60	0.59	o. k.
10	4	4.3	5.32	0.72	†
10	4	4.2	5.02	0.91	†
15	4	4.3	5.33	0.50	o. k.
10	3	3.1	5.20	1.07	†
10	2	2.8	4.48	0.39	o. k.
12	4	4.2	5.03	0.37	o. k.
10	4	4.1	4.88	0.43	†
10	4	3.9	5.38	0.90	o. k.

	Average.	Standard.
Ash	5.91	8
Starch	0.58	2.5

All the samples bore a statement of net weight, which was practically satisfied in all cases. The cost of 4 oz. packages ranged from 7 to 15 cents.

TABLE XI:—

Station No.	Manufacturer and Brand.	Cost per package.	Net Weight. Claimed.	Net Weight. Found.	Ash. Total.	Ash. Insoluble in acid.	Crude Fiber.	Starch.	Non-volatile ether extract.	Microscopical Examination.
		cts.	oz.	oz.						
	Not found adulterated.									
7140	Acker, Merrall and Condit Co., New York	10	4	4.2	6.37	1.41	10.75	39.82	8.08	o. k.
6703	Austin, Nichols and Co., New York. Republic Brand	9	4	4.2	5.06	0.57	13.23	35.44	7.29	o. k.
7058	Austin, Nichols and Co., New York. Sunbeam Brand	10	3	3.1	6.53	1.23	11.68	37.63	7.76	o. k.
7112	A. F. Beckmann and Co., New York. Crown Aster Brand	10	4	3.9	6.33	0.96	12.55	36.73	7.41	o. k.
6683	Bennett, Simpson and Co., New York. (Genuine Malabar.)	14	4	4.1	4.02	0.16	12.15	39.78	6.86	o. k.
6712	A. C. Blenner and Co., New Haven. Diamond Brand	10	1.5	1.7	6.85	1.15	13.45	35.05	8.72	o. k.
7146	James Butler, New York. Peerless Brand	10	4	4.3	6.76	1.35	12.13	35.61	7.57	o. k.
7177	Clark, Chapin and Bushnell, New York. Elite Brand	10	4	4.1	4.77	0.15	11.78	37.30	8.34	o. k.
7167	The A. Colburn Co., Philadelphia, Pa.	15	..	7.5	5.23	0.67	12.73	40.39	8.41	o. k.
7099	Davey Bros., Bridgeport	10	3	3.1	5.28	0.60	14.85	33.25	7.74	o. k.
7088	Direct Importing Co., Boston, Mass., Benefit Brand	7	3	2.9	6.15	1.18	10.40	42.58	7.64	o. k.
6741	E. R. Durkee and Co., New York. Gauntlet Brand	10	3	3.2	5.71	1.18	10.83	40.78	8.40	o. k.
7125	East India Tea Co., South Norwalk	10	3	3.0	6.64	1.50	11.20	41.40	7.71	o. k.
6757	B. Fischer and Co., New York	10	1.5	1.3	6.95	1.52	14.18	34.76	8.23	o. k.
6707	B. Fischer and Co., New York	10	2	2.0	4.70	0.08	10.33	39.88	8.50	o. k.
6754	Grand Union Tea Co., Brooklyn, N. Y.	10	2.5	2.8	6.58	1.33	13.60	34.42	7.50	o. k.
6738	Great Atl. and Pac. Tea Co., Jersey City, N. J. Red Front Brand	7	4	4.1	5.55	0.89	9.85	43.37	8.12	o. k.
6696	Edw. E. Hall and Son, New Haven. (Singapore.)	13	4	4.1	5.86	0.86	11.33	37.86	8.21	o. k.
7040	The E. S. Kibbe Co., Hartford	10	4	4.1	5.83	1.43	14.60	32.90	8.09	o. k.
7171	Francis H. Leggett and Co., New York. Premier Brand	10	4	4.1	6.62	1.43	11.10	39.38	7.62	o. k.
6749	Logan Bros. Co., New Haven. L.B.C. Brand	10	4	4.3	6.45	1.02	14.10	32.62	8.51	o. k.
6711	Miner, Read and Tullock, New Haven. Sunrise Brand	10	4	3.8	6.23	1.55	13.58	33.69	7.83	o. k.
6686	The Mohican Co., New York. Mohican Brand	10	4	4.0	5.00	0.11	11.10	38.25	7.56	o. k.
6761	D. and L. Slade Co., Boston, Mass.	10	4	3.9	5.23	0.00	11.93	38.87	7.30	o. k.
7050	Sprague, Warner and Co., Chicago. Richelieu Brand	10	2	1.9	4.98	0.18	13.48	35.89	7.23	o. k.
6699	Stickney and Poor Spice Co., Boston, Mass.	10	4	3.6	5.80	0.68	13.68	34.65	8.98	o. k.
7108	Union Pacific Tea Co., New York. Sovereign Brand	10	2	2.8	6.83	1.35	11.28	38.59	7.77	o. k.
7079	Village Store Co., Bridgeport. Mardor Brand	10	4	3.8	5.38	0.25	13.13	34.15	7.55	o. k.
	Adulterated or below standard.									
7067	Seeman Bros., New York. White Rose Brand	10	4	4.0	6.30	0.88	15.70	33.58	7.79	excess shells
6691	James Van Dyk Co., New York. Ambassador Brand	12	4	4.1	6.03	1.16	16.18	30.60	7.64	excess shells
7077	Ross W. Weir and Co., New York. Tiger Head Brand	10	4	4.0	6.08	0.93	17.05	28.24	8.53	excess shells
7164	The Williams and Carleton Co., Hartford. Williams' Brand	10	3	3.2	7.15	1.79	11.58	39.71	8.10	o. k.

BLACK PEPPER.

U. S. Standard. "The dried immature berry of *Piper nigrum,* and contains not less than 6 per cent of non-volatile ether extract, not less than 25 per cent of starch, not more than 7 per cent of total ash, not more than 2 per cent of ash insoluble in hydrochloric acid, and not more than 15 per cent of crude fiber."

BLACK PEPPER.

Twenty-eight of the 32 samples satisfied this standard. **7164** contained an excess of ash, while **7067, 6691** and **7077** contained excessive pepper shells. The standard is so liberal as regards crude fiber that manufacturers at times take advantage of it by adding ground pepper shells to a high-grade pepper, a practice which of course constitutes adulteration, although the sample may meet the standard's requirements.

A comparison of the average composition of the unadulterated samples with the standard shows that the latter is in great need of revision, particularly as regards insoluble ash, crude fiber and starch:

	Average.	Standard.
Ash, total	5.85	7
Ash, acid-insoluble	0.89	2
Crude fiber	12.32	15
Starch	37.32	25
Non-volatile ether extract	7.90	6

All but one of the samples, **7167,** bore the required statement of net weight. All but two of these were full-weight, **6757** showing a shortage of 0.2 oz. with 1.5 oz. claimed, and **6699** a shortage of 0.4 oz. in a 4 oz. package. The cost of 4 oz. packages ranged from 7 to 14 cents, whereas the two 1.5 oz. samples each cost 10 cents.

Cayenne Pepper.

U. S. Standard. "The dried ripe fruit of *Capsicum frutescens, C. baccatum,* or some other small-fruited species of *Capsicum,* and contains not less than 15 per cent of nonvolatile ether extract, not more than 6.5 per cent of total ash, not more than 0.5 per cent of ash insoluble in hydrochloric acid, not more than 1.5 per cent of starch, and not more than 28 per cent of crude fiber."

Only 8 of the 28 samples satisfied this standard. All but one of the deficient samples showed an excess of acid-insoluble ash (sand). **6702, 6706, 6694, 7064** and **6710** showed also an excess of total ash. **7166, 7089** and **7091** showed high total ash, high insoluble ash and low nonvolatile ether extract. **7121, 6688** and **7109** were deficient in nonvolatile ether extract, **7166** and **7109** showing the unusually low percentages of 9.22 and 6.57, respectively: the last named sample also showed an excess of starch. **7107** was adulterated with cereal starch, containing nearly four times as much starch as permitted by the standard.

Apparently the cayenne pepper coming into our ports is frequently very dirty and manufacturers have some difficulty in cleaning it sufficiently to meet the standard. In spite of the criticism often heard that this standard is too exacting it is evident from the analyses here reported that certain manufacturers are able to meet it without charging the consumer excessive prices for the purified spice. This fact is clearly shown by the average composition of the standard and sub-standard spices.

	Standard.	Sub-standard.
Ash, total	5.84	6.48
Ash, acid-insoluble	0.36	0.79
Crude fiber	24.37	24.25
Starch	1.17	1.13*
Non-volatile ether extract	16.59	15.50

All but one of the samples, **7166,** bore the required statement of net weight. Three samples showed a decided shortage, **7121** 0.5 oz. in a 4 oz., **6706** 0.2 oz. in a 2 oz., and **6694** 1.1 oz. in a 3 oz. package; the last named brand contained only about one-third of the weight claimed. The cost of 4 oz. packages ranged from 7 to 15 cents, that of 2 oz. from 5 to 10 cents.

White Pepper.

U. S. Standard. "The dried mature berry of *Piper nigrum,* from which the outer coating, or the outer and inner coatings, have been removed, and contains not less than 6 per cent of nonvolatile ether extract, not less than 50 per cent of starch, not more than 4 per cent of total ash, not more than 0.5 per cent of ash insoluble in hydrochloric acid, and not more than 5 per cent of crude fiber."

Twenty-four of the 28 samples satisfied this standard. **7061** exceeded the limit for total ash and acid-insoluble ash, while **7098, 6704** and **7043** contained excessive fiber due to an excess of pepper shells.

The average composition of the unadulterated samples as compared with the standard is shown below. The standard for total ash and insoluble ash is far too liberal.

	Average.	Standard.
Ash, total	1.69	4
Ash, acid-insoluble	0.16	0.5
Crude fiber	3.79	5
Starch	57.92	50
Non-volatile ether extract	8.20	6

* Excluding **7107.**

TABLE XII:—

Station No.	Manufacturer and Brand.
	Not found adulterated.
7178	Clark, Chapin and Bushnell, New York. Elite Brand
6743	E. R. Durkee and Co., New York. Gauntlet Brand
6739	Great Atl. and Pac. Tea Co., Jersey City, N. J. Red Front Brand
7155	Francis H. Leggett and Co., New York. Premier Brand
7033	The E. S. Kibbe Co., Hartford
6713	Miner, Read and Tullock, New Haven. Sunrise Brand
7135	R. C. Williams and Co., New York. Royal Scarlet Brand Paprika
7117	The Williams and Carleton Co., Hartford. Williams' Brand
	Adulterated or below standard.
7136	Acker, Merrall and Condit Co., New York
6702	Austin, Nichols and Co., New York. Republic Brand
7150	James Butler, New York. Peerless Brand
7166	†The A. Colburn Co., Philadelphia, Pa.
7131	Andrew Davey, New York. Atlas Brand
7100	Davey Bros., Bridgeport
7089	Direct Importing Co., Boston, Mass. Benefit Brand
7121	East India Tea Co., South Norwalk
6706	B. Fischer and Co., New York
6752	Grand Union Tea Co., Brooklyn, N. Y.
6694	Edw. E. Hall and Son, New Haven. (Zanzibar.)
7064	Chas. G. Lincoln and Co., Hartford. Capitol Mills Brand
6746	Logan Bros. Co., New Haven. L.B.C. Brand
6688	The Mohican Co., New York. Mohican Brand
7042	Seeman Bros., New York. White Rose Brand
6710	Serv-us Pure Food Co., New York. Serv-us Brand
7107	Union Pacific Tea Co., New York. Sovereign Brand
6690	James Van Dyk Co., New York. Ambassador Brand
7091	Village Store Co., Bridgeport. Mardor Brand
7109	No manufacturer given (Sold by Erberle's Delicatessen, Bridgeport)

* No artificial color in any sample.
† Sample caked.

All but two of the samples bore the required statement of net weight. **7085** was short by 0.6 oz. in a 3 oz. package. The cost of 4 oz. packages ranged from 9 to 15 cents.

SAGE.

In the absence of a standard for this seasoning material we hesitate to class any of the samples as adulterated. Sage is usually classified commercially according to the amount of stems present, as stemless, fancy picked, and ordinary grinding sage. In such a classification the amount of crude fiber would be an important criterion for judgment.

Various authorities have found the ash of commercial sage to range from 3.8 to 8.8 per cent. It will be noted from the table that ten of our samples exceed this maximum. **7120** with

CAYENNE (RED) PEPPER.*

Cost per package.	Net Weight. Claimed.	Net Weight. Found.	Ash. Total.	Ash. Insoluble in acid.	Crude Fiber.	Starch.	Non-volatile ether extract.	Microscopical Examination.
cts.	oz.	oz.						
10	2	2.2	6.00	0.41	25.55	0.51	17.48	o. k.
13	3	3.1	5.27	0.38	24.95	1.29	16.82	o. k.
7	4	4.3	5.79	0.31	25.38	1.25	15.63	o. k.
10	4	4.1	5.63	0.39	25.03	1.07	17.26	o. k.
10	4	4.1	6.24	0.16	23.58	1.46	15.17	o. k.
5	1.5	2.0	6.24	0.46	23.95	1.46	15.89	o. k.
10	1	1.6	7.91	0.70	19.63	2.03	13.99	o. k.
10	4	4.0	5.67	0.43	22.18	1.13	17.88	o. k.
16	4	4.2	5.49	0.66	23.04	0.96	19.31	o. k.
9	4	4.3	6.73	0.72	23.48	0.93	17.26	o. k.
12	4	3.8	5.99	0.66	23.25	0.90	18.55	o. k.
15	..	8.0	6.54	0.82	26.88	0.53	9.22	o. k.
10	4	3.9	5.84	0.51	24.85	1.13	18.29	o. k.
10	3	3.0	5.88	0.53	24.13	1.18	17.69	o. k.
7	3	3.1	7.10	0.68	24.25	0.96	13.34	o. k.
15	4	3.5	5.66	0.54	26.28	1.18	13.70	o. k.
10	2	1.8	7.71	1.89	24.13	1.35	16.60	o. k.
13	2.5	2.8	6.43	1.10	27.95	1.13	16.04	o. k.
15	3	1.9	8.22	1.08	25.25	0.84	15.11	o. k.
10	4	4.0	6.73	0.65	24.58	1.29	15.75	o. k.
13	4	4.3	6.31	0.56	21.80	1.46	16.78	o. k.
10	4	4.3	5.10	0.31	18.20	1.01	13.10	o. k.
10	4	3.9	5.71	0.56	23.68	1.29	19.07	o. k.
10	3	3.2	8.34	1.17	21.83	1.24	15.26	o. k.
10	2	2.9	6.33	1.25	24.15	5.57	15.37	cereal starch
15	4	4.1	5.78	0.69	24.00	1.43	18.05	o. k.
10	4	4.2	7.43	0.80	26.45	0.90	14.84	o. k.
5	2	1.9	6.38	0.53	26.78	1.69	6.57	o. k.

TABLE XIII:—

Station No.	Manufacturer and Brand.
	Not found adulterated.
7138	Acker, Merrall and Condit Co., New York
7113	A. F. Beckmann and Co., New York. Crown Aster Brand
6684	Bennett, Simpson and Co., New York. (Tellicherry.)
7148	James Butler, New York. Peerless Brand
7175	Clark, Chapin and Bushnell, New York. Elite Brand
7132	Andrew Davey, New York. Atlas Brand
7085	Direct Importing Co., Boston, Mass. Benefit Brand
6709	E. R. Durkee and Co., New York. Gauntlet Brand
6708	B. Fischer and Co., New York
7078	Edwin J. Gillies and Co., New York
7168	Edwin J. Gillies and Co., New York. Tiger Head Brand
6751	Grand Union Tea Co., Brooklyn, N. Y.
6715	Great Atl. and Pac. Tea Co., Jersey City, N. J. Red Front Brand
6695	Edw. E. Hall and Son, New Haven. (Tellicherry)
7075	Lincoln, Seyms and Co., Hartford. Union Club Brand
6747	Logan Bros. Co., New Haven. L.B.C. Brand
7083	Miner, Read and Tullock, New Haven. Sunrise Brand
6689	The Mohican Co., New York. Mohican Brand
7072	D. and L. Slade Co., Boston, Mass.
7051	Sprague, Warner and Co., Chicago. Richelieu Brand
6698	Stickney and Poor Spice Co., Boston, Mass.
7105	Union Pacific Tea Co., New York. Sovereign Brand
6692	James Van Dyk Co., New York. Ambassador Brand
7092	Village Store Co., Bridgeport. Mardor Brand
	Adulterated or below standard.
6704	Austin, Nichols and Co., New York. Republic Brand
7098	Davey Bros., Bridgeport
7061	Chas. G. Lincoln Co., Hartford. Capitol Mills Brand
7043	Seeman Bros., New York. White Rose Brand

15.86 per cent of ash is certainly abnormal in this respect; the high ash is apparently due to excessive stems rather than to sand, as the insoluble ash amounts to only 0.58 per cent.

The crude fiber also shows a wide range, from 13.72 to 24.35 per cent. The samples group themselves into two fairly well-defined classes in respect to crude fiber, one showing from 13.72 to 18.92, the other from 19.92 to 24.35 per cent. The samples of whole leaves show a much lower fiber than most of the

WHITE PEPPER.

Cost per package.	Net Weight. Claimed.	Net Weight. Found.	Ash. Total.	Ash. Insoluble in acid.	Crude Fiber.	Starch.	Non-volatile ether extract.	Microscopical Examination.
cts.	oz.	oz.						
15	4	4.1	1.43	0.13	4.00	56.08	7.12	o. k.
10	4	3.9	1.08	0.10	3.20	58.11	7.24	o. k.
15	4	3.9	1.16	0.12	3.42	59.68	7.46	o. k.
12	4	4.2	2.25	0.24	4.28	54.96	7.32	o. k.
15	4	4.0	1.13	0.17	3.88	56.59	7.27	o. k.
10	4	4.0	1.48	0.19	3.98	57.77	7.54	o. k.
8	3	2.4	3.50	0.35	4.90	57.40	6.57	o. k.
13	3	3.1	1.67	0.05	1.63	58.84	9.45	o. k.
10	..	2.9	2.00	0.12	1.60	61.48	8.82	o. k.
10	4	4.0	1.43	0.25	4.63	55.69	7.08	o. k.
10	..	2.0	1.88	0.28	4.45	57.15	7.19	o. k.
13	2.5	2.8	1.36	0.11	4.95	61.48	7.42	o. k.
7	4	4.2	1.27	0.21	3.93	56.92	7.53	o. k.
15	4	4.0	1.42	0.17	3.75	57.55	7.43	o. k.
10	4	3.9	3.95	0.35	4.70	56.70	7.23	o. k.
13	4	4.0	1.72	0.14	4.08	57.38	6.83	o. k.
5	1.5	1.7	1.40	0.18	4.43	56.02	7.02	o. k.
10	4	4.1	1.46	0.16	4.08	56.76	6.47	o. k.
10	3	3.6	1.15	0.10	4.05	59.96	7.63	o. k.
10	2	2.1	1.25	0.03	4.68	64.41	7.63	o. k.
10	3	2.9	1.68	0.26	4.40	56.14	7.48	o. k.
10	2	3.0	1.48	0.13	4.10	56.42	6.38	o. k.
12	4	4.0	1.45	0.10	3.25	60.19	6.95	o. k.
10	4	4.0	1.68	0.13	4.70	56.42	7.73	o. k.
9	4	4.1	2.95	0.24	5.25	51.75	6.96	excess shells
10	3	3.0	2.40	0.08	6.40	52.14	7.02	excess shells
10	4	4.0	4.33	0.65	4.13	55.47	7.14	o. k.
10	4	3.9	2.00	0.13	5.25	54.45	8.24	excess shells

ground samples, suggesting that many of the latter contain more than the normal amount of stems.

The ether extract also shows a considerable range, not so wide, however, as with the other ingredients. The total extract ranged from 10.11 to 15.14, the non-volatile from 9.23 to 13.86, and the volatile from 0.88 to 2.11 per cent.

It is worthy of note that the single imported sample, and one presumably of high quality, put up by Crosse and Blackwell,

TABLE XIV:—

Station No.	Manufacturer and Brand.
	Whole leaves.
7120	W. Burton and Co., New York
7047	Crosse and Blackwell, London, Engl.
7127	John S. Sills and Sons, New York
	Ground leaves.
7142	Acker, Merrall and Condit Co., New York
7070	Austin, Nichols and Co., New York. Sunbeam Brand
7159	Bennett, Simpson and Co., New York
7046	The Wm. Boardman and Sons Co., Hartford
7145	James Butler, New York. Peerless Brand
7049	E. R. Durkee and Co., New York. Gauntlet Brand
7052	B. Fischer and Co., New York
7180	B. Fischer and Co., New York
7035	Grand Union Tea Co., Brooklyn, N. Y.
7160	Edw. E. Hall and Son, New Haven
6760	The E. S. Kibbe Co., Hartford
7059	Chas. G. Lincoln and Co., Hartford. Capitol Mills Brand
7082	Miner, Read and Tullock, New Haven. Sunrise Brand
7073	D. and L. Slade Co., Boston, Mass.
7054	Stickney and Poor Spice Co., Boston, Mass.
7103	Union Pacific Tea Co., New York. Sovereign Brand
7115	The Williams and Carleton Co., Hartford. Williams' Brand
	Maximum
	Minimum
	Average

contained minimum amounts of ash and crude fiber and by far the largest amount of volatile ether extract.

The writer has suggested to the U. S. Government the following tentative standard for this material:

"Sage is the dried leaf of *Salvia officinalis* L.; and contains not less than 1 per cent of volatile ether extract, not more than 10 per cent of total ash, not more than 1 per cent of ash insoluble in hydrochloric acid, and not more than 20 per cent of crude fiber."

This standard appears to be a liberal one, yet of the 20 samples examined 4 fail to meet its requirements for total ash, 2

SAGE.

Station No.	Cost per package.	Net Weight. Claimed.	Net Weight. Found.	Ash. Total.	Ash. Insoluble in acid.	Crude Fiber.	Ether Extract. Total.	Ether Extract. Non-volatile.	Ether Extract. Volatile.
	cts.	oz.	oz.						
7120	3	..	0.5	15.86	0.58	13.92	13.55	11.77	1.78
7047	20	1.5	2.0	7.87	0.35	13.89	14.25	12.14	2.11
7127	5	..	0.7	9.48	0.65	16.94	15.14	13.86	1.28
7142	10	4	4.3	8.30	0.45	20.10	13.28	12.22	1.06
7070	10	2	2.2	8.53	0.60	13.72	14.65	13.49	1.16
7159	20	4	3.8	7.33	0.10	24.23	11.64	10.60	1.04
7046	10	4	3.7	8.09	0.62	22.60	10.39	9.41	0.98
7145	3	..	0.7	10.02	1.79	15.40	14.33	13.24	1.09
7049	10	1.25	1.3	8.30	0.57	20.72	12.46	11.03	1.43
7052	9	2	2.1	9.91	0.96	16.32	13.91	12.50	1.41
7180	5	1.75	1.4, 1.5, 1.3	8.55	0.33	24.05	10.11	9.23	0.88
7035	10	2.5	2.6, 3.2	8.89	0.68	18.92	11.89	10.75	1.14
7160	20	?	2.2	10.59	1.01	22.32	12.70	11.81	0.89
6760	10	4	4.1	9.08	0.66	19.92	11.33	10.13	1.20
7059	10	3	3.1	7.64	0.51	24.35	10.61	9.62	0.99
7082	10	4	4.2	9.04	0.53	20.90	11.75	10.72	1.03
7073	10	2	2.1	9.87	0.65	14.62	12.75	11.74	1.01
7054	15	4	4.3	10.00	0.85	18.17	13.03	12.10	0.93
7103	10	1	2.5	8.80	0.51	20.71	10.74	9.83	0.91
7115	10	4	4.1	8.28	0.51	22.05	12.39	11.34	1.05
	..	..	..	**15.86**	**1.79**	**24.35**	**15.14**	**13.86**	**2.11**
	..	..	..	**7.33**	**0.10**	**13.72**	**10.11**	**9.23**	**0.88**
	..	..	..	**9.22**	**0.65**	**19.19**	**12.55**	**11.38**	**1.17**

for insoluble ash, 10 for crude fiber and 4 for volatile ether extract.

Three of the samples bore no statement of net weight, and on one the statement was too indistinct to be read. The only serious shortages were noted in the three packages of **7180**, for which 1.75 oz. was claimed, but which contained only 1.4, 1.5 and 1.3 oz. The prices asked were very variable, 3 cents for 0.5 oz.; from 5 to 20 cents for 1.5 oz.; and from 10 to 20 cents for either 2 or 4 oz.

THYME.

The U. S. Government has adopted the following tentative standard for thyme:—"Not more than 14 per cent of total ash, not more than 4 per cent of ash insoluble in hydrochloric acid, and not less than 1 per cent of volatile ether extract."

Judged by this standard 10 samples contained an excess of total ash, 12 an excess of acid-insoluble ash, and all but 2 were deficient in volatile ether extract.

Especial attention is called to **7053** and **7162**, which contained very high percentages of ash due to the presence of abnormal amounts of sand, 7.82 and 9.29 per cent, respectively; these samples likewise showed a marked deficiency in volatile ether extract.

TABLE XV:—

Station No.	Manufacturer and Brand.
	Whole leaves.
7144	James Butler, New York. Peerless Brand
7036	Grand Union Tea Co., Brooklyn, N. Y.
	Ground leaves.
7143	Acker, Merrall and Condit Co., New York
7081	Austin, Nichols and Co., New York. Sunbeam Brand
7158	Bennett, Simpson and Co., New York
7044	Bennett, Simpson and Co., New York
7069	The A. Colburn Co., Philadelphia, Pa.
6758	E. R. Durkee and Co., New York. Gauntlet Brand
7053	B. Fischer and Co., New York
7179	B. Fischer and Co., New York
7170	Edwin J. Gillies and Co., New York. Tiger Head Brand
7162	Edw. E. Hall and Son, New Haven
7063	Lincoln, Seyms and Co., Hartford
7084	D. and L. Slade Co., Boston, Mass.
7055	Stickney and Poor Spice Co., Boston, Mass.
7116	The Williams and Carleton Co., Hartford. Williams' Brand
	Maximum
	Minimum
	Average

Five of the samples bore no statement of net weight. Prices of 10 cents for either 2 or 4 oz. prevailed.

DOVITAM.

5578. *Dovitam* (I give life), White King Squab Products Co.; Vineland, N. J.: Price 25 cents for 5.7 oz.; (= 5.3 fl. oz.) A turbid liquid with solidified fatty particles.

Solids	3.47
Total nitrogen	0.26
Protein (N x 6.25)	1.63
Ash	0.21
Phosphoric acid in ash	0.07
Lecithin phosphoric acid	0.014
Fat	1.66

THYME.

Cost per package.	Net Weight. Claimed.	Net Weight. Found.	Ash. Total.	Ash. Insoluble in acid.	Crude Fiber.	Ether Extract. Total.	Ether Extract. Non-volatile.	Ether Extract. Volatile.
cts.	oz.	oz.						
3	..	0.7	13.85	3.86	18.64	8.72	7.98	0.74
10	1.5	1.7	16.41	5.30	18.67	9.75	8.96	0.79
10	4	4.1	15.20	4.80	17.90	8.88	8.30	0.58
10	4	4.3	13.90	4.17	16.65	9.03	8.16	0.87
10	4	4.1	11.07	2.41	17.97	10.72	9.98	0.74
10	..	4.2	16.14	4.56	14.52	7.22	6.43	0.79
9	2	2.8	17.14	4.35	17.27	7.75	7.05	0.70
10	2	2.2	13.94	3.92	19.55	9.75	9.07	0.68
9	2	2.0	19.83	7.82	15.17	8.39	7.72	0.67
5	..	1.5	13.94	3.74	17.61	8.34	7.69	0.65
10	4	4.0	15.56	4.58	17.98	8.66	7.88	0.78
20	4	2.9	21.47	9.29	13.48	4.91	4.56	0.35
10	..	2.9	13.70	4.18	17.57	8.09	7.09	1.00
10	2	2.0	17.81	6.99	20.24	7.51	6.83	0.68
10	..	2.0	15.75	6.05	16.55	8.86	7.80	1.06
10	4	4.4	18.56	6.51	16.47	8.48	7.78	0.70
..	..	..	21.47	9.29	20.24	10.72	9.98	1.06
..	..	..	11.07	2.41	13.48	4.91	4.56	0.35
..	..	..	15.89	5.16	17.27	8.44	7.70	0.74

In discussing this product it is necessary to quote some of the statements of the label and the circular accompanying the sample.

"*Dovitam* is a highly nutritious liquid food prepared from four week old White King squabs by a process devised after lengthy experimentation in the department of food chemistry of a leading Eastern university.

"The method of preparation renders available in a most palatable and assimilable form, organic phosphorus, marrow fat, protein and the mineral salts of the bony structures. *Dovitam* is, therefore, a powerful reconstructive, presenting the more important principles of the body tissues, differing from beef extracts and other excrementitious products in that it is rich in protein, fat and other constituents of the human economy. An analysis of an average sample shows it to contain, per six ounces:

"Lecithin		3.00 grains
Phosphate of lime	65.66	
Phosphate of potash	14.08	
Phosphate of soda	11.60	
Phosphate of magnesia	4.19	0.24%
Phosphate of iron	1.11	
Sulphate of potash	1.04	
Chlorid of soda	0.90	
Undetermined (silica)	1.42	
Protein		1.44%
Fat		3.18%

"*Dovitam* is a Natural, healthful product, containing most important nutritive principles. Its food value is very high as may be seen by the following table:

	Calories per lb.
"Guinea hen	865
Chicken broiler	880
Quail	945
Squab	1470

"*Dovitam* is indicated in the case of impaired vitality and all wasting diseases, in Anaemia, Malnutrition, in nerve and body weakness of the aged, and in the case of delicate children, who need the greatest amount of nourishment with the least possible digestive effort.

"*Dovitam* insures rapid convalescence because of its high Lecithin (organic phosphorus) content and its unusual assimilability."

The following are extracts from published testimonials accompanying the sample:

"In cases of Tuberculosis, Marasmus and other wasting diseases the results obtained have been extraordinarily good." "Regarding Mrs. ———, a case of pulmonary tuberculosis, I am pleased to report that I am using *Dovitam* with almost unbelievable results." "I am convinced that the food value of *Dovitam* is beyond question superior to any of the so called 'foods.'"

In another case of acute miliary tuberculosis the obliging physician testifies as follows:

"About this time *Dovitam* was called to my attention, and after consideration of its analysis decided to administer it to the patient. Two cans of *Dovitam* were ordered per day. Up to the present she had gained 26¾ lbs. (three months) and I regard this case as completely arrested."

The misleading form in which the Company's analysis of the product at once raises suspicion as to its value as a food. The jumbling of values in grains and percents, and the percentage analysis of the ash, are most confusing even to one accustomed to chemical data. The lecithin claimed amounts to three grains per six ounces, or if properly expressed to 0.114 per cent, a much less imposing figure. The ash amounts to only 0.21 per cent, which likewise takes away most of the significance from the 65.66 per cent of phosphate of lime, this meaning of course 65.55 per cent of the ash and not of the original material. Assuming that the Company's ash analysis is correct, and assuming that all the nitrogen is present in the form of protein (a somewhat generous assumption), the following would be a proper statement of its composition in the general form used by the Company:

	%
Lecithin phosphoric acid	0.014
Phosphate of lime	0.138
Phosphate of potash	0.030
Phosphate of soda	0.024
Phosphate of magnesia	0.009
Phosphate of iron	0.002
Sulphate of potash	0.002
Chlorid of soda	0.002
Undetermined (silica)	0.003
Protein	1.63
Fat (including lecithin)	1.66
Water	96.53

The importance of the ash analysis entirely disappears when expressed in this proper form, the fat is seen to be only about one-half the amount claimed, and the water percentage, 96.53, shows with what an extremely attenuated food product we are dealing.

The expression of the calorific values of different forms of poultry is also misleading. The high value given for squabs of course refers to the whole edible portion of the bird (exclusive of giblets) and not to an extremely dilute extract of a part of it, as is *Dovitam.* Instead of the 1470 calories per pound as claimed for squabs, *Dovitam* would yield 97.

The "high lecithin" content of *Dovitam* is quite imaginary, as it contains only 0.014 per cent of lecithin phosphoric acid.

The testimonials regarding its value in the feeding of tuberculosis patients would be more convincing if more details were given. In the Company's circular it is stated that *Dovitam*

"may also be given with rice, barley, instant tapioca or easily digested vegetables, macaroni, spaghetti, milk or cream, etc."

If the physicians whose testimonials are quoted used *Dovitam* in connection with the above-named foods, it is not improbable that some favorable results might have been secured, but such results would have been due to the nutritious foods supplied and not to this watery infusion of squab juice. *Dovitam* may possess some value as an appetizer and a stimulant, but for nutritive purposes our analysis indicates that it would be almost as valueless as meat extract, of which it is in reality a species.

VEGETABLE EXTRACTS.

1932. *Milennium Extract,* The Milennium Food Co., Boston. "Not made from flesh." Price 60 cents for 4.3 oz.

5535. *Savora Vegetable Meat Extract,* The Kellogg Food Co.: Battle Creek, Mich. Price 50 cents for 16.6 oz.

	1932	5535
Moisture	26.13	25.09
Total nitrogen	5.67	3.37
Ash	26.39	42.87
Chlorin	8.70	20.97
= Sodium chlorid	14.36	34.60
Creatinin	none	none
Nitrates	none	none

These products are both vegetable extracts of the yeast extract type, and contain no meat extract. Such products, like meat extract, have but little food value, and their main usefulness lies in their stimulating and appetizing qualities. They are by no means inexpensive products. It will be noted that the Kellogg extract contains nearly 60 per cent of water and common salt. Its brand name, "Vegetable Meat Extract," is improper and contradictory.

II. DRUG PRODUCTS.

DRUGS FROM STOCKS OF DISPENSING PHYSICIANS.

An amendment to the Food and Drug Act passed at the last session of the Legislature authorized the Dairy and Food Commissioner to examine the drugs dispensed by physicians throughout the state. Obviously it was impossible to sample in a single inspection all the drugs kept in stock by such physicians, and our attention was first directed to drugs sold by the manufacturers at prices somewhat below the market or under other suspicious circumstances. One hundred and thirty-one such samples have thus far been collected by the Commissioner's agent, Mr. Benze, and the analyses of 53 of these, all that have been completed, are reported herewith. Of the samples 41 were tablets or pills, while 12 were liquid preparations, the latter appearing to be dispensed comparatively rarely by physicians. It is very satisfactory to record the almost universal courtesy with which the agent was received by the different physicians, and the spirit of coöperation manifested. The samples represent 26 classes of preparations made by 17 manufacturers. The names and addresses of the firms represented and the drugs attributed to each are shown below.

Bristol Myers Co., Brooklyn, N. Y.
- Strychnin sulphate.
- Antiseptic Tablets.
- Sol. Pept. Iron and Manganese.

Buffington Pharm. Co., Worcester, Mass.
- Sol. Pept. Iron and Manganese.

C. P. Cippola, Bridgeport.
- Tinct. Iodin.

Daggett & Miller Co., Providence, R. I.
- Formin (2).
- Phenolphthalein.
- Calomel and Phenolphthalein.

The Drugs Products Co., New York.
- Calomel and Soda.

The G. F. Harvey Co., Saratoga Springs, N. Y.
- Blaud's Compound No. 9.
- Digestive Aromatic Tablets.
- Headache Pills.
- Migrain Citrated Tablets.

The Harvey Co., Saratoga Springs, N. Y.
- Calomel and Soda.
- Nitroglycerin (2).
- Tablet Triturates Paregoric.

Independent Pharm. Co., Worcester, Mass.
- Elix. Iron and Manganese Peptonates.

The National Drug Co., Philadelphia.
- Calomel (2).
- Fowler's Solution.
- Elix. Pepsin Lactated No. 2.
- Hexamethylene tetramine.

The Norwich Co., Norwich, N. Y.
- Corrosive sublimate.

The Norwich Pharmacal Co., Norwich, N. Y.
- Formin.

Tailby-Nason Co., Boston.
- Tabs. Salparettes.
- Elix. Iron, Quinin and Strychnin.
- Aspirin.
- Quinin sulphate.
- Syr. Codein Compound.

The Tilden Co., New Lebanon, N. Y.
- Syr. Iodid of Iron.
- Elix. Iron, Quinin and Strychnin (2).

The Tracy Co., New London, Conn.
- Quinin sulphate.
- Antiseptic Tablets No. 1.
- Hepatic Tablets No. 2.
- Sedative Tablets.
- Neurosal, Tracy.
- Migrain No. 7.
- Corrosive sublimate.

Walker & Gibson, Albany, N. Y.
- Spirit of Nitre.

Yates Drug and Chemical Co., New York.
- Sodium bromid.
- Calomel and Soda.
- Migrain Tablets.
- Sodium salicylate (2).
- Antiseptic Tablets.
- Calomel.
- Headache Tablets.
- Nitroglycerin.

Manufacturer unknown.
- Acetphenetidin.

In the case of tablets at least half of the number making up the sample were weighed individually. These were then ground into a composite sample and the mixture analyzed. In certain instances only the active drug or drugs were determined, while in others a complete analysis was made.

TABLETS.

Antiseptic Tablets.

11433. *Antiseptic Tablet Triturates,* made by Bristol Myers Co.; stock of Dr. F. L. Day, Bridgeport.

Claimed per tablet. Corrosive sublimate 1.75 grs.; citric acid 0.87 gr.

Found. The weights of 25 tablets ranged from 154.9 to 187.2, average, 166.9 mgms. These contained 65.22 per cent of corrosive sublimate, or from 1.56 to 1.88 grs.; average, 1.68 grs. per tablet.

Tablets satisfactory.

11423. *Corrosive Mercuric Chlorid Tablets No. 1,* made by The Norwich Co.; stock of Dr. D. J. McCarthy, Bridgeport.

Claimed per tablet. Corrosive sublimate 7.3 grs.; ammonium muriate, 7.7 grs.

Found. The weights of 10 tablets ranged from 1004.8 to 1061.2, average, 1026.1 mgms. These contained 47.73 per cent of corrosive sublimate, or from 7.40 to 7.82, average, 7.56 grs. per tablet.

Tablets satisfactory.

11417. *Antiseptic Tablets No. 1,* made by The Tracy Co.; stock of Dr. C. F. English, New Hartford.

Claimed per tablet. Corrosive sublimate 7.3 grs.; ammonium muriate 7.7 grs.

Found. The weights of 10 tablets ranged from 1072.8 to 1157.6, average, 1124.6 mgms. These contained 44.08 per cent of corrosive sublimate, or from 7.30 to 7.87, average, 7.65 grs. per tablet.

Tablets satisfactory.

11439. *Corrosive Sublimate Tablets,* made by The Tracy Co.; stock of Dr. B. S. Barrows, Hartford.

Claimed per tablet. Corrosive sublimate 1.75 grs., citric acid 0.87 gr.

Found. The weights of 24 tablets ranged from 133.6 to 166.2, average, 145.3 mgms. These contained 60.26 per cent of corrosive sublimate, or from 1.24 to 1.54, average, 1.35 grs. per tablet.

Tablets deficient in corrosive sublimate.

11408. *Berney's Special Antiseptic Tablets,* made by Yates Drug and Chem. Co.; stock of Dr. R. W. Crane, Stamford.

Claimed per tablet. Corrosive sublimate 7 grs.; citric acid 3.48 grs.

Found. Sample consisted of 8 more or less perfect tablets and some broken fragments. The only perfect tablet weighed 782.0 mgms. The material contained 62.70 per cent of corrosive sublimate, or 7.57 grs. per tablet.

Tablets satisfactory.

Aspirin Tablets.

11416. *Aspirin Tablets* (The Sphinx Pharmaceuticals), made by Tailby-Nason Co.; stock of Dr. L. D. H. Caya, New Hartford.

Claimed per tablet. Aspirin 5 grs.

Found. The weights of 12 tablets ranged from 332.9 to 365.9, average, 352.2 mgms. These contained 90.66 per cent of aspirin and 9.00 per cent of matter insoluble in chloroform; no free salicylic acid present. The tablets, therefore, contained from 4.66 to 5.12, average, 4.93 grs. of aspirin per tablet.

Tablets satisfactory.

Blaud's Compound No. 9.

11412. *Blaud's Compound No. 9,* made by The G. F. Harvey Co.; stock of Dr. A. F. Hewitt, Bridgeport.

Claimed per tablet. Blaud's mass 5 grs.; corrosive sublimate 1/80 gr.; strychnin sulphate 1/60 gr.; arsenious acid 1/50 gr.; capsicum oleoresin 1/64 gr.; and gentian extract 1/16 gr. Blaud's mass should contain not less than 20 per cent of iron carbonate, so 5 grs. should contain at least 1 gr. of iron carbonate.

Found. The weights of 20 pills ranged from 520.8 to 562.6, average, 538.8 mgms. The sample showed the following composition:

Iron carbonate	11.09	Strychnin sulphate	0.21
Corrosive sublimate	0.13	Capsicum oleoresin	present
Arsenious acid	0.23	Gentian extract	probably

The pills therefore had the following composition in grains:

	Iron carbonate.	Corrosive sublimate.	Arsenious acid.	Strychnin sulphate.
Heaviest	0.963	0.0113	0.0200	0.0182
Lightest	0.893	0.0105	0.0185	0.0169
Average	0.922	0.0108	0.0191	0.0175
Claimed	1.000	0.0125	0.0200	0.0167

While there is a slight deficiency in corrosive sublimate, the pills as a whole may be considered satisfactory.

Calomel Tablets.

11438. *Calomel Tablets Triturates,* made by The National Drug Co.; stock of Dr. B. S. Barrows, Hartford.

Claimed per tablet. Calomel 0.25 gr.; flavored with wintergreen.

Found. The weights of 25 tablets ranged from 77.5 to 88.2, average, 83.7 mgms. These contained 17.36 per cent of calomel, or from 0.208 to 0.236, average, 0.223 gr. per tablet.

Tablets showed a slight deficiency in calomel.

11406. *Calomel Tablet Triturates,* made by The National Drug Co.; stock of Dr. J. J. Costanzo, Stamford.

Claimed per tablet. Calomel 0.10 gr.; flavored with wintergreen.

Found. The weights of 20 tablets ranged from 30.5 to 35.0, average, 32.7 mgms. These contained 18.64 per cent of calomel, or from 0.088 to 0.101, average, 0.093 gr. per tablet.

Tablets satisfactory.

11418. *Hepatic Tablets No. 2,* made by The Tracy Co.; stock of Dr. K. E. Kellogg, New Britain.

Claimed per tablet. Calomel 2 grs.; aloin 1/5 gr.; hydrastin 1/4 gr.; podophyllin 1/4 gr.; leptandrin 1/4 gr.

Found. The weights of 10 tablets ranged from 420.9 to 454.1, average, 441.9 mgms. These contained 27.65 per cent of calomel; aloin and hydrastin present; no specific tests made for podophyllin and leptandrin. The tablets contained from 1.79 to 1.94, average, 1.89 grs. of calomel.

Tablets satisfactory.

11409. *Calomel Tablets,* made by Yates Drug and Chem. Co.; stock of Dr. P. P. Vanoleet, Stamford.

Claimed per tablet. Calomel 0.10 gr.

Found. The weights of 30 tablets ranged from 30.9 to 34.9, average, 33.7 mgms. They contained 18.70 per cent of calomel, or from 0.090 to 0.101, average, 0.097 gr. per tablet.

Tablets satisfactory.

Calomel and Phenolphthalein Tablets.

11437. *Calomel and Phenolphthalein Tablets,* made by Daggett and Miller Co.; stock of Dr. D. C. Brown, Danbury.

Claimed per tablet. Calomel 0.10 gr.; phenolphthalein 0.10 gr.; aromatics q. s.

Found. The weights of 25 tablets ranged from 70.2 to 77.9, average, 75.0 mgms. They contained 8.82 per cent of phenolphthalein and 8.62 per cent of calomel, so that

	Phenolphthalein. grs.	Calomel. grs.
Heaviest contained	0.106	0.103
Lightest contained	0.095	0.093
Average contained	0.101	0.099

Tablets satisfactory.

Calomel and Soda Tablets.

11451. *Calomel and Soda Tablets No. 1,* made by The Drug Products Co.; stock of Dr. C. P. Townsend, Bridgeport.

Claimed per tablet. Calomel 0.10 gr.; sodium bicarbonate 1 gr.

Found. The weights of 35 tablets ranged from 78.9 to 88.4, average, 83.6 mgms. They contained 7.78 per cent of calomel and 77.60 per cent of sodium bicarbonate, so that

	Calomel grs.	Sodium bicarbonate. grs.
Heaviest contained	0.106	1.06
Lightest contained	0.095	0.95
Average contained	0.100	1.00

Tablets satisfactory.

11425. *Calomel and Soda Tablets No. 5,* made by The Harvey Co.; stock of Dr. Joseph Cohen, Bridgeport.

Claimed per tablet. Calomel 0.25 gr.; sodium bicarbonate 2 grs.

Found. The weights of 20 tablets ranged from 165.5 to 178.4, average, 172.6 mgms. They contained 10.15 per cent of calomel and 76.33 per cent of sodium bicarbonate, so that

	Calomel grs.	Sodium bicarbonate. grs.
Heaviest contained	0.28	2.10
Lightest contained	0.26	1.95
Average contained	0.27	2.04

Tablets satisfactory.

11402. *Calomel and Sodium Tablets No. 4,* made by Yates Drug and Chem. Co.; stock of Dr. H. F. Moore, Bethel.

Claimed per tablet. Calomel 1 gr.; sodium bicarbonate 1 gr.

Found. The weights of 25 tablets ranged from 147.2 to 175.9, average, 161.5 mgms. They contained 34.60 per cent of calomel and 39.82 per cent of sodium bicarbonate, so that

	Calomel grs.	Sodium bicarbonate. grs.
Heaviest contained	0.94	1.08
Lightest contained	0.79	0.90
Average contained	0.86	0.99

Twenty-two of 25 tablets contained less than 0.90 gr. of calomel, in other words were deficient by more than 10 per cent.

Digestive Aromatic Tablets.

11414. *Digestive Aromatic Tablets,* made by The G. F. Harvey Co.; stock of Dr. T. J. Bergin, Coscob.

Claimed per tablet. Pepsin 4 grs.; diastase 1/20 gr.; pancreatin 1/2 gr.; lactic acid 1/20 gr.

Found. The weights of 24 tablets ranged from 313.6 to 351.0, average, 335.8 mgms. The enzymatic activity of the tablets was equal to diastase and trypsin of about 20 per cent U. S. P. strength, and to pepsin from 3.6 to 5.5 per cent of U. S. P. strength.

Tablets deficient in enzymatic activity.

Headache Tablets.

11415. *Headache Pills (Saratoga Goldens),* made by The G. F. Harvey Co.; stock of Dr. Walter Hitchcock, Norwalk.

Claimed per pill. Acetanilid 2 1/8 grs.; sodium bicarbonate 1/4 gr.; caffein alkaloid 3.8 gr.; camphor monobrom. 1/4 gr.; strychnin sulphate 1/250 gr.; nitroglycerin 1/3000 gr.

Found. The weights of 10 pills ranged from 230.3 to 269.2, average (excluding single light pill), 261.4 mgms. They contained as follows:

Acetanilid	51.26	Strychnin sulphate (approx.)	0.15
Caffein	8.94	Nitroglycerin	present
Sodium bicarbonate	5.87		

The content of the tablets in grains, therefore, was as follows:

	Acetanilid.	Caffein.	Sodium bicarbonate.	Strychnin sulphate.
Heaviest	2.13	0.37	0.24	0.006(?)
Lightest	1.82	0.32	0.21	0.005(?)
Average	2.07	0.36	0.24	0.006(?)

The amount of material was too small for accurate determinations of strychnin and nitroglycerin; both were present but the figures reported for the former are only approximate.

Pills satisfactory.

11410. *Migraine Citrated Tablets No. 2,* made by The G. F. Harvey Co.; stock of Dr. W. E. Rice, Stamford.

Claimed per tablet. Acetanilid 2 grs.; camphor monobrom. 1/2 gr.; caffein citrate 1/2 gr.

Found. The weights of 10 tablets ranged from 240.2 to 249.8, average, 246.8 mgms. They contained 51.62 per cent of acetanilid and 13.40 per cent of caffein citrate (U. S. P.); camphor monobrom. present. The content of the tablets in grains was, therefore, as follows:

	Acetanilid.	Caffein citrate.
Heaviest	1.99	0.52
Lightest	1.81	0.50
Average	1.97	0.51

Tablets satisfactory.

11403. *Tab. Salparettes (Headache Powder Improved)*, made by Tailby-Nason Co.; stock of Dr. W. M. Stahl, Danbury.

Claimed per tablet. Acetanilid 3 grs.; strontium salicylate 1/2 gr.; sodium bicarbonate 1/2 gr.; celery seed, caffein.

Found. The weights of 16 tablets ranged from 441.4 to 470.8, average, 460.1 mgms. They contained

Acetanilid	42.12	Chloroform-insoluble	54.74
Strontium salicylate	8.92	Ash	13.68
Sodium bicarbonate	8.74	Celery	present
Caffein	2.10		

The content of the tablets in grains was, therefore, as follows:

	Acetanilid.	Strontium salicylate.	Sodium bicarbonate.	Caffein.
Heaviest	3.06	0.65	0.64	0.15
Lightest	2.87	0.61	0.60	0.14
Average	2.99	0.63	0.62	0.15

Tablets satisfactory.

11431. *Migraine Tablets No. 7,* made by The Tracy Co.; stock of Dr. J. H. Finnegan, Bridgeport.

Claimed per tablet. Phenacetin 2.5 grs.; caffein citrate 0.5 gr.; camphor monobrom. 1 gr.; sodium bicarbonate 1 gr.

Found. The weights of 20 tablets ranged from 260.0 to 317.9, average, 304.0 mgms. They contained

Acetphenetidin (phenacetin)	22.10	Sodium bicarbonate	11.42
Acetanilid	24.75	Camphor monobrom	present
Caffein citrate (U. S. P.)	8.72		

The content of the tablets in grains was, therefore, as follows:

	Acetphenetidin.	Acetanilid.	Caffein citrate.	Sodium bicarbonate.
Heaviest	1.09	1.22	0.43	0.56
Lightest	0.89	0.99	0.35	0.46
Average	1.04	1.16	0.41	0.53

The claimed amounts of active and inactive ingredients was 5 grs., but in no case did any tablet weigh as much as this, the average being only 4.69 grs. A deficiency in the claimed amounts of the drugs, therefore, was to be expected, and was found. Furthermore, instead of the tablets containing 2.5 grs. of acetphenetidin, they contained on the average 1.04 grs. of acetphenetidin and 1.16 grs. of acetanilid. The tablets were clearly misbranded both as to amount and identity of ingredients present.

11411. *Headache Tablets (Dr. F. H. Hawley)*, made by Yates Drug and Chem. Co.; stock of Dr. R. R. Gaudy, Stamford.

Claimed per tablet. Acetanilid 2.5 grs.; aromatic powder 0.5 gr.; sodium bicarbonate 1 gr.; caffein 0.5 gr.; camphor 0.10 gr.; cassia oil.

Found. The weights of 10 tablets ranged from 338.5 to 359.9, average, 350.1 mgms. They contained

Acetanilid	45.70	Oil of cassia, or cinnamon	present
Caffein	9.40	Camphor	present
Sodium bicarbonate	18.65	Vegetable tissue	present

The content of the tablets in grains was, therefore, as follows:

	Acetanilid.	Caffein.	Sodium bicarbonate.
Heaviest	2.54	0.52	1.04
Lightest	2.39	0.49	0.97
Average	2.47	0.51	1.01

Tablets satisfactory.

11405. *Migraine Tablets,* made by Yates Drug and Chem. Co.; stock of Dr. T. J. O'Donnell, Greenwich.

Claimed per tablet. Acetanilid 2 grs.; camphor monobrom. 0.5 gr.; caffein citrate 0.5 gr.

Found. The weights of 10 tablets ranged from 245.2 to 260.8, average, 253.4 mgms. They contained 50.54 per cent of acetanilid and 14.48 per cent of caffein citrate (U. S. P.); camphor monobrom. present. The content of the tablets in grains was, therefore, as follows:

	Acetanilid.	Caffein citrate.
Heaviest	2.12	0.58
Lightest	1.91	0.55
Average	1.98	0.57

Tablets satisfactory.

11446. *Acetphenetidin Tablets.* Manufacturer and physician unknown.

Claimed per tablet. Acetphenetidin 3 grs.

Found. The weights of 18 tablets ranged from 195.2 to 243.8, average, 220.9 mgms. They contained no acetphenetidin, but did contain approximately 58 per cent of terpin hydrate, 36.14 per cent of sugar and 5.86 per cent of talc. They contained, therefore, from 1.75 to 2.18, average, 1.98 grs. of terpin hydrate per tablet.

Tablets clearly misbranded.

Hexamethylene Tetramine Tablets.

11404. *Formin Tablets,* made by Daggett and Miller Co.; stock of Dr. D. N. Selleck, Danbury.

Claimed per tablet. Formin 5 grs.

Found. The weights of 18 tablets ranged from 312.4 to 329.6, average, 320.3 mgms. They consisted wholly of hexamethylene tetramine, so they contained of that drug from 4.82 to 5.09, average, 4.94 grs. per tablet.

Tablets satisfactory.

11424. *Formin Tablets,* made by Daggett and Miller Co.; stock of Dr. N. T. Pratt, Bridgeport.

Claimed per tablet. Formin 5 grs.

Found. The weights of 15 tablets ranged from 310.0 to 331.6, average, 323.5 mgms. They consisted wholly of hexamethylene tetramine, so they contained of that drug from 4.78 to 5.12, average, 4.99 grs. per tablet.

Tablets satisfactory.

11430. *Hexamethylene Tetramine Tablets,* made by The National Drug Co.; stock of Dr. F. C. Buckmiller, Bridgeport.

Claimed per tablet. 5 grs.

Found. The weights of 15 tablets ranged from 315.4 to 332.8, average, 324.3 mgms. They consisted wholly of hexamethylene tetramine, so they contained of that drug from 4.87 to 5.14, average, 5.00 grs. per tablet.

Tablets satisfactory.

11429. *Formin Tablets,* made by Norwich Pharmacal Co.; stock of Dr. E. R. Kelsey, Winsted.

Claimed per tablet. Formin 5 grs.

Found. The weights of 15 tablets ranged from 321.8 to 335.8, average, 328.8 mgms. They contained 99.8 per cent of hexamethylene tetramine, or from 4.97 to 5.18, average, 5.07 grs. per tablet.

Tablets satisfactory.

Neurosal.

11422. *Neurosal, Tracy, (Neuralgic, Headache),* made by The Tracy Co.; stock of Dr. J. W. Gerber, Bridgeport.

Claimed per tablet. Acetanilid 2.5 grs.; camphor monobrom. 0.5 gr.; sodium salicylate 1 gr.; extr. hyoscyamus 1/8 gr.; tinct. gelsemium 2 min.

Found. The weights of 10 tablets ranged from 357.8 to 399.8, average, 370.9 mgms. Their analysis was as follows:

Acetanilid	40.02	Camphor monobrom	present
Sodium salicylate	17.26	Gelsemium	present
Alkaloids	0.70	Caffein	none
		Hyoscyamus	no test made

The content of the tablets in grains, therefore, as far as was quantitatively determined, was as follows:

	Acetanilid.	Sodium salicylate.	Alkaloids.
Heaviest	2.47	1.06	0.043
Lightest	2.21	0.95	0.039
Average	2.29	0.99	0.040

Tablets satisfactory although slightly low in acetanilid.

Nitroglycerin Pills.

11448. *Nitgoglycerin Pills,* made by The Harvey Co.; stock of Dr. S. M. Garlick, Bridgeport.

Claimed per pill. Nitroglycerin 1/100 gr.

Found. The weights of 25 pills ranged from 40.6 to 47.8, average, 44.0 mgms. They were gelatin-coated and contained 1.42 per cent of nitroglycerin, or from 0.0089 to 0.0105, average, 0.0096 gr. per pill.

Pills satisfactory.

11551. *Nitroglycerin Pills,* made by The Harvey Co.; stock of Dr. C. K. Heady, Milford.

Claimed per pill. Nitroglycerin 1/100 gr.

Found. The weights of 25 pills ranged from 41.8 to 49.2, average, 46.1 mgms. They contained 1.32 per cent of nitroglycerin, or from 0.0085 to 0.0100, average, 0.0094 gr. per pill.

Pills satisfactory.

11554. *Nitroglycerin Tablets,* made by Yates Drug and Chem. Co.; stock of Dr. G. F. Lewis, Stratford.

Claimed per tablet. Nitroglycerin 1/100 gr.

Found. The weights of 25 tablets ranged from 86.8 to 106.2, average, 97.1 mgms. They contained 0.74 per cent of nitroglycerin, or from 0.0099 to 0.0121, average, 0.0111 gr. per tablet.

Tablets satisfactory.

Paregoric Tablets.

11435. *Tablet Triturates of Paregoric,* made by The Harvey Co.; stock of Dr. J. R. Coffey, New Haven.

Claimed per tablet. Paregoric 20 min.

Found. The weights of 25 tablets ranged from 90.0 to 107.2, average, 95.0 mgms. The tablets contained 0.00052 gm. of morphin. The minimum strength of U. S. P. paregoric is 0.00049 gm. of morphin per 20 min. The average tablet, therefore, contained morphin slightly in excess of the U. S. P. requirement for 20 min. of paregoric. Paregoric was further indicated by the presence of camphor, oil of anise and benzoic acid, all normal ingredients of that drug.

Phenolphthalein Tablets.

11436. *Videns Phenolphthalein Tablets,* made by Daggett and Miller Co.; stock of Dr. D. C. Brown, Danbury.

Claimed per tablet. Phenolphthalein 1.5 grs.

Found. The weights of 24 tablets ranged from 312.9 to 377.8, average, 356.0 mgms. Their analysis showed loss at 100° C. 0.36, ash 9.53 and phenolphthalein 21.60 per cent; oil of cassia, or cinnamon, present. The tablets contained, therefore, from 1.04 to 1.26, average 1.19 grs. of phenolphthalein, or a deficiency ranging from 0.24 to 0.46 gr.

Tablets deficient in phenolphthalein.

Quinin Sulphate Tablets.

11432. *Quinin Sulphate Tablets,* made by Tailby-Nason Co.; stock of Dr. W. C. Watson, Bridgeport.

Claimed per tablet. Quinin sulphate 2 grs.

Found. The weights of 15 tablets ranged from 248.6 to 271.5, average, 263.7 mgms. They contained 47.80 per cent of quinin sulphate, or from 1.84 to 2.00, average, 1.95 grs. per tablet.

Tablets satisfactory.

11400. *Quinin Sulphate Tablets,* made by The Tracy Co.; stock of Dr. Wm. B. Cogswell, Stratford.

Claimed per tablet. Quinin sulphate 2 grs.

Found. The weights of 16 tablets ranged from 250.6 to 269.5, average, 260.2 mgms. They contained 48.44 per cent of quinin sulphate, or from 1.87 to 2.02, average, 1.95 grs. per tablet.

Tablets satisfactory.

Sedative Tablets.

11420. *Sedative Tablets (Dr. Brown),* made by The Tracy Co.; stock of Dr. C. W. Gardner, Bridgeport.

Claimed per tablet. Sodium bromid 2.5 grs.; potassium bromid 2.5 grs.; ammonium bromid 2.5 grs.; tinct. cannabis indica 5 min.; tinct. hyoscyamus 5 min.

Found. The weights of 20 tablets ranged from 523.5 to 540.4, average, 531.2 mgms. Their composition was as follows:

Loss at 100° C.	7.86	Ammonium	5.54
Bromin	68.22	= Ammonium bromid	30.08
Potassium	10.47	Chloroform extract	1.92
= Potassium bromid	31.87	Cannabis indica	present
Sodium	6.71	Alkaloids	present
= Sodium bromid	29.84	Hyoscyamus	no test made

The content of the tablets, therefore, as far as the bromids were concerned, was as follows:

	Potassium bromid. grs.	Sodium bromid. grs.	Ammonium bromid. grs.
Heaviest	2.66	2.49	2.51
Lightest	2.58	2.41	2.43
Average	2.61	2.45	2.47

Tablets satisfactory.

Sodium Bromid Tablets.

11401. *Sodium Bromid Tablets,* made by Yates Drug and Chem. Co.; stock of Dr. G. F. Wight, Bethel.

Claimed per tablet. Sodium bromid 10 grs.