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Thirty-fifth Annual Report

OF

The Connecticut Agricultural
Experiment Station

Being the annual report for the year ended October 31

1911

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CONNECTICUT AGRICULTURAL EXPERIMENT STATION.

OFFICERS AND STAFF.

SEPTEMBER 30, 1911

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APPROVED BY
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PLANT BREEDING. H. K. HAYES, B.S., *Plant Breeder*.
C. D. HUBBELL, *Assistant*.

BUILDINGS AND GROUNDS. WILLIAM VEITCH, *In Charge*.

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REPORT OF THE BOARD OF CONTROL
OF
THE CONNECTICUT AGRICULTURAL EXPERIMENT
STATION.

To His Excellency, Simeon E. Baldwin, Governor of Connecticut:

The Board of Control of The Connecticut Agricultural Experiment Station herewith respectfully submits its report for the year ending November 1, 1911.

The following minute regarding William Henry Brewer, for many years a member of this Board, was adopted by the Board at its meeting on December 22, 1910:

Professor William H. Brewer, Ph.D., LL.D., a member of this Board for thirty-three years, died at his home in New Haven on November 2, 1910. His manifold work as geographer, botanist, sanitarian and teacher needs no recital here.

As one of the pioneers in bringing agricultural science to the knowledge of farmers and teaching its value for practical ends, his name will be held in grateful remembrance by the farmers of this State.

Born and brought up on a farm and having personal experience of farm work, he began his studies in Yale College with the object of fitting himself for the life of a farmer. Drawn by his tastes for natural science and eagerness to follow up the studies he had begun, he finished the regular course and graduated at the Sheffield Scientific School in 1852. After studying abroad at Paris, Heidelberg and Munich, serving as a college professor at Washington College, Pennsylvania, and the University of California, and working for four years on the survey of agriculture in 1864, he returned to the Scientific School of Yale as professor of agriculture in 1864, and held that position until his retirement as professor emeritus in 1903.

He was professor of agriculture not only within college halls but everywhere in the State. His intimate acquaintance with practical farming, his scientific attainments, the wide range of his knowledge and of his interests, together with his broad common sense, made him a welcome and effective speaker at farmers' gatherings everywhere.

He was earnest and influential in establishing this Agricultural Experiment Station and he served it wisely and effectively until he died. His last public act was to attend a meeting of this Board only a few days before his death.

Probably no one in the University during the last fifty years was called on so often and so variously for public service outside of the institution as Professor Brewer, and in all of it he was faithful, tactful and efficient.

THE MEMBERS OF THIS BOARD wish here to record their sense of personal loss, their appreciation of his rare qualities as a friend and adviser, and of his long and effective labors for the advance of agriculture.

IT IS ORDERED that this minute be entered on the records of this Station and that a copy be sent to Professor Brewer's family.

A detailed account of the work of each of the several departments of the Station will appear in the reports of individual members of the staff, which are now in preparation.

We therefore only call attention to certain facts relating to the Station welfare which will not be discussed in those publications.

The General Assembly, at the January session of 1911, appropriated \$6,500 to this Station to cover the loss caused by the fire of January 10, 1910.

Chapter 192 of the Public Acts of 1911 provides for the printing of an annual report of this Station, which had been the practice for thirty years, in place of the biennial report required by statute during the last four years.

Chapter 134 of the Public Acts of 1911 requires that the net contents of all packages of food products shall be plainly marked on the outside in terms of weight, measure, or numerical count, and that the director of this Station, with the Dairy and Food Commissioner, shall establish rules and regulations as to the reasonable variations and allowances which shall be permitted. No penalty is to be enforced prior to eighteen months from the passage of this Act.

Chapter 274 forbids adulteration of turpentine or spirits of turpentine and makes it the duty of the Dairy and Food Commissioner and the director of this Station "acting jointly" to enforce this law. To the Commissioner alone is given the right of inspection. This statute, unlike any other relating to adulteration, makes the Station jointly responsible for enforcing the law. This is a departure from previous policy. Hitherto the Station's responsibility has been limited to testing suspected

articles, reporting its findings to the Commissioner, and giving expert evidence in court when required.

There have been no changes of importance in the Station staff except that Mr. Walter O. Filley has been appointed assistant state forester, an office created by the last General Assembly, and Mr. A. B. Champlain, an assistant in the entomological department, resigned October 1, 1911, to accept a position in the State Laboratory of Economic Zoology of Pennsylvania.

During the fall, an exhibit illustrative of the several departments of the Station work was made at six agricultural fairs and also at the Station grounds in New Haven, the last especially for the teachers of the State who were attending a convention at the time in New Haven. Members of the Station staff were in constant attendance at all these exhibits to explain them and to answer questions. This involved the almost complete suspension of our regular laboratory work for nearly six weeks, which was a serious interruption. The large attendance, however, and the interest shown in the Station work as illustrated by the exhibits convince us that this is one of the most effective ways of diffusing information regarding our work among the farmers of the State.

The Station has bought a farm of twenty acres at Mount Carmel, not far from the city, including a small house for the caretaker, has set out an orchard of apples and peaches for experiment, has begun an experiment on the effect both on the crop and on the soil of fertilizers and manures, and another on the handling of an old and neglected orchard.

At the Centerville field, which will be given up in the spring of 1912, we have over 800,000 white pine seedlings, three years old, which are being sold at cost to citizens of this State for forest planting.

On this field also corn and tobacco breeding work, as well as other experiments, has been carried on during the present year. Hereafter this work will be concentrated on our own fields at Mount Carmel.

The Station receives one-half of the so-called Adams Fund which, by Act of Congress and the rulings of the Secretary of Agriculture, must be used wholly for scientific research, preferably in a small number of "projects" approved by the Office of

Experiment Stations. The Station's share of this fund is devoted to two projects: a study of the laws of inheritance in maize and tobacco, and a study of the composition, structure and relative nutritive value of the vegetable proteins. This last project, which has engaged Dr. Osborne's time for many years, now receives very substantial aid from the Carnegie Institution of Washington.

Bulletin 167, *Inheritance in Maize*, gives an account of five years' study of the subject, and Bulletin 168 is a discussion of the facts discovered which may be of immediate practical account. The results of work on the other project are published in physiological and chemical journals and in monographs of the Carnegie Institution and are not further noticed in this report.

During the year there have been issued parts of a biennial report aggregating 512 pages with 21 plates in editions of 10,000 copies, and three bulletins aggregating 174 pages with 30 plates. Nine thousand five hundred copies of one of these were printed, of another three thousand, but of the third, which was so technical as to be of value chiefly to investigators, only one thousand were printed. The spray calendar has also been revised to include the results of recent work and is mailed as requested.

Fifty-one addresses have been given by members of the staff at farm institutes, field meetings, granges and other gatherings of farmers, and the Station correspondence has involved the writing of more than 9400 letters and manuscript reports.

The following summary shows in brief the departments of the Station work and the special directions it has taken:

ENTOMOLOGICAL DEPARTMENT.

Inspection of all the nurseries in the State and of imported nursery stock to prevent distribution of insect and fungous pests; inspection of apiaries on request or complaint; gypsy moth control work at Stonington and Wallingford; search for the brown-tail moth and destruction of its winter nests in northeastern Connecticut; studies of life-histories of certain insects, preparation of exhibits; and publications in various journals on entomological subjects; also coöperation with the botanical department in the study of summer sprays, which is described below.

BOTANICAL DEPARTMENT.

The preparation of artificial cultures of many fungi, most of them of economic importance, for purposes of investigation; studies on the oöspore production of the potato blight in artificial cultures and the relation of media to the stages and character of growth of fungi in artificial cultures; publication of papers on botanical subjects; studies in the field of the chestnut blight, calico of tobacco and peach yellows; tests of Millar's Cream muskmelon; and spraying experiments with melons, cucumbers and potatoes.

In coöperation with the Entomological Department, very extensive and careful tests have been made to determine the comparative value of the various summer sprays on apples, peaches, pears, plums, cherries and some other fruits. The tests were made in thirteen orchards and involved the individual examination of 93,000 apples and about 25,000 peaches.

SEED TESTING.

Tests of purity and vitality of field and garden seeds and identification of weed seeds for farmers and dealers; and studies of methods of seed testing.

FORESTRY DEPARTMENT.

The care of the three Station nurseries, containing about 1,100,000 young trees for forest planting; care of the Station forest plantations, including forest planting, cleaning out worthless species and liberation cutting; a test of basket willows; a demonstration planting of red and white pine at Putnam Memorial Camp Ground; inspection of State forests and destruction of pine weevil; making fire lines and improvement thinning at the Portland forest; the careful gathering of statistics of the 828 forest fires of the year which caused damage amounting to more than \$235,000. New and desirable legislation has been secured regarding forest fires and the work of the forest fire wardens further systematized. Examinations of woodland for private owners have been made and advice given regarding planting, thinning and cutting. In coöperation with the U. S. Forest Service a study is being made of the woodworking industries of

the State, to get if possible a better utilization of home-grown woods and give the woodland owner information as to markets for his product.

CHEMICAL DEPARTMENT.

Analyses and published reports of all commercial fertilizers sold in the State, of commercial feeds, and of human food products and drugs; examinations of foods and drugs for the Dairy and Food Commissioner, and expert evidence in court as required; study of methods of analysis; and analytical work required in connection with field experiments.

PLANT BREEDING.

(Supported by Adams Fund)

Studies of inheritance of characters in corn and tobacco and of the yields of first year corn hybrids.

PROTEIN RESEARCH.

(Supported by Adams Fund)

Studies of the composition, structure and relative nutritive values of the vegetable proteins.

The above list of the important parts of the Station work illustrates how it covers the whole State and affects the interests of all its citizens, whether farmers or not.

Each session of the General Assembly adds to the State's requirements of the Station, the calls made by farmers and others for the help which it is the object of a Station to give, and the natural and inevitable expansion of its work have made the Station's income insufficient for its needs. The strictest economy will be necessary for the next year, and without a larger income than it now has the work which it is doing must thereafter be lessened and its working force cut down. For the general expenses of the Station no increase of appropriation has been made by the State since 1895.

All of which is respectfully submitted.

GEORGE A. HOPSON, *Secretary.*

REPORT OF THE TREASURER, 1911

E. H. JENKINS, in account with THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION for the fiscal year ending September 30, 1911.

RECEIPTS.

Balance on hand, October 1, 1910 (State Agricultural Appropriation)	\$1,655.26
State Appropriation, Agriculture	\$10,000.00
State Appropriation, Food	2,500.00
State Appropriation, Insect Pest	3,000.00
State Appropriation, Gypsy Moth	4,000.00
United States Appropriation, Hatch	7,500.00
United States Appropriation, Adams	7,500.00
Analysis Fees	12,500.00
Sale of Farm Products	80.79
Miscellaneous Receipts	339.81
From the Lockwood Estate	16,611.23
	<hr/>
Total	64,031.83
	<hr/>
	\$65,687.09

DISBURSEMENTS.

E. H. Jenkins, director, salary	\$2,800.00
E. H. Jenkins, treasurer, "	400.00
W. H. Brewer, salary	8.34
G. A. Hopson, "	75.00
V. E. Cole, "	850.00
L. M. Brautlecht, "	750.00
J. P. Street, "	2,500.00
T. B. Osborne, "	2,400.00
E. M. Bailey, "	1,550.00
C. B. Morrison, "	1,158.34
R. B. Roe, "	1,093.75
C. E. Shepard, "	875.00
W. E. Britton, "	2,000.00
G. P. Clinton, "	2,200.00
E. M. Stoddard, "	758.32
S. N. Spring, "	2,500.00
W. O. Filley, "	1,030.73
H. K. Hayes, "	1,125.00
E. L. Ferry, "	1,033.32
H. Lange, "	925.00
V. L. Churchill, "	825.00
Wm. Veitch, "	675.00
Luva Francis, "	350.00

E. L. Avery, salary	\$ 390.00
H. W. Kiley (Labor)	728.00
Wm. Pokrob "	728.00
C. D. Hubbell "	728.00
Geo. Graham "	724.00
M. H. Jagger "	499.00
Jos. Keating "	180.00
L. Robinson "	475.00
L. Nolan "	173.00
Labor	3,842.79
Publications	1,137.82
Postage	357.71
Stationery	709.31
Telephone and Telegraph	161.69
Freight and Express	296.30
Gas, Kerosene and Electricity	545.28
Coal	1,583.00
Water	134.44
Chemicals and Laboratory Supplies	897.82
Agricultural and Horticultural Supplies	2,567.05
Miscellaneous Supplies	575.76
Fertilizers	480.51
Feeding Stuffs	188.98
Library and Periodicals	843.58
Tools and Machinery	334.31
Furniture and Fixtures	294.00
Scientific Apparatus	218.02
Live Stock	11.00
Traveling by the Board	118.11
Traveling by the Staff	1,295.91
Traveling in connection with Adams Fund Invest- gations	139.71
Fertilizer Sampling	231.60
Food Sampling	249.25
Insurance	65.80
Insect Pest Appropriation to State Entomologist	3,000.00
Contingent	572.51
Lockwood Expenses	400.00
Gypsy Moth Appropriation to State Entomologist ...	4,000.00
New Buildings	396.90
Betterments	1,035.39
Repairs	337.14
Rental of Land	105.00
Purchase of Land	6,000.00
	<hr/>
	\$65,634.49
Analysis Fees on hand Sept. 30, 1911	52.60
Total	<hr/>
	\$65,687.09

NEW HAVEN, CONN., Nov. 14th, 1911.

THIS IS TO CERTIFY that we have examined the accounts of E. H. Jenkins, Treasurer of The Connecticut Agricultural Experiment Station, for the year ending Sept. 30th, 1911, have compared the same with the vouchers therefor and found them correct.

WILLIAM P. BAILEY,

EDWARD S. ROBERTS,

Auditors of Public Accounts.

E. H. JENKINS, in account with THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION for the fiscal year ending Sept. 30, 1911.

Receipts and Disbursements in connection with the rebuilding of the laboratory building destroyed by fire January 10, 1910.

RECEIPTS.

Balance on hand Oct. 1, 1910.....	\$141.48
Salvage	5.89
	<hr/>
	\$147.37

DISBURSEMENTS.

Fixtures	\$ 3.05
Apparatus, Laboratory Supplies and Miscellaneous	22.97
Part of interest on loan of \$6,000	121.35
	<hr/>
	\$147.37

THIS CERTIFIES that we have examined the account which relates to loss by fire and rebuilding new building, have compared the same with the vouchers therefor and find them correct, the said account being closed and balanced by the expenditure of all moneys in the account, same being evidenced by vouchers on file and bank book.

WILLIAM P. BAILEY,

EDWARD S. ROBERTS,

Auditors of Public Accounts.

ERRATA.

Page 124, Stollwerck's Milk Cocoa is stated to contain glucose. This statement is an error. There is no evidence of the presence of glucose or other adulterant in this brand.

Page 200, nineteenth line from top, for henzoic read benzoic.

Page 227, "The Biles' product" mentioned under Dried Distillers' Grains refers only to rye grains, the analysis of which is given on page 250, and not at all to the other and higher grade brands of distillers' grains sold by the Biles Company.

Page 229. The manufacturers state that Husted's Steam Cooked Feed contains only whole and cracked corn and whole oats but no wheat.

PART I.

Report on Commercial Fertilizers, 1911.

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

The General Statutes require every dealer in commercial fertilizers within this state

1. To report annually to this station, with his name and address, the names of the brands which he sells.

2. To see that every package of fertilizer which he sells bears a legible and correct statement, giving the number of pounds in the package, name of the fertilizer, name and address of the manufacturer, place of manufacture and a statement of composition, expressed in a way approved by this station.

3. In case a fertilizer not hitherto sold in Connecticut is offered for sale, to file at this station, *in advance of its sale*, two certified copies of the statement above described and a sealed glass jar containing not less than a pound of the fertilizer, with an affidavit that it is a fair sample.

4. To pay to the director of the station, on or before May 1, annually, an analysis fee on every brand sold by him, which will usually be ten, twenty or thirty dollars according as one, two, or all three of the ingredients—nitrogen, phosphoric acid and potash—are contained or claimed to exist in the fertilizer.

The agent or seller is free from requirements 2, 3 and 4 only when the manufacturer or importer fulfils them instead.

The station provides blank forms for the reports of dealers and manufacturers and will send copies of the law on application.

The statutes also require this station to analyze samples of every brand of commercial fertilizer sold in the state and to prepare and publish a report on them.

OBSERVANCE OF THE FERTILIZER LAW.

During 1911, forty individuals or firms have entered for sale in this state three hundred and thirty-seven brands of fertilizers, classified as follows:

Special manures for particular crops.....	146
Other nitrogenous superphosphates.....	96
Bone manures and "bone and potash".....	29
Fish, tankage, castor pomace and chemicals.....	66
Total	337

SAMPLING AND COLLECTION OF FERTILIZERS.

During April, May and June, Mr. V. L. Churchill, the sampling agent of this station, visited one hundred and five towns and villages in Connecticut to draw samples of commercial fertilizers for analysis. These places were distributed as follows:

Litchfield County	4
Hartford County	34
Tolland County	10
Windham County	7
New London County	13
Middlesex County	8
New Haven County	18
Fairfield County	11
Total	105

In these places seven hundred and twenty samples were taken.

The agent could not find the following brands which had been entered for sale in the state: American Agricultural Chemical Co.'s H. G. Sulphate, Kainit, Dried Blood, No. West. Pot. & Truck Guano, W. & C. Royal Bone Phosphate, Bowker's H. G. Nit. Mixture, Special Crop Grower, New England Tankage, Swift's Lowell Fertz. Co.'s Nitrate Soda, Wilcox Fertz. Co.'s Steamed Bone. Therefore no analyses of them will be found in this report.

CLASSIFICATION OF THE FERTILIZERS ANALYZED.*

	Number of Samples.
I. <i>Containing nitrogen as the chief active ingredient.</i>	
Nitrate of soda	13
Dried blood	2
Cotton seed meal	273
Castor pomace	4

* The analyses of fertilizers included in this chapter have been made under the direction of Mr. Street, chemist in charge, by Messrs. Bailey, Morrison, Roe and Shepard, station chemists, and Mr. Lange. The results have been discussed by the director.

2. <i>Containing phosphoric acid as the chief active ingredient.</i>	
Basic slag phosphate	7
Precipitated bone phosphate	2
Dissolved rock phosphate or acid phosphate.....	15
3. <i>Containing potash as the chief active ingredient.</i>	
High grade sulphate of potash.....	5
Double sulphate of potash and magnesia	3
Kainit	4
Muriate of potash	17
Carbonate of potash	1
Vegetable potash	1
4. <i>Containing nitrogen and phosphoric acid.</i>	
Bone manures	28
Tankage	26
Dry ground fish	10
5. <i>Mixed fertilizers.</i>	
Acid phosphate and potash	3
Factory-mixed complete fertilizers	275
Home mixtures	13
6. <i>Miscellaneous fertilizers, manures and amendments</i>	78
Total	780

EXPLANATIONS CONCERNING THE ANALYSES.

The analyses given on the following pages show the quantities of nitrogen, phosphoric acid and potash present in the samples, and, where possible, their solubilities. These solubilities give some indication as to the probable availability to crops.

The average cost of most of the samples is calculated from the prices quoted by the sellers of the goods. In some cases quite different prices are charged by dealers for the same goods. *These quotations, therefore, should be regarded only as a general guide, not as a basis for individual purchases.*

When materials contain either nitrogen, phosphoric acid or potash as the single fertilizer ingredient, the cost per pound of that ingredient is easily calculated from the ton price and the analysis. Thus, if a sample of muriate of potash contains 50.2 per cent. of potash, which is 1004 pounds per ton, and costs \$42.50 per ton, actual potash costs $4250 \div 1004$, or 4.2 cents per pound.

Fertilizers which are mixtures of various raw materials and contain two or more of the fertilizer ingredients above named are reported with an attached valuation.

VALUATION OF FERTILIZERS.

There is so much misunderstanding as to the real meaning of the term valuation as it is used in our fertilizer reports that particular attention is called to the following explanations:

The valuation of a fertilizer is the result of calculating the retail cash cost at freight centers of an amount of nitrogen, phosphoric acid and potash in high grade materials equal to the amount contained in one ton of the fertilizer. It is a valuation of only one factor which makes up the cost of a fertilizer, namely, the market cost of the three kinds of plant food in it. Valuation no more shows the fair retail price of a fertilizer than quotations of steel billets can show the fair price for small amounts of structural steel of a specified shape. If, however, the prices of steel remain fairly uniform, a comparison of these with the rates charged by different companies *in open competition* for the finished product is a help, though not a perfect guide, to the buyer in studying the bids of different manufacturers; or to borrow an illustration from the excellent discussion of this matter in the Report of the Vermont station, it is something like a determination of the cost of leather which goes into the making of a pair of shoes. Many other charges, most of them relatively small, go to make up the final cost of the finished goods.

To illustrate: Of two fertilizers, A and B, let us assume that A contains 3.5 per cent. of organic nitrogen, 4.5 per cent. of water-soluble, 3 per cent. of citrate-soluble and one per cent. of insoluble phosphoric acid and 6 per cent. of potash, and sells at retail for \$35.00. B contains 2.0 per cent. organic nitrogen, 3.5 per cent. of water-soluble, 3 per cent. citrate-soluble and 4 per cent. insoluble phosphoric acid and 8 per cent. of potash, and retails for \$32.00.

We assume that both are in good condition, sold by well-known and reputable manufacturers, and the prices are the best obtainable for these two brands. The question is, which is the better purchase: 70 pounds of nitrogen, 150 pounds of soluble phosphoric acid, 20 pounds of insoluble phosphoric acid and 120 pounds of potash at \$35.00; or 40 pounds of nitrogen, 130 pounds of soluble phosphoric acid, 80 pounds of insoluble phosphoric acid and 160 pounds of potash for \$32.00. Obviously the

first thing to do is to get the approximate value of all these separate ingredients in one figure so as to have some common basis of comparison. In a ton of A are 70 pounds of organic nitrogen, which can be bought for about 20 cents a pound; 150 pounds of soluble phosphoric acid, which can be bought for $4\frac{1}{2}$ cents per pound in form of acid phosphate; 20 pounds of insoluble phosphoric acid, for which we may allow 2 cents per pound; 120 pounds of potash, which can be bought in form of muriate for $4\frac{1}{4}$ cents per pound.

Calculating as follows,

$$\begin{array}{r} 70 \times 20 = 14.00 \\ 150 \times 4\frac{1}{2} = 6.75 \\ 20 \times 2 = .40 \\ 120 \times 4\frac{1}{4} = 5.10 \\ \hline 26.25 \end{array}$$

it appears that the plant food in fertilizer A can be bought, at freight centers, in raw materials, for about \$26.25, and a similar calculation shows that the corresponding figure for fertilizer B is \$22.25. These two figures are the "valuations" of the two fertilizers. They give a single figure to represent the trade value of the actual plant food in each of these two fertilizers, A and B, and nothing else.

Valuations do not, of course, show the agricultural value of the plant food in fertilizers. Nor do they show the cost to the manufacturer of the stock which he used in the mixture. His profit comes in part from skill and judgment in buying the plant food on the most favorable terms. The valuation shows simply what it would cost the farmer to buy the same amount of plant food as the mixed fertilizer contains, at freight centers, unmixed, in raw materials of good quality.

But the cost of the plant food contained in a mixed fertilizer is but one item, though the largest single item, in its cost. Other items are grinding and mixing, bags, freight, agents' commissions, as well as other items, overhead factory charges, losses and profits.

It cannot be stated too emphatically that the valuation does not and cannot show the fair retail price of fertilizers, but only one item—the largest item to be sure—of the cost. In fact one must add ten dollars or more to the valuation to approximate what would be, in most cases, a fair selling price.

Fertilizer A costs \$35.00, and the plant food in it has a valuation of \$26.25. Fertilizer B costs \$32, and its plant food a valuation of \$22.25. The charges for converting the raw materials into a uniform mixture and delivering it are \$8.75 in A and \$9.75 in B; or, in A about 33.3 per cent. of the valuation of the plant food in it, and in B, 43.9 per cent.—figures which we call percentage difference between cost and valuation. Assuming the substantial accuracy of the costs of plant food and that the nitrogen, phosphoric acid and potash are equally valuable in both brands, it is clear that A is a better purchase than B. For while the difference between cost and valuation (i. e., the cost of manufacture and selling) is only one dollar more in B than in A, in the latter it is about 44 per cent. of the value of the raw material, and in the former only about 33 per cent.

To recapitulate:

1. Valuation represents one item, and the largest item, in the cost of mixed commercial fertilizers. It is a valuation of only one factor which makes up the market price, namely, the average market cost of the untreated raw materials of high quality which enter into its composition.
2. It affords a basis for estimating, approximately, the fair selling price.
3. It affords a basis of comparing fertilizers which differ considerably in composition and price.
4. It does not represent the fair selling price.
5. It does not show the agricultural value of the ingredients in it.

The trade-values used in the calculations made in this report are only approximately correct, for market prices constantly fluctuate, but they are accurate enough to be used to compare fertilizers which are on sale at the same time.

TRADE-VALUES OF FERTILIZER ELEMENTS FOR 1911.

The average trade-values or retail costs in market, per pound, of the ordinarily occurring forms of nitrogen, phosphoric acid and potash in raw materials and chemicals, as found in New England, New York and New Jersey markets during 1911 and adopted at a conference of representatives of the New England and New Jersey Stations in March, 1911, are as follows:

	Cents per pound.
Nitrogen in nitrates	16
ammonia salts	16
Organic nitrogen in dry and fine ground fish and blood.....	23
in cotton seed meal and castor pomace.....	21
in fine* bone and tankage and in mixed fertilizers.....	20
in coarse* bone and tankage.....	15
Phosphoric acid, soluble in water.....	4½
citrate-soluble†	4
of fine bone and tankage.....	4
of cotton seed meal and castor pomace.....	4
of coarse bone and tankage, and ashes.....	3½
insoluble in water and in ammonium citrate in mixed fertilizers	2
Potash as high-grade sulphate and in mixtures free from muriate (or chlorides)	5
as muriate	4¾
in cotton seed meal and castor pomace.....	5

The foregoing are, as nearly as can be estimated, the prices at which, during the six months preceding March last, the respective ingredients were retailed for cash, in our large markets, in those raw materials which are the regular source of supply. The valuations obtained by use of the above figures will be found to correspond fairly with the average retail prices, at the large markets, of standard raw materials.

METHOD OF VALUATION OF BONE AND TANKAGE.

To obtain the valuation of ground bone or tankage the sample is sifted into two grades, that finer than $\frac{1}{80}$ inch, "fine," and that coarser than $\frac{1}{80}$ inch, "coarse."

The nitrogen value of each grade is separately computed by multiplying the pounds of nitrogen per ton by the per cent. of each grade, multiplying the product by the trade-value per pound of nitrogen in that grade, and taking this final product as the result in cents. Summing up the separate values of each grade

* In this report "fine," as applied to bone and tankage, signifies smaller than $\frac{1}{80}$ inch; "coarse," larger than $\frac{1}{80}$ inch.

† Dissolved from 2 grams of the fertilizer, previously extracted with pure water, by 100 cc. neutral solution of ammonium citrate, sp. gr. 1.09, in thirty minutes at 65° C., with agitation once in five minutes. Commonly called "reverted" or "backgone" phosphoric acid.

thus obtained, together with the values of each grade of phosphoric acid, similarly computed, the total is the valuation of the sample.

METHOD OF VALUATION OF MIXED FERTILIZERS.

The organic nitrogen in mixed fertilizers is reckoned at 20 cents per pound, nitrogen of nitrates, and ammonia salts and phosphoric acid in its three forms of solubility, at the prices given above. Potash is rated at $4\frac{1}{4}$ cents, if sufficient chlorine is present in the fertilizer to combine with it to make muriate. If there is more potash present than will combine with the chlorine, then this excess of potash is reckoned at 5 cents per pound, except in certain special cases, to be noted later, where carbonate of potash has been used in the mixture.

To obtain the Valuation of a Fertilizer, multiply the pounds per ton of nitrogen, etc., by the trade-value per pound. The several products give the values per ton of the several ingredients and their sum is the total valuation per ton.

Percentage Difference shows the percentage excess of the cost price over the average retail cost, at freight centers, of the nitrogen, phosphoric acid and potash contained in the fertilizer and furnishes the best means we have for expressing the comparative commercial (but not agricultural) value of the different brands.

This information helps the purchaser to determine whether it is better economy to buy the commercial mixed fertilizers, of which so many are now offered for sale, or to purchase and mix for himself the raw materials.

THE SOLUBILITY OF ORGANIC NITROGEN.

The analyses of mixed fertilizers include determinations of the solubility of the organic nitrogen both in water and in an alkaline solution of potassium permanganate. The reasons for this and the significance of the figures require explanation.

Organic nitrogen costs four or five times as much as phosphoric acid or potash, and the forms in which it is used in mixed fertilizers differ greatly in market price as well as in agricultural value. Some method for distinguishing the forms which have real agricultural value from those which are comparatively inert is most desirable and after several years of study and experiment

both here and elsewhere methods have been devised to determine the solubility of organic nitrogen and thus to distinguish between the two forms of nitrogen with enough accuracy to make their use helpful in judging of the quality of organic nitrogen. The following papers present the results of some of the experimental work done here.

It remains to explain the significance of the terms used in the tables of analyses to express the nitrogen solubility.

Water-soluble organic nitrogen is that which is soluble in water under the prescribed method of treatment.

Active insoluble organic nitrogen is insoluble in water, but soluble in an alkaline solution of potassium permanganate.

Inactive insoluble organic nitrogen is insoluble in either of the above-named reagents.

All of these forms of nitrogen are found in every organic nitrogenous substance, but the relative quantities are quite different. In general, when more than one-half of the water-insoluble organic nitrogen in any mixture is insoluble in permanganate, the conclusion is justified that some agriculturally inferior form is present.

A MODIFICATION OF THE NEUTRAL PERMANGANATE METHOD TO DETERMINE THE SOLUBILITY OF ORGANIC NITROGEN.

By JOHN PHILLIPS STREET.

When the neutral permanganate method was devised some years ago by the writer, series of mixtures of known composition were prepared, in which it was possible to determine the solubility of the organic nitrogen both in the raw material and when mixed with the usual phosphatic and potassic ingredients of commercial fertilizers. In these mixtures arbitrary amounts of acid phosphate and muriate of potash were used, the total weight of the mixtures always being 50 grams, the acid phosphate ranging from 10 to 34.5 grams, and the muriate being constant at 10 grams.

Each of the mixtures, with one exception, contained 1.50 per cent. of organic nitrogen in different forms. The following solubility figures were obtained. (See *Jour. Ind. Eng. Chem.*, 2, 312.)

	Percent. Solubility of Nitrogen.	
	In original material.	In mixed fertilizer.
Dried blood	95.6	92.9
Tankage	95.1	91.8
Garbage tankage	58.9	75.1
Cotton seed meal	95.1	92.9
Dried fish	96.4	90.0
Ground bone	93.6	92.0
Peat	42.8	37.1
Dried blood and peat.....	89.1	86.0

The agreement in solubilities of the organic form when used alone and when mixed was considered quite satisfactory; at any rate, the figures obtained were sufficient, in the writer's estimation, to allow of a differentiation between the valuable and relatively useless forms of organic ammoniates. Further tests, however, have shown that the method as originally published may give misleading results, which in certain cases would be most unfair to high-grade materials. In other words, under certain conditions, a high-grade material like dried blood, which shows a high permanganate solubility, when mixed with acid phosphate and muriate shows solubilities which would class it with garbage tankage and only a little above peat. The cause of this discrepancy lay either with the acid phosphate or the potash. Accordingly another series of mixtures was made in which the quantity of these ingredients was varied, while the amount of organic nitrogen was kept constant at 0.0450 gm. Tests of these mixtures showed at once that the muriate of potash had no effect on the results. A sample of dried blood which, unmixed, showed a solubility of 97, when mixed with muriate, showed 95 and 96. This same blood, however, when mixed with 2 gms. of acid phosphate, showed a solubility of only 90, and with 4 gms. only 59. In three other samples of blood the presence of 4 gms. of acid phosphate reduced the solubilities from 96, 94 and 96 to 53, 70 and 67, respectively. While this discrepancy was most marked in the case of dried blood, a decreased solubility was also noted in tankage, fish, hide and skin meal, tartar pomace, solubilized organic nitrogen, and peat. With knuckle bone and cotton seed meal the acid phosphate seemed to have little effect, and with garbage tankage the solubility of the nitrogen in the mixture was, as has always been the writer's experience, considerably higher than in the raw material.

It was thought at first that the relatively large amount of acid phosphate (4 gms.), compared with the charge of dried blood (0.34 gm.), prevented complete action of the permanganate. Experiments in which the permanganate mixture was agitated much more frequently than directed in the method, however, gave no better results. Thinking that the acidity of the acid phosphate might be the determining factor, another series of tests was carried out in which one gram of sodium carbonate was added just prior to the introduction of the permanganate solution. The results obtained were most satisfactory, as the table shows. A 96 blood with 2 gms. of acid phosphate showed 96; with 4 gms., 90. A 91 tankage, with the same amounts of acid phosphate, showed 94 and 85. A 97 bone showed 93; a 93 fish, 92; a 92 cotton seed meal, 95; a 54 tartar pomace, 48; a 65 solubilized organic nitrogen, 65; a 46 peat, 42. Garbage tankage again showed a high result, the availability increasing from 47 to 68, but even this high figure is too low to mislead any one as to its value.

The writer makes no attempt to explain just what causes these discrepancies. That they exist, however, is an undoubted fact, and the simple modification, at least in the materials tested, appears to give true and reasonable results.

In using the neutral permanganate method, it must be remembered that it is not an absolute method by which the agricultural value of an organic nitrogenous material may be determined. A long series of tests, however, shows that it does differentiate between the good and the bad; materials of generally recognized value like blood, tankage, ground bone, dried fish, cotton seed meal and castor pomace, rarely showing solubilities less than 90, while leather, mora meal, tobacco stems, peat, sheep manure, garbage tankage, tartar pomace, beet root manure and fillerine show from 17 to 69. The method possesses the further advantages of simplicity of manipulation, of easy maintenance of uniform conditions (a very important matter) and of measuring a definite chemical action, namely, the amount of organic nitrogen not decomposed by a definite quantity of permanganate of potash solution of fixed and uniform strength, acting for a definite time at a uniform temperature on a definite amount of material. Every condition can be definitely controlled and the personal equation is almost negligible.

SOLUBILITY OF ORGANIC NITROGEN OF RAW MATERIALS BY THE ALKALINE PERMANGANATE METHOD.

By JOHN PHILLIPS STREET.

During the last three years many determinations of the solubility of the organic nitrogen of the various crude fertilizer materials have been made at this station by the neutral permanganate method. Since then the directors of the New England, New York and New Jersey stations have adopted a different method, the *alkaline* permanganate method, which gives figures not strictly comparable with those obtained by the neutral method. Accordingly this year 55 samples of raw materials were tested for solubility by the alkaline method, and the results are shown in the following table.

SOLUBILITY OF ORGANIC NITROGEN.

(Alkaline Permanganate Method.)

Material	Nitrogen.				Total.	Percentage Solubility of Organic Nitrogen.	Percentage Permanganate Solubility of Insoluble Organic Nitrogen.
	In Ammonia.	In Water-soluble Organic.	In Active Insoluble Organic.	In Inactive Insoluble Organic.			
Dried Blood	0.00	2.50	6.81	2.04	11.35	82.0	77.0
"	0.02	0.09	9.48	3.77	13.36	71.7	71.5
Tankage	0.01	3.30	2.01	0.47	5.79	91.7	81.0
"	0.15	2.63	1.81	0.55	5.14	89.0	76.7
"	0.30	2.50	4.75	1.14	8.69	86.4	80.7
"	0.19	1.84	3.06	0.77	5.86	86.4	80.0
"	0.27	3.42	2.04	1.03	6.76	84.1	66.4
"	0.08	4.29	1.68	1.20	7.25	83.3	58.3
"	0.28	3.46	1.97	1.14	6.85	82.6	63.3
"	0.21	1.34	3.41	1.04	6.00	82.0	76.6
"	0.03	1.28	1.43	0.76	3.50	78.1	65.2
"	0.25	0.66	4.81	1.74	7.46	75.9	73.4
"	0.13	0.42	4.81	1.74	7.10	75.0	73.4
"	0.28	2.42	2.67	1.81	7.18	73.8	59.6
"	0.10	0.80	1.47	0.81	3.18	73.7	64.5
"	0.12	1.94	2.78	1.69	6.53	73.6	62.1
"	0.14	0.50	5.62	2.24	8.50	73.2	71.5
"	0.30	2.47	2.58	1.89	7.24	72.9	57.8
"	0.30	0.86	2.72	1.45	5.33	71.2	65.2
"	0.36	1.87	2.70	1.97	6.90	69.9	57.8
"	0.25	2.48	2.60	1.73	7.06	65.0	60.0
" Average.....	0.20	2.03	2.89	1.32	6.44	78.3	68.1

Materials.	Nitrogen.				Total.	Percentage Solubility of Organic Nitrogen.	Percentage Permanganate Solubility of Insoluble Organic Nitrogen.
	In Ammonia.	In Water-soluble Organic.	In Active Insoluble Organic.	In Inactive Insoluble Organic.			
Tankage (abnormal samples)	1.50	0.45	1.17	0.88	4.00	64.8	57.5
"	5.82	0.77	1.14	1.13	8.86	62.8	50.0
"	0.04	0.51	2.60	2.49	5.64	55.5	51.1
"	0.12	0.36	2.74	2.76	5.98	52.9	49.8
" (garbage tankage) (leather preparation)	0.05	0.50	0.35	1.44	2.34	37.1	19.6
Dried Fish	0.00	0.26	1.44	4.31	6.01	28.3	25.0
"	0.50	1.01	5.03	1.32	7.86	82.1	79.2
"	0.43	0.77	5.69	1.75	8.64	78.7	76.5
"	0.14	0.47	6.18	2.30	9.09	74.3	72.9
"	0.58	1.06	4.51	2.20	8.35	71.7	67.2
"	0.50	0.81	5.16	2.39	8.86	71.4	68.3
"	1.15	2.15	2.96	2.12	8.38	70.7	58.2
"	0.85	1.40	3.29	2.06	7.60	69.5	61.5
"	0.55	0.96	1.24	1.17	3.92	65.3	51.5
"	0.79	1.00	3.96	2.69	8.44	64.8	59.5
"	0.50	0.84	3.95	2.93	8.22	62.0	57.4
" Average.....	0.60	1.05	4.20	2.09	7.94	71.1	65.2
Dissolved Bone.....	0.21	1.09	0.78	0.64	2.72	74.5	54.9
Castor Pomace	0.01	0.78	1.92	1.91	4.62	58.6	50.1
"	0.01	0.91	1.95	2.11	4.98	57.5	48.0
"	0.01	0.82	1.97	2.23	5.03	55.6	47.0
"	0.02	0.62	2.18	2.38	5.20	54.1	47.8
" Average.....	0.01	0.78	2.01	2.16	4.96	56.5	48.2
Shoddy Waste	0.01	0.11	6.52	2.06	8.70	77.3	76.0
Pouncing or Shaving Dust	0.00	0.50	10.11	3.59	14.20	74.7	73.8
Hare's Hair	0.11	0.42	10.00	3.55	14.08	74.6	73.8
Coney Hair	0.17	0.00	8.43	2.63	11.23	76.0	76.0
Hair Sweepings	0.10	0.19	8.45	2.86	11.60	75.1	74.8
Park's Fertilizer (Hat Factory Waste) ...	0.00	0.77	8.83	2.48	12.08	79.5	78.2
Muck or Peat	0.00	0.05	0.63	0.68	1.36	50.0	48.3
"	0.00	0.00	0.63	1.42	2.05	30.6	30.6
"	0.00	0.04	0.45	1.33	1.82	26.9	25.1
"	0.01	0.03	0.38	1.36	1.78	23.2	21.5
" Average.....	0.00	0.03	0.52	1.20	1.75	32.7	31.4
Sheep Manure	0.42	0.33	0.48	1.15	2.38	41.3	29.2
"	0.06	0.34	0.57	1.45	2.42	38.6	27.8
"	*0.48	0.16	0.21	0.59	1.44	38.5	26.2
" Average.....	0.32	0.28	0.42	1.06	2.08	39.5	27.7

The permanganate solubility of the water-insoluble nitrogen of the two samples of dried blood ranged from 71.5 to 77. Nineteen samples of tankage ranged from 57.8 to 81.0, with an average of

*Contains 0.43% in form of nitrates.

68.1. The six abnormal tankages ranged from 19.6 to 57.5, the lowest figure being obtained with the garbage tankage and almost as low a figure, 25.0, being given by the leather preparation. Dried fish ranged from 51.5 to 79.2 (average, 65.2), again a very wide variation. Dissolved bone gave the low figure of 54.9, and castor pomace also the low figures 47.0 to 50.1. The hat factory wastes ranged from 73.8 to 78.2, surprisingly high figures. Peat ranged from 21.5 to 48.3, and sheep manure from 26.2 to 29.2.

While in general these values are relatively similar to those obtained by the neutral method, the individual variations in the different classes of material are much wider than by that method, as is shown in the following typical materials:

	Neutral.	Alkaline.
Dried blood	94-97	72-77
Tankage	83-95	58-81
Dried fish	86-94	52-79

There is no question that either method serves as a useful means of distinguishing between such materials as blood, bone, tankage and fish on the one hand, and materials like peat and leather on the other. In such materials, however, as our sample of coney hair, the alkaline method shows a nitrogen solubility quite as high as that of high-grade blood, and therefore not distinguishable from it by this method alone. In a valuable material, such as castor pomace, the alkaline method shows an average solubility of 48.2, classing it, if judged by this figure alone, with the inferior materials. The neutral method gives castor pomace a solubility of 88, close to that obtained with other high-grade materials. In such instances as this, if the alkaline method is to be used with any certainty, strict attention must also be given to the amount of water-soluble organic nitrogen. The table shows this to average 0.78 in castor pomace, while in peat only traces are present.

POT EXPERIMENTS ON NITROGEN AVAILABILITY.

BY JOHN PHILLIPS STREET.

The constantly increasing demand for organic nitrogen and the high price of blood, fish and similar high-grade materials, have tempted some fertilizer manufacturers to use waste materials rich in nitrogen but whose fertilizing value is at least questionable.

The "wet-mixing" process, however, has come into quite general use. By this process the crude ammoniates are subjected for some hours to the action of sulphuric acid in so-called "dens." The action of the acid generates a high heat which, with the sulphuric, phosphoric and hydrofluoric acid present, thoroughly disintegrates the nitrogenous materials and destroys their original physical structure. Analysis of the residual products from this process shows that a considerable part of the organic nitrogen is made soluble in water and a part converted into compounds which yield ammonia on distillation with magnesia. While theoretically it would seem that this nitrogen should exist in a form readily available to plants, little experimental work has been done to establish this contention. The determination of the agricultural value of nitrogen thus prepared is of great importance. If manufacturers are able to convert inert nitrogen into available forms, their efforts towards conservation of our resources should be encouraged; if, on the other hand, the process is only a specious means of working-off relatively valueless material on the purchaser, words of warning can not be too loudly proclaimed.

The writer is one of a committee appointed by the directors of the Experiment Stations of New England, New Jersey and New York to study methods for determining nitrogen availability. This committee was invited by a prominent fertilizer company to witness the "wet-mixing" process as conducted commercially at its factory, and to take any samples which they chose. By the courtesy of this firm a batch of about 100 tons of base goods was made by the "wet-mixing" process in the presence of the committee. Samples were taken of each of the nitrogenous materials, the rock phosphate and the sulphuric acid used, and at the completion of the mixing process the "den" was sealed by the committee. After two days, the seals were broken in the presence of the committee, the material removed and a sample of about 1500 pounds taken. This was passed through a No. 3 screen, the tailings amounting to less than 2.5 per cent., and was treated with 5 per cent. of carbonate of lime. The following summary shows the change in character the nitrogen had undergone from the acid treatment: 100 parts of the nitrogen that went into the den contained 6.5 parts in ammonia form, 7.8 as water-soluble organic and 85.7 as water-insoluble organic, while 100 parts of the nitrogen in the finished base contained 14.3 parts in ammonia

form, 57.7 as water-soluble organic and 28 as water-insoluble organic.

The nitrogenous materials used in making this "base" were hair tannage, garbage tannage, and unacidulated treated leather. Samples of each of these crude materials, as well as the finished base, were taken by the committee. In the experiments that are here reported the hair, garbage tannage, treated leather and base were the identical materials used in this "wet-mixing" test, and consequently the results secured have the increased value associated with materials whose history is known.

Fertilizers Used in the Vegetation Tests.

A sufficient quantity of the base goods was transferred to a filter and thoroughly washed with successive portions of water at room temperature. The residue was dried, reground and analyzed. The soluble-nitrogen solution was made up to a definite volume and nitrogen determined in aliquot portions. Besides the raw materials entering into the "mix" and the finished base goods, nitrate of soda was selected as a typical high-grade water-soluble form, cotton seed meal as a high-grade organic form, and peat as a form generally admitted to be inert. The nitrogen content of the materials used is shown below.

Nitrate of soda	15.80	per cent.
Cotton seed meal	6.80	"
Base	1.57	"
" water-insoluble	0.63	"
" water-soluble .....	.1080	gm. per 100 c.c.
Garbage tannage	2.45	per cent.
Treated leather	6.40	"
Hair waste	8.23	"
Peat	2.81	"

In addition to the nitrogenous fertilizers, all the pots received applications of sulphate of potash and acid phosphate in the quantities stated in the table. Each pot also received a uniform application of 2 gms. of calcium carbonate. In adding the lime an effort was made to use a quantity sufficient to maintain nearly neutral or slightly alkaline conditions. The greatest amount of acid applied in the fertilizer was in pots 19 to 20 and 49 to 50, where the water-soluble part of the base was used. The acidity of 140 cc. of the solution of the water-soluble base, the quantity actually applied, was equivalent to 1.485 gms. of calcium carbon-

ate, while the acidity of the water-soluble portion of 4 gms. of acid phosphate applied was equivalent to 0.566 gm. of calcium carbonate. The maximum free acidity possible in any of the pots was, therefore, equivalent to 2.051 gms. of calcium carbonate.

A uniform application of 1.5 gms. of sulphate of potash and 4 gms. of acid phosphate was made on all the pots except Nos. 4, 5, 34 and 35, where the amount of these mineral fertilizers was increased fifty per cent. The nitrogenous fertilizers were applied in amounts equivalent to 0.15 gm. actual nitrogen, except in Nos. 9, 10, 39, 40, 14, 15, 44 and 45, where 0.25 gm. was applied.

Soil and Crops Used.

The soil used was an artificial mixture of seven parts sand and one of garden soil, the latter being dried and screened before mixing. The pots were ordinary 8-inch flower pots, coated with shellac on the inside. The pots were tared to an equal weight of 5 lbs. 2 ozs., with pieces of broken flower pots, and 13 lbs. of the mixed soil was placed in each.

The pots were filled and samples of the soil taken on March 14. On the next day the upper three inches of the soil of each pot were removed, the designated amount of fertilizer intimately mixed with it, and the mixtures returned to the pots. Seeds of Japanese millet and oats were then sown in Nos. 1 to 30, and 31 to 60 respectively. On March 30, the oats were thinned out to a uniform stand of 15 plants, except in No. 39, where there were 13, and in Nos. 52, 54 and 57, where there were 14 plants. The millet germinated very poorly and, on April 13, the pots were partially reseeded with germinated seeds to a uniform stand of 15 or 16 plants.

Throughout the whole experiment, water was added as needed, complete saturation of the soils never being reached, a slight deficiency rather than an excess of water being generally maintained.

The crops were photographed on June 19. The oats were harvested on June 20, the millet on July 5, before maturity in both cases. The plants were cut off as close to the ground as possible, air-dried, ground, and nitrogen determined. The roots and the short stubble were disregarded.

Tables I and II give the detailed results.

TABLE I.—POT EXPERIMENTS—MILLET.

Pot No.	Fertilizer applied. Grams.	Nitrogen in Fertilizer. Grams.	Green weight of crop. Grams.	Air-dry weight Grams.	Nitrogen in air-dry matter, per cent.	Nitrogen in crop. Grams.	Nitrogen gain over pots 1-3. Grams.	Nitrogen recovered, per cent.	Average nitro- gen recovered, per cent.	Nitrogen (NAN ₂ O=100), per cent.
1	1.5 Sulphate of potash, 4 acid phosphate.....	.....	44.5	11.5	0.44	.0506	(Ave. .0551)	...	...	...
2	" "	.....	42.5	11.0	0.50	.0550	.....	...	...	...
3	" "	.....	45.5	11.5	0.52	.0598	.....	...	...	...
4	6 " "	.....	40.5	10.0	0.46	.0460	.....	...	...	...
5	2.25 " "	.....	43.0	10.0	0.50	.0500	.....	...	...	...
6	4 " "	.....	1501	34.0	0.48	.1632	.1081	72.0	...	...
7	1.5 " "	.....	1501	107.5	0.53	.1617	.1066	71.0	71.5	100.
8	" " 0.95 nitrate of soda.....	.....	1501	107.5	0.53	.1617	.1066	*59.2	...	...
9	" " " "	.....	1501	108.0	0.48	.1440	.1081	*62.1	...	...
10	1.58 " "	.....	2496	140.0	0.50	.2100	.1549	77.2	...	...
11	" " 2.21 cotton seed meal.....	.....	1503	96.0	0.47	.1199	.1927	43.1	...	...
12	" " " "	.....	1503	90.5	0.50	.1128	.0648	38.4	...	55.0
13	" " " "	.....	1503	81.5	0.50	.1100	.0549	36.5	...	...
14	3.68 " "	.....	2502	97.0	0.58	.1653	.1102	44.0	...	...
15	" " " "	.....	2502	102.5	0.49	.1421	.0870	34.8	39.4	...
16	9.55 base.....	.....	1499	98.0	0.56	.1430	.0879	58.6	54.1	75.7
17	" " " "	.....	1499	88.0	0.56	.1341	.0793	52.9	...	...
18	" " " "	.....	1512	102.0	0.52	.1352	.0801	53.0	...	...
19	140 cc. base, water-soluble.....	.....	1512	96.5	0.50	.1350	.0799	52.8	52.9	74.1
20	" " " "	.....	1512	94.5	0.52	.0806	.0255	17.0	...	...
21	23.81 " " water-insoluble	.....	1500	61.5	0.55	.0578	.0027	1.8	9.4	13.2
22	" " " "	.....	1500	45.5	0.55	.0578	.0027	1.8	...	...
23	6.12 garbage tankage.....	.....	1499	67.5	0.51	.0918	.0367	24.5	...	...
24	" " " "	.....	1499	77.0	0.54	.1080	.0529	35.3	29.9	41.9
25	2.34 treated leather.....	.....	1498	54.5	0.48	.0720	.0109	11.3	...	...
26	" " " "	.....	1498	54.5	0.48	.0744	.0193	12.9	12.1	16.9
27	1.82 hair waste.....	.....	1498	72.0	0.49	.0907	.0356	23.8	...	32.2
28	" " " "	.....	1498	66.5	0.49	.0882	.0331	22.1	23.0	...
29	5.34 peat.....	.....	1501	42.0	0.45	.0495	—	.0056	...	...
30	" " " "	.....	1501	48.0	0.45	.0585	.0034	2.3	2.3	3.2

* Omitted from average.

TABLE II.--POT EXPERIMENTS--OATS.

Pot No.	Fertilizer applied. Grams.	Nitrogen in Fertilizer. Grams.	Green-weight of crop. Grams.	Air-dry weight of crop. Grams.	Nitrogen in air-dry matter. per cent.	Nitrogen in crop. per cent.	Nitrogen gain over pots 31-33. Grams. (Ave. .0035)	Nitrogen recovered. per cent.	Average nitrogen recovered. per cent.	Nitrogen recovered (NaNO ₃ =100). per cent.
31	I.5 Sulphate of potash, 4 acid phosphate.....	.....	21.5	7.5	0.90	.0675	.....	.....	.....	.....
32	" " " "	.....	23.0	8.5	0.74	.0629	.....	.....	.....	.....
33	" " " "	.....	24.0	8.0	0.75	.0600	.....	.....	.....	.....
34	2.25 " " " "	6	25.5	8.5	0.81	.0689	.....	.....	.....	.....
35	" " " "	.....	31.5	11.0	1.09	.1199	.....	.....	.....	.....
36	I.5 " " " "	.1501	49.5	18.0	1.05	.1890	.1255	83.6	.....	.....
37	" " " "	.1501	41.5	15.0	1.29	.1935	.1300	86.6	88.7	100
38	" " " "	.1501	44.0	17.0	1.22	.2074	.1439	95.9	.....	.....
39	" " " "	.1501	44.0	18.0	1.59	.2862	.2227	89.2	.....	.....
40	I.58 " " " "	.2496	52.0	18.5	1.48	.2738	.2103	84.3	86.8	.....
41	2.21 cotton seed meal.....	.1503	40.5	13.0	0.89	.1157	.0522	34.7	.....	.....
42	" " " "	.1503	38.5	13.0	0.92	.1196	.0561	37.3	34.1	38.5
43	" " " "	.1503	40.5	12.0	0.91	.1092	.0457	30.4	.....	.....
44	3.68 " " " "	.2502	40.0	13.0	1.24	.1612	.0977	39.0	.....	.....
45	" " " "	.2502	43.0	14.5	1.07	.1552	.0917	36.7	37.9	.....
46	9.55 base.....	.1499	39.5	13.0	1.03	.1339	.0704	47.0	.....	.....
47	" " " "	.1499	49.5	14.0	1.06	.1484	.0849	56.6	54.2	61.2
48	" " " "	.1499	43.0	13.0	1.17	.1521	.0886	59.1	.....	.....
49	140 cc. base, water-soluble..	.1512	46.0	15.5	0.89	.1380	.0745	49.3	.....	.....
50	" " " "	.1512	47.0	15.5	1.02	.1581	.0946	62.6	56.0	63.3
51	23.81 " " water-insoluble	.1500	32.5	9.0	0.97	.0873	.0238	15.9	.....	.....
52	" " " "	.1500	27.5	8.0	1.01	.0808	.0173	11.5	13.7	15.5
53	6.12 garbage tannage.....	.1499	29.0	8.5	0.84	.0714	.0079	5.3	.....	.....
54	" " " "	.1499	31.5	10.0	0.93	.0930	.0205	19.7	12.5	14.1
55	2.34 treated leather.....	.1498	40.5	12.5	0.89	.1113	.0478	31.9	.....	.....
56	" " " "	.1498	38.5	13.0	0.85	.1105	.0470	31.4	31.7	35.8
57	1.82 hair waste.....	.1498	36.5	11.0	0.88	.0968	.0333	22.2	22.2	25.1
58	" " " "	.1498	34.5	11.0	0.88	.0968	.0333	22.2	.....	.....
59	5.34 peat.....	.1501	24.0	8.5	0.76	.0646	.0011	0.7	.....	.....
60	" " " "	.1501	27.0	9.0	0.81	.0729	.0094	6.3	3.5	4.0

The larger application of minerals on Nos. 4 and 5 gave no increased crop of millet; the similar application on Nos. 34 and 35 gave only a slightly increased crop of oats. From these results it is concluded that sufficient phosphoric acid and potash were present to make the nitrogen applied the determining factor in the amount of the crop secured in every case. Again, the increased yields of both millet and oats where larger applications of nitrate of soda and cotton seed meal were supplied, indicate that in no case was the amount of nitrogen applied excessive.

With very few exceptions the parallels secured in both experiments were satisfactorily close. When considered on the basis of nitrogen actually recovered in the crop, the divergence between parallels is larger in a few cases, but in no case sufficiently wide to prevent conclusions being drawn as to the efficacy of the different fertilizers.

The no-nitrogen plots gave very uniform yields and clearly indicated the nitrogen-need of the soil used.

The Crops Secured.

The following tabulation shows the average air-dry crops secured by the various treatments, the average crop increase due to the form of nitrogen used, and the average relative crop increase, assuming the average yield from the smaller amount of nitrate of soda equals 100.

AVERAGE CROP AND AVERAGE CROP INCREASE SECURED.

Form of Nitrogen.	Amount of Nitrogen applied.	Millet.			Oats.		
		Air-dry Crop.	Increased Air-dry Crop.	Relative Increase of Crop.	Air-dry Crop.	Increased Air-dry Crop.	Relative Increase of Crop.
Minerals only, normal .....	..	11.3	..	..	8.0	..	..
“ “ 1½ normal ..	..	10.0	..	..	9.8	..	..
Nitrate of Soda .....	.15	31.5	20.2	100	16.7	8.7	100
“ “ .....	.25	42.0	30.7	..	18.3	10.3	..
Cotton Seed Meal .....	.15	23.8	12.5	62	12.7	4.7	54
“ “ .....	.25	28.8	17.5	..	13.8	5.8	..
Base .....	.15	26.7	15.4	76	13.3	5.3	61
“ water-soluble .....	.15	26.5	15.2	75	15.5	7.5	86
“ water-insoluble .....	.15	13.0	1.7	8	8.5	0.5	6
Garbage Tankage .....	.15	19.0	7.7	38	9.3	1.3	15
Treated Leather .....	.15	15.3	4.0	20	12.8	4.8	55
Hair Waste .....	.15	18.3	7.0	35	11.0	3.0	35
Peat .....	.15	12.0	0.7	3	8.8	0.8	9

Before discussing the above table, it is well to consider the forms in which the nitrogen existed in the different fertilizers applied. The following tabulation shows the percentages of ammonia and water-soluble organic nitrogen found in each, and the amount of soluble nitrogen applied to each pot:

Material.	Ammonia. per cent.	Nitrogen as Water-Soluble Organic. per cent.	Total Water-Soluble Nitrogen. per cent.	Water- Soluble Nitrogen in Fertilizer Applied. gms.	Per cent. of Total Nitrogen Soluble in Water. per cent.
Cotton seed meal	0.06	0.74	0.80	.018	12
Base	0.24	1.06	1.30	.124	83
“ water-soluble .....	..	..	..	.151	100
“ water-insoluble .....	..	..	..	.000	0
Garbage tankage	0.10	0.10	0.20	.012	8
Treated leather	0.36	0.45	0.81	.019	13
Hair waste	0.80	1.14	1.94	.035	23
Peat	0.10	0.01	0.11	.006	4

These figures may explain the relatively high crop increases obtained with the base compared with those from cotton seed meal, eighty-three per cent. of the nitrogen of the former and only twelve per cent. of the cotton seed meal nitrogen being soluble in water. The crop increase from the use of cotton seed meal is normal in both crops, but the high increases obtained with the base goods emphasize its excellence as a fertilizer. In the case of millet the water-soluble base gave a little less crop increase than the total base, while in the case of oats it gave a slightly larger return. These small differences have no practical significance, for the amount of insoluble nitrogen in the base is so small that pots 16-20 and 46-50 might almost be considered parallel tests. The excellence of the nitrogen of the base as an increased crop producer is apparent with both the crops grown.

The water-insoluble base and the peat show almost no power of increased crop production. The results with the other forms of nitrogen are variable with the two crops. With millet, garbage tankage and hair waste show about half the crop-producing power of the base goods, while treated leather is only about one-fourth as good. With oats, treated leather gives a much higher return, nearly equalling the base goods, while hair waste gives about one-half and garbage tankage about one-fourth as much as the base. Why, with oats, treated leather should give such a high return, actually higher than that secured with cotton

seed meal, is one of the anomalies of pot experiments for which we can offer no explanation.

The Availability of the Nitrogen to the Crop.

While from a practical point of view the amount of crop secured is of prime importance, the purpose of these experiments was chiefly to determine to what extent the plants could utilize the different forms of nitrogen supplied. The tabulation below shows the relative amounts of nitrogen recovered in the crops, the nitrogen recovery from the smaller application of nitrate of soda being assumed to be 100:

	Per cent. Nitrogen Recovered			Per cent. Nitrogen Recovered	
	Millet.	Oats.		Millet.	Oats.
Nitrate of soda	100	100	Garbage tankage	42	14
Cotton seed meal	55	39	Treated leather	17	36
Base	76	61	Hair waste	32	25
“ water-soluble	74	63	Peat	3	4
“ water-insoluble ..	13	16			

The relative nitrogen recovery differs in no essential from the relative crop-producing power of the different fertilizers. Averaging the recovery from the two crops on the basis of nitrate of soda equals 100, the total base and water-soluble base show an availability of 69, cotton seed meal 47, hair waste 29, garbage tankage 28, treated leather 27, insoluble base 15 and peat 4.

It is of interest to note how little influence the form of fertilization had on the percentage content of nitrogen in the air-dry crop of millet. It ranged from 0.44 to 0.59 per cent., the kind of fertilizer apparently having but little effect. In the oats, however, the nitrogen ranged from 0.74 to 1.59 per cent., nitrate of soda giving not only the largest crops but the crops richest in nitrogen.

Conclusions.

Definite conclusions cannot be drawn from a limited number of pot experiments. The experiments here reported, however, indicate that the “wet-mix” acid treatment of materials, like hair waste, treated leather and garbage tankage, yields a fertilizer of high crop-producing power with millet and oats, and one whose nitrogen availability to these crops is superior to that of cotton seed meal, and from sixty to seventy-five per cent. of that of nitrate of soda. Furthermore, in these tests, the value of the base-goods nitrogen rested almost entirely on the portion which

is soluble in water, this portion showing an availability of from sixty-three to seventy-four per cent. of that of nitrate of soda with millet and oats.

I. RAW MATERIALS CHIEFLY VALUABLE FOR NITROGEN.

NITRATE OF SODA OR SODIUM NITRATE.

Nitrate of soda is mined in Chili and purified there before shipment. As offered in the Connecticut market this year, it contains about 15.42 per cent. of nitrogen, equivalent to 93.6 per cent. of pure sodium nitrate. The other usual constituents are moisture and small quantities of common salt and Glauber's salt (sodium sulphate).

Shipments differ somewhat in composition, as is shown by the thirteen samples which have been analyzed, as follows:

26403. Sold by Armour Fertilizer Works. Sampled from stock of A. Grulich, Meriden.

26217. Sold by Coe-Mortimer Co. Sampled from stocks of W. O. Goodsell, Bristol and Spencer Bros., Suffield.

26269. Sold by Wilcox Fertilizer Co. Sampled at factory.

26201. Sold by Sanderson Fertilizer and Chemical Co. Sampled at factory.

26202. Sold by L. T. Frisbie Co. Sampled from stock of Lightbourn & Pond Co., New Haven.

26273. Sold by American Agricultural Chemical Co. Sampled from stock of J. A. Glasnapp, West Cheshire.

26570. Sold by German Kali Works. Sampled from stock of E. A. Standish, Andover.

26402. Sold by Bowker Fertilizer Co. Sampled from stock of W. H. Burr, Westport.

26343. Sold by Nitrate Agencies Co. Sampled from stock of C. R. Treat, Orange.

26200. Sold by Nitrate Agencies Co. Sampled from stocks of L. M. Benham, Highwood, and Andrew Ure, Highwood.

26203. Sold by Rogers Manufacturing Co. Sampled from stock of S. A. Flight, Highwood.

26482. Sold by C. M. Shay Fertilizer Co. Sampled from stock of Farmers' Association, Leonard's Bridge.

26424. Sampled from stock of Connecticut School for Boys, Meriden.

The nitrogen contained in these samples was in every case as much as or more than was guaranteed.

The per cent. of nitrogen in these samples ranges from 15.16 to 15.64 and averages 15.42.

The retail cost of nitrogen ranges from 15.5 to 17.4 cents per pound, the average being 16.4.

The nitrogen of nitrate of soda is unquestionably the most quickly and fully available form which is accessible, and this year it has been the cheapest. For quick action, particularly on such crops as grain, grass and potatoes, which make a large part of their growth when the soil is still too cold for the active decay and nitrification of organic forms of nitrogen, nitrate of soda is especially valuable.

ANALYSES OF NITRATE OF SODA.

Station No.	26403	26217	26269	26201	26202	26273	26570
<i>Percentage amount of</i>							
Nitrogen found	15.52	15.50	15.40	15.44	15.36	15.52	15.26
Nitrogen guaranteed	14.81	15.00	15.00	15.00	15.00	15.00	15.00
Cost per ton.....	\$48.00	50.00	49.50	50.00	50.00	52.00	52.00
Nitrogen costs cents per							
pound	15.5	16.1	16.1	16.2	16.3	16.8	17.0
Station No.	26402	26343	26200	26203	26482	26424	
<i>Percentage amount of</i>							
Nitrogen found	15.24	15.16	15.30	15.44	15.44	15.64	
Nitrogen guaranteed	15.00	15.00	15.00	15.00	15.00	15.65	
Cost per ton.....	\$53.00	.....	.....	.....	.....	.....
Nitrogen costs cents per							
pound	17.4	.....	.....	.....	.....	.....

DRIED BLOOD.

Two samples from the stock of the station, used in fertilizer experiments, 26307 and 26416, contained 11.35 and 13.36 per cent. of nitrogen, respectively. The solubility of the organic nitrogen in these samples, see page 12, was 82.0 and 71.7 per cent.

COTTON SEED MEAL.

Much more cotton seed meal is used in this state as a tobacco fertilizer than as a dairy feed. Two hundred and seventy-three samples have been analyzed, representing nearly as many car lots, and approximately 6,100 tons. For this the buyers have paid more than \$195,000. But little dependence can be placed

at present on the guaranteed composition of cotton seed meal. It is bagged and tagged at a large number of mills, widely scattered in the Southern States. Many of these mills have no regular tests made of their mill run, but state to the commission men what they believe is the content of nitrogen of the meal they put out. The commission house sends tags bearing its name and address with the guaranty, and orders car lots shipped to fill orders. When the car arrives in this state, if the meal is found to be inferior to the guaranteed quality, the dealer in Connecticut is liable under the pure food law to criminal prosecution. If such action was begun it would be a perfect defense to show a valid guaranty from the house outside the state, of whom the meal was bought. Then the case would be transferred to the United States authorities, who would prosecute either the commission house or the manufacturer. Rigid enforcement of the law would no doubt, in time, force manufacturers to give in all cases correct guaranties.

The following table shows that more than one-fifth of the samples fall below their guaranties in respect to nitrogen. Inasmuch, however, as the Connecticut dealer has to pay for his meal before it is tested, and as neither he nor the firm which sold it to him had any knowledge of the quality of the meal other than that which the manufacturer's label gives, an attempt at strict enforcement of the law would result in hardship to Connecticut dealers, restriction of the supply, and probably increased cost to the buyer. To meet these conditions one firm, at least, gives with the guaranty on every bag a promise to make a specified reduction in the price for every unit of nitrogen that is lacking.

Samples of much of the meal which comes into the Connecticut valley are analyzed here, and buyers of this meal can therefore obtain a rebate for any deficiency of quality, by making demand on the dealer, provided they place their orders with a firm which agrees to refund for low grade meal. The fairest way to deal in such materials is to buy by the analysis; let us say, for illustration, \$32.00 for 7 per cent. meal, which means twenty-three cents per pound for nitrogen. Allow a variation of 0.2 per cent. either side of the 7 per cent. for errors and discrepancies in samples and analyses, etc. Then for every 0.1 per cent. less than 6.89 per cent. of nitrogen found in the goods let the seller deduct forty-six cents from the ton price, and for

every 0.1 per cent. more than 7.2 per cent. let him add the same amount.

Of the 273 samples examined 59 were below their guaranty. The percentage of nitrogen ranged from 5.68 to 7.82 and the average was 6.97. Prices varied not only with the time of shipment but with the quality of the meal and averaged \$32.11 per ton, making the average cost of nitrogen in cotton seed meal 20.4 cents per pound.

The average cost of nitrogen to the buyer has been the same for all samples having over 6½ per cent. of nitrogen, but the average cost of nitrogen in samples having less than 6½ per cent. has been considerable higher. It should be said that the prices in the table are those originally charged, but that in the case of Humphrey-Godwin's goods, and possibly of others, wherever the meal fell below the guaranty, the price was correspondingly reduced.

Those who wish to have the meal examined at the station must bear in mind that proper sampling is no less important than accurate analysis, and that careless sampling makes the analysis worse than useless. The seller will not, and should not, accept an analysis unless he has proof that the sample was properly drawn. At least twenty bags should be opened in every car lot, and about a pint taken from each by thrusting the hand or a cup down into the meal. These samples should then be mixed carefully, and two samples drawn from the mixture, one to be sent to the station and the other held for the manufacturer in case it is called for. The one who samples should be prepared to make affidavit as to the date, No. of car, number of bags opened, etc. The sample sent to the station should be fully described on a blank, which will be furnished on application.

This information should be given to the station before the analysis is undertaken, for the station has no right to do work with state funds unless it has some assurance that the work, when done, will be of value to the public. Frequently we receive samples with no marks to identify them, broken packages from which a part or all the sample has run out over the mail matter, samples quite too small to be representative, and samples not of stock delivered in the state, but of what some shipper *proposes* to supply. These, of course, are worthless, but they are not positively harmful, whereas a sample of meal on sale in the state, which is apparently all right, but has not been carefully drawn, may do great injustice either to buyer or seller.

ANALYSES OF COTTON SEED MEAL, 1911.

Station No.	Dealer, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen.		Cost per ton.	Nitrogen costs cents per pound.
			Found.	Guaranteed.		
26004	American Cotton Oil Co.	J. E. Phelps.	6.69	6.18	\$32.00	20.6
26003		"	6.37	6.18	32.00	21.7
26652		T. J. Coleman.	6.24	6.18	29.50	20.2
26338	F. W. Brode and Co.	R. H. Ensign.	7.00	6.50	29.50	17.9
26619		Conn. Tobacco Corporation	6.90	.....	.....	.....
26616		"	6.86	.....	.....	.....
26615		"	6.83	.....	.....	.....
26614		"	6.83	.....	.....	.....
26608		"	6.82	.....	.....	.....
26606		"	6.80	.....	.....	.....
26612		"	6.75	.....	.....	.....
26620		"	6.74	.....	.....	.....
26618		"	6.66	.....	.....	.....
26613		"	6.64	.....	.....	.....
26607		"	6.62	.....	.....	.....
26604		"	6.62	.....	.....	.....
26658		N. J. Trench and others.	6.60	.....	.....	.....
26125		Spencer Bros. and others.	6.56	.....	30.50	19.8
26611		Conn. Tobacco Corporation	6.55	.....	30.00	19.5
26605		"	6.53	.....	.....	.....
26373		W. M. Hinson.	6.53	.....	.....	.....
26335		R. H. Ensign.	6.53	.....	30.25	19.8
26610		Conn. Tobacco Corporation	6.51	6.50	32.00	21.2
26374		W. M. Hinson.	6.50	.....	.....	.....
26337		R. H. Ensign.	6.50	.....	36.25	24.5
26617		Conn. Tobacco Corporation	6.49	6.50	32.00	20.8
26609		"	6.40	.....	.....	.....
			6.35	.....	.....	.....

ANALYSES OF COTTON SEED MEAL, 1911.—Continued.

Station No.	Dealer, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen.		Cost per ton.	Nitrogen costs cents per pound.
			Found.	Guaranteed.		
26340	T. H. Bunch Co. No. 2.....	B. C. Fuller.....	6.39	6.50	\$30.00	20.1
26088	S. P. Davis.	N. J. Trench, C. H. Eno.....	7.54	6.50	30.50	17.3
26336		R. H. Ensign.....	7.48	6.50	31.00	17.7
26174		Amos D. Bridge's Sons.....	7.44	.....	31.00	17.9
26175		".....	7.41	.....	31.00	18.1
25990		W. B. Whitlock and others.....	7.32	6.50	31.50	18.5
26550		James Price.....	6.60	6.59	30.00	19.4
26551		William Fromley.....	6.08	6.59	31.75	22.5
26177	Rodney J. Hardy and Sons.	Arthur Sikes and others.....	7.52	7.00	31.00	17.7
26176		".....	7.48	7.00	32.00	18.4
26000		".....	7.37	.....	31.75	18.5
26394		".....	7.30	6.50	30.00	17.4
26332		".....	6.89	6.50	30.00	18.6
26157		".....	6.64	6.50	30.50	19.7
26529	Humphreys, Godwin and Co.	Olds and Whipple.....	7.82	7.82	34.00	18.9
26505		".....	7.82	7.76	34.00	18.9
26506		".....	7.69	7.65	33.50	18.9
26417		Loomis Bros. and others.....	7.68	6.50	30.00	16.7
26448		Olds and Whipple.....	7.66	7.69	36.00	20.6
26180		".....	7.63	7.61	36.50	21.0
26303		".....	7.59	7.57	36.50	21.1
26302		".....	7.59	7.57	36.50	21.1

ANALYSES OF COTTON SEED MEAL, 1911.—Continued.

Station No.	Dealer, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen.		Cost per ton.	Nitrogen costs cents per pound.
			Found.	Guaranteed.		
26371	Olds and Whipple.	".....	7.57	7.49	\$36.00	20.9
26530		".....	7.56	7.65	33.50	19.2
26446		".....	7.55	7.53	36.00	20.9
26419		".....	7.55	7.53	33.00	18.9
26299		".....	7.54	7.36	30.00	21.0
26155		".....	7.54	7.49	36.00	21.0
26447		".....	7.54	7.69	36.00	21.0
26302		".....	7.52	7.53	36.50	21.3
26300		".....	7.51	7.49	36.00	21.0
26212		".....	7.51	7.41	35.50	20.7
26507		".....	7.50	7.53	33.00	19.1
26059		".....	7.48	7.49	35.50	20.9
26116		".....	7.44	7.49	35.50	20.9
26179		".....	7.44	7.37	35.50	20.9
26115		".....	7.43	7.49	35.50	20.9
26420		".....	7.42	7.41	32.50	18.9
26087		".....	7.34	7.37	35.00	20.8
26238		".....	7.33	7.12	35.00	20.9
26142		".....	7.31	7.32	35.00	20.9
26086		".....	7.30	7.28	35.00	21.0
26117		".....	7.28	7.29	35.50	21.4
26239		".....	7.27	7.24	35.50	21.4
26153		".....	7.27	7.12	34.50	20.7
26118		".....	7.26	7.28	35.00	21.1
26163		".....	7.26	7.32	35.00	21.1
26305		".....	7.26	7.32	35.50	21.6
26306		".....	7.24	7.28	35.50	21.5
26133		".....	7.22	7.08	34.50	20.9
26130		".....	7.22	7.36	35.50	21.5

ANALYSES OF COTTON SEED MEAL, 1911.—Continued.

Station No.	Dealer, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen.		Cost per ton.	Nitrogen costs cents per pound.
			Found.	Guaranteed.		
26350	26229.....	Spencer Bros. and others.....	7.22	6.50	\$30.50	18.1
25967	22456.....	Olds and Whipple.....	7.21	7.24	36.00	21.9
25944	2284.....	".....	7.19	7.20	35.00	21.3
25975	93837.....	".....	7.18	7.24	36.00	22.0
26215	4433.....	".....	7.17	7.20	35.00	21.3
25933	19868.....	".....	7.17	7.20	36.00	22.0
25998	67894.....	".....	7.16	7.16	34.50	21.0
26131	27759.....	".....	7.16	7.19	35.00	21.4
26154	34039.....	".....	7.14	7.24	35.00	21.4
26472	2109.....	Arthur Sikes and others.....	7.12	6.50	30.00	18.0
25973	6727.....	H. K. Brainard and others.....	7.12	7.00	33.00	20.1
26304	27408.....	Olds and Whipple.....	7.10	7.00	33.00	20.2
26351	18913.....	".....	7.08	7.08	35.00	21.6
26141	60504 X 10914.....	C. G. Lawton.....	7.06	6.56	30.00	18.1
26028	682249.....	Spencer Bros., C. Michel.....	7.04	6.50	30.00	18.1
26178	60519.....	Spencer Bros., Bissell-Graves Co.....	7.04	7.00	32.00	19.6
25980	62002.....	Olds and Whipple.....	7.03	7.20	35.00	21.7
25974	3862.....	".....	7.03	7.00	33.00	20.3
26082	68703.....	Spencer Bros., Bissell-Graves Co.....	7.03	7.00	33.00	20.4
26369	17348.....	H. K. Brainard and others.....	7.02	7.00	32.50	20.0
26083	1010.....	".....	7.00	7.00	33.00	20.4
25964	21174.....	Olds and Whipple.....	6.99	7.00	34.00	21.2
25999	25909.....	".....	6.99	7.00	33.00	21.2
25965	20603.....	".....	6.99	7.00	33.00	21.2
26084	46337.....	H. K. Brainard and others.....	6.98	7.00	32.75	20.3
26167	44908 X 27473.....	Spencer Bros. and others.....	6.98	6.50	30.25	18.5
26349	26832.....	".....	6.98	6.50	30.50	18.7
26134	91340 X 131048.....	".....	6.98	7.00	31.25	19.2

ANALYSES OF COTTON SEED MEAL, 1911.—Continued.

Station No.	Dealer, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen.		Cost per ton.	Nitrogen costs cents per pound.
			Found.	Guaranteed.		
25981	559285.....	Broad Brook Lumber and Coal Co.....	6.98	....	\$31.65	19.5
26032	6819.....	Olds and Whipple.....	6.98	7.00	33.50	20.9
26008	88190.....	".....	6.98	7.00	34.00	21.2
26007	76090.....	".....	6.97	7.00	34.00	21.2
26025	68249.....	Spencer Bros., Bissell-Graves Co.....	6.97	....	31.25	19.3
26006	35975.....	Olds and Whipple.....	6.95	7.00	34.00	21.3
25966	71419.....	".....	6.94	7.00	33.00	20.7
26079	68703.....	Spencer Bros., Bissell-Graves Co.....	6.94	7.00	31.25	19.4
26122	131048.....	".....	6.93	....	31.25	19.4
25957	42037.....	Olds and Whipple.....	6.92	7.00	33.00	20.7
26171	48151.....	Spencer Bros. and others.....	6.91	6.50	30.50	18.9
26161	285.....	Loomis Bros. Co., C. Sandman.....	6.90	6.50	30.50	18.9
26370	2128.....	Arthur Sikes and others.....	6.90	6.50	30.00	18.6
26224	60818.....	Spencer Bros., H. Zera.....	6.89	6.50	....	....
26135	13224.....	Spencer Bros., Bissell-Graves Co.....	6.89	7.00	31.25	19.5
25959	98578.....	"..... and others.....	6.89	6.50	32.50	20.4
26208	2234.....	Loomis Bros. Co. and others.....	6.88	6.50	30.00	18.6
26333	17348.....	H. K. Brainard, S. H. Neelans.....	6.88	7.00	31.00	19.3
25970	18358.....	Spencer Bros. and others.....	6.88	6.50	31.50	19.7
25988	526401.....	Olds and Whipple.....	6.87	7.00	34.00	21.6
26062	90641 X 27575.....	Spencer Bros., John Sullivan.....	6.87	6.50	31.00	19.4
26085	63386.....	Spencer Bros., H. Russell.....	6.87	6.50	31.00	19.4
26214	122576.....	Olds and Whipple.....	6.86	7.00	31.00	19.4
26219	41221.....	Spencer Bros. and others.....	6.85	6.50	31.50	19.8
26026	28.....	Spencer Bros.....	6.84	....	....	....
26015	10582.....	"..... and others.....	6.84	6.50	31.25	19.6
25972	4289.....	Loomis Bros. Co.....	6.84	6.50	32.50	20.6
26301	35334.....	Olds and Whipple.....	6.84	6.58	30.00	18.7
25994	.....	F. M. Thompson.....	6.82	6.56	30.75	19.3

ANALYSES OF COTTON SEED MEAL, 1911.—Continued.

Station No.	Dealer, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen.		Cost per ton.	Nitrogen costs cents per pound.
			Found.	Guaranteed.		
26099	15429	Spencer Bros. and others.	6.82	6.50	\$31.00	19.5
26097	17477	" " C. F. Whittemore.	6.81	6.50	31.25	19.7
25968	95864	Spencer Bros., Bissell-Graves Co.	6.81	7.00	31.50	19.9
26124	13224	" " and others.	6.80	...	31.25	19.7
25984	5152	" " " " " "	6.79	6.50	31.50	20.0
25930	87469	" " " " " "	6.79	6.50	31.50	20.0
25924	41403	" " " " " "	6.78	7.00	31.50	20.0
25960	3966	" " " " " "	6.78	6.50	30.50	19.3
26221	47065	" " " " " "	6.78	6.50	32.00	20.4
26091	14650	Loomis Bros. Co. and others.	6.78	6.50	31.00	19.6
25943	7635	Olds and Whipple.	6.78	7.20	35.00	22.6
26166	75718	" " " " " "	6.78	6.58	29.50	18.5
25986	16141	Spencer Bros., L. A. Kent.	6.76	7.00	31.50	20.1
26504	134143	" " " " " "	6.76	6.50	31.00	19.7
26241	30878	H. K. Brainerd, C. T. Remington,	6.76	7.00	33.00	21.2
26074	1382	Loomis Bros. Co.	6.76	6.50	31.00	19.7
26220	47625	Spencer Bros., J. E. Hastings.	6.75	6.50	30.00	19.0
26126	74903	" " and others.	6.74	7.00	30.50	19.4
26090	39613	" " " " " "	6.74	6.50	30.50	19.4
26001	1490	Arthur Sikes and others.	6.74	...	31.50	20.1
26658	33671	Olds and Whipple.	6.74	6.58	31.00	19.8
26372	14144	" " " " " "	6.74	6.58	29.50	18.6
26182	63924	" " " " " "	6.74	6.58	30.00	19.0
26123	32696	Spencer Bros., Bissell-Graves Co.	6.73	...	31.25	20.0
26169	1004	" " C. A. Harmon.	6.72	6.50	29.75	18.9
26136	32696	" " Bissell-Graves Co.	6.72	7.00	31.25	20.0
26102	17070	Loomis Bros. Co. and others.	6.72	6.50	30.50	19.4
26222	79606	Spencer Bros., L. Boroski.	6.71	6.50	29.50	18.7
26075	8607X18969	" " and others.	6.71	6.50	32.00	20.6

ANALYSES OF COTTON SEED MEAL, 1911.—Continued.

Station No.	Dealer, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen.		Cost per ton.	Nitrogen costs cents per pound.
			Found.	Guaranteed.		
25985	5592	Spencer Bros. and others.	6.71	7.00	\$31.50	20.2
26022	1584	Arthur Sikes, E. S. Seymour.	6.71	7.00	31.75	20.4
26183	579400	Olds and Whipple.	6.71	6.58	30.00	19.1
25951	25045	" " " " " "	6.70	7.00	35.00	22.9
26501	12861	Spencer Bros. and others.	6.70	6.50	30.00	19.1
26109	11307	A. W. Burrows.	6.69	6.50	31.75	20.5
26092	14852	Loomis Bros. Co., C. G. Sandman.	6.69	6.50	30.50	19.5
26253	27728	Olds and Whipple.	6.68	6.50	30.00	19.2
26121	16690	" " " " " "	6.68	6.58	30.50	19.6
25950	13248	" " " " " "	6.68	7.00	35.00	22.9
26223	60818	Spencer Bros., H. Zera.	6.68	6.50	...	...
25949	36677	" " and others.	6.68	7.00	31.50	20.3
26061	64255	" " John Sullivan.	6.67	6.50	31.00	20.0
26368	18811	H. K. Brainerd.	6.66	6.50	30.00	19.2
26181	48109	Olds and Whipple.	6.65	7.00	32.50	21.2
26147	15846	Spencer Bros. and others.	6.64	6.50	29.50	18.9
26060	84638	" " " " " "	6.64	6.50	32.50	21.2
26500	26446X34202	" " " " " "	6.63	6.50	30.00	19.3
26172	60818	" " " " " "	6.63	6.50	30.50	19.7
26209	H. W. M.	F. M. Thompson, H. W. Mohr.	6.63	6.18	30.50	19.7
26623	80698	H. K. Brainerd, A. H. Brainerd.	6.62	7.00	31.25	20.3
26185	36165	F. M. Thompson.	6.62	6.50	30.75	19.9
26098	28176	Spencer Bros. and others.	6.62	6.50	32.00	20.9
25983	6371	" " " " " "	6.60	6.50	31.50	20.6
25907	Dark.	" " " " " "	6.60	...	...	...
26156	510231	Olds and Whipple.	6.60	7.00	32.50	21.3
26148	10124	" " " " " "	6.60	6.50	29.50	19.0
26002	1496	Arthur Sikes and others.	6.60	...	31.75	20.7
26034	2094	Loomis Bros. Co., C. Sandman.	6.60	6.50	31.50	20.6

ANALYSES OF COTTON SEED MEAL, 1911.—Continued.

Station No.	Dealer, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen.		Cost per ton.	Nitrogen costs cents per pound.
			Found.	Guaranteed.		
26089	51490	Loomis Bros. Co. and others.	6.60	6.50	\$31.00	20.4
26298	33917	Amos D. Bridge's Sons, E. E. Thompson.	6.60	...	31.00	20.2
26090	5055	Loomis Bros. Co. and others.	6.59	6.50	31.00	20.4
26056	(?)	J. B. Parker.	6.59	...	32.00	21.0
26334	...	Loomis Bros. Co., R. H. Ensign.	6.57	6.18	31.00	20.3
25992	30509	The Coles Co.	6.57	6.50	33.00	21.8
25939	61945	Olds and Whipple.	6.57	7.00	31.50	20.7
25971	301377	Spencer Bros. and others.	6.56	6.50	31.50	20.7
26502	21050	" " and others.	6.55	6.50	30.00	19.5
26095	25502 X 24036	" " and others.	6.54	6.50	31.00	20.3
26168	42665	Olds and Whipple.	6.54	6.50	30.25	19.8
25945	8052	" " and others.	6.53	7.00	35.00	23.4
26165	22527	" " and others.	6.53	7.00	32.50	21.5
25946	98314	" " and others.	6.53	6.58	28.70	18.6
26225	60818	Spencer Bros., H. Zera.	6.53	6.50	...	...
26035	20049	Loomis Bros. Co., C. Sandman.	6.52	6.50	31.50	20.8
25940	28366	Olds and Whipple.	6.52	6.50	31.50	20.8
26017	4026	Spencer Bros., Mrs. M. Doughney.	6.52	7.00	30.50	20.0
26128	120372	" " and others.	6.51	6.50	29.25	19.1
26173	42973	" " J. Barnett.	6.51	6.50	31.50	20.8
26019	93506	" " and others.	6.51	6.50	31.50	20.8
25922	33462	Olds and Whipple.	6.51	6.58	30.00	19.9
25920	8576	Arthur Sikes and others.	6.51	...	30.00	19.7
26445	2155	Broad Brook Lumber and Coal Co.	6.51	...	31.25	20.7
26012	11667	" " and others.	6.50	6.50	30.65	20.2
26005	12637	Olds and Whipple.	6.50	6.58	31.00	20.5
26659	18513	Spencer Bros. and others.	6.49	7.00	31.50	20.9
25923	535492	" " and others.	6.49	6.50	29.75	19.6
26170	82799	" " and others.	6.49	6.50	...	...

ANALYSES OF COTTON SEED MEAL, 1911.—Continued.

Station No.	Dealer, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen.		Cost per ton.	Nitrogen costs cents per pound.
			Found.	Guaranteed.		
26164	536207	Olds and Whipple.	6.49	7.00	\$32.50	21.7
26132	60615	" " and others.	6.49	6.50	30.00	19.8
26144	3112	" " and others.	6.47	6.58	30.50	20.2
26621	131259	" " and others.	6.46	6.58	31.00	20.6
25941	14326	" " and others.	6.45	7.00	31.50	21.0
25937	70391	Spencer Bros.	6.45	7.00	31.50	21.0
25925	Dark	" " and others.	6.45	...	31.50	21.0
26127	39476	" " and others.	6.45	6.50	30.50	20.3
26027	11322	" " and others.	6.45	6.50	31.00	20.7
26016	2138	" " and others.	6.45	6.50	30.00	19.9
25935	94227	Olds and Whipple.	6.44	7.00	35.00	23.8
26119	4868	" " and others.	6.44	6.58	30.50	20.3
26622	38712	" " and others.	6.44	6.58	31.00	20.7
25942	20479	Spencer Bros. and others.	6.43	6.58	30.00	19.9
26094	10495	" " and others.	6.43	6.50	30.00	19.9
25921	107466	" " and others.	6.42	7.00	31.50	21.1
26110	...	G. W. Agee.	6.42	...	...	...
26033	14518	Olds and Whipple.	6.42	6.58	31.00	20.8
25938	51486	" " and others.	6.42	7.00	31.50	21.1
25926	61180	Spencer Bros.	6.41	...	32.50	22.0
26120	37417	Olds and Whipple.	6.40	6.58	30.50	20.4
25947	77214	" " and others.	6.40	6.58	28.22	18.6
26213	17546	" " and others.	6.38	6.50	29.50	19.7
25934	42088	" " and others.	6.37	7.00	35.00	24.1
26143	13792	Spencer Bros. and others.	6.34	6.50	29.50	19.8
25987	57854	Arthur Sikes and others.	6.34	7.00	31.50	21.4
26011	85584	Spencer Bros.	6.29	7.00	32.00	22.0
25948	Stray 70.	" " and others.	6.28	6.50	31.50	21.6
25954	134090	H. K. Brainerd, G. A. Douglas	6.28	6.18	32.00	22.0

Station No.	Dealer, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen.		Cost per ton.	Nitrogen costs cents per pound.
			Found.	Guaranteed.		
260139		Olds and Whipple, A. E. Holcomb.....	6.24	6.50	\$31.50	21.8
26103		Spencer Bros.....	6.10	....	....	....
26018		" " L. P. Bissell.....	6.09	7.00	32.00	22.7
26023		" " Bissell-Graves Co.....	6.04	7.00	31.25	22.3
25969		" " and others.....	6.01	6.50	32.50	23.4
26009		H. K. Brainard, S. Alden.....	5.84	6.50	32.50	24.1
25995		" " and others.....	5.81	6.50	32.50	24.2
26010		" " F. Ponchot.....	5.73	6.50	32.50	24.6
25906		Spencer Bros.....	5.68	6.18	....	....
	George B. Robinson, Jr.					
26240		E. N. Austin.....	6.56	....	28.00	18.0
25961		Broad Brook Lumber and Coal Co.....	6.55	....	30.00	19.6
25952		" " " " " " " " " " " "	6.45	....	31.65	21.2
25996		" " " " " " " " " " " "	6.43	....	30.65	20.4
25993		" " " " " " " " " " " "	6.41	6.50	30.50	20.4
26418		E. N. Austin.....	6.10	6.58	28.20	19.6
	W. Newton Smith.					
26503		Spencer Bros., E. C. Holdridge.....	6.62	6.50	31.00	20.1
26444		Arthur Sikes and others.....	6.35	7.00	31.00	21.0
	J. E. Soper Co.					
26339		B. C. Fuller.....	6.62	6.50	30.00	19.4
	Jobber unknown.					
26113		C. C. Graves.....	6.56	6.50	....	....
26114		" " Mrs. Tobin.....	6.74	6.50	....	....
26210		" " " " " " " " " " " "	6.94	6.50	....	....
26211		" " " " " " " " " " " "	6.95	6.50	....	....

CASTOR POMACE.

Castor pomace, a residue from the manufacture of castor oil, and extremely poisonous to stock, which will eat it greedily if they have the chance, is used more or less as a fertilizer for tobacco. The following four samples have been examined:

26399. Sold by American Agricultural Chemical Co. Sampled from stock of C. F. Brewer, East Hartford.

26697. Sold by American Agricultural Chemical Co. Sampled and sent by A. B. Phelps, Granby.

26277. Sold by Baker Castor Oil Co. Sampled from stocks of F. S. Bidwell & Co., Windsor Locks, and Spencer Bros., Suffield.

26276. Sold by Olds & Whipple. Sampled at factory.

ANALYSES OF CASTOR POMACE.

Station No.	26399	26697	26277	26276
<i>Percentage amounts of</i>				
Nitrogen, in form of ammonia	0.01	0.01	0.01	0.02
" organic, water-soluble ...	0.91	0.82	0.78	0.62
" " active insoluble..	1.95	1.97	1.92	2.18
" " inactive insoluble	2.11	2.23	1.91	2.38
" total, found	4.98	5.03	4.62	5.20
" " guaranteed	4.53	....	4.50	5.00
Cost per ton	\$24.00	25.00	25.00	25.00
Nitrogen costs cents per pound..	21.5	22.3	24.3	21.6

Castor pomace also contains, on the average, 1.95 per cent. of phosphoric acid and 0.95 per cent. of potash. These are taken into account in computing the cost of the nitrogen.

The cost of nitrogen in castor pomace ranges from 21.5 to 24.3 cents and averages 22.4 cents per pound, two cents higher than in cotton seed meal.

The solubility of the organic nitrogen ranges from 54.1 to 58.6; average, 56.5 per cent. The significance of nitrogen solubility is discussed on page 8.

II. RAW MATERIALS CHIEFLY VALUABLE FOR PHOSPHORIC ACID.

BASIC SLAG PHOSPHATE OR THOMAS SLAG.

This material is a by-product of the steel manufacture. The highest grade on the market contains from 17 to 19 per cent. of phosphoric acid and 35 to 50 per cent. of lime in finely divided form. There are, however, very inferior grades offered for sale at prices which the farmer cannot afford to pay and against which he should be on his guard. The lime is in efficient form for correcting soil acidity. The phosphoric acid is fairly available to plants, though showing small "availability" by the conventional method described on page 7 of this report. In most cases it will probably be found less quick in its action as a source of phosphoric acid, but more lasting in its effects than acid phosphate. For top-dressing grass land and for fruit trees it has given very satisfactory results.

Five samples of Basic Slag of standard quality were analyzed, as follows:

26476. Sold by American Agricultural Chemical Co. Sampled from stock of Connecticut Valley Orchard Co., Berlin.

26199. Sold by Coe-Mortimer Co. Sampled from stocks of L. M. Benham, Highwood, and Lightbourn & Pond Co., New Haven.

26453. Sold by Sanderson Fertilizer and Chemical Co. Sampled at factory.

26449. Sold by Sanderson Fertilizer and Chemical Co. Sampled and sent by A. E. Plant, Branford.

26270. Sold by Wilcox Fertilizer Co. Sampled at factory.

The usual guaranty for this material is from 17 to 19 per cent. of phosphoric acid, of which from 15 to 16 per cent. is "available" by Wagner's method of extraction, with from 35 to 50 per cent. of lime.

All the samples tested contained the guaranteed amount of phosphoric acid.

ANALYSES OF BASIC SLAG.

Station No.	26476	26199	26453	26449	26270
<i>Percentage amount of</i>					
Phosphoric acid	17.35	17.86	17.80	17.14	18.66
Cost per ton	\$19.00	19.00	18.00	16.00	19.00

Inferior Basic Slag.

In October, a sample was sent by Dr. F. Milton Smith, who stated that it represented two tons of basic slag bought of the Fertilizer Materials Supply Co., 80 Wall St., New York. The firm wrote him that it was 16 to 18 per cent. slag, although it would be tagged 14 per cent. The station analysis showed only 10.59 per cent. of phosphoric acid soluble in acid. The station agent later drew a sample from seven bags of this material at Dr. Smith's farm, at Darien. This sample contained 9.98 per cent. of acid-soluble phosphoric acid, thus confirming the gross inferiority of this Basic Slag. The Fertilizer Materials Supply Company stated that other analyses had justified the guaranty given on the goods, but as they handle four different grades of basic slag, one of which contains 10-12 per cent. of phosphoric acid, by some mistake this lower grade must have been shipped. The Company returned its check to Dr. Smith to make good the deficiency.

PRECIPITATED BONE PHOSPHATE.

This is a manufacturing by-product, stated to be made by adding some form of lime to solutions of phosphoric acid, which throws down the acid in a form which dries to a fine, white powder, containing phosphoric acid combined with lime. This phosphate is mostly insoluble in water, but apparently readily available to plants. It is an excellent form for use in tobacco fertilizer. Both samples analyzed were sold by Olds & Whipple.

26216. Sampled and sent by Connecticut Tobacco Corporation, Tariffville, and **26375** sampled and sent by W. M. Hinson, Hazardville. The cost per ton in each case was \$36.40.

	26216	26375
Water-soluble phosphoric acid.....	1.65	1.52
Citrate-soluble phosphoric acid.....	34.75	34.21
Citrate-insoluble phosphoric acid.....	4.64	1.71
Total phosphoric acid.....	41.04	37.44

"Available" phosphoric acid in this form costs about 5 cents per pound.

DISSOLVED ROCK PHOSPHATE OR ACID PHOSPHATE

This material is made by treating mineral phosphate with oil of vitriol. Several grades are on the market, guaranteed to contain 14, 16 or 20 per cent. of "available" phosphoric acid.

ANALYSES OF ACID PHOSPHATE.

Station No.	Percentage amount of	26566	26274	26477	26525	26401	26149	26267	26242
Water-soluble phosphoric acid	11.41	10.98	12.43	10.83	11.89	2.02	14.58	14.94
Citrate-soluble phosphoric acid	2.66	5.70	2.87	4.01	2.02	18.53	1.83	1.05
Citrate-insoluble phosphoric acid	2.62	1.28	0.88	1.61	1.56	1.77	0.63	1.20
Total phosphoric acid	16.69	17.96	16.18	16.45	15.47	22.32	17.04	17.19
Sum of water-soluble and citrate-soluble phosphoric acid found	14.07	16.68	15.30	14.84	13.91	20.55	16.41	15.99
"Available" phosphoric acid guaranteed	14.00	14.00	14.00	14.00	12.00	20.00	14.00	16.00
Cost per ton	\$13.00	16.00	15.00	15.00	14.50	22.00	17.50	18.00
"Available" phosphoric acid costs cents per pound	4.6	4.8	4.9	5.1	5.2	5.4	5.3	5.6
Station No.	Percentage amount of	26398	26423	26342	26197	26481	26627	26759	.....
Water-soluble phosphoric acid	11.46	11.35	10.55	11.65	15.12	10.52	10.27	.....
Citrate-soluble phosphoric acid	2.29	3.56	3.96	3.31	2.18	4.77	5.09	.....
Citrate-insoluble phosphoric acid	0.83	1.66	1.00	0.75	0.46	1.47	1.50	.....
Total phosphoric acid	14.58	16.57	15.51	15.71	17.76	16.76	16.86	.....
Sum of water-soluble and citrate-soluble phosphoric acid found	13.75	14.91	14.51	14.96	17.30	15.29	15.36	.....
"Available" phosphoric acid guaranteed	14.00	14.00	14.00	14.00	14.00	16.00	16.00	.....
Cost per ton	\$18.00	.....	.....	.....	.....	.....	.....	.....
"Available" phosphoric acid costs cents per pound	6.6	.....	.....	.....	.....	.....	.....	.....

26566. Star Phosphate. Sold by Armour Fertilizer Works. Sampled from stock of A. Grulich, Meriden.

26274. Sold by American Agricultural Chemical Co. Sampled from stock of S. D. Woodruff & Sons, Orange.

26477. Atlantic Dissolved Phosphate. Sold by Atlantic Fertilizer Co. Sampled from stock of J. E. Fagan, Bloomfield.

26525. Sold by Fertilizer Materials Supply Co. Sampled and sent by W. A. Simpson, Wallingford.

26401. Sold by L. T. Frisbie Co. Sampled from stock of Lightbourn & Pond Co., New Haven.

26267. Sold by Wilcox Fertilizer Co. Sampled at factory.

26242. Sold by Baugh Chemical Co. Sampled and sent by E. Manchester & Sons, Winsted.

26149. Sold by Olds & Whipple. Sampled and sent by C. B. Sheldon, West Suffield.

26398. Sold by Bowker Fertilizer Co. Sampled from stock of C. F. Brewer, East Hartford.

26423. Sold by Fertilizer Materials Supply Co. Sampled from stock of Connecticut School for Boys, Meriden.

26342. Sold by Patron's Exchange. Sampled from stock of C. R. Treat, Orange.

26197. Sold by Nitrate Agencies Co. Sampled from stocks of L. M. Benham and Andrew Ure, Highwood.

26481. Sold by C. M. Shay Fertilizer Co. Sampled from stock of Farmers' Association, Leonard's Bridge.

26627. Sold by Rogers Manufacturing Co. Sampled at factory.

26759. Sold by Rogers Manufacturing Co. Sampled at factory.

COST AND VALUATION.

The retail cash cost of acid phosphate has ranged from \$13.00 to \$22.00 per ton, making "available" phosphoric acid cost 5.3 cents per pound. This is the average figure. In mixed car lots "available" phosphoric acid has been bought by farmers for from 4.2 to 4.6 cents per pound.

The range in retail prices quoted is very large.

The Rogers Manufacturing Company objected that the analyses of 26627 did not at all agree with other analyses which had been made of this stock, and requested that another sample be tested. This was done, with the result given in 26759, which does not differ substantially from the first sample.

III. RAW MATERIALS OF HIGH GRADE CONTAINING POTASH.

HIGH-GRADE SULPHATE OF POTASH.

(ANALYSES ON PAGE 43.)

This chemical should contain about 90 per cent. of pure potassium sulphate (sulphate of potash), equivalent to about 49 per cent. of potassium oxide ("potash"), and it should be nearly free from chlorides. The five samples analyzed were of good quality and met their guaranties.

The average cost of potash in high-grade sulphate in these samples is 5.18 cents per pound.

DOUBLE MANURE SALT.

(ANALYSES ON PAGE 43.)

This material is frequently sold on a guaranty of "48-50 per cent. sulphate," which is equivalent to 25.9-27.0 per cent. of potassium oxide (actual potash). Besides some 46-50 per cent. of potassium sulphate, it contains over 30 per cent. of magnesium sulphate, chlorine equivalent to 3 per cent. of common salt, a little sodium and calcium sulphates, and varying quantities of moisture.

The three samples analyzed were of average composition.

The cost of potash per pound in double manure salt was 5.6 cents, in the average of the two samples, somewhat higher than in high-grade sulphate. In mixed car lots it was bought for 4.1 cents.

KAINIT.

(ANALYSES ON PAGE 43.)

Kainit contains from 11 to 15 per cent. of potash, more than that quantity of soda, and rather less magnesia. These "bases" are combined with chlorine and sulphuric acid. It usually contains more water than either the sulphate or muriate of potash and is sold on a guaranty of from 12 to 15 per cent. of potash.

The four samples analyzed were of average composition.

The average cost of potash per pound in kainit was 5.63 cents, but in mixed car lots it was bought for 4.8 cents.

Misbranded Muriate of Potash.

26526 was stated to have been sold by the Fertilizer Materials Supply Company of New York as muriate of potash for \$42

POTASH SALTS. PERCENTAGE COMPOSITION AND COST PER POUND OF POTASH.

Station No.	Drawn from Stock in possession of	Sampled and sent by	Potash soluble in water.		Cost per ton	Potash costs cents per pound.
			Found.	Guaranteed.		
	<i>High-Grade Sulphate of Potash.</i>					
26251	John Merrill, Suffield, from Nitrate Agencies Co.	Station Agent.....	50.74	48.0	\$50.00	4.9
26271	Wilcox Fertilizer Co.....	Station Agent.....	51.52	48.0	51.50	5.0
26218	Apothecaries Hall Co., Waterbury, Spencer Bros., Suffield, from German Kali Works.....	Station Agent.....	50.66	48.0	53.00	5.2
26355	Rogers Mfg. Co.....	Station Agent.....	48.81	48.0	52.00	5.3
26150	C. B. Sheldon, W. Suffield, from Olds & Whipple	C. B. Sheldon.....	49.45	48.7	54.00	5.5
	<i>Double Manure Salt.</i>					
26426	Conn. School for Boys, Meriden, from Fert. Materials Supply Co.....	Station Agent.....	28.30	27.0	.....	....
26527	W. A. Simpson, Wallingford, from Fert. Materials Supply Co.....	W. A. Simpson.....	27.32	....	29.00	5.3
26626	E. Halladay, Suffield, from Amer. Agr. Chem. Co.	Station Agent.....	27.35	26.0	32.00	5.9
	<i>Kainit.</i>					
26567	A. Grulich, Meriden, from Armour Fert. Works	Station Agent.....	14.13	12.0	13.00	4.6
26571	E. A. Standish, Andover, from German Kali Works	Station Agent.....	13.85	12.0	17.00	6.1
26573	E. White, Rockville, from Nitrate Agencies Co.	Station Agent.....	12.80	12.0	16.00	6.2
26421	Conn. School for Boys, Meriden.....	Station Agent.....	13.32	12.0	.....	....
	<i>Muriate of Potash.</i>					
26354	Rogers Mfg. Co.....	Station Agent.....	52.96	50.0	43.00	4.1
26450	A. E. Plant, Branford, from Sanderson F. & C. Co.	A. E. Plant.....	50.81	50.0	42.00	4.1
26250	John Merrill, Suffield, from Nitrate Agencies Co.	Station Agent.....	50.96	50.0	43.00	4.2

POTASH SALTS. PERCENTAGE COMPOSITION AND COST PER POUND OF POTASH.—Continued.

Station No.	Drawn from Stock in possession of	Sampled and sent by	Potash soluble in water.		Cost per ton.	Potash costs cents per pound.
			Found.	Guaranteed.		
26206	<i>Muriate of Potash, continued.</i>	Station Agent.....	52.62	50.0	\$45.00	4.3
26268	Sanderson Fert. & Chem. Co.....	Station Agent.....	51.06	50.0	44.00	4.3
26352	Wilcox Fertilizer Co.....	Station Agent.....	51.40	49.0	46.00	4.5
26569	D. L. Clark, Milford, from Amer. Agr. Chem. Co.	Station Agent.....	53.83	48.0	48.00	4.5
26982	L. A. Gowdy, Somerville, from Coe-Mor-	J. J. Copp.....	49.50	....	46.00	4.6
26205	timer Co.....	Station Agent.....	48.58	50.0	46.00	4.7
26532	J. J. Copp, Grotton, from Shay Fertilizer Co.	F. R. Jennings.....	49.80	49.0	43.00	4.3
26533	Lightbourn & Pond Co., New Haven, from L. T.	F. R. Jennings.....	50.44	49.0	43.00	4.2
26452	Frisbie Co.....	Station Agent.....	51.22	49.0	....	....
26425	F. R. Jennings, Fairfield, from Amer. Agr.	Station Agent.....	51.39	50.5	....	....
26204	Chem. Co.....	Station Agent.....	51.12	50.0	....	....
26483	F. H. Hale, Glastonbury, from Bowker Fert. Co.	Station Agent.....	46.78	50.0	....	....
26295	Conn. School for Boys, Meriden, from Fert.	Station Agent.....	47.27	....	....	....
	Materials Supply Co.....					
	L. M. Benham & Andrew Ure, Highwood, Ger-					
	man Kali Works.....					
	Farmers' Asso., Leonard's Bridge, from C. M.					
	Shay Fert. Co.....					
	Station.....					

per ton. The sample sent by W. A. Simpson, Wallingford, was not commercial muriate of potash but contained only 10.89 per cent. of potash and 36.47 per cent. of chlorine.

The sample, it was later found, was taken from only one bag, and appeared to be some low-grade potash salt or possibly sweepings from broken bags of such salts. Whether the two tons were like this sample cannot now be determined. The selling company states that it was bought by them as high-grade muriate, that other lots sold by them were of standard grade as appears in the table, and they believe that through some carelessness or mistake a single bag of sweepings was included in the shipment made to them.

MURIATE OF POTASH.

(ANALYSES ON PAGES 43 AND 44.)

Commercial muriate of potash contains about 80 per cent. of muriate of potash (potassium chloride), equivalent to 50.5 per cent. of actual potash, 15 per cent. or more of common salt and 4 per cent. or more of water.

26205 was 1.42 per cent. and 26483 3.22 per cent. below its guaranty.

The other fourteen samples were of average composition.

The average cost per pound of potash in the muriate (excluding 26526) was 4.37 cents. In mixed car lots it has cost from 3.7 to 4.06.

CARBONATE OF POTASH.

Commercial carbonate of potash has been a popular form of potash fertilizer for tobacco. During the past year, however, only one sample was sent for analysis.

26376. Sold by Olds & Whipple. Sent by W. M. Hinson, Hazardville.

Percentage amount of

Potash found	63.84
Cost per ton	\$90.00
Potash costs cents per pound.....	7.0

VEGETABLE POTASH.

This material is understood to be the ashes of beet residues from the manufacture of beet sugar, and is considerably used as

a source of potash in tobacco formulas. One sample was analyzed.

26353. Sold by Olds & Whipple. Sampled from their stock and that of E. T. Hurlbut, Somerville.

Percentage amount of	
Potash calculated as muriate.....	2.29
" " sulphate	1.43
" " carbonate	22.82
Total water-soluble potash	26.54
Cost per ton	\$44.50
Potash costs cents per pound.....	8.4

ANALYSES OF

Station No.	Manufacturer and Brand.	Dealer or Purchaser.
<i>Sampled by Station Agent:</i>		
26731	Amer. Agric. Chem. Co., Bone Meal.....	H. M. Kent Co.
26730	Amer. Agric. Chem. Co., Fine Ground Bone ..	G. L. Dennis
26732	Armour Fertilizer Co., Bone Meal.....	Brower & Malone
26733	Berkshire Fertilizer Co., Fine Ground Bone...	Hotchkiss & Templeton
26734	Valentine Bohl, Self Recommending Fertilizer.	Apothecaries Hall Co.
26736	Bowker Fertilizer Co., Fresh Ground Bone....	Lightbourn & Pond Co.
26735	Bowker Fertilizer Co., Market Bone.....	M. M. Hansen.....
26737	Buffalo Fertilizer Co., Bone Meal.....	A. D. Bridge's Sons
26738	Coe-Mortimer Co. XXX Ground Bone.....	W. O. Burr, R. H. Morgan.....
26739	Peter Cooper's Glue Factory, Pure Bone Dust.	Apothecaries Hall Co.
26740	Essex Fertilizer Co., Ground Bone.....	W. K. Ackley.....
26741	L. T. Frisbie Co., Fine Bone Meal.....	W. O. Goodsell, L. T. Frisbie Co.
26743	National Fertilizer Co., Ground Bone.....	F. T. Blish Hardware Co.
26744	New England Fertilizer Co., Ground Bone....	A. Grulich.....
26745	Parmenter & Polsey, Ground Bone.....	Pring Bros.....
26746	Rogers & Hubbard Co., Knuckle Bone Flour..	H. W. Andrews.....
26747	Rogers & Hubbard Co., Strictly Pure Fine Bone	F. S. Platt Co.....
26749	Rogers Mfg. Co., Fine Ground Bone.....	Meeker Coal Co., C. P. Beach.....
26748	Rogers Mfg. Co., Knuckle Bone Flour.....	L. M. Benham.....
26750	Sanderson Fert. & Chem. Co., Ground Bone....	R. H. Hall.....
26751	C. M. Shay Fertilizer Co., Ground Bone.....	F. O. Brown.....
26752	M. L. Shoemaker & Co., Swift-Sure Bone Meal	Olds & Whipple.....
26753	Swift's Lowell Fertilizer Co., Ground Bone....	C. W. Lines Co.....
26754	Wilcox Fertilizer Co., Ground Bone.....	E. A. Stiles.....
26755	Wilcox Fertilizer Co., Ground Bone.....	I. W. Dennison & Co.....
<i>Sampled by Purchasers and others.</i>		
26057	Buffalo Fertilizer Co., Ground Bone.....	E. C. Warner.....
26451	Buffalo Fertilizer Co., Bone Meal.....	A. E. Plant.....
26742	E. L. James, Warrenville, Ground Bone.....	Sent by manufacturer.....

IV. RAW MATERIALS CONTAINING NITROGEN AND PHOSPHORIC ACID.

BONE MANURES.

The terms "Bone Dust," "Ground Bone," "Bone Meal" and "Bone" sometimes signify material made from dry, clean and pure bones; in other cases these terms refer to the result of crushing fresh or moist bones, which have been cooked in steam tanks to recover grease, and the product sometimes sold as "tank-

BONE MANURES.

Dealer's cash price per ton.	Valuation per ton.	Percentage difference between cost and valuation.	Chemical Analysis.				Mechanical Analysis.	
			Nitrogen.		Phosphoric Acid.		Finer than 1-50 inch.	Coarser than 1-50 inch.
			Found.	Guaranteed.	Found.	Guaranteed.		
\$32.00	\$20.11	59.1	2.11	1.7	16.17	13.0	66	34
32.00	27.58	16.0	2.42	2.5	24.20	22.0	71	29
29.76	29.76	0.0	3.00	2.5	25.30	22.0	49	51
27.00	32.53	17.0*	2.53	2.5	28.70	20.0	90	10
32.00	31.96	0.1	4.15	3.4	21.78	22.0	67	33
33.00	28.29	16.7	2.42	2.5	25.80	22.0	59	41
30.00	23.37	28.4	2.36	1.9	19.88	18.7	55	45
31.00	27.15	14.2	2.84	2.9	21.88	22.0	66	34
33.00	29.52	11.8	2.84	2.5	25.04	23.0	65	35
30.00	26.02	11.4	2.00	2.1	26.56	22.0	50	50
33.00	30.86	6.9	2.48	2.5	28.02	22.0	72	28
31.50	31.57	0.2*	3.73	3.3	24.20	18.0	56	44
32.00	19.17	66.9	1.75	1.6	16.94	13.7	60	40
33.00	31.66	4.2	2.68	2.5	27.82	23.0	76	24
32.50	30.00	8.3	2.65	2.5	26.23	20.0	70	30
38.00	33.75	12.6	3.86	3.8	25.41	24.7	69	31
38.00	28.53	33.2	3.50	2.9	22.32	22.0	42	58
34.00	34.64	1.9*	3.58	3.0	26.66	22.0	84	16
35.00	32.30	8.3	3.80	3.5	25.46	24.0	49	51
32.00	21.28	50.3	1.50	2.5	21.36	20.0	51	49
31.00	29.06	6.7	2.53	2.0	25.20	25.0	76	24
35.00	36.70	4.6*	5.56	4.5	23.13	20.0	49	51
33.00	30.38	8.6	2.90	2.5	26.10	23.0	62	38
32.00	29.98	6.7	2.86	2.5	26.74	22.0	49	51
33.00	29.40	12.2	2.96	2.5	24.64	22.0	61	39
.....	.....	.....	2.99	2.0	22.95	22.0	57	43
.....	.....	.....	3.10	...	24.18	....	50	50
.....	.....	.....	4.24	3.0	20.00	20.0	7	93

* Valuation exceeds cost.

age"; or they apply to bone from which a large share of the nitrogenous substance has been extracted in the manufacture of glue. When they are equally fine, the nitrogen of all these varieties of bone probably has about the same fertilizing value. But the agricultural value of bone depends very largely on its fineness. It is a matter of common observation that a whole bone may lie in the ground for a good while without going to pieces. Fine grinding increases enormously the surface which plant roots and the disintegrating forces of the soil can act upon, and by so doing make the nitrogen and phosphoric acid available. Much of the bone now sold is dry, free from grease, and could be easily ground finer than it usually is. More attention should be paid, both by manufacturers and purchasers, to the fineness of this material. Increased demand for a fine bone dust will soon make it more common in the market.

The table of analyses of bone manures contains a column "Valuation per ton." Full explanation of the meaning of this term, and the method of calculation will be found on pages 4 to 8.

Bone Manures Sampled by the Station Agent.

In the tables on pages 46 and 47 are tabulated analyses of twenty-five samples.

The samples satisfied their guaranties in all cases but one. **26750**, Sanderson's Ground Bone, contained only 1.50 per cent. of nitrogen, 1.00 per cent. below guaranty.

Three of these bone manures, **26750**, Sanderson's; **26743**, National Fertilizer Co.'s, and **26731**, American Agricultural Chemical Co.'s, contained considerable saline matter, chlorides and sulphates of soda, added, no doubt, as dryers and preservatives.

The average cost of the twenty-five samples examined was \$32.62 and the average valuation \$29.03.

Sampled by Others than the Station Agent.

In the tables on pages 46 and 47 are included three analyses of samples drawn by others than the Station Agent. The station is responsible only for the analyses, not for the correctness of the sampling of these.

SLAUGHTER-HOUSE TANKAGE.

(ANALYSES ON PAGES 50 AND 51.)

After boiling or steaming various slaughter-house wastes, fat rises to the surface and is removed, the soup is run off and the settlings are dried and sold as tankage. In general, it contains more nitrogen and less phosphoric acid than bone, but both ingredients probably have about the same agricultural value as bone, and their valuation is calculated on the same basis.

Sampled by the Station Agent.

The analyses of ten samples are given in the table. In nitrogen these range from 3.18 to 8.69 per cent., and in phosphoric acid from 8.48 to 17.96 per cent.

The solubility of the organic nitrogen of ten samples ranges from 69.9 to 89.0, with an average of 79.1 per cent.

Three analyses call for special notice:

26341. The buyer states that this was bought on the unit basis, with a guaranty of 7.67 per cent. of ammonia, which is the equivalent of 6.31 per cent. of nitrogen, being 0.31 per cent. more than was found by analysis.

26266. The Wilcox Fertilizer Company objected that this analysis, showing nitrogen far above the guaranty, and phosphoric acid somewhat below it, did not fairly represent the stock they were putting out, and asked that another sample be drawn and analyzed. This was done and is shown in **26655**.

26196. The percentage of nitrogen in this tankage is quite below what is guaranteed.

Sampled by Others than the Station Agent.

The analyses of ten samples are given in the table; in some samples only a partial analysis was made.

25624 is a waste product from a glue factory, sold for \$3.25 a ton, the cost of the freight. The percentage of nitrogen is low, the material contained over 53 per cent. of water, but the solubility of the nitrogen is high and its fertilizing value is probably good.

26078 is the product of a sausage factory. The percentage of nitrogen is low and of phosphoric acid high, as compared with the tankage made at rendering establishments.

ANALYSES OF TANKAGE.

Station No.	Manufacturer.	Dealer or Purchaser.
<i>Sampled by Station Agent.</i>		
26454	American Agr. Chem. Co.....	H. M. Kent Co., Stamford.....
26341	Buffalo Fertilizer Co.....	C. R. Treat, Orange.....
26653	Buffalo Fertilizer Co.....	A. D. Clark, Orange.....
26195	L. T. Frisbie Co.....	Lightbourn & Pond Co., New Haven
26478	Lister's Agr. Chem. Works (Ground Bone and Tankage).....	D. H. Carrier; John Foster.....
26194	C. M. Shay Fertilizer Co.....	L. M. Benham; H. D. Johnson; Andrew Ure.....
26266	*Wilcox Fertilizer Co.....	Manufacturer.....
26655	Wilcox Fertilizer Co.....	Manufacturer.....
26196	Not known.....	L. P. Kling, Highwood.....
26248	Not known No. 1.....	S. D. Woodruff & Sons, Orange.....
<i>Sampled by Purchasers and others.</i>		
25624	Residue from Glue Manufacture	W. O. Burr, Fairfield.....
26261	C. H. Davis & Co.....	G. H. Selcer, Norwich.....
26151	Olds & Whipple.....	C. B. Sheldon, W. Suffield.....
26243	C. M. Shay Fertilizer Co.....	E. Manchester & Sons, Winsted.....
26137	C. M. Shay Fertilizer Co.....	C. R. Burr & Co., Manchester.....
26474	Springfield Rendering Co.....	Somerville Mfg. Co., Somerville.....
26078	.....	W. E. Coe, Stamford.....
25892	.....	S. D. Woodruff & Sons, Orange.....
25904	No. 1.....	S. D. Woodruff & Sons, Orange.....
25905	No. 2.....	S. D. Woodruff & Sons, Orange.....

* See note on page 49.

ANALYSES OF TANKAGE.

Dealers' cash price per ton.	Valuation per ton.	Percentage difference between cost and valuation.	Chemical Analysis.								Mechanical Analysis.	
			Nitrogen.						Phosphoric Acid.			
			Ammonia.	Water-Soluble Organic.	Active Insoluble Organic.	Inactive Insoluble Organic.	Total found.	Total guaranteed.	Found.	Guaranteed.	Finer than 1-50 inch.	Coarser than 1-50 inch.
\$28.00	\$28.93	3.2*	0.30	0.86	2.72	1.45	5.33	4.94	13.89	13.73	48	52
34.00	31.18	9.0	0.19	1.84	3.06	0.77	5.86	6.15	14.35	....	49	51
34.00	31.84	6.8	0.21	1.34	3.41	1.04	6.00	6.35	14.58	....	49	51
33.00	31.37	5.1	0.15	2.63	1.81	0.55	5.14	4.94	17.96	15.00	49	51
28.00	21.09	32.7	0.10	0.80	1.47	0.81	3.18	2.67	12.98	12.00	55	45
33.75	28.92	16.7	0.27	3.42	2.04	1.03	6.76	6.59	9.27	....	28	72
.....	.....	...	0.14	0.50	5.63	2.23	8.50	6.59	9.58	10.00	60	40
.....	.....	...	0.13	0.42	4.81	1.74	7.10	6.59	10.31	10.00	...	...
.....	.....	...	0.30	2.50	4.75	1.14	8.69	9.10	8.48	....	46	54
.....	.....	...	0.36	1.87	2.70	1.97	6.90	...	10.52	....	30	70
.....	.....	...	0.00	1.72	1.05	0.25	3.02	...	....	....	...	...
30.00	.....	...	0.25	0.66	4.81	1.74	7.46	...	10.02	....	...	...
34.00	28.96	17.4	0.12	1.94	2.78	1.69	6.53	5.76	8.34	8.00	48	52
34.00	29.33	15.9	0.28	3.46	1.97	1.14	6.85	7.00	9.34	12.00	29	71
.....	.....	...	0.29	6.71			7.00	...	9.34	....	...	...
35.00	31.68	10.4	0.08	4.29	1.68	1.20	7.25	8.00	8.85	13.05	46	54
30.00	.....	...	0.03	1.28	1.43	0.76	3.50	...	22.45	....	...	...
.....	.....	...	0.25	2.48	2.60	1.73	7.06	...	10.71	....	...	...
.....	.....	...	0.28	2.42	2.67	1.81	7.18	...	10.58	....	...	...
.....	.....	...	0.30	2.47	2.59	1.88	7.24	...	10.52	....	...	...

* Valuation exceeds cost.

Spurious Tankage.

Various articles have been sold, or offered for sale, in Connecticut this year as tankage which were not tankage, but mixtures containing inferior forms of nitrogen of low solubility, in some cases reinforced with sulphate of ammonia to bring the total nitrogen up to the amount found in genuine tankage. Their analyses are as follows:

SPURIOUS TANKAGE.

Station No.	Manufacturer or Dealer.	Nitrogen.						Phosphoric Acid.	
		As Ammonia.	Organic.			Total.		Found.	Guaranteed.
			Water-soluble.	Active insoluble.	Inactive insoluble.	Found.	Guaranteed.		
26422	Fertilizer Materials Supply Co., N. Y.....	0.12	0.36	2.74	2.76	5.98	5.76	5.22	6.8
26524	Fertilizer Materials Supply Co., N. Y.....	0.04	0.51	2.60	2.49	5.64	5.76	5.83	6.8
26565	Armour Fertilizer Works	1.50	0.45	1.17	0.88	4.00	4.12	14.44	16.0
25211	Manufacturer unknown..	...	0.26	1.44	4.31	6.01	5.7	...	6.8
26249	" "	0.05	0.50	0.35	1.44	2.34	...	2.03	...
25629	" "	5.82	0.77	1.14	1.13	8.86	...	...	...

26565. Made by Armour Fertilizer Works. Sampled from stock of A. Grulich, Meriden.

26524 and **26422.** Sold by Fertilizer Materials Supply Co., N. Y. One sample of stock bought by Conn. School for Boys, Meriden, the other by W. A. Simpson, Wallingford. The Fertilizer Materials Supply Co. states that this tankage was bought of a reputable rendering establishment in Chicago and was understood by them to be genuine slaughter house tankage, and that the Chicago establishment, in reply to a later inquiry, stated in a general way that no inferior material was used, but not with satisfactory definiteness regarding this particular shipment.

25629. Sent by the E. B. Clark Co., Milford. **25211** and **26249.** Sent by S. D. Woodruff & Sons, Orange. The manufacturer's names are unknown.

The three samples at the bottom of the table were sent for examination by prospective buyers, who stated that the tankages were offered for sale, but were suspected of being inferior.

The sample, **26565**, sold by Armour Fertilizer Works contains 1.5 per cent. of nitrogen as ammonia. No such amount is ever found in a straight tankage, as will be seen from the table on page 12, the highest percentage found in those examined being 0.36.

Practically all of the nitrogen in a tankage (from 4.5 to 8 per cent.) is in organic form. The above sample has but 2.50 per cent. in this form. The solubility of its organic nitrogen is also lower than the average of slaughter-house tankage. On the other hand, the percentage of phosphoric acid is higher than in most tankages. It has evidently been treated with acid and is in fact a nitrogenous superphosphate and not a tankage.

Of the organic nitrogen in the two samples sold by the Fertilizer Materials Supply Company, 47.1 and 44.5 per cent., respectively, are classed as inactive insoluble nitrogen as defined on page 9.

In genuine tankages, tabulated on page 12, only 21.7 per cent. of the organic nitrogen is in this class, as the average, the highest figure being 28.8. The percentage of phosphoric acid is little more than half what is usually found in tankages which have between 5 and 6 per cent. of nitrogen.

The determinations show quite conclusively that these two samples are not genuine tankage but nitrogenous matters of low solubility and probably inferior fertilizing value.

The same conclusion is warranted regarding **25211**, which has only 1.7 per cent. of nitrogen that can be considered of good agricultural value. **26249** is a garbage tankage, also of small agricultural value.

25629 is another sample sold as tankage, but containing 5.82 per cent. of ammonia, probably added as sulphate to some inferior stuff (as shown by the low solubility of its nitrogen), to make it "analyze" like a high-grade tankage.

It is a misnomer, and works deception, to call any of these materials "tankage," a word which has long had in the trade the meaning given on page 49.

Farmers are warned against buying "tankage" which the seller does not guarantee to be genuine slaughter-house tankage. As the above statements show, nitrogenous matters of small fertilizer value are now being sold under the misleading, if not directly fraudulent, name of tankage.

It will later appear that in a few cases they have also been found in mixed fertilizers.

DRY GROUND FISH AND ACIDULATED FISH.

(ANALYSES ON FOLLOWING PAGE.)

This is a by-product from the manufacture of fish oil, a process which removes from the fish little that is of value as a fertilizer. The fresh fish are cooked by steam, pressed to remove the oil, and dried either in the air or by steam. The scrap is sometimes sprinkled with diluted oil of vitriol to check putrefaction, whereby the bones are softened and to some extent dissolved.

The analyses of ten samples appear in the table: **26510** is below its nitrogen guaranty.

The solubility of the organic nitrogen ranges from 62.0 to 82.1, with an average of 71.1 per cent.

The samples of dry ground fish have on an average 8.48 per cent. of nitrogen and 7.06 per cent. of phosphoric acid, at an average cost of \$43.75.

All are of good quality.

MIXTURES OF PHOSPHATES WITH POTASH SALTS.

26535. Wheeler's Grass and Oats Manure. Sampled from stocks of R. H. Hall, East Hampton, J. C. Nettleton, Madison, and T. Richmond, New Milford.

26568. American Agricultural Chemical Co.'s Grass and Oats. Sampled from stock of Alvah Morgan, East Lyme.

Both of these brands are made by the American Agricultural Chemical Company.

26572. National Soluble Bone and Potash. Sampled from stock of Gallagher Bros., Wallingford.

ANALYSES OF DRY GROUND FISH AND ACIDULATED DRY FISH.

Station No.	Manufacturer and Dealer.	Nitrogen.						Phosphoric Acid.					Cost per ton.	Valuation per ton.	Percentage difference between cost and valuation.
		Ammonia.	Water-Soluble Organic.	Active Insoluble Organic.	Inactive Insoluble Organic.	Total found.	Total guaranteed.	Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total found.	Total guaranteed.			
26275	<i>Sampled by Station Agent.</i> American Agric. Chem. Co. Stock of Spencer Bros., Suffield.	0.50	0.84	3.95	2.93	8.22	8.23	0.74	5.59	1.38	7.71	7.00	\$45.00	\$42.79	5.2
26400	Bowker Fertilizer Co. Stock of C. F. Brewer, East Hartford.	0.50	0.81	5.16	2.39	8.86	8.23	0.79	5.10	1.43	7.32	6.00	45.00	45.42	0.9*
26654	National Fertilizer Co. Stock of W. E. Burbank, Suffield.	0.43	0.77	5.69	1.75	8.64	8.23	0.47	5.33	1.20	7.00	6.00	46.00	44.31	3.8
26534	Niantic Menhaden O. & G. Co. Stock of Spencer Bros., Suffield.	1.15	2.15	2.96	2.12	8.38	8.25	0.87	5.82	1.29	7.98	6.00	45.00	42.90	4.9
26397	Olds & Whipple. Stock of manufacturer.	0.58	1.06	4.51	2.20	8.35	7.40	0.79	4.80	1.23	6.82	6.00	40.00	42.64	6.2*
26198	Sanderson Fertilizer and Chemical Co. Stock of manufacturer.	0.50	1.01	5.03	1.32	7.86	6.0	0.54	4.92	2.55	8.01	6.00	43.00	40.91	5.1
26511	Wilcox Fertilizer Co. Stock of Spencer Bros. and M. E. Thompson.	0.14	0.47	6.18	2.30	9.09	8.50	0.48	3.81	1.63	5.92	6.00	44.00	45.75	3.8
26528	<i>Sampled by Purchaser.</i> Fertilizer Materials Supply Co. Sampled by W. A. Simpson, Wallingford.	0.79	1.00	3.96	2.69	8.44	8.23	2.08	3.33	0.32	5.73	5.40	42.00	42.38	0.9*
26480	<i>ACIDULATED DRY FISH.</i> Niantic Menhaden O. & G. Co. Stock of F. H. Rolf, Guilford.	0.55	0.96	1.24	1.17	3.92	3.30	0.29	2.40	3.95	6.64	3.50	26.00	21.02	23.7
26510	Wilcox Fertilizer Co. Stock of manufacturer.	0.85	1.40	3.29	2.06	7.60	7.81	1.79	3.77	0.72	6.28	5.00	42.50	38.69	9.8

* Valuation exceeds cost.

ANALYSES.

	26535	26568	26572
Water-soluble phosphoric acid	8.76	9.77	9.19
Citrate- " " "	2.49	1.83	2.14
Citrate-insoluble " "	1.02	1.24	0.99
Total phosphoric acid found	12.27	12.84	12.32
Total phosphoric acid guaranteed	12.0	12.0	12.0
Water-soluble potash found	2.17	2.41	2.19
Potash guaranteed	2.0	2.0	2.0
Cost per ton	\$22.50	25.00	20.00
Valuation per ton	\$12.13	12.80	12.24
Percentage difference between cost and valuation.	85.5	95.4	63.4

NITROGENOUS SUPERPHOSPHATES AND GUANOS.

(ANALYSES ON PAGES 62 TO 85.)

Here are included all the commercial mixed fertilizers containing nitrogen, phosphoric acid and potash which have been analyzed in 1911, tabulated under the names of their manufacturers, alphabetically arranged. The names and addresses of the agents from whom the samples were taken are omitted because of the restrictions placed on the station printing, and the additional analytical data, which must be printed in the table. These data concern the value of the organic nitrogen, a matter which has been under discussion and study for a long time.

THE SOLUBILITY OF THE ORGANIC NITROGEN IN MIXED FERTILIZERS.

The discussion on pages 8 to 22 shows that of all forms of nitrogenous organic matter which are considered to be readily available to crops, a part, usually a small part, dissolves in water. Of the remainder, a part, *and the larger part*, is soluble in potassium permanganate solution, when used in the way described. There remains the smaller part of the nitrogen which is insoluble in either water or permanganate, and this we call "inactive" organic nitrogen.

It is not contended that this insoluble nitrogen is wholly inert and does not become, in time, available to crops; but our own vegetation tests, as well as more extensive tests made by others, justify the belief that it is distinctly inferior in immediate fertilizing action to the soluble portions, and that it is reasonable to call it "inactive."

The discussion above referred to also shows that most of the forms of organic nitrogen so far tested, which are commonly considered to have inferior trade and farm values, such as wool waste, leather preparations, garbage tankage, peat, etc., contain very little, if any, nitrogen soluble in water. A part, differing with the nature of the material, is soluble in permanganate solution, while the rest, *and the larger part*, is insoluble or "inactive." In a word, it is possible to judge whether the organic nitrogen in a mixture is in an active or an inferior form, by determining its solubility.

All the nitrogenous superphosphates this year analyzed have been tested as to the solubility of their organic nitrogen. Our study of the whole matter forces us to look with suspicion on samples in which the inactive nitrogen makes up one-half or more of the organic nitrogen which is insoluble in water. The presence of inferior forms, however, does not *always* condemn the fertilizer as inferior. To illustrate:

In a previous report, 1909-10, p. 76, we have discussed the use of inferior forms of nitrogen, such as peat or garbage tankage, as a "conditioner." A small amount of either, added to a mixture of chemicals which, without this addition, cakes or hardens on storage, will keep it fine and soft indefinitely. In some cases a "conditioner" may be absolutely necessary and defensible if the nitrogen which it contains is not included in the manufacturer's guaranty, i. e. if he furnishes enough soluble nitrogen to meet his guaranty without counting this inactive form. But where the organic nitrogen makes a very considerable part of the total nitrogen and more than a half or more of it is inactive we consider the mixture to be inferior.

The fertilizers named in the following table as a rule contain little or no water-soluble organic nitrogen and the percentage of "inactive" organic nitrogen is in most cases considerably larger than the percentage of active-insoluble organic nitrogen. They are, for these reasons, open to strong suspicion of containing comparatively inert forms of nitrogen.

In some of them, however, the percentage of nitrogen guaranteed is supplied *without taking account of the "inactive" nitrogen*. No objection is made to its use under these circumstances.

The others, which do not meet their guaranty after deducting the "inactive" nitrogen, are printed in full face type.

(All figures refer to nitrogen alone and are percentage amounts.)

	Inactive Insoluble Organic per cent. of Total N.	In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, active-insoluble.	Organic, inactive-insoluble.	Total.	Guaranty.	Per cent. of the water-insoluble nitrogen which is inactive.*	Active nitrogen exceeds, +, or is less than, -, the guaranty.
Williams and Clark Potato Manure	29	0.71	0.20	0.33	0.33	0.63	2.20	2.06	65.6	- .49
Armour All-Soluble	21	1.42	0.23	0.00	0.56	0.59	2.80	2.88	51.3	- .67
“ Ammoniated Bone with Potash	15	1.95	0.14	0.12	0.39	0.45	3.05	2.47	53.6	+ .13
Armour's Complete Potato...	30	0.76	0.10	0.00	0.35	0.51	1.72	1.65	59.3	- .44
“ Fish and Potash	23	1.33	0.20	0.00	0.28	0.53	2.34	2.06	65.4	- .28
“ Fruit and Root Crop	19	1.17	0.06	0.07	0.19	0.35	1.84	1.65	64.8	- .16
“ H. G. Potato	22	1.17	0.05	0.00	0.22	0.40	1.84	1.65	64.5	- .21
“ Bidwell's Formula	15	1.56	0.41	0.07	0.27	0.40	2.71	2.47	59.7	- .16
Berkshire Grass Special	18	3.30	0.12	0.00	0.66	0.89	4.97	5.0	57.4	- .02
Buffalo Farmers' Choice	33	.....	0.34	0.10	0.20	0.31	0.95	0.80	60.8	- .16
Clark Special for General Use	8	1.44	1.68	0.00	0.21	0.27	3.60	3.30	56.2	+ .03
“ Special 10% Brand	7	1.55	1.66	0.00	0.14	0.27	3.62	3.30	65.9	+ .05
Coe-Mortimer's Gold Brand	20	0.10	1.42	0.27	0.37	0.53	2.69	2.47	58.9	- .31
Mapes Average Soil Complete	6	2.35	1.70	0.00	0.12	0.26	4.43	4.1	68.4	+ .07
“ Cereal Brand	19	0.84	0.56	0.05	0.26	0.39	2.10	1.69	60.0	+ .03
“ “A” Brand	11	1.44	0.69	0.00	0.18	0.30	2.61	2.47	62.5	- .10
“ Corn Manure	16	1.02	0.88	0.08	0.23	0.43	2.64	2.47	65.2	- .20
“ Economical Potato	9	1.86	1.14	0.11	0.16	0.31	3.58	3.29	66.0	- .02
“ Fruit and Vine	17	1.55	0.10	0.03	0.22	0.39	2.29	1.65	63.9	+ .25
“ Potato Manure	7	2.08	1.28	0.12	0.13	0.27	3.88	3.69	67.5	- .08
“ Tobacco Starter, Imp.	10	3.60	0.13	0.00	0.37	0.48	4.58	4.1	56.5	± .00
“ Vegetable Manure	7	2.99	1.40	0.08	0.26	0.34	5.07	4.9	56.7	- .17
Woodruff's Home Mixture	25	1.60	0.09	0.41	0.63	0.92	3.65	3.29	59.4	- .50

* See definition, p. 9.

I. SAMPLED BY STATION AGENT.

Analyses Requiring Special Notice.

26228 and **26437**. Bowker's Lawn and Garden Dressing. The first analysis showed considerably less potash than was guaranteed and somewhat less phosphoric acid. A second sample, **26437**, contained the full percentage of potash and rather more phosphoric acid. Neither fully meets the guaranty in either nitrogen or total phosphoric acid.

26323. Bowker's Market Garden Fertilizer. The sample contained less than the guaranteed amount of potash. It was composed of three samples, one of which, it was learned after the analysis was done, might have been last year's stock. It was not possible to get another sample of this brand, but nitrogen and potash were determined in each of the three samples to see whether some one of them might be totally different from the others. The results were:

Nitrogen ..	3.08, 2.30, 2.50	Average..	2.63	Guaranteed..	2.47
Potash	8.63, 10.29, 9.18	“ ..	9.36	“ ..	10.00

These figures show no close agreement, but no such wide divergence as proves confusion with another brand.

26542. Bowker's Tobacco Ash Elements. This analysis was made on a mixture of two samples drawn by the station agent, one from stock of E. A. Root, East Granby, the other from G. N. Thompson, Suffield. The potash is 0.83 per cent. below guaranty and the “available” phosphoric acid 2.11 per cent. above.

Another sample, **26760**, drawn by our agent from Bissell-Graves Co., had 15.26 per cent. of potash. Two others, **26395** and **26396**, drawn by the Bissell-Graves Co., contained 14.95 and 14.77 per cent., and finally, a sample sent by Seth Viets, West Suffield, **26989**, contained 14.41 per cent. Two other samples, **26629** and **26289**, of which the full analyses are given on pages 82 and 83, showed 14.24 and 15.97 per cent. of water-soluble potash respectively.

It is obvious that this brand contains, on the average, very nearly the guaranteed amount of water-soluble potash, but the nature of the mixture, and probably the mechanical separation of the ingredients of the fertilizer, make a very accurate sampling difficult.

26640. Stockbridge Manure for Seeding Down. This analysis shows a per cent. less of potash than is guaranteed. It was made on a mixture of two samples which contained 8.74 and 9.39 per cent. respectively. Another sample, **26981**, was then drawn of another dealer, the analysis of which, as appears in the table, differs from the first, chiefly in a higher per cent. of potash, which does not, however, meet the guaranty.

26283. Stockbridge Top Dressing and Forcing. This analysis made on a mixture of two samples showed a serious

deficiency in nitrogen. A second sample, **26436**, drawn from stock of another dealer, fully met the guaranty.

26641, 26643, 26645, 26645 and **26642** are Special Potato, Gold Brand Excelsior Guano, New Englander Corn and Potato, Peruvian Vegetable Grower and Red Brand Excelsior Guano, made by the Coe-Mortimer Co. All showed a deficiency of potash. Second samples of each were drawn, in some cases from other dealers, which in all but two cases met the manufacturer's guaranty.

26230. Essex Fertilizer Co.'s Complete for Potatoes, Roots and Vegetables. In identical samples the company's chemist found 3.15 per cent. of nitrogen, while the station found 3.02 per cent. Repetition of our work did not change this figure.

26231. Frisbie's Vegetable Grower. The analysis was made on a single sample and showed a deficiency of both nitrogen and potash. The manufacturer protested that the analysis did not represent the stock he was shipping and asked that another sample be drawn. Two other samples were therefore taken and the analysis of a mixture of them is given in the table, **26386**. This analysis shows the full amount of nitrogen guaranteed, but a deficiency of one per cent. of potash.

26681, National Fertilizer Co.'s Complete Root Fertilizer, showed a deficiency of both nitrogen and potash. A second sample was therefore drawn from the stock of the same dealer, which, as appears in the table, **27019**, met the manufacturer's guaranty. This second sample does not represent the same shipment of stock as the first.

26287. Rogers & Hubbard Co.'s Potato Phosphate. As this analysis showed slightly less nitrogen than was guaranteed, the manufacturers asked that a second sample be drawn. This was done, from stock of another dealer, and is represented by **26715**. This shows somewhat more nitrogen and less potash than the first analysis.

GUARANTIES.

Of the 255 samples, 56, or nearly one-fifth of the number, did not in all respects meet their guaranties: 25 were deficient in potash, 17 in nitrogen, 5 in phosphoric acid, and 9 in two or more ingredients.

In most cases the deficiency was not large and was balanced by a corresponding surplus of another ingredient, so that the buyer got an amount of plant food fully equivalent to what was guaranteed.

In two brands, however, the deficiency was not thus balanced by excess of other ingredients. These are **26438**, Buffalo Top Dressing, and **26664**, Chittenden's Potato Manure.

COST.

An effort is made to get a statement of cash retail price from each dealer from whom a sample is taken and these statements are in all cases submitted to the manufacturer for criticism. In general an average of the quoted prices forms the basis of comparison between cost and valuation.

VALUATION.

The method and meaning of valuation is explained on page 8.

The schedule of trade-values is given on page 7. The organic nitrogen in mixed fertilizers is reckoned at 20 cents per pound. Citrate-insoluble phosphoric acid is rated at 2 cents per pound. Potash is rated at $4\frac{1}{4}$ cents, if sufficient chlorine is present in the fertilizer to combine with it to make muriate. If there is more potash present than will combine with the chlorine, then this excess of potash is reckoned at 5 cents per pound, except in those cases where carbonate of potash has been used in the mixture. But if carbonate of potash is claimed, the per cent. of potash required to combine with both the chlorine and the soluble sulphuric acid is subtracted from the whole amount of potash present and the remainder is calculated as carbonate.

In most cases the valuation of the ingredients in superphosphates falls considerably below the retail price. The difference between the two figures represents the manufacturer's charges for converting raw materials into manufactured articles and selling them. The charges are for grinding and mixing, bagging or barreling, storage and transportation, commission to agents and dealers, long credits, interest on investments, bad debts, and, finally, profits. This matter has been discussed on page 4. The following statement, given by a manufacturer, serves to show in a general way what these items are and their approximate amount:

Final mixing, bagging and loading	\$1.50
Bags (100 lb.)	1.50
Shrinkage, 5 per cent.	1.00
Interest 12 months, average	2.00
Commissions for warehousing, selling and collecting, average 5 per cent.	2.00
Freight 2.50 to 3.50 or more	3.00
	<hr/>
	\$11.00

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation per ton.	Percentage difference between cost and valuation.
<i>Sampled by Station Agent:</i> The American Agricultural Chemical Co., New York City.					
26430	Complete Manure with 10% Potash.	Milford, Meriden	\$38.25	\$26.06	46.8
26536	Complete Tobacco Manure (from Sulphate)	Hazardville, Windsor Locks, New Milford ..	38.75	27.95	38.6
26356	Complete Tobacco Manure (from Carbonate)	Glastonbury	37.00	29.74	24.4
26357	Grass and Lawn Top Dressing	New Haven, Wapping ..	35.50	20.24	75.4
26308	H. G. Fertilizer, 10% Potash	Norwich Town, Rockville.	38.25	23.66	61.7
26592	H. G. Tobacco Manure	Wapping	48.00	34.87	37.7
26706	H. G. Tobacco Manure	Broad Brook	48.00	37.22	29.0
26591	Tobacco Starter and Grower	Hazardville, New Milford	38.50	24.81	55.2
<i>Bradley Branch.</i>					
26312	Complete Manure for Potatoes and Vegetables	Norwich Town, Milford, Stafford Springs	37.50	26.19	43.2
26513	Complete Manure for Top Dressing, Grass and Grain	Hazardville, Andover	38.50	23.72	62.3
26630	Complete Manure with 10% Potash ..	Burnside	39.00	26.07	49.6
26310	Corn Phosphate	Norwich Town, Milford, So. Coventry	29.00	17.67	64.1
26559	Eclipse Phosphate	Milford, Putnam	28.00	14.33	95.4
26404	Farmers' New Method Fertilizer ...	Middletown, Stafford Springs, Putnam	30.00	17.17	74.7
26311	Niagara Phosphate	Middletown, Milford, So. Coventry	27.75	12.58	120.6
26309	Potato Fertilizer	Middletown, Milford, So. Coventry	30.25	19.07	58.6
26313	Potato Manure	Suffield, Milford, Stafford Springs	33.00	20.56	60.5
26380	Superphosphate	Suffield, Thompsonville, Windsor Locks	33.25	19.72	68.6
<i>Church Branch.</i>					
26278	Fish and Potash	Hazardville, Middletown .	30.00	16.46	82.3
<i>Great Eastern Branch.</i>					
26460	General	East Lyme, Madison, Torrington	29.25	15.20	92.4
26560	H. G. Vegetable, Vine and Tobacco Fertilizer	East Hampton, Madison ..	32.50	20.94	55.2
26593	Northern Corn Special	East Hampton	32.00	19.97	60.2
<i>North Western Branch.</i>					
26537	Fish, Bone and Potash	New Haven, Bristol, Suffield	30.00	17.70	69.5
26595	Market Garden Phosphate	Southport, New Milford ..	33.75	22.48	50.1

ANALYSES AND VALUATIONS.

NITROGEN.					PHOSPHORIC ACID.								POTASH.		Station No.	
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, active insoluble.	Organic, inactive insoluble.	Total.		Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total.		"Available."		Found.		Guaranteed.
					Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.			
...	2.43	0.11	0.36	0.41	3.31	3.3	5.25	1.19	0.51	6.95	7.0	6.44	6.0	10.45	10.0	26430
...	0.23	0.81	2.10	1.34	4.48	4.5	1.18	3.82	1.65	6.65	4.0	5.00	3.0	¹ 5.61	5.5	26536
0.15	0.13	1.24	1.89	1.11	4.52	4.5	0.19	5.40	2.87	8.46	4.0	5.59	3.0	² 5.57	5.5	26356
2.37	0.16	0.16	0.65	0.51	3.85	3.9	3.99	1.62	0.36	5.97	6.0	5.61	5.0	2.16	2.0	26357
0.68	0.90	0.09	0.47	0.28	2.42	2.5	4.65	2.64	1.29	8.58	7.0	7.29	6.0	9.91	10.0	26308
...	3.20	0.14	1.82	0.65	5.81	5.8	4.76	1.59	0.26	6.61	6.0	6.35	5.0	³ 8.73	10.0	26592
0.36	3.16	0.08	1.59	0.77	5.96	5.8	4.04	1.37	0.35	5.76	6.0	5.41	5.0	⁴ 11.51	10.0	26706
0.06	1.88	0.36	0.86	0.44	3.60	3.3	6.94	1.83	0.58	9.35	9.0	8.77	8.0	⁵ 4.11	4.0	26591
0.65	1.42	0.20	0.68	0.32	3.27	3.3	7.17	2.11	1.06	10.34	9.0	9.28	8.0	7.31	7.0	26312
2.27	1.93	0.13	0.39	0.26	4.98	4.9	3.31	1.89	1.04	6.24	6.0	5.20	5.0	2.65	2.5	26513
0.09	2.68	0.03	0.38	0.27	3.45	3.3	4.46	2.08	0.70	7.24	7.0	6.54	6.0	10.03	10.0	26630
0.64	0.59	0.19	0.49	0.33	2.24	2.1	5.87	2.75	1.45	10.07	9.0	8.62	8.0	1.92	1.5	26310
...	0.20	0.34	0.29	0.37	1.20	1.0	5.84	2.54	1.66	10.04	9.0	8.38	8.0	2.05	2.0	26559
0.20	0.75	0.18	0.48	0.34	1.95	1.7	6.51	2.32	1.19	10.02	9.0	8.83	8.0	3.21	3.0	26404
0.09	0.24	0.24	0.22	0.29	1.08	0.8	5.77	2.17	1.04	8.98	8.0	7.94	7.0	1.38	1.0	26311
0.43	0.60	0.16	0.60	0.37	2.16	2.1	6.32	2.54	1.37	10.23	9.0	8.86	8.0	3.51	3.0	26309
0.36	1.24	0.17	0.54	0.37	2.68	2.5	5.39	1.53	0.77	7.69	7.0	6.92	6.0	5.58	5.0	26313
0.09	1.31	0.25	0.56	0.30	2.51	2.5	7.32	2.14	1.34	10.80	10.0	9.46	9.0	2.31	2.0	26380
0.15	0.36	0.37	0.61	0.62	2.11	2.1	4.50	2.34	0.90	7.74	7.0	6.84	6.0	2.53	2.0	26278
...	0.15	0.27	0.24	0.29	0.95	0.8	6.03	2.56	1.54	10.13	9.0	8.59	8.0	4.02	4.0	26460
...	1.00	0.40	0.29	0.41	2.10	2.1	6.35	2.17	1.59	10.11	9.0	8.52	8.0	6.16	6.0	26560
...	1.43	0.32	0.54	0.31	2.60	2.5	7.00	2.34	1.59	10.93	10.0	9.34	9.0	2.23	2.0	26593
0.34	0.48	0.46	0.65	0.59	2.52	2.5	2.69	2.32	0.68	5.69	5.0	5.01	4.0	4.38	4.0	26537
...	1.56	0.09	0.51	0.44	2.60	2.5	6.60	2.30	1.16	10.06	9.0	8.90	8.0	5.99	6.0	26595
1 1.20% as max.																

¹ 1.20% as muriate, 4.41% as sulphate.
² 1.73% as muriate, 2.29% as sulphate.
³ 1.55% as carbonate.

⁴ 1.30% as muriate, 7.43% as sulphate.
⁵ 1.25% as muriate, 10.26% as sulphate.
⁶ 0.65% as muriate, 3.46% as sulphate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation per ton.	Percentage difference between cost and valuation.
<i>Sampled by Station Agent: North Western Branch (Continued).</i>					
26226	10% Potato Fertilizer.....	Waterbury, New Haven ..	\$37.00	\$23.64	56.5
26594	Universal Fertilizer	So. Meriden	33.00	22.03	49.8
<i>Packers' Union Branch.</i>					
26597	Animal Corn Fertilizer	Waterford	32.00	19.79	61.7
26596	Gardeners' Complete Manure	Riverton, East Granby....	37.00	26.49	39.7
26561	Potato Manure.....	Waterford, East Hampton	32.00	21.03	52.2
<i>Quinnipiac Branch.</i>					
26514	Climax Phosphate	Plainfield, Andover	24.75	14.03	76.4
26515	Corn Manure	Wallingford, Plainfield, Andover	28.00	17.31	61.8
26432	Market Garden Manure	Southport, Norwalk	36.50	26.17	39.5
26279	Phosphate	Wallingford, New London	32.00	19.73	62.2
26431	Potato Manure.....	New London, Southport, Norwalk	31.75	18.20	74.5
26314	Potato Phosphate	Wallingford, New London, Southport	29.75	18.99	56.7
<i>Read Branch.</i>					
26433	Practical Potato Special	Hazardville, Plantsville, New Canaan	30.00	14.86	101.9
26434	Standard Superphosphate	Plantsville, Ellington, So. Meriden	31.25	14.84	110.6
26598	Vegetable and Vine Fertilizer	East Canaan	33.00	21.86	51.0
<i>Wheeler Branch.</i>					
26538	Corn Fertilizer.....	Torrington, Riverton, East Granby	29.75	16.28	82.7
26599	Havana Tobacco Grower	Riverton, East Granby....	36.50	26.41	38.2
26539	Potato Manure.....	Torrington, Riverton, East Granby	31.00	18.13	71.0
<i>Williams and Clark Branch.</i>					
26600	Americus Ammoniated Bone Super- phosphate	Waterbury, Hillstown	33.50	20.15	66.3
26461	Americus Corn Phosphate	Milford, Ellington, Wal- lingford	30.75	16.18	90.0
26601	Americus H. G. Special Fertilizer ..	Plainville, Wapping	38.75	25.89	49.7
26562	Americus Potato Manure	Wapping, Ellington	32.25	19.04	60.4
26462	Potato Phosphate	Waterbury, Ellington, Wal- lingford	33.75	19.38	74.1
<i>The Armour Fertilizer Works, Baltimore, Md.</i>					
26435	All Soluble.....	New Haven, Bridgeport, Norwalk	33.25	21.49	54.7
26488	Ammoniated Bone with Potash	Danielson, Norwalk, Wil- limantic	29.00	18.75	54.7

ANALYSES AND VALUATIONS—Continued.

NITROGEN.										PHOSPHORIC ACID.						POTASH.		Station No.
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, active insoluble.	Organic, inactive insoluble.	Total.		Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total.		"Available."		Found.	Guaranteed.			
					Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.					
0.10	0.63	0.26	0.42	0.44	1.85	1.7	6.02	2.98	1.27	10.27	9.0	9.00	8.0	10.01	10.0	26226		
...	1.22	0.14	0.70	0.54	2.60	2.5	7.71	2.06	0.49	10.26	9.0	9.77	8.0	4.49	4.0	26594		
...	1.27	0.31	0.60	0.30	2.48	2.5	6.88	2.78	1.09	10.75	10.0	9.66	9.0	2.40	2.0	26597		
0.10	1.51	0.25	0.36	0.41	2.63	2.5	5.27	1.97	1.05	8.29	7.0	7.24	6.0	10.67	10.0	26596		
...	0.85	0.43	0.40	0.37	2.05	2.1	6.35	2.40	1.28	10.03	9.0	8.75	8.0	6.30	6.0	26561		
0.06	0.25	0.26	0.38	0.28	1.23	1.0	5.32	2.64	1.61	9.57	9.0	7.96	8.0	2.14	2.0	26514		
0.52	0.50	0.23	0.61	0.34	2.20	2.1	5.49	2.98	1.66	10.13	9.0	8.47	8.0	1.59	1.5	26515		
...	1.72	0.29	0.93	0.47	3.41	3.3	7.40	1.19	0.60	9.19	9.0	8.59	8.0	7.13	7.0	26432		
0.82	0.53	0.13	0.54	0.44	2.46	2.5	5.71	3.78	2.09	11.58	10.0	9.49	9.0	2.32	2.0	26279		
0.45	1.05	0.08	0.48	0.37	2.43	2.5	4.76	2.24	0.97	7.97	7.0	7.00	6.0	5.08	5.0	26431		
0.49	0.56	0.24	0.52	0.31	2.12	2.1	6.44	2.77	1.37	10.58	9.0	9.21	8.0	3.27	3.0	26314		
...	0.12	0.21	0.26	0.31	0.90	0.8	2.55	1.89	0.79	5.23	5.0	4.44	4.0	8.51	8.0	26433		
...	0.16	0.26	0.28	0.30	1.00	0.8	5.99	2.05	0.81	8.85	9.0	8.04	8.0	4.26	4.0	26434		
...	1.03	0.42	0.42	0.41	2.28	2.1	6.42	2.28	1.68	10.38	9.0	8.70	8.0	6.22	6.0	26598		
...	0.75	0.33	0.30	0.28	1.66	1.7	6.36	2.58	1.51	10.45	9.0	8.94	8.0	2.19	2.0	26538		
0.10	1.51	0.28	0.42	0.31	2.62	2.5	5.38	1.89	1.07	8.34	7.0	7.27	6.0	10.52	10.0	26599		
...	1.15	0.25	0.31	0.34	2.05	2.1	6.22	2.61	1.34	10.17	9.0	8.83	8.0	3.08	3.0	26539		
...	1.33	0.22	0.61	0.44	2.60	2.5	7.69	1.89	1.05	10.63	10.0	9.58	9.0	2.31	2.0	26600		
0.44	0.69	0.22	0.41	0.36	2.12	2.1	6.35	2.51	1.78	10.64	9.0	8.86	8.0	1.90	1.5	26461		
0.06	2.27	0.11	0.54	0.46	3.44	3.3	7.12	1.69	0.70	9.51	9.0	8.81	8.0	7.01	7.0	26601		
0.71	0.20	0.33	0.33	0.63	2.20	2.1	6.79	1.82	1.24	9.85	9.0	8.61	8.0	3.41	3.0	26562		
0.24	1.05	0.15	0.64	0.40	2.48	2.5	4.94	1.99	0.87	7.80	7.0	6.93	6.0	4.82	5.0	26462		
1.42	0.23	0.00	0.56	0.59	2.80	2.9	6.48	1.83	0.75	9.06	8.5	8.31	8.0	4.75	4.0	26435		
1.95	0.14	0.12	0.39	0.45	3.05	2.5	4.60	1.97	0.93	7.50	6.5	6.57	6.0	2.51	2.0	26488		
¹ 1.00% as muriate, 9.67% as sulphate.																		
² 0.51% as muriate, 10.01% as sulphate.																		

1 1.00% as muriate, 9.67% as sulphate.

2 0.51% as muriate, 10.01% as sulphate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation per ton.	Percentage difference between cost and valuation.
<i>Sampled by Station Agent.</i> The Armour Fertilizer Works Baltimore, Md. (Continued).					
26381	Bidwell's Formula for all Crops....	Windsor Locks	\$30.00	\$21.52	39.4
26632	Bone, Blood and Potash.....	Bridgeport, Rockville ...	38.50	28.83	33.5
26602	Complete Potato	Danielson	28.00	19.56	43.1
26631	Corn King	Silver Lane, Waterbury...	32.50	21.35	52.2
26405	Fish and Potash Mixture	Meriden, Branford, Danielson	25.00	16.48	51.7
26563	Fruit and Root Crop Special	Meriden, Danielson	26.50	19.03	39.3
26406	H. G. Potato	New Haven, Bridgeport, Danielson	32.75	23.84	37.4
26633	Market Garden	New Haven, Rockville ...	37.00	25.81	43.4
Berkshire Fertilizer Co., Bridgeport, Conn.					
26634	Ammoniated Bone Phosphate.....	Waterbury, Staffordville ..	28.50	15.68	81.8
26541	Complete Fertilizer	Waterbury, Burnside, Granby	34.75	22.64	53.5
26280	*Grass Special	Waterbury, Norwich Town ..	36.50	24.57	48.6
26382	Long Island Special.....	Milldale, Wethersfield ...	34.50	26.56	29.9
26540	Potato and Vegetable Phosphate...	Waterbury, Staffordville, Granby	31.75	17.32	83.3
26635	Tobacco Special with Carbonate....	Hillstown	38.00	32.00	18.7
F. E. Boardman, Middletown, Conn.					
26315	Complete Fertilizer	Middletown	34.00	29.38	15.7
Bowker Fertilizer Co., New York City.					
26227	Bone and Wood Ash Fertilizer.....	New Haven.. ..	20.00	14.86	34.6
26636	Complete Alkaline Tobacco Grower	E. Hartford, East Granby.	34.50	27.86	23.8
26637	Complete Alkaline Tobacco Grower, with Carbonate	Suffield	34.50	29.05	18.8
26321	Corn Phosphate	New London, Norwich, Rockville	32.00	15.90	101.3
26464	Early Potato Manure	Milldale, Wethersfield, Yalesville	37.50	24.02	56.1
26543	Farm and Garden Phosphate.....	East Berlin, East Granby.	29.50	17.22	71.3
26316	Fisherman's Brand Fish and Potash	Waterbury, New London, East Berlin	29.25	17.76	64.7
26281	Gloucester Fish and Potash.....	New Haven, Norwich ...	27.00	12.62	113.9
26639	Hill and Drill Phosphate	Waterbury, Norwich	35.00	20.18	73.4
26228	*Lawn and Garden Dressing	New Haven	36.00	18.63	93.2
26437	* " " "	Bridgeport.....	36.00	20.18	78.4
26323	†Market Garden Fertilizer	Norwich, Milldale, East Hartford	37.25	23.82	56.4
26322	Potato and Vegetable Fertilizer	E. Glastonbury, Yantic, East Berlin	32.75	21.60	51.6

* See note on page 58.

† See note on page 59.

ANALYSES AND VALUATIONS—Continued.

NITROGEN.					PHOSPHORIC ACID.								POTASH.			Station No.
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, active insoluble.	Organic, inactive insoluble.	Total.		Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total.		"Available."		Found.	Guaranteed.	
					Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.			
1.56	0.41	0.07	0.27	0.40	2.71	2.5	6.43	2.07	1.34	9.84	8.5	8.50	8.0	¹ 5.22	5.0	26381
1.29	1.00	0.15	1.04	0.37	3.85	4.1	7.01	1.51	1.15	9.67	8.5	8.52	8.0	8.57	7.0	26632
0.76	0.10	0.00	0.35	0.51	1.72	1.7	5.95	2.10	1.46	9.51	10.0	8.05	7.0	6.77	6.0	26602
1.54	0.18	0.04	0.53	0.47	2.76	2.5	6.41	1.93	0.96	9.30	8.5	8.34	8.0	4.69	4.0	26631
1.33	0.20	0.00	0.28	0.53	2.34	2.1	4.64	1.79	1.23	7.66	6.5	6.43	6.0	2.63	2.0	26405
1.17	0.06	0.07	0.19	0.35	1.84	1.7	6.24	2.30	1.46	10.00	8.5	8.54	8.0	5.44	5.0	26503
1.17	0.05	0.00	0.22	0.40	1.84	1.7	6.55	2.23	1.24	10.02	8.5	8.78	8.0	² 10.36	10.0	26406
1.67	0.53	0.12	0.83	0.40	3.55	3.3	6.85	1.25	0.28	8.38	8.5	8.10	8.0	7.16	7.0	26633
...	0.02	0.16	0.50	0.64	1.32	0.8	5.16	3.76	0.91	9.83	9.0	8.92	8.0	2.84	2.0	26634
...	1.10	0.22	0.58	0.69	2.59	2.5	5.64	2.94	0.46	9.04	9.0	8.58	8.0	6.53	6.0	26541
3.30	0.12	0.00	0.66	0.89	4.97	5.0	2.04	2.63	0.63	5.30	5.0	4.67	4.0	3.81	2.0	26280
0.08	1.76	0.20	0.96	0.73	3.73	3.3	3.70	3.04	0.92	7.66	7.0	6.74	6.0	8.21	7.0	26382
...	0.06	0.24	0.78	0.75	1.83	1.7	3.68	2.91	1.20	7.79	7.0	6.59	6.0	4.62	4.0	26540
1.05	0.12	0.81	1.60	1.63	5.21	4.5	0.87	1.85	0.20	2.92	4.0	2.72	3.0	³ 6.57	5.5	26635
0.84	1.28	0.04	0.77	0.63	3.56	2.9	3.10	3.81	0.38	7.29	..	6.91	7.0	12.75	10.0	26315
0.05	0.10	0.23	0.67	0.48	1.53	1.7	2.35	4.24	2.52	9.11	7.0	6.59	6.0	2.76	2.0	26227
1.20	0.14	0.29	1.66	0.98	4.27	4.1	1.13	5.79	2.11	9.03	5.0	6.92	4.0	⁴ 5.44	5.0	26636
1.07	0.07	0.44	1.69	0.99	4.26	4.1	1.03	5.27	1.79	8.09	5.0	6.30	4.0	⁵ 5.43	5.0	26637
0.40	0.50	0.15	0.42	0.25	1.72	1.7	5.92	2.35	1.68	9.95	9.0	8.27	8.0	2.19	2.0	26321
0.48	0.95	0.35	0.84	0.49	3.11	3.3	6.01	1.67	0.69	8.37	8.0	7.68	7.0	6.69	7.0	26464
...	0.87	0.44	0.36	0.36	2.03	1.7	6.37	1.93	0.81	9.11	9.0	8.30	8.0	2.60	2.0	26543
0.16	0.72	0.30	0.78	0.45	2.41	2.5	3.59	1.88	1.02	6.49	5.0	5.47	4.0	4.34	4.0	26316
0.23	0.10	0.19	0.24	0.18	0.94	0.8	6.10	2.62	1.19	9.91	9.0	8.72	8.0	1.23	1.0	26281
...	1.32	0.44	0.55	0.31	2.62	2.5	7.09	2.44	1.20	10.73	10.0	9.53	9.0	2.29	2.0	26639
0.67	1.20	0.08	0.87	0.35	3.17	3.3	2.26	1.56	0.73	4.55	8.0	3.82	4.0	4.57	5.0	26228
0.84	1.12	0.03	0.80	0.31	3.10	3.3	2.73	1.56	0.87	5.16	8.0	4.29	4.0	6.22	5.0	26437
...	1.25	0.27	0.82	0.32	2.66	2.5	5.08	1.62	0.73	7.43	7.0	6.70	6.0	9.44	10.0	26323
0.28	1.21	0.33	0.48	0.34	2.64	2.5	6.85	2.28	1.33	10.46	9.0	9.13	8.0	4.36	4.0	26322

1 1.00% as muriate, 4.22% as sulphate.

2 7.18% as muriate, 3.18% as sulphate.

3 0.40% as muriate, 0.76% as sulphate, 5.41% as carbonate.

4 0.53% as muriate, 4.91% as sulphate.

5 0.25% as muriate, 2.40% as sulphate, 2.78% as carbonate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation per ton.	Percentage difference between cost and valuation.
<i>Sampled by Station Agent: Bowker Fertilizer Co., New York City (Continued).</i>					
26383	Potato and Vegetable Phosphate ...	New London, Norwich, Meriden	\$29.70	\$16.80	75.6
26463	Sure Crop Phosphate	Yantic, East Berlin, Yalesville	28.00	14.56	92.3
26542	*Tobacco Ash Elements	East Granby, Suffield	32.00	23.10	38.5
26544	Tobacco Starter	East Hartford, East Granby	32.50	21.55	50.8
26320	Stockbridge Sp'l Complete Manure for Corn and all Grain Crops. ...	Yantic, Milldale, Meriden	38.50	27.71	38.9
26282	Stockbridge Sp'l Complete Manure for Potatoes and Vegetables	New Haven, East Glastonbury, Milldale	39.25	26.08	50.5
26640	*Stockbridge Sp'l Complete Manure for Seeding Down, etc.	Yantic, Yalesville	38.00	23.20	63.8
26981	*Stockbridge Sp'l Complete Manure for Seeding Down, etc.	Newington	35.00	24.06	45.5
26283	*Stockbridge Sp'l Complete Manure for Top Dressing and for Forcing. ...	New Haven, New Britain	40.50	26.07	55.4
26436	†Stockbridge Sp'l Complete Manure for Top Dressing and for Forcing. ...	Stamford, New Canaan ...	45.00	29.11	54.6
26638	Stockbridge Sp'l Complete Manure for Tobacco	Rockville, New Milford ..	48.50	33.15	46.3
The Buffalo Fertilizer Co., Buffalo, N. Y.					
26325	Celery and Potato Special	Hazardville, West Cheshire, Ansonia	33.75	22.01	53.3
26384	Farmer's Choice	Branford, Norwich Town, Ansonia	24.75	15.54	59.3
26385	Fish Guano	Colchester, Manchester, Westville	24.50	14.19	72.7
26326	High Grade Manure	Plainville, West Cheshire, Westport	36.00	25.98	38.6
26284	New England Special	Plainville, Hazardville, West Cheshire	28.75	18.82	52.8
26545	Tobacco Producer	Hazardville, Windsor Locks, West Suffield ...	39.50	26.48	49.2
26438	Top Dresser	West Cheshire, Manchester, New Canaan	40.75	27.71	47.1
26324	Vegetable and Potato	Plainville, Norwich Town, Colchester	33.50	21.86	53.2
The E. D. Chittenden Co., Bridgeport, Conn.					
26663	Complete Tobacco and Onion Grower	Broad Brook	34.50	25.09	37.5
26665	Connecticut Tobacco Grower	Broad Brook (2)	46.00	31.06	48.1
26661	Fish and Potash	Broad Brook	28.00	16.12	73.7

* See note on page 59.

† See note on page 60.

ANALYSES AND VALUATIONS—Continued.

NITROGEN.										PHOSPHORIC ACID.						POTASH.		Station No.
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, active insoluble.	Organic, inactive insoluble.	Total.		Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total.		"Available."		Found.	Guaranteed.			
					Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.					
0.36	0.45	0.29	0.45	0.25	1.80	1.7	6.44	2.54	1.46	10.44	9.0	8.98	8.0	2.16	2.0	26383		
0.06	0.16	0.25	0.26	0.29	1.02	0.8	7.04	2.31	1.61	10.96	10.0	9.35	9.0	2.15	2.0	26463		
...	...	...	...	...	0.24	..	0.50	7.61	3.99	12.10	...	8.11	6.0	¹ 14.17	15.0	26542
0.59	1.21	0.08	0.46	0.42	2.76	2.5	6.76	2.04	0.47	9.27	9.0	8.80	8.0	² 4.14	3.0	26544		
0.68	1.30	0.13	0.89	0.38	3.38	3.3	8.22	2.13	0.87	11.22	11.0	10.35	10.0	7.43	7.0	26320		
0.93	0.65	0.26	0.85	0.48	3.17	3.3	4.96	2.01	0.78	7.75	7.0	6.97	6.0	9.74	10.0	26282		
0.46	1.03	0.26	0.60	0.25	2.60	2.5	4.65	2.12	1.16	7.93	9.0	6.77	6.0	8.99	10.0	26640		
0.11	1.02	1.53			2.66	2.5	4.72	2.00	0.83	7.55	9.0	6.72	6.0	9.59	10.0	26981		
0.40	1.00	0.21	1.64	0.57	3.82	4.9	4.19	1.41	0.73	6.33	6.0	5.60	4.0	7.90	6.0	26283		
0.77	0.91	0.00	2.51	1.02	5.21	4.9	3.05	1.53	0.67	5.25	6.0	4.58	4.0	6.33	6.0	26436		
1.43	3.06	0.17	0.53	0.39	5.58	5.8	3.14	2.13	0.60	5.87	5.0	5.27	4.0	³ 9.90	10.0	26638		
0.92	0.08	0.08	0.22	0.25	1.55	1.6	5.48	3.36	1.00	9.84	9.0	8.84	8.0	10.10	10.0	26325		
...	0.34	0.10	0.20	0.31	0.95	0.8	4.92	3.59	1.02	9.53	9.0	8.51	8.0	5.06	5.0	26384		
...	0.23	0.13	0.27	0.31	0.94	0.8	4.19	5.31	1.57	11.07	10.0	9.50	9.0	2.30	2.0	26385		
1.50	1.66	0.00	0.26	0.13	3.55	3.3	5.23	2.23	0.64	8.10	8.0	7.46	7.0	8.89	10.0	26326		
0.83	0.60	0.20			1.63	1.6	6.76	3.21	0.87	10.84	10.0	9.97	9.0	5.22	5.0	26284		
0.18	2.84	0.00	0.71	0.56	4.29	4.5	3.15	4.02	1.11	8.28	6.0	7.17	5.0	⁴ 5.34	5.5	26545		
3.32	1.12	0.14	0.37	0.35	5.30	5.7	3.92	2.66	0.74	7.32	7.0	6.58	6.0	4.83	5.0	26438		
0.82	1.16	0.00	0.21	0.13	2.32	2.4	5.77	2.86	0.75	9.38	9.0	8.63	8.0	7.52	7.0	26324		
...	1.90	1.10	0.21	0.15	3.36	3.3	6.84	1.71	1.79	10.34	10.0	8.55	8.0	⁵ 5.01	5.0	26663		
0.69	2.25	0.38	1.09	0.63	5.04	5.0	4.32	0.79	1.11	6.22	6.0	5.11	4.0	⁶ 8.37	8.0	26665		
1.68	0.10	0.15	0.48	0.35	2.76	2.5	3.95	1.05	1.04	6.04	6.0	5.00	...	1.98	4.0	26661		

¹ 1.14% as muriate, 13.03% as sulphate.² 0.60% as muriate, 3.54% as sulphate.³ 1.70% as muriate, 8.20% as sulphate.⁴ 0.73% as muriate, 4.61% as sulphate.⁵ 0.57% as muriate, 4.44% as sulphate.⁶ 0.53% as muriate, 7.84% as sulphate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation per ton.	Percentage difference between cost and valuation.
<i>Sampled by Station Agent: The E. D. Chittenden Co., Bridge- Port, Conn. (Continued).</i>					
26662	Potato and Grain.....	Broad Brook	\$32.50	\$24.11	34.8
26664	Potato Manure.....	Broad Brook	28.50	18.36	55.2
26660	Tobacco Special	Broad Brook	34.50	26.27	31.3
The Everett B. Clark Seed Co., Milford, Conn.					
26255	Special Mixture for General Use...	Milford	31.00	26.12	18.7
26254	Special 10% Brand.....	Milford	34.00	27.23	24.9
The Coe-Mortimer Co., New York City.					
26641	*Celebrated Special Potato Fertilizer	West Hartford, Torrington	32.00	17.17	86.4
26967	* " " " " " "	Torrington	33.00	16.36	101.7
26666	Complete Manure 10% Potash	Torrington	37.00	21.92	68.8
26643	*Gold Brand Excelsior Guano	West Hartford	32.00	21.92	46.0
26965	* " " " " " "	Bridgeport	32.00	22.06	45.1
26466	H. G. Ammoniated Bone Superphosphate	West Hartford, Norwich, Torrington	31.75	17.48	81.6
26465	*New Englander Corn and Potato Fertilizer.....	West Hartford, Torrington, Winsted	29.25	12.04	142.9
26966	*New Englander Corn and Potato Fertilizer.....	Torrington	28.00	13.35	109.7
26646	Peruvian Tobacco Fertilizer	Somerville, Hillstown	49.00	33.47	46.4
26645	*Peruvian Vegetable Grower.....	West Cheshire	43.00	28.81	49.3
26963	* " " " " " "	Greenwich.....	36.00	28.13	28.0
26642	*Red Brand Excelsior Guano	W. Cheshire, Somerville..	38.50	25.09	53.4
26964	* " " " " " "	Bridgeport	37.50	24.39	53.8
26644	Tobacco and Onion Special	Somerville.....	38.00	27.50	38.2
Conn. Valley Orchard Co., Berlin, Conn.					
26327	H. G. Complete Fertilizer	Berlin.....	27.00	21.60	25.0
T. H. Eldredge, Norwich, Conn. (Made for)					
26263	Special Fish and Potash	Norwich.....	30.00	17.05	76.0
26262	Special Superphosphate.....	Norwich.....	28.00	14.23	96.8
Essex Fertilizer Co., Boston, Mass.					
26649	Complete Manure for Corn, Grain and Grass	Plainville, East Hartford .	40.50	26.05	55.5

* See note on page 60.

ANALYSES AND VALUATIONS—Continued.

NITROGEN.					PHOSPHORIC ACID.								POTASH.		Station No.	
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, active insoluble.	Organic, inactive insoluble.	Total.		Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total.		" Available. "		Found.		Guaranteed.
					Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.			
0.26	2.60	0.26	0.19		3.31	3.3	7.06	1.04	0.91	9.01	10.0	8.10	8.0	6.61	6.0	26662
0.31	0.29	0.85	0.25	0.20	1.90	2.0	5.19	1.97	1.77	8.93	10.0	7.16	8.0	5.04	6.0	26664
0.17	3.21	0.31	0.63	0.42	4.74	4.3	3.67	0.61	0.68	4.96	5.0	4.28	3.0	16.05	5.5	26660
1.44	1.68	0.00	0.21	0.27	3.60	3.3	6.77	1.98	0.79	9.54	...	8.75	8.0	7.32	7.0	26255
1.55	1.66	0.00	0.14	0.27	3.62	3.3	5.09	1.82	0.73	7.64	...	6.91	6.0	10.58	10.0	26254
0.86	0.49	0.11	0.23	0.24	1.93	1.7	5.57	2.54	0.86	8.97	9.0	8.11	8.0	3.71	4.0	26641
0.88	0.42		0.40		1.70	1.7	5.94	2.05	0.73	8.72	9.0	7.99	8.0	3.90	4.0	26967
0.16	1.44	0.23	0.30	0.39	2.52	2.5	5.00	1.08	0.60	6.68	7.0	6.08	6.0	8.85	10.0	26666
0.10	1.42	0.27	0.37	0.53	2.69	2.5	6.36	2.10	1.05	9.51	9.0	8.46	8.0	5.36	6.0	26643
0.88	1.57		0.40		2.85	2.5	6.64	1.70	0.51	8.85	9.0	8.34	8.0	5.98	6.0	26965
0.64	0.65	0.17	0.25	0.33	2.04	1.9	5.86	2.57	0.95	9.38	9.0	8.43	8.0	3.11	3.0	26466
0.09	0.39	0.12	0.17	0.18	0.95	0.8	4.56	2.35	0.87	7.78	8.5	6.91	7.5	2.69	3.0	26465
0.15	0.40		0.44		0.99	0.8	5.53	2.23	0.91	8.67	8.5	7.76	7.5	3.19	3.0	26966
1.57	0.74	0.45	1.44	0.79	4.99	5.0	1.44	4.56	0.70	6.70	7.0	6.00	6.0	10.26	10.0	26646
0.75	1.45	0.45	0.49	0.21	3.35	3.3	2.65	6.92	1.16	10.73	9.0	9.57	8.0	8.85	9.0	26645
0.88	1.40		1.02		3.30	3.3	2.29	7.13	1.16	10.58	9.0	9.42	8.0	8.62	9.0	26963
0.90	1.52	0.29	0.33	0.37	3.41	3.3	6.30	2.14	0.78	9.22	9.0	8.44	8.0	6.70	7.0	26642
0.98	1.40		0.84		3.22	3.3	5.52	2.81	0.65	8.98	9.0	8.33	8.0	6.80	7.0	26964
0.76	0.16	0.36	1.40	0.59	3.27	3.0	3.95	4.15	1.00	9.10	7.0	8.10	6.0	8.00	8.0	26644
...	1.10	0.21	0.68	0.48	2.47	2.5	8.14	1.88	0.47	10.49	10.0	10.02	9.0	4.21	4.0	26327
...	0.19	0.40	0.71	0.64	1.94	2.1	1.66	3.81	2.41	7.88	6.0	5.47	5.0	4.64	4.0	26263
...	0.12	0.26	0.44	0.32	1.14	1.0	1.53	6.79	2.62	10.94	10.0	8.32	8.0	2.25	2.0	26262
...	1.40	0.80	0.78	0.28	3.26	3.3	4.83	1.50	0.28	6.61	7.0	6.33	6.0	9.96	10.0	26649

1 0.60% as muriate, 5.45% as sulphate.

2 0.90% as muriate, 9.36% as sulphate.

3 0.45% as muriate, 8.40% as sulphate.

4 0.62% as muriate, 8.00% as sulphate.

5 5.78% as muriate, 1.02% as sulphate.

6 0.80% as muriate, 7.20% as sulphate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation per ton.	Percentage difference between cost and valuation.
<i>Sampled by Station Agent:</i>					
Essex Fertilizer Co., (Continued).					
26230	*Complete Manure for Potatoes, Roots and Vegetables	Bristol, Plainville, East Hartford	\$39.75	\$25.52	55.8
26647	Fertilizer for Grass and Top Dressing	So. Manchester	45.00	28.23	59.4
26229	Market Garden and Potato Manure	Bristol, Plainville	35.00	18.91	85.1
26648	Special Tobacco Manure	East Hartford, Hazardville	44.00	30.02	46.6
26489	Tobacco Starter and Grower	East Hartford, Poquonock, Ellington	39.00	24.71	57.8
26256	XXX Fish and Potash	Plainville, East Hartford, Suffield	32.00	17.50	82.9
Fertilizer Materials Supply Co., New York City.					
26962	Tuttle's No. 4 Corn Mixture	Wallingford .....	....	25.00	....
The L. T. Frisbie Co., New Haven, Conn.					
26329	Corn and Grain Fertilizer	Hartford, Ansonia, So. Manchester	29.25	19.08	53.3
26328	Potato Manure	Hartford, Ansonia, So. Manchester	33.25	23.70	40.3
26231	*Vegetable Grower	New Haven	39.00	25.68	51.9
26386	*" "	Hartford, New Haven	37.00	26.67	38.7
Lister's Agricultural Chemical Works, Newark, N. J.					
26667	Ammoniated Dissolved Bone Phosphate	No. Branford	29.00	17.88	62.2
26669	Complete Tobacco Manure	Warehouse Point	37.50	24.28	54.4
26651	Complete Tobacco Manure with Carbonate	Glastonbury, Burnside ...	39.00	26.50	47.2
26650	Corn and Potato Fertilizer	Hamden, Stafford Springs	32.00	18.48	73.2
26387	Potato Manure	Glastonbury, Burnside, Warehouse Point	38.25	26.46	44.6
26388	Special Grass Mixture	Glastonbury, Warehouse Point	35.75	24.73	44.6
26670	Special 10% Fertilizer	Wallingford	34.00	23.86	42.5
26467	Standard Pure Bone Superphosphate of Lime	Burnside, Warehouse Point, Wallingford	32.00	20.30	57.6
26671	Success Fertilizer	Warehouse Point, Moodus	28.00	16.27	72.1
26668	3-6-10 for Potatoes	Suffield	34.50	25.52	35.2
E. Manchester & Sons, Winsted, Conn.					
26672	Formula	Winsted, East Haddam ...	32.00	27.74	15.4
26546	Special	Winsted, Simsbury, Avon.	35.25	34.33	2.7

* See note on page 60.

ANALYSES AND VALUATIONS—Continued.

NITROGEN.					PHOSPHORIC ACID.								POTASH.		Station No.	
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, active insoluble.	Organic, inactive insoluble.	Total.		Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total.		"Available."		Found.		Guaranteed.
					Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.			
...	1.37	0.65	0.81	0.19	3.02	3.3	5.57	1.07	0.28	6.92	7.0	6.64	6.0	10.07	10.0	26230
...	1.62	1.15	0.76	0.49	4.02	4.1	5.37	2.27	0.41	8.05	8.0	7.64	7.0	7.81	8.0	26647
...	0.41	0.58	0.64	0.29	1.92	2.0	6.05	2.35	0.41	8.81	9.0	8.40	8.0	4.79	5.0	26229
2.25	0.05	0.46	0.88	0.39	4.03	4.1	5.32	1.63	0.33	7.28	7.0	6.95	6.0	9.79	10.0	26648
2.47	0.08	0.24	0.89	0.31	3.99	4.1	3.91	1.06	0.19	5.16	5.0	7.97	4.0	6.46	6.0	26489
...	0.49	0.66	0.47	0.33	1.95	2.0	5.64	2.71	0.67	9.02	9.0	8.35	8.0	3.02	3.0	26256
1.34	0.08	0.05	0.73	0.65	2.85	3.0	1.64	2.80	1.88	6.32	8.0	4.44	8.0	12.07	6.0	26962
...	0.35	0.70	0.51	0.33	1.89	1.6	2.52	5.27	5.83	13.62	8.0	7.79	8.0	3.50	3.0	26329
...	0.55	1.14	0.57	0.38	2.64	2.5	3.40	5.34	2.33	11.07	8.0	8.74	6.0	6.26	6.0	26328
...	1.37	1.19	0.35	0.26	3.17	3.3	5.12	3.95	3.70	12.77	8.0	9.07	6.0	5.71	8.0	26231
...	1.28	1.47	0.51	0.27	3.53	3.3	3.35	3.84	3.86	11.05	8.0	7.19	6.0	6.99	8.0	26386
...	0.13	0.56	0.90	0.56	2.15	2.1	6.33	2.29	1.24	9.86	9.0	8.62	8.0	1.59	1.5	26667
0.61	1.99	0.57	0.64	0.42	4.23	4.1	2.64	2.19	0.72	5.55	5.0	4.83	4.0	5.15	5.0	26669
2.36	0.03	0.29	1.12	0.48	4.28	4.1	0.35	3.48	2.60	6.43	5.0	3.83	4.0	5.13	5.0	26651
...	0.23	0.64	0.66	0.47	2.00	1.7	5.88	2.84	1.36	10.08	9.0	8.72	8.0	3.02	3.0	26650
0.30	1.78	0.50	0.47	0.39	3.44	3.3	7.04	1.76	0.90	9.70	9.0	8.80	8.0	7.35	7.0	26387
1.05	0.02	0.10	0.33	0.23	1.73	1.7	8.93	1.92	0.92	11.77	..	10.85	10.0	10.26	10.0	26388
...	0.51	0.52	0.53	0.34	1.90	1.7	6.56	2.34	0.95	9.85	9.0	8.90	8.0	10.02	10.0	26670
0.56	0.52	0.52	0.59	0.45	2.64	2.5	6.63	2.68	1.55	10.86	10.0	9.31	9.0	2.21	2.0	26467
...	0.15	0.57	0.34	0.28	1.34	1.2	6.75	2.97	1.29	11.01	10.0	9.72	9.0	2.41	2.0	26671
0.97	0.13	0.53	0.79	0.44	2.86	2.5	3.75	2.86	1.10	7.71	7.0	6.61	6.0	10.41	10.0	26668
0.51	0.13	1.28	0.79	0.56	3.27	3.5	3.36	4.61	1.25	9.22	8.0	7.97	....	9.36	8.0	26672
0.94	0.19	2.11	0.93	0.87	5.04	5.0	3.24	4.48	0.60	8.41	8.0	7.72	....	8.51	7.5	26546

¹ 1.79% potash as muriate, 8.00% as sulphate.² 0.78% potash as muriate, 5.68% as sulphate.³ 0.84% potash as muriate, 4.31% as sulphate.⁴ 0.60% potash as muriate, 1.02% as sulphate, 3.51% as carbonate.⁵ 1.45% as muriate, 7.06% as sulphate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation per ton.	Percentage difference between cost and valuation.
<i>Sampled by Station Agent:</i>					
The Mapes Formula and Peruvian Guano Co., New York City.					
26257	Average Soil Complete Manure	Hartford, Windsor Locks, Meriden	\$38.00	\$26.80	41.8
26673	Cereal Brand	Hartford	30.00	17.31	73.3
26407	Complete Manure "A" Brand	Hartford, Meriden, Southington	37.25	21.05	77.0
26264	Corn Manure	Hartford, Meriden, Norwich	37.00	23.37	58.3
26479	Dissolved Bone	Hartford	33.00	23.52	40.3
26675	Economical Potato Manure	Hartford, Southington	37.50	26.15	43.4
26285	Fruit and Vine Manure	Hartford, Meriden	42.00	24.54	71.1
26258	Potato Manure	Hartford, Windsor Locks, Meriden	41.00	27.48	49.2
26674	Seeding Down Manure	Forestville	42.00	33.20	26.5
26679	Tobacco Ash Constituents	Hartford, Windsor Locks	34.50	24.89	38.6
26516	Tobacco Manure, Wrapper Brand	Buckland, Hartford, Hazardville	49.25	40.49	21.6
26676	Tobacco Starter, Improved	Windsor Locks, Glastonbury	37.50	24.16	55.2
26408	Top Dresser, Imp'd, Full Strength	Hartford, Buckland, Forestville	53.25	42.84	24.3
26677	Top Dresser, Imp'd, Half Strength	Hartford, Windsor Locks	34.50	21.93	57.3
26678	Vegetable Manure for Light Soils	Hartford, Norwich	43.50	31.29	39.0
The National Fertilizer Co., New York City.					
26490	Ammoniated Bone Phosphate	Wallingford, Torrington, Willimantic	28.00	16.27	72.1
26686	Complete Corn and Grain Fertilizer	Hartland, East Windsor Hill	35.50	25.46	39.4
26680	Complete Grass Fertilizer	So. Manchester	39.00	23.16	68.4
26681	*Complete Root Fertilizer	Silver Lane	38.00	22.27	70.6
27019	* " " "	Silver Lane	38.00	25.08	51.5
26553	Complete Tobacco Fertilizer	Suffield, Hartland, New Milford	38.00	24.71	53.8
26682	Connecticut Valley Tobacco Grower	Broad Brook	45.00	31.83	41.4
26687	Eureka Potato Fertilizer	Willimantic, So. Manchester	35.50	23.66	50.0
26330	Fish and Potash	Silver Lane, West Cheshire, So. Manchester	30.75	18.96	62.2

* See note on page 60.

ANALYSES AND VALUATIONS—Continued.

NITROGEN.							PHOSPHORIC ACID.							POTASH.		Station No.
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, active insoluble.	Organic, inactive insoluble.	Total.		Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total.		"Available."		Found.	Guaranteed.	
					Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.			
2.35 0.84	1.70 0.56	0.00 0.05	0.12 0.26	0.26 0.39	4.43 2.10	4.1 1.7	1.30 0.54	6.66 7.48	0.56 1.25	8.52 9.27	8.0 8.0	7.96 8.02	7.0 6.0	¹ 5.71 3.60	5.0 3.0	26257 26673
1.44	0.69	0.00	0.18	0.30	2.61	2.5	0.87	9.76	2.34	12.97	12.0	10.63	10.0	² 3.23	2.5	26407
1.02 1.86 1.55	0.88 0.21 1.14 0.10	0.08 1.09 0.11 0.03	0.23 0.78 0.16 0.22	0.43 0.64 0.31 0.39	2.64 2.72 3.58 2.29	2.5 2.1 3.3 1.7	0.84 6.69 0.55 0.07	8.62 8.03 5.87 6.17	2.05 0.93 0.59 2.20	11.51 15.65 7.01 8.44	10.0 6.0 7.0	9.46 14.72 6.42 6.24	8.0 12.0 4.0 5.0	6.88 ³ 8.94 ⁴ 10.98	6.0 8.0 10.0	26264 26479 26675 26285
2.08 2.62 ...	1.28 0.05	0.12 0.08	0.13 0.27	0.27 0.10	3.88 3.12 0.64	3.7 2.5 0.5	1.66 0.05 0.00	7.72 13.44 3.35	0.65 4.98 2.53	10.03 18.47 5.88	8.0 18.0 5.7	9.38 13.49 3.35	8.0	⁵ 6.84 11.85 ⁶ 14.25	6.0 10.0 15.0	26258 26674 26679
3.74	0.04	0.40	1.31	0.99	6.48	6.2	0.08	4.76	0.92	5.76	4.5	4.84	....	⁷ 10.12	10.5	26516
3.60	0.13	0.00	0.37	0.48	4.58	4.1	0.05	7.80	1.11	8.96	8.0	7.85	6.0	⁸ 2.19	1.0	26676
6.66	2.91	0.12	0.19	0.13	10.01	9.9	0.35	7.26	0.78	8.39	8.0	7.61	5.0	⁹ 4.17	4.0	26408
3.55 2.99	1.41 1.40	0.01 0.08	0.15 0.26	0.34	5.12 5.07	4.9 4.9	0.37 0.84	3.27 8.02	0.75 0.68	4.39 9.54	4.0 8.0	3.64 8.86	2.5 6.0	¹⁰ 2.24 ¹¹ 7.21	2.0 6.0	26677 26678
0.19 1.66 0.13	0.71 2.42 0.60 1.80	0.33 0.25 0.24 0.19	0.28 0.51 0.62 0.40	0.23 0.33 0.48 0.33	1.74 3.51 3.60 2.85	1.7 3.3 4.1 3.3	5.95 6.54 3.37 6.67	2.59 2.25 2.81 2.05	1.41 1.06 1.05 1.09	9.95 9.85 7.23 9.81	9.0 9.0 7.0 9.0	8.54 8.79 6.18 8.72	8.0 8.0 6.0 8.0	2.40 6.18 5.73 5.09	2.0 6.0 5.0 6.0	26490 26686 26680 26681
2.22 0.27	0.15 1.05 0.08	.... 0.30 1.14	.... 0.88 1.87	.... 0.89 1.58	3.40 3.12 4.94	3.3 3.3 4.9	6.60 5.81 0.39	2.19 3.20 3.00	1.10 1.24 1.37	9.89 10.25 4.76	9.0 9.0 4.0	8.79 9.01 3.39	8.0 8.0 1.0	6.17 ¹² 4.94 ¹³ 6.64	6.0 5.0 8.0	27019 26553 26682
0.13 0.87 10.706	1.23 0.76	0.13 0.11	0.57 0.53	0.36 0.47	2.42 2.74 2.74	2.5 2.9 2.9	4.89 4.35 4.35	2.19 1.84 1.84	0.97 0.86 0.86	8.05 7.05 7.05	7.0 7.0 7.0	7.08 6.19 6.19	6.0 6.0 6.0	10.05 4.21 4.21	10.0 4.0 4.0	26687 26330 26330

1 0.72% as muriate, 4.99% as sulphate.

2 2.99% as muriate, 0.24% as sulphate.

3 1.01% as muriate, 7.93% as sulphate.

4 1.10% as muriate, 9.88% as sulphate.

5 0.85% as muriate, 5.99% as sulphate.

6 1.50% as muriate, 5.06% as sulphate, 7.69% as carbonate.

7 1.40% as muriate, 3.00% as sulphate, 5.72% as carbonate.

8 0.65% as muriate, 1.54% as sulphate.

9 1.02% as muriate, 3.15% as sulphate.

10 0.49% as muriate, 1.75% as sulphate.

11 0.96% as muriate, 6.25% as sulphate.

12 1.10% as muriate, 3.84% as sulphate.

13 0.40% as muriate, 2.12% as sulphate, 4.12% as carbonate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation per ton.	Percentage difference between cost and valuation.
<i>Sampled by Station Agent: The National Fertilizer Co., (Continued).</i>					
26683	Formula "A"	Willimantic	\$33.00	\$23.40	41.0
26685	Market Garden Fertilizer	So. Manchester, East Windsor Hill	34.00	22.10	53.8
26491	Potato Phosphate	Silver Lane, So. Manchester, Wallingford	33.00	21.07	56.6
26552	Tobacco Special	Silver Lane, So. Manchester, Suffield, Hartland ..	37.25	26.43	40.9
27020	"	Silver Lane	35.00	28.71	21.0
26684	Tobacco Special with Carbonate	Simsbury	37.00	29.38	25.9
26492	XXX Fish and Potash	So. Manchester, Torrington, Winsted	29.00	17.66	64.2
New England Fertilizer Co., Boston, Mass.					
26574	Corn and Grain Fertilizer	Plantsville, Rockville	28.50	13.33	113.8
26688	Corn Phosphate	Jewett City	31.00	17.04	81.9
26575	H. G. Potato Fertilizer	Plantsville, Jewett City ...	35.00	21.70	61.3
26689	Perfect Tobacco Grower	Suffield, Warehouse Point ..	36.50	24.67	48.0
26358	Potato Fertilizer	Plantsville, Rockville, So. Manchester	31.25	16.41	90.4
26331	Superphosphate	Meriden, Suffield, So. Manchester	32.50	20.30	60.1
The Niantic Menhaden Oil & Guano Co., South Lyme, Conn.					
26286	Bone, Fish and Potash	New London, Norwich ...	30.50	19.02	60.4
26708	Corn and Grain Fertilizer	Norwich, Guilford	31.50	22.23	41.7
26707	H. G. Tobacco Fertilizer	Silver Lane, Burnside (2) ..	35.00	27.78	26.0
26761	Market Garden Manure	Norwich	40.00	32.60	22.7
26409	Potato and Vegetable Manure	New London, New Haven, Guilford	32.75	22.95	42.7
Nitrate Agencies Co., New York City.					
26710	Peruvian Guano	Waterbury	28.00	19.80	41.4
Olds & Whipple, Hartford, Conn.					
26233	Complete Corn and Potato Fertilizer	Hartford	34.00	24.80	37.1
26235	Complete Grass Fertilizer	Hartford	34.00	24.63	38.0
26518	Complete Tobacco Fertilizer	Hartford	37.00	29.95	23.5
26439	Fish and Potash	Hartford	30.00	21.07	42.4
26234	H. G. Potato Fertilizer	Hartford	37.00	29.90	23.7
26517	Special Phosphate	Hartford	35.00	25.77	35.8

ANALYSES AND VALUATIONS—Continued.

NITROGEN.					PHOSPHORIC ACID.								POTASH.		Station No.	
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, active insoluble.	Organic, inactive insoluble.	Total.		Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total.		"Available."		Found.		Guaranteed.
					Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.			
0.79	0.85	0.19	0.93	0.34	3.10	3.3	5.04	2.24	0.84	8.12	7.0	7.28	6.0	6.64	6.0	26683
....	1.47	0.29	0.36	0.38	2.50	2.5	6.53	1.99	1.14	9.66	9.0	8.52	8.0	6.29	6.0	26685
....	0.96	0.39	0.37	0.44	2.16	2.1	6.73	1.77	1.56	10.06	9.0	8.50	8.0	6.00	6.0	26491
0.12	0.16	0.43	2.19	1.21	4.11	4.5	2.05	2.76	1.23	6.04	4.0	4.81	3.0	¹ 5.83	5.5	26552
0.23	0.17	4.10		1.22	4.50	4.5	2.03	3.01	1.10	6.14	4.0	5.04	3.0	² 6.48	5.5	27020
0.13	0.15	0.95	1.83		4.28	4.5	0.19	4.58	2.97	7.74	4.0	4.77	3.0	³ 6.15	5.5	26684
0.15	0.74	0.26	0.74	0.61	2.50	2.5	3.99	2.05	0.88	6.92	6.0	6.04	5.0	3.28	3.0	26492
0.06	0.05	0.70	0.30	0.20	1.31	1.2	4.18	2.91	0.70	7.79	8.0	7.09	7.0	2.13	2.0	26574
....	0.10	0.90	0.40	0.25	1.65	1.6	6.76	1.64	1.25	9.65	9.0	8.40	8.0	3.09	3.0	26688
0.37	0.58	0.75	0.53	0.25	2.48	2.5	6.39	1.91	0.41	8.71	9.0	8.30	8.0	6.00	6.0	26575
2.36	0.13	0.88	0.49	0.16	4.02	4.1	3.68	1.26	0.15	5.09	5.0	4.94	4.0	⁴ 6.33	6.0	26689
....	0.37	0.67	0.45	0.20	1.69	1.6	5.32	1.94	0.42	7.68	8.0	7.26	7.0	4.05	4.0	26358
....	0.78	0.84	0.56	0.24	2.42	2.5	5.71	2.53	1.25	9.49	9.0	8.24	8.0	4.21	4.0	26331
0.57	0.55	0.15	0.66	0.77	2.70	2.5	2.50	3.86	0.60	6.96	6.0	6.36	5.0	⁵ 3.73	3.0	26286
0.75	0.38	0.04	0.79	0.56	2.52	2.1	5.64	3.82	1.18	10.64	8.0	9.46	7.0	⁶ 4.54	3.5	26708
1.24	0.25	0.33	0.95	0.77	3.54	3.3	4.30	4.27	2.32	10.89	8.0	8.57	7.0	⁷ 6.68	6.0	26707
1.14	0.54	0.54	1.41	1.11	4.74	4.1	4.28	4.15	1.41	9.84	8.0	8.43	7.0	⁸ 7.31	6.0	26761
0.89	0.40	0.24	0.65	0.60	2.78	2.5	4.70	3.98	1.13	9.81	8.0	8.68	7.0	⁹ 5.11	4.0	26409
0.41	0.78	0.01	0.53	0.37	2.10	2.3	0.89	10.24	3.80	14.93	15.3	11.13	7.8	2.16	2.4	26710
....	0.85	0.65	0.87	0.97	3.34	3.3	0.34	6.98	1.62	8.94	7.0	7.32	6.0	¹⁰ 6.37	6.0	26233
0.56	0.88	0.62	0.95	0.89	3.34	3.3	0.42	6.91	1.55	8.88	7.0	7.33	6.0	¹¹ 6.20	6.0	26235
....	0.06	2.00	0.91	1.17	4.70	4.5	0.00	3.26	0.14	3.40	3.5	3.26	3.0	¹² 6.15	5.5	26518
....	0.43	0.48	1.10	0.93	2.94	2.5	2.10	5.11	0.82	8.03	6.0	7.21	5.0	3.93	3.0	26439
....	0.66	0.71	1.24	0.80	3.41	3.3	2.03	5.13	1.25	8.41	...	7.16	6.0	¹³ 11.48	10.0	26234
0.12	1.06	0.77	1.19	1.27	4.41	4.1	2.84	2.61	0.77	6.22	...	5.45	4.0	¹⁴ 4.22	3.0	26517
1.10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

¹ 1.10% as muriate, 4.73% as sulphate.² 0.90% as muriate, 5.58% as sulphate.³ 0.80% as muriate, 2.86% as sulphate, 2.45% as carbonate.⁴ 0.90% as muriate, 5.43% as sulphate.⁵ 1.30% as muriate, 2.43% as sulphate.⁶ 0.65% as muriate, 3.89% as sulphate.⁷ 0.60% as muriate, 6.08% as sulphate.⁸ 0.40% as muriate, 6.91% as sulphate.⁹ 0.77% as muriate, 4.34% as sulphate.¹⁰ 5.28% as muriate, 1.09% as sulphate.¹¹ 5.06% as muriate, 1.14% as sulphate.¹² 0.60% as muriate, 0.68% as sulphate, 4.87% as carbonate.¹³ 7.50% as muriate, 3.98% as sulphate.¹⁴ 0.70% as muriate, 3.52% as sulphate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation per ton.	Percentage difference between cost and valuation.
<i>Sampled by Station Agent:</i>					
Parmenter & Polsey Fertilizer Co., Boston, Mass.					
26711	Grain Grower	Plantsville	\$26.00	\$14.05	85.1
26554	Plymouth Rock Brand	Wallingford, So. Woodstock, Plantsville	32.00	20.05	59.6
26576	Potato Fertilizer	Cromwell, Plantsville	30.50	17.31	76.2
26578	Potato Grower	So. Woodstock, Mansfield	38.00	22.95	65.6
26577	Special Tobacco Grower	Wallingford, Warehouse Point	39.25	27.69	41.7
The Rogers & Hubbard Co., Middletown, Conn.					
26359	Complete Phosphate	Wallingford, Branford, So. Manchester	28.25	18.58	52.0
26713	Grass and Grain Fertilizer	So. Manchester, New Canaan	45.00	29.31	53.5
26714	New Market Garden Phosphate	Wilton, New Canaan	37.00	22.98	61.0
26360	Oats and Top Dressing	Wallingford, East Hampton, So. Manchester	55.00	41.94	31.1
26715	*Potato Phosphate	Moodus, Wilton	33.50	22.31	50.2
26287	* " "	Wallingford, Branford ..	33.50	21.63	59.4
26519	Soluble Corn and General Crops Manure	Wallingford, East Hampton, Andover	36.75	24.41	50.6
26520	Soluble Potato Manure	Branford, East Hampton, Andover	43.00	32.29	33.2
26712	Soluble Tobacco Manure	Somers	49.00	37.08	32.1
The Rogers Mfg. Co., Rockfall, Conn.					
26716	All Round Fertilizer	Rockfall, Niantic	30.50	17.41	75.2
26580	Complete Potato and Vegetable Fertilizer	East Granby, Suffield, Wapping	33.25	21.84	52.2
26581	Fish and Potash	Rockfall, Wapping, East Winsted	31.50	21.76	44.8
26521	H. G. Complete Corn and Onion Manure	Highwood, Somerville (2). ..	35.25	26.81	31.5
26717	H. G. Grass and Grain	Somerville	38.50	34.69	11.0
26718	H. G. Oats and Top Dressing	Rockfall	48.00	34.90	37.5
26555	H. G. Soluble Tobacco Manure	Southington, New Milford ..	46.00	37.76	21.8
26556	H. G. Tobacco and Potato Manure ..	Somerville, Southington, New Milford	40.00	32.06	24.8
26579	H. G. Tobacco Grower	East Granby (2), Suffield ..	37.50	30.44	23.2
26719	Tobacco Starter	Wapping (2)	34.00	22.85	48.8
Sanderson Fertilizer & Chemical Co., New Haven, Conn.					
26363	Atlantic Coast Bone, Fish and Potash	New Haven, Cromwell, East Hampton	25.75	16.83	53.0

* See note on page 60.

ANALYSES AND VALUATIONS—Continued.

NITROGEN.										PHOSPHORIC ACID.						POTASH.		Station No.
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, active insoluble.	Organic, inactive insoluble.	Total.		Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total.		"Available."		Found.	Guaranteed.			
					Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.					
0.06	0.04	0.61	0.40	0.25	1.36	1.2	6.04	1.54	0.38	7.96	8.0	7.58	7.0	2.20	2.0	26711		
....	0.83	0.83	0.38	0.41	2.45	2.5	5.74	2.41	0.81	8.96	9.0	8.15	8.0	4.11	4.0	26554		
0.07	0.08	0.43	0.54	0.36	1.48	1.6	3.99	3.18	0.56	7.73	7.0	7.17	6.0	6.07	6.0	26576		
0.05	1.05	0.29	0.70	0.31	2.40	2.5	5.35	1.05	0.32	6.72	7.0	6.40	6.0	9.93	10.0	26578		
2.49	0.06	0.51	0.84	0.33	4.23	4.1	3.49	1.43	0.36	5.28	5.0	4.92	4.0	¹ 8.57	8.0	26577		
0.61	0.05	0.27	0.44	0.22	1.59	1.5	4.62	4.35	1.07	10.04	8.0	8.97	7.0	5.50	5.0	26359		
0.46	0.13	0.39	0.71	0.63	2.32	2.2	0.06	10.11	5.26	15.43	16.0	10.17	6.5	12.07	12.0	26713		
1.13	0.05	0.24	0.35	0.31	2.08	2.0	3.43	4.17	0.81	8.41	7.0	7.60	6.0	10.41	10.0	26714		
7.83	0.03	0.09	0.47	0.14	8.56	8.5	0.05	6.82	1.46	8.33	8.0	6.87	4.5	9.28	8.0	26360		
1.03	0.05	0.29	0.38	0.35	2.10	2.0	6.12	4.92	1.18	12.22	10.0	11.04	9.0	5.70	5.0	26715		
1.06	0.06	0.15	0.33	0.30	1.90	2.0	6.49	4.38	1.23	12.10	10.0	10.87	9.0	6.00	5.0	26287		
1.29	0.05	0.43	0.54	0.38	2.69	2.5	2.10	5.91	1.30	9.31	8.0	8.01	6.0	8.92	8.0	26519		
2.06	0.21	0.61	1.48	0.73	5.09	5.0	0.90	7.48	3.24	11.62	10.0	8.38	7.0	² 5.83	5.0	26520		
2.23	0.23	0.61	1.31	0.65	5.03	5.0	0.96	8.20	2.28	11.44	10.0	9.16	7.0	³ 10.72	10.0	26712		
0.90	0.06	0.22	0.35	0.43	1.96	1.6	5.31	3.98	1.06	10.35	10.0	9.29	8.0	2.31	2.0	26716		
0.40	0.09	0.45	0.93	0.55	2.42	2.3	4.92	4.25	0.92	10.09	10.0	9.17	8.0	5.12	5.0	26580		
1.09	0.14	0.57	0.85	0.80	3.45	3.3	2.65	2.74	1.04	6.43	6.0	5.39	4.0	4.64	3.8	26581		
1.73	0.10	0.35	0.94	0.50	3.62	3.6	2.68	5.54	1.13	9.35	8.0	8.22	6.0	7.65	7.0	26521		
0.46	0.00	0.03	2.06	0.71	3.26	3.0	0.08	8.95	9.34	18.37	16.0	9.03	....	13.00	12.5	26717	
4.58	0.08	0.48	0.82	0.33	6.29	6.3	1.14	6.78	1.42	9.34	9.0	7.92	7.0	7.57	7.5	26718		
1.20	0.21	0.96	1.48	1.05	4.90	5.0	0.98	7.29	1.32	9.59	8.0	8.27	6.0	⁴ 12.18	11.0	26555		
0.67	0.16	0.94	1.17	0.89	3.83	3.5	1.07	7.02	1.62	9.71	9.0	8.09	7.0	⁵ 10.30	8.8	26556		
2.11	0.15	1.10	1.24	0.66	5.26	5.0	0.72	4.42	1.05	6.19	5.0	5.14	4.0	⁶ 6.79	6.0	26579		
0.75	0.25	0.64	1.05	1.15	3.84	3.8	1.32	3.90	1.55	6.77	5.0	5.22	4.0	⁷ 3.45	3.0	26719		
0.12	0.52	0.28	0.72	0.46	2.10	1.7	1.49	3.38	1.62	6.49	6.0	4.87	4.0	5.01	4.0	26363		

¹ 1.20% as muriate, 7.37% as sulphate.² 1.13% as muriate, 4.70% as sulphate.³ 0.90% as muriate, 9.82% as sulphate.⁴ 0.88% as muriate, 11.30% as sulphate.⁵ 0.80% as muriate, 9.50% as sulphate.⁶ 1.30% as muriate, 5.49% as sulphate.⁷ 0.60% as muriate, 2.85% as sulphate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation per ton.	Percentage difference between cash and valuation.
<i>Sampled by Station Agent: Sanderson Fertilizer & Chemical Co. (Continued).</i>					
26362	Corn Superphosphate	New Haven, Shelton, Portland	\$28.25	\$18.82	50.1
26361	Formula A	New Haven, Derby, Portland	36.00	24.92	44.5
26237	Formula B	Highwood, New Haven ..	35.00	25.95	34.9
26557	Kelsey's Bone, Fish and Potash	Branford, Granby	27.50	24.82	10.8
26364	Potato Manure	New Haven, East Hampton, Shelton, Derby	31.50	19.37	62.6
26720	Special with 10% Potash	New Haven, Portland	37.00	23.42	58.0
26522	Top Dressing for Grass and Grain ..	New Haven, Cromwell, Torrington	37.25	27.90	33.5
The C. M. Shay Fertilizer Co., Groton, Conn.					
26523	Corn Fertilizer	Leonard's Bridge, Preston, Andover	28.50	21.14	34.8
26365	Potato Manure	New Britain, Meriden, Leonard's Bridge	33.00	26.72	23.5
26721	Grass Fertilizer	Leonard's Bridge, Groton ..	36.00	28.58	26.0
26486	Special Mixture	Gilead	35.00	33.54	4.4
26487	"	"	32.00	27.58	16.0
M. L. Shoemaker & Co., Philadelphia, Pa.					
26259	"Swift-Sure" Superphosphate for General Use	Hartford, Windsor Locks, Milford	35.00	25.19	38.9
26582	"Swift-Sure" Superphosphate for Potatoes	Milford, Guilford	35.00	26.58	31.7
26583	"Swift-Sure" Superphosphate for Truck, Corn and Onions	Milford, Guilford	29.00	19.93	45.5
Swift's Lowell Fertilizer Co., Boston, Mass.					
26726	Swift's Perfect Tobacco Grower	Warehouse Point, Ellington	38.00	24.48	55.2
26723	" Potato Grower	Southport	35.00	26.16	33.8
26722	" Special Corn and Vegetable Manure	Warehouse Point, New Canaan	38.00	25.33	50.0
26724	Swift's Special Grass Mixture	Rockville	39.00	26.14	49.2
26412	" Special Potato Fertilizer	Southport, Warehouse Point, Guilford	34.75	22.30	55.8
26411	" Superior Fertilizer with 10% Potash	Rockville, Wethersfield, Guilford	38.75	28.69	35.0
26725	Swift's Tobacco Manure	Warehouse Point	42.00	30.97	35.6
26558	" Lowell Animal Brand	Suffield, New Britain, Cheshire	33.75	19.85	70.0

ANALYSES AND VALUATIONS—Continued.

NITROGEN.							PHOSPHORIC ACID.							POTASH.		Station No.
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, active insoluble.	Organic, inactive insoluble.	Total.		Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total.		"Available."		Found.	Guaranteed.	
					Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.			
0.21	0.14	0.68	0.67	0.45	2.15	1.7	5.22	3.11	1.66	9.99	9.0	8.33	7.0	3.12	2.0	26362
0.78	1.24	0.32	0.73	0.34	3.41	3.3	4.93	2.32	1.19	8.44	9.0	7.25	6.0	7.19	6.0	26361
0.72	1.02	0.33	0.76	0.49	3.32	3.3	6.22	1.92	1.11	9.25	10.0	8.14	6.0	¹ 6.63	6.0	26237
....	0.70	0.78	0.95	1.00	3.43	2.5	2.13	4.65	0.88	7.66	5.0	6.78	4.0	² 5.77	4.0	26557
0.16	0.60	0.46	0.63	0.33	2.18	1.7	3.71	2.36	1.16	7.23	7.0	6.07	5.0	6.55	6.0	26364
0.48	1.48	0.26	0.38	0.22	2.82	2.5	4.25	1.79	1.18	7.22	7.0	6.04	5.0	9.38	10.0	26720
1.98	0.50	0.00	1.01	0.61	4.10	4.0	5.94	2.12	0.61	8.67	...	8.06	7.0	7.28	7.0	26522
0.20	0.15	0.97	0.68	0.98	2.98	2.5	1.63	4.54	1.71	7.88	...	6.17	7.0	4.38	3.0	26523
1.02	0.12	0.98	0.72	0.81	3.65	3.5	4.14	4.51	0.79	9.44	...	8.65	7.5	6.34	6.0	26365
0.81	0.15	1.66	0.87	0.93	4.42	4.0	1.93	5.16	1.80	8.89	...	7.09	7.5	5.98	6.0	26721
0.50	0.20	2.43	1.01	0.67	4.81	4.1	1.32	5.58	1.93	8.83	8.0	6.90	8.0	³ 8.76	7.5	26486
....	0.15	1.76	0.86	0.65	3.42	2.9	2.50	4.56	2.20	9.26	...	7.06	8.0	8.52	7.5	26487
1.01	0.02	0.48	0.90	0.50	2.91	2.9	7.36	2.63	0.77	10.76	...	9.99	9.0	⁴ 5.47	4.5	26259
1.08	0.03	0.57	0.81	0.54	3.03	2.9	6.92	3.00	0.77	10.69	...	9.92	8.0	7.53	7.0	26582
0.70	0.01	0.28	0.46	0.30	1.75	1.7	5.67	3.53	1.41	10.61	...	9.20	8.0	5.91	5.0	26583
2.29	0.13	0.32	0.84	0.36	3.94	4.1	3.77	1.23	0.18	5.18	5.0	5.00	4.0	⁵ 6.35	6.0	26726
....	1.15	0.91	0.84	0.32	3.22	3.3	4.68	2.19	0.38	7.25	7.0	6.87	6.0	9.52	10.0	26723
....	1.55	0.75	0.63	0.27	3.20	3.3	6.98	1.71	0.42	9.11	9.0	8.69	8.0	7.00	7.0	26722
....	2.30	0.89	0.57	0.25	4.01	4.1	6.19	1.55	0.18	7.92	8.0	7.74	7.0	5.95	6.0	26724
0.04	1.10	0.23	0.62	0.25	2.24	2.5	5.40	1.02	0.12	6.54	7.0	6.42	6.0	10.02	10.0	26412
....	1.98	0.64	0.65	0.33	3.60	3.7	6.51	1.41	0.40	8.32	8.0	7.92	7.0	10.26	10.0	26411
2.33	0.06	0.46	0.83	0.31	3.99	4.0	5.54	1.49	0.22	7.25	7.0	7.03	6.0	⁶ 10.80	10.0	26725
....	0.94	0.78	0.41	0.27	2.40	2.5	5.83	2.52	0.82	9.17	9.0	8.35	8.0	4.00	4.0	26558

¹ 0.97% as muriate, 5.66% as sulphate.² 0.70% as muriate, 5.07% as sulphate.³ 2.10% as muriate, 6.66% as sulphate.⁴ 0.80% as muriate, 4.67% as sulphate.⁵ 0.94% as muriate, 5.41% as sulphate.⁶ 1.00% as muriate, 9.80% as sulphate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation per ton.	Percentage difference between cost and valuation.
	<i>Sampled by Station Agent:</i> Swift's Lowell Fertilizer Co. <i>(Continued).</i>				
26414	Swift's Lowell Bone Fertilizer.....	Rockville, Warehouse Point, Guilford	\$30.25	\$17.46	73.3
26410	Swift's Lowell Empress Brand.....	Southington, Guilford, Moosup	27.00	13.20	104.5
26413	Swift's Lowell Potato Manure.....	Rockville, Southington, Guilford	31.25	16.09	94.2
26288	Swift's Lowell Potato Phosphate....	Suffield, New Britain ...	35.00	21.58	62.2
26459	Tanner & Wilcox, Winsted, Conn. Reliable Potato and Garden Phosphate.....	Winsted	34.00	30.73	10.6
26415	Wells & Downs, Danielson, Conn. Special Economical 6-8-5.....	Danielson, Brooklyn (3) ..	35.00	29.29	19.5
26727	The Wilcox Fertilizer Co., Mystic, Conn. Complete Bone Superphosphate....	Mystic, So. Meriden	36.00	20.26	77.7
26265	Fish and Potash	Suffield, Wallingford, Mystic	27.75	18.69	48.5
26729	4-8-10 Fertilizer	Mystic, Ellington	41.00	30.97	32.4
26493	Grass Fertilizer	Suffield, Mystic	38.25	27.58	38.7
26585	H. G. Fish and Potash	Mystic, Ellington	31.00	25.13	23.4
26728	H. G. Tobacco Special	Mystic, Ellington	38.00	27.64	37.5
26495	Potato Fertilizer	Suffield, So. Meriden, Andover	31.00	19.26	61.0
26494	Potato, Onion and Vegetable Phosphate	Wallingford, Norwich, Andover	35.50	27.42	29.5
26584	Special Superphosphate.....	Mystic, So. Meriden	30.00	14.81	102.6
26260	S. D. Woodruff & Sons, Orange, Conn. Home Mixture.....	Orange	31.00	26.64	16.4
26628	<i>Sampled by Purchasers and others :</i> Bowker's Complete Alkaline Tob. Grower with Carbonate				
26289	*Bowker's Tobacco Ash Elements..	W. Suffield : S. Viets	29.29	24.19	...
26629	* " " " "	W. Suffield : S. Viets	32.50	22.45	...
26456	Buffalo High Grade Manure	W. Suffield : S. Viets	21.42	...	...
26319	Coe-Mortimer's Peruvian Tobacco Fertilizer	Branford : A. E. Plant ... Pogonock : J. A. Dubon..	46.00	35.22	...

* See note on page 59.

ANALYSES AND VALUATIONS—Continued.

NITROGEN.							PHOSPHORIC ACID.						POTASH.		Station No.	
In Nitrates.	In Ammonia.	Organic, water-soluble	Organic, active in soluble.	Organic, inactive insoluble.	Total.		Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total.		"Available."		Found.		Guaranteed.
					Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.			
....	0.09	0.95	0.40	0.24	1.68	1.6	6.84	1.76	1.37	9.97	9.0	8.60	8.0	3.16	3.0	26414
....	0.06	0.64	0.32	0.20	1.22	1.3	4.13	3.20	0.69	8.02	8.0	7.33	7.0	2.13	2.0	26410
....	0.31	0.58	0.43	0.28	1.60	1.6	5.05	2.28	0.54	7.87	8.0	7.33	7.0	3.94	4.0	26413
0.15	1.00	0.41	0.55	0.30	2.41	2.5	7.37	1.31	0.40	9.08	9.0	8.68	8.0	5.91	6.0	26288
1.10	0.06	0.68	1.16	0.66	3.66	3.3	3.72	5.17	3.49	12.38	9.3	8.89	8.0	9.56	9.0	26459
2.14	2.59	0.20	0.11		5.04	4.9	6.46	1.61	1.60	9.67	9.0	8.07	8.0	6.08	5.0	26415
1.22	0.13	0.23	0.47	0.37	2.42	2.1	1.56	6.03	4.36	11.95	9.0	7.59	8.0	4.34	3.0	26727
....	0.27	0.53	0.99	0.81	2.60	2.5	0.74	4.27	3.34	8.35	6.0	5.01	5.0	3.62	3.0	26265
1.87	0.10	0.17	0.85	0.58	3.57	3.3	5.35	3.42	1.50	10.27	9.0	8.77	8.0	¹ 11.14	10.0	26729
1.81	0.18	0.22	1.42	0.59	4.22	4.1	3.53	3.33	2.57	9.43	7.0	6.86	6.0	² 6.02	5.0	26493
0.09	0.25	0.73	1.54	1.04	3.65	3.3	4.17	2.12	0.95	7.24	7.0	6.29	6.0	5.85	5.0	26585
1.17	0.05	0.32	1.17	0.86	3.57	3.3	0.00	6.30	2.83	9.13	7.0	6.30	5.0	³ 8.29	7.0	26728
0.97	0.11	0.28	0.61	0.29	2.26	2.1	1.63	4.74	3.02	9.39	7.0	6.37	6.0	5.44	4.5	26495
1.52	0.20	0.17	1.10	0.63	3.62	3.3	5.09	3.24	1.70	10.12	8.0	8.33	7.0	⁴ 7.30	6.0	26494
0.20	0.14	0.22	0.47	0.31	1.34	1.0	1.50	6.39	2.87	10.76	9.0	7.89	8.0	2.48	2.0	26584
1.60	0.09	0.41	0.63	0.92	3.65	3.3	3.40	4.46	1.57	9.43	8.0	7.86	...	7.21	8.0	26260
1.00	0.00	0.38	1.53	0.89	3.80	4.1	1.15	5.63	1.66	8.44	5.0	6.78	4.0	⁵ 6.50	5.0	26628
....	....	....	....	....	0.14	...	1.05	6.78	3.57	11.40	...	7.83	6.0	⁶ 15.97	15.0	26289
1.41	0.21	0.00	....	....	0.12	...	0.96	7.11	1.37	9.44	...	8.07	6.0	⁷ 14.98	15.0	26629
1.81	0.90	0.34	0.09	0.14	1.85	...	3.53	3.17	0.69	7.39	...	6.70	...	10.96	....	26456
														⁸ 10.61	10.0	26319

6.88% as muriate, 4.26% as sulphate. 6.90% as muriate, 15.07% as sulphate.
 3.99% as muriate, 2.03% as sulphate. 7.04% as muriate, 14.24% as sulphate.
 0.80% as muriate, 7.40% as sulphate. 8.08% as muriate, 9.81% as sulphate.
 5.78% as muriate, 1.52% as sulphate.
 0.41% as muriate, 2.34% as sulphate, 3.75% as carbonate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation per ton.	Percentage difference between cost and valuation.
26972	<i>Sampled by Purchasers and others:</i> Conn. Valley Orchard Co., High Grade Fertilizer.....	Deep River: C. V. O. Co.	\$28.00	....	....
26458	Sanderson's Kelsey's Bone, Fish and Potash	Branford: A. E. Plant ...	....	\$25.40	....
26457	Sanderson's Kelsey's Bone, Fish and Potash, 10% Potash	Branford: A. E. Plant ...	....	24.84	....
26512	Sanderson's Special Mixture, 4-8-8 ..	Milford: F. H. Woodruff & Sons .....	....	25.11	....
26244	Manchester's Formula	Winsted: E. Manchester & Sons .....	....	28.06	....
26245	Manchester's Special Formula	Winsted: E. Manchester & Sons .....	....	33.61	....
26159	Shay's Special	Manchester: C. R. Burr & Co. ....	....	36.85	....
26547	Wilcox's Browning's Formula	Storrs: E. J. Browning ..	30.00	32.58	....
26246	Wilcox's Fielden's Formula No. 1 ..	Groton: H. Fielden	34.04	32.99	....
26247	Wilcox's Fielden's Formula No. 2 ..	Groton: H. Fielden	40.76	39.41	....
26317	Wilcox's Fielden's Formula No. 1 ..	Groton: H. Fielden .....	....	30.71	....
26318	Wilcox's Fielden's Formula No. 2, Grass.	Groton: H. Fielden .....	....	30.79	....

To obtain the Valuation of a Fertilizer, multiply the pounds per ton of nitrogen, etc., by the trade-value per pound. The several products give the values per ton of the several ingredients and their sum is the total valuation per ton.

PERCENTAGE DIFFERENCE.

Percentage Difference shows the percentage excess of the cost price over the average retail cost, at freight centers, of the nitrogen, phosphoric acid and potash contained in the fertilizer; that is, the percentage amount of the cost of the raw materials which was added to it by charges for manufacture and sale.

ANALYSES AND VALUATIONS—Continued.

NITROGEN.						PHOSPHORIC ACID.						POTASH.		Station No.		
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, active insoluble.	Organic, inactive insoluble.	Total.		Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total.		"Available."			Found.	Guaranteed.
					Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.			
....	....	....	....	....	2.60	2.5	....	....	....	10.21	11.0	....	....	4.16	4.0	26972
0.08	0.69	0.81	1.17	0.88	3.63	...	2.49	4.27	0.93	7.69	....	6.76	...	¹ 5.57	....	26458
0.42	0.71	0.30	0.80	0.72	2.95	...	2.41	2.93	0.83	6.17	....	5.34	...	² 10.54	....	26457
0.83	0.97	0.90	0.32	0.21	3.23	3.3	0.00	6.14	3.63	9.77	8.0	6.14	...	8.55	8.0	26512
0.10	0.15	1.70	1.00	0.84	3.79	3.5	2.66	4.07	1.88	8.61	8.0	6.73	...	7.88	8.0	26244
1.04	0.18	1.83	1.07	0.95	5.07	5.0	3.17	4.13	1.05	8.35	8.0	7.30	...	³ 7.92	7.5	26245
1.75	0.18	4.31			6.24	...	0.12	4.97	0.67	5.76	...	5.09	...	10.67	....	26159
3.50	0.00	0.08			3.58	...	7.84	1.25	0.18	9.27	...	9.09	...	15.21	....	26547
2.89	0.08	0.14	1.90	0.85	5.86	...	0.00	2.63	0.43	3.06	...	2.63	...	⁴ 9.88	....	26246
2.74	0.07	0.33	1.82	1.12	6.08	...	0.21	2.93	0.63	3.77	...	3.14	...	17.13	....	26247
1.77	0.09	0.19	1.55	0.80	4.40	...	0.12	2.84	0.52	3.48	...	2.96	...	⁵ 12.17	....	26317
2.44	0.08	0.18	1.48	0.88	5.06	...	0.14	2.48	0.45	3.07	...	2.62	...	⁶ 10.43	....	26318

¹ 0.74% as muriate, 4.83% as sulphate.

² 9.57% as muriate, 0.97% as sulphate.

³ 1.25% as muriate, 6.67% as sulphate.

⁴ 1.55% as muriate, 8.33% as sulphate.

⁵ 1.10% as muriate, 11.07% as sulphate.

⁶ 1.10% as muriate, 9.33% as sulphate.

This information helps the purchaser to determine whether it is better economy to buy the commercial mixed fertilizers, of which so many are now offered for sale, or to purchase and mix for himself the raw materials. In some cases the prices quoted by dealers differ very widely, in extreme cases by \$5.00 per ton. As the percentage difference varies with the price, any uncertainty or misstatement as to price makes a corresponding uncertainty and inaccuracy in the percentage difference.

The average cost per ton of two hundred and fifty-five nitrogenous superphosphates, of which the costs and valuations are given in the table, is \$34.51, the average valuation \$23.10.

The average composition and cost of nitrogenous superphosphates for the last four years have been as follows:

	Nitrogen.	Total Phosphoric Acid.	"Available" Phosphoric Acid.	Potash.	Cost per Ton.	Percentage Difference.
1908.....	2.91	9.55	7.97	5.63	\$34.13	38.5
1909.....	2.93	9.52	8.09	5.78	33.96	52.1
1910.....	2.98	9.28	7.83	5.88	34.36	46.9
1911.....	2.95	8.86	7.60	6.01	34.51	49.4

A full statement of the average percentages of the different forms of nitrogen in the nitrogenous superphosphates in 1911 is, *Nitrogen*, as nitrates, 0.74; as ammonia, 0.73; water-soluble organic, 0.38; active-insoluble organic, 0.64; inactive organic, 0.46.

The above averages do not at all represent, of course, the average quality of the whole amount of commercial fertilizer used in the state. To get that result would require a knowledge of the tonnage of each brand which was sold. If 30,000 tons of a high-grade fertilizer were bought in this state and 10,000 tons of a low-grade, the average composition of the fertilizer used would be got, not by averaging the analyses of the two brands, but by multiplying the analysis of the high-grade brand by three before averaging.

2. SAMPLED BY PURCHASERS AND OTHERS.

In the table pages 82 to 85 are given the analyses of seventeen samples drawn by others than the station agent. The station assumes the responsibility only for the accuracy of analysis of these samples, not for the accuracy of the sampling. The sender, however, provides a certificate, stating that the sample was drawn properly in substantial accordance with the station's directions.

HOME MIXTURES.

The following table contains analyses of thirteen samples of fertilizer mixtures sent by those who had prepared or used them. The formulas by which they were prepared are also given.

The analyses indicate more care in weighing and mixing than has been usual in previous years. 26485, however, has more than twice as much potash as the formula should furnish.

Knowing the source of the organic nitrogen in these mixtures, the determination of its solubility shows the value of the con-

ventional method used generally with mixtures. Eleven of the thirteen samples contained organic nitrogen, of which from 76.5 to 90.5 per cent. was soluble and active, satisfactory percentages for the high-grade materials used, tankage, bone or blood. In 26429 and 26428, however, the solubility is only 45.9 and 46.3, respectively, entirely too low percentages for tankage. The tankage used in these mixtures, however, 26422, as has already been shown on page 52, is distinctly inferior.

The home mixtures have an average composition of 3.59 nitrogen, 8.15 available phosphoric acid and 9.59 potash, the average cost is \$29.15, and represents, in most cases, car lots, unmixed, delivered.

LIME IN VARIOUS FORMS.

1. Limestone, Quick-lime and Slaked Lime.

The following thirteen samples of lime were collected by the station agent, most of them in November, 1910, and show various grades of lime on sale at Connecticut and Massachusetts kilns.

25605. Fresh Burned Lime. New England Lime Co., Redding.

25593. Fresh Burned Lime, 1st Grade. The Stearns Lime Co., Danbury.

25594. Burned Lime, 2d Grade. The Stearns Lime Co., Danbury.

25595. Ground Lime Stone. The Stearns Lime Co., Danbury.

25604. Lime Hydrate. Connecticut Lime Co., Canaan.

25599. Air-slaked Lime. New England Lime Co., Canaan.

25602. Air-slaked Lime. New England Lime Co., East Canaan.

25597. Air-slaked Lime. New England Lime Co., New Milford.

25591. Air-slaked Lime. New England Lime Co., Redding.

25598. Air-slaked Lime. Connecticut Lime Co., Canaan.

25600. Air-slaked Lime, Wet. Canfield Lime Co., East Canaan.

26252. Lime. North Adams Lime Co., North Adams, Mass. Stock of John Merrill, Suffield.

26427. R. R. Land Lime. Rockland-Rockport Lime Co., Rockland, Me. Stock of James Price, Warehouse Point.

HOME MIXTURES—FORMULAS.

Station No.	Made by or for	Formula.								
		Nitrate of Soda.	Dried Blood.	Ground Bone.	Tankage.	Acid Phosphate.	Basic Slag.	Muriate of Potash.	Sulphate of Potash.	Double Manure Salt.
26484	W. T. Andrew, Tyler City.....	250	...	700	690	...	360	...	...	...
26366	E. J. Ayres, North Franklin, No. 1..	200	...	500	1000	...	300	...	...	...
26367	E. J. Ayres, North Franklin, No. 2..	200	...	667	958	...	175	...	...	...
26190	L. M. Benham, Highwood, Strawberry	...	...	600	600	...	600	...	...	...
26191	L. M. Benham, Highwood, Potato...	150	...	668	435	...	400	...	...	...
26192	L. M. Benham, Highwood, Pea and Bean.	132	...	768	800	...	300	...	...	...
26485	A. D. Clark, Orange.....	200	...	700	600	...	150	...	...	...
26389	H. E. Clark, Middlebury, Grass.....	400	300	900	...	...	...	400	...	...
26390	H. E. Clark, Middlebury, Corn.....	400	300	900	...	...	...	400	...	...
26391	H. E. Clark, Middlebury, Orchard..	170	...	...	...	1400	...	430	...	...
26429	Conn. School for Boys, Meriden, Grass.....	500	...	500	400	...	250	...	350	...
26428	Conn. School for Boys, Meriden, Vegetable.....	100	...	750	750	...	200	...	200	...
26193	L. P. Kling, Highwood, Onions and Beets.....	100	...	600	900	...	400	...	...	...

	Fresh Burned Lime.			Ground Limestone.	Fresh Slaked Lime.	Air-Slaked Lime.
	25605	25593	25594	25595	25604	25599
Lime	59.35	93.28	64.58	47.31	47.54	38.92
Magnesia	37.50	1.95	4.89	4.20	31.92	25.95
Iron oxide	1.10	2.14	5.08	1.20	0.50	0.94
Carbonic acid	1.00	0.68	11.79	40.53	0.12	4.12
Insoluble in acid	0.89	1.95	10.46	6.76	4.22	0.84
Water	0.16	.....	3.20	.....	15.70	29.23
Cost per ton f.o.b. bulk car- lots	5.00	5.75†	4.50	3.50*	.....	4.00
Lime-magnesia costs in cents per 100 lbs.....	26	30	32	34	.....	31

* Not sold in bulk. Price includes paper bags.

† Fine ground.

HOME MIXTURES—ANALYSES.

Station No.	NITROGEN.						PHOSPHORIC ACID.				Potash.	Cost per ton.
	In Nitrates.	In Ammonia.	In organic, water-soluble.	In organic, active insoluble.	In organic, inactive insoluble.	Total.	Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total.		
26484	1.95	0.05	0.65	0.99	0.34	3.98	3.99	6.32	1.00	11.31	9.41	\$28.51†
26366	1.75	0.08	0.77	0.54	0.27	3.41	6.60	3.50	0.90	11.00	7.92	27.70†
26367	2.48	0.08	0.89	0.63	0.36	4.44	6.09	3.55	1.07	10.71	5.31	27.30†
26190	.....	0.09	1.10	0.64	0.33	2.16	3.20	4.07	1.61	8.88	16.73	27.80§
26191	1.04	0.07	0.60	1.49	0.36	3.56	1.95	6.15	5.50	13.60	10.11	32.00§
26192	1.21	0.09	1.19	0.92	0.22	3.63	3.71	4.21	1.98	9.90	8.76	26.00§
26485	1.62	0.05	0.40	1.31	0.54	3.92	3.19	5.41	2.81	11.41	10.71	29.50†
26389	3.01	0.19	0.72	0.78	0.32	5.02	0.11	8.22	4.78	13.11	10.65*	36.25||
26390	2.40	0.16	0.80	0.90	0.27	4.53	0.11	8.05	3.11	11.27	13.31	35.70||
26391	0.96	0.00	0.06	0.03	.....	1.05	0.00	7.76	4.14	11.90	11.60†	26.25||
26429	3.83	0.02	0.02	0.48	0.59	4.94	2.79	1.32	0.50	4.61	9.61	24.35§
26428	0.94	0.02	0.04	0.72	0.88	2.60	5.14	2.48	1.09	8.71	8.97†	28.50§
26193	0.83	0.08	0.76	1.41	0.34	3.42	5.15	2.92	0.91	8.98	11.52	.....

* 1.32% as muriate, 9.33% as sulphate. † 0.80% as muriate, 10.80% as sulphate.

‡ 7.88% as muriate, 1.09% as sulphate. || Car lot mixed delivered.

§ Unmixed car lots delivered. ¶ Unmixed delivered.

	Air-Slaked Lime.						
	25602	25597	25591	25598	25600	26252	26427
Lime	49.90	45.11	43.68	45.49	30.03	59.10	61.38
Magnesia	35.52	30.47	29.26	30.52	19.27	0.56	1.54
Iron oxide	0.72	1.56	3.92	1.22	4.14	.....	.....
Carbonic acid	4.94	2.14	5.24	4.34	5.72	.....	.....
Insoluble in acid ..	1.31	1.41	1.97	0.57	1.01	.....	.....
Water	7.61	19.31	5.93	17.86	39.83	.....	.....
Cost per ton	\$4.00	4.00	4.00	3.50	.....	5.25†	9.50†
Lime-magnesia costs in cents per 100 lbs.	23	26	28	23	.....	44	.....

‡ Retail delivered.

25600 is wet from exposure to the weather and in consequence it has a smaller amount of lime than the others.

A sample of ground limestone, sent by W. H. Plumb, Stevenson, **27235**, made by him from his own quarry, contained 51.90 per cent. of lime and 0.93 per cent. of magnesia, being a quite pure calcitic limestone.

The following nine samples were sent in by the purchasers and, with one exception, were designated simply as "Lime" or "Agricultural Lime":

26152, sold by Olds & Whipple, Hartford; sent by C. B. Sheldon, West Suffield. **26296**, sold by Bellefonte Lime Co.; sent by E. N. Austin, Suffield. **26625**, Farnam Lime Co., sold by Olds & Whipple; sent by J. B. Lewis, Southington. **26696**, sent by Saml. Orr, West Suffield. **26766**, sent by C. F. Curtiss, Plantsville. **25909**, R. R. Land Hydrated Lime, sold by Rockland-Rockport Lime Co., Rockland, Me.; sent by G. W. Thorpe, West Cheshire. **25910**, sold by West Stockbridge Lime Co., West Stockbridge, Mass.; sent by F. M. Peasley, Waterbury. **25911**, sold by Massachusetts Lime Co., Sheffield, Mass.; sent by W. H. Camp, Waterbury. **27010**, sold by Mr. Plumb, Stevenson; sent by N. W. Hendryx, New Haven.

	26152	26296	26625	26696	26766
Lime	72.02	65.76	67.68	63.26	42.52
Magnesia .....	.....	0.54	1.06	0.93	2.43
Insoluble in acid .....	.....	.....	.....	.....	.....
Loss on ignition .....	.....	24.98	.....	.....	.....
Cost per ton	\$10.00	10.00	10.00	.....	10.00
Lime-magnesia costs cents per 100 lbs.	69	76	73	.....	1.12
	25909	25910	25911	27010	
Lime	62.98	56.46	54.56	50.96	
Magnesia	1.80	5.44	3.06	0.40	
Insoluble in acid	1.34	3.29	10.99	7.90	
Loss on ignition .....	.....	.....	.....	40.34*	
Cost per ton	\$9.50	1.50	5.00†	.....
Lime-magnesia costs cents per 100 lbs.	73	.....	43	.....

* Much carbonic acid present.

† In bags.

2. Lime Kiln Ashes.

Seven samples were analyzed, four taken by the station agent and three sent in by purchasers.

25592. New England Lime Co., Redding.

25596. New England Lime Co., New Milford.

25601. Canfield Lime Co., East Canaan. Out of doors.

25603. New England Lime Co., East Canaan. Out of doors.

26473. Sold by Buffalo Fertilizer Co.; sent by Somerville Mfg. Co., Somerville.

26531. Massachusetts Lime Co., Sheffield, Mass.; sent by Warner-Miller Co., New Haven.

26975. Sold by W. L. Mitchell, New Haven; sent by W. P. Lockwood, Georgetown.

	25592	25596	25601	25603	26473	26531	26975
Potash	3.39	4.07	3.11	1.56	0.34	1.52	0.12
Phosphoric acid	1.87	1.70	1.85	1.37	0.24	0.64	0.09
Lime	49.09	44.76	41.15	45.09	44.00	51.60	32.10
Magnesia	12.98	10.40	13.77	15.04	0.55	2.36	0.65
Iron oxide	5.60	4.76	5.40	4.50	.....	.....	.....
Carbonic acid	26.15	32.43	29.25	31.88	.....	.....	.....
Insoluble in acid....	2.23	4.76	7.30	1.82	.....	6.12	36.13
Water .....	.....	.....	.....	.....	.....	.....	3.02
Cost per ton car-lots at kilns	\$7.50	7.50	.....	4.50	5.00	5.50	5.00*
Lime-magnesia costs cents per 100 lbs.	28	27	.....	19	51	35	74

26975 is inferior in quality, having a relatively low per cent. of lime and a high percentage of insoluble ballast. The cost of lime-magnesia in these ashes is calculated by allowing 4¼ cents per pound for water-soluble potash and 3 cents for phosphoric acid.

These twenty-nine analyses show a rather wide range of composition and of price. It is safer to buy quick-lime or slaked lime from the kilns than to pick up "bargains" in "waste lime," which is likely to have a good deal of foreign matter, sand and silicates in it.

The calculations of cost are based on "lime-magnesia"; that is, both are counted together, assuming that for a first heavy liming of soils, at least, magnesia is not inferior in effect to lime.

* Delivered.

In general, it appears that in bulk, f.o.b., at the kilns, the lime-magnesia of stone lime or "quick-lime" costs about 28 cents per 100 pounds; of air-slaked lime, 29½ cents; of ground limestone, 34 cents; and of lime-kiln ashes, 32 cents.

At retail, delivered, it costs more than twice as much. The freight rates from Connecticut kilns to the center of the state are about \$1.40 per ton in twenty-five-ton car-lots, or \$1.80 in five-ton lots. That is, in car-lots of lime, with 95 per cent. of lime-magnesia, the freight adds 7.4 cents to the cost of 100 pounds of lime-magnesia; on 75 per cent. goods, it adds 9.3 cents, and on 50 per cent. goods, 14 cents.

MARL.

This is a soft, fine carbonate of lime, well adapted for agricultural use near the place of production. Since only about half of the material is lime, freight charges often make the cost of actual lime delivered too high for economical use.

25642, sent by H. F. Pillsbury & Son, Barton, Vt.

26100, Shell Marl, sold by Vermont Marl Co.; sent by Geo. T. Howland, Norwich.

	25642	26100
Lime	51.27	49.50
Equal to carbonate of lime.....	91.47	88.31
Insoluble in acid	3.88	7.02

COTTON HULL AND COTTON BOLL ASHES.

This valuable tobacco fertilizer has almost disappeared from our markets. Only six samples were examined this year.

26292, sent by F. B. Hatheway, Suffield; **26508**, sent by H. A. Henshaw, Suffield; **26624**, sent by Olds & Whipple; all sold by Olds & Whipple, Hartford.

26994, "Gin and Memp," and **26995**, "HAN," both sent by Spencer Bros., Suffield.

27021, sent by W. M. Hinson, Hazardville.

	26292	26508	26624	26994	26995	27021
Water-soluble potash	21.94	22.05	22.22	15.98	14.32	20.66
Potash guaranty	23.00	23.00	23.00	18.57	14.41	.....
Cost per ton	\$45.00	45.00	46.00	*	*	.....
Potash costs cents per pound	8.79	8.74	8.90	11.2	11.2	.....

* Cost \$2.25 per unit of water-soluble potash.

In calculating the cost of the potash per pound an allowance of \$6.43 is made for the phosphoric acid contained in the ashes.

None of the samples reached the potash guaranty, the shortage ranging from 0.09 to 2.59 per cent.

WOOD ASHES.

25203. Canada Wood Ashes, sent by Hitchcock Hardware Co., Watertown.

25991. "B." Wood Ashes, sold by J. E. Perkins, Suffield; sent by Bissell Graves Co., Suffield.

26058. Wood Ashes from Stafford Mills, sent by H. M. Gager, Somers. Costs 25 cents per bushel of 60 pounds at mills.

26291. Canada Wood Ashes, sold by John Joynt, Lucknow, Canada, claimed to contain 6 per cent. of potash; sent by F. S. Bidwell & Co., Windsor Locks.

26297. Beaver Brand Unleached Hard Wood Ashes, sold by Chas. Stevens, Napanee, Canada, claimed to contain 4 per cent. of potash; sent by G. N. Skinner, Rockville.

26509. Canada Ashes, sold by Bowker Fertilizer Co., New York, and claimed to contain 3 per cent. of potash; sampled from stock of Lightbourn & Pond Co., New Haven.

26968. Ashes, sold by Magnus, Mebee & Reynard, New York; sent by Connecticut Valley Orchard Co., Deep River.

26990. Unleached Wood Ashes from birch mill; sent by Theo. A. Stanley, New Britain.

27017. Pure Unleached Canada Hardwood Ashes, sent by F. W. Judson, Waterbury.

Two out of the five lots of "pure unleached Canada ashes" contain less than 1 per cent. of water-soluble potash. Two others have less than 3 per cent. and one only, **26291**, has over 4 per cent. of water-soluble potash.

The sample **26058**, from mills in this state, for which no claim is made that it is "pure" or "hard wood" or "Canadian," ranks with the best of the imported articles and is cheaper than any.

The prices quoted range from \$12 to \$18 a ton: too high, in our opinion, to permit of their economical use. Lime, for which they are chiefly valuable, can be bought more cheaply in other forms.

ANALYSES OF WOOD ASHES.

	25203	25991	26058	26291	26297	26509	26968	26990	27017
Total potash.....	....	....	....	5.10	....	....	....	....	1.51
Water-soluble potash.....	0.91	3.19	3.88	4.11	2.22	2.93	2.55	3.62	0.81
Phosphoric acid.....	1.64	2.37	2.05	1.73	0.83	3.06	2.03	5.76	1.74
Lime.....	32.88	29.39	36.72	21.17	23.65	23.32	28.94	45.34	43.19
Magnesia.....	2.75	3.04	....	2.29	1.45	1.86	2.58	....	....
Insoluble in acid.....	9.13	....	....	....	....	....	14.98	....	13.35
Moisture.....	13.38	21.50	16.65	....	....	....	19.63	....	....
Cost per ton.....	....	\$11.00	8.33†	15.00	12.00	18.00	12.00	....	....

† At the mill.

26990 is ashes from birch twigs. The mineral matter of young twigs is specially rich in phosphates, which explains the high per cent. of phosphoric acid found.

TOBACCO ASHES.

25915. Ashes from broad leaf tobacco, burned while in the bundle ready for delivery to packer; sent by G. A. Cleaveland, Windsor Locks.

26290. Sent by C. A. Prout, Suffield.

	25915	26290
Potash	18.54	20.23
Phosphoric acid	1.60	2.24
Lime	18.12	20.70
Magnesia .....	....	6.55

SHEEP MANURE.

26232.* Pulverized Sheep Manure, sold by Natural Guano Co., Aurora, Ill.; sampled from stock of D. B. Wilson Co., Waterbury. *Guaranty*, 2.25 nitrogen, 1.50 available phosphoric acid and 1.50 potash.

26236. Wizard Brand Manure, sold by Pulverized Manure Co., Chicago, through Frank S. Platt Co., New Haven; sampled from stock of Lightbourn & Pond Co., New Haven. *Guaranty*, 1.8 nitrogen, 1.0 phosphoric acid and 1.0 potash.

26709. Sheepino Natural Guano, sold by Niantic Menhaden Oil and Guano Co., South Lyme; sampled from stock of J. P. Barstow & Co., Norwich. *Guaranty*, 1.50 nitrogen, 1.0 phosphoric acid and 4.0 potash.

	26232	26236	26709
Nitrogen in nitrates	0.00	0.00	0.43
“ in ammonia	0.06	0.42	0.05
“ organic, water-soluble	0.34	0.33	0.16
“ “ active insoluble	0.57	0.48	0.21
“ “ inactive insoluble.....	1.45	1.15	0.59
Total nitrogen	2.42	2.38	1.44
Water-soluble phosphoric acid	0.53	0.80	0.23
Citrate-soluble “ “	0.43	0.23	0.64
Citrate-insoluble “ “	0.28	0.13	0.10
Total phosphoric acid	1.24	1.16	0.97
Potash calculated as muriate.....	0.80	0.90	2.30
“ “ sulphate	1.47	0.78	1.94
Total potash	2.27	1.68	4.24
Cost per ton	\$25.00	30.00	38.00

The analyses show that this material contains moderate amounts of nitrogen, phosphoric acid and potash, which could be bought in forms of fertilizer chemicals for about \$11 to \$12 per ton.

The solubility of the organic nitrogen is very low, ranging from 38.5 to 41.3. The same is true of the nitrogen of other forms of manure. It must be remembered, however, that 60 per cent. of sheep manure consists of fine, easily decomposable animal and vegetable matter, which forms humus in the soil and has great value in feeding the soil bacteria and in regulating the water content of the soil, and that the chief value of all manure, at least on light soils naturally poor in humus, usually rests in this humus-bearing and humus-yielding material. The sheep manure contains, ton for ton, two or three times as much of it as stable manure.

TOBACCO STEMS.

26293. Sold by R. M. Goodrich; sent by W. H. Olcott, South Manchester.

26996. Cut Stems, sent by H. K. Brainard, Thompsonville.
26997, long stems, sent also by Mr. Brainard.

	26293	26996	26997
Nitrogen in nitrates	0.30	.....	.....
" " ammonia	0.27	.....	.....
" organic	1.63	.....	.....
Total nitrogen	2.20	2.37	2.48
Phosphoric acid	0.41	0.42	0.41
Potash	3.29	6.00	5.32
Cost per ton	\$12.00	12.00	12.00

MUCK.

25640, taken from surface of a swamp formerly covered by a pond; **25641**, taken from eighteen inches below surface of swamp; both sent by Olaf Swanson, Naugatuck.

25958, sent by W. Harrington, Greenwich.

26138, from a New Jersey bog, sent by B. T. Fairchild, Greenwich.

26983, sent by G. A. Drew, Greenwich.

27000, sent by C. M. Jarvis, Berlin.

27011, surface samples; **27012**, taken from three feet below surface; both sent by F. DeWitt Wells, Greenwich.

	25640	25641	25958	26138	26983	27000	27011	27012
Water	65.33	80.06	62.04	57.21	74.40	79.81	11.40	62.96
Organic matter	25.24	12.82	29.41	33.02	6.17	16.03	26.94	29.39
Mineral matter.....	9.43	7.12	8.55	9.77	19.43	4.16	61.66	7.65
Nitrogen	0.90	0.38	0.82	1.36	0.22	0.45	1.09	0.81

Calculated Water-free.

Organic matter	72.82	64.36	77.34	77.17	24.09	79.38	30.41	79.35
Mineral matter.....	27.18	35.64	22.66	22.83	75.91	20.62	69.59	20.65
Nitrogen	2.60	1.89	2.16	3.18	0.87	2.22	1.23	2.19

The four samples tested showed organic nitrogen solubilities of 23.2, 26.9, 30.6 and 50.0 per cent.

Inquiry was usually made by those who sent the samples as to the fertilizer value of muck or peat. The percentages of potash and phosphoric acid are very small. The nitrogen in muck,—which is essentially vegetable matter, which has slowly decayed in the absence of much air,—is that which has resisted the general decay or has changed into forms which are resistant. Naturally it will become only slowly available to crops. The chief value of muck lies in its vegetable matter or humus. This is a very effective absorbent when fairly dry, and can be used in stables to absorb urine and dung liquor and as a deodorizer.

Connecticut experience has also shown that when peat is composted with its own bulk of stable manure, the mixture is as valuable as the same bulk of manure.

The nature of these mucks is best learned from the water-free analyses. The mineral matter is chiefly sand and soil. Samples **26983** and **27011** contain more of this than of peat, and in so far are less valuable. On the other hand, peats which in water-free condition consist chiefly of vegetable matter, hold water very tenaciously, and dry out very slowly after digging, so that they are expensive to handle. It is quite possible that the peats which contain a good deal of soil may dry out so much more rapidly than the others as to make it more profitable to handle them.

SHODDY AND HAIR WASTES.

26077. Shoddy Waste, sent by G. W. Hughes, Rockville.

26586, Park's Fertilizer; **26587**, Pouncing or Shaving Dust; **26588**, Hare's Hair; **26589**, Coney Hair; and **26590**, Sweepings. These are all hat factory wastes from Danbury.

These samples were only analyzed with respect to their nitrogen content.

	26077	26586	26587	26588	26589	26590
Nitrogen in ammonia	0.01	0.00	0.00	0.11	0.17	0.10
" organic, water-soluble...	0.11	0.77	0.50	0.42	0.00	0.19
" " active insoluble...	5.83	8.83	10.11	10.00	8.43	8.45
" " inactive insoluble.	2.75	2.48	3.59	3.55	2.63	2.86
Total nitrogen	8.70	12.08	14.20	14.08	11.23	11.60
Percentage solubility of organic nitrogen	68.3	79.5	74.7	74.6	76.2	75.1

MISCELLANEOUS FERTILIZERS.

26024. *Totty's Carnation Fertilizer*, sent by A. A. Young, Jewett City. Price, \$3.00 per ten pounds. It contained 8.73 per cent. nitrogen, 6.52 per cent. phosphoric acid and 21.24 per cent. potash.

27002. *Liquid Manure*, sent by William Bunker, Ridgefield. It had a specific gravity of 1.002 and contained 0.03 per cent. nitrogen and 0.18 per cent. ash; its fertilizing value is extremely slight.

27254. *Liquid Manure*, being the drainage from barnyard manure. Collected from a vault beneath the manure pile. Sent by A. A. Young, Jewett City. It has a specific gravity of 1.0073 and contains: nitrogen as ammonia 0.057 per cent., nitrogen organic 0.23 per cent., phosphoric acid 0.019, and potash 0.39 per cent.

26764. *Gluten Meal*, made by Corn Products Refining Co., New York, sent by H. C. Humphrey. It contained 7.05 per cent. nitrogen.

26186 and 26187. *Phosphatic Material*, sent by R. S. Woodruff, New Haven. The former contained 0.23 per cent. citrate-soluble, 3.25 per cent. citrate-insoluble and 3.48 per cent. total phosphoric acid; the latter contained 1.20 per cent. citrate-soluble, 8.55 per cent. citrate-insoluble and 9.75 per cent. total phosphoric acid.

25630. *Elm Tree Food*, made by Frost, Boston; sent by H. L. Wells, New Haven. It contained 2.62 per cent. nitrogen, 11.42 per cent. phosphoric acid, 5.40 per cent. potash and 23.67 per cent. lime.

25212. *Shay's Chrysanthemum Fertilizer*, sold by C. M. Shay, Groton; sent by T. W. Head, Groton. Only the nitrogenous con-

stituents were determined; it contained 0.42 per cent. as nitrates, 0.08 per cent. as ammonia, 2.87 per cent. as organic, and 3.37 per cent. total nitrogen. Its reaction was strongly alkaline.

25955. *Ash Base*, made by burning unleached manure from stock yards and livery stables; sent by American Reduction and Fertilizer Company, Kansas City. It contained 3.07 per cent. phosphoric acid and 3.74 per cent. potash.

THE COST OF NITROGEN, PHOSPHORIC ACID AND POTASH IN RAW MATERIALS.

Nitrogen. The analyses show that in 1911 the average retail cash cost of nitrogen and also the observed range of cost was:

	Average.	Range.
In nitrate of soda about	16.4	15.5-17.4
" cotton seed meal	20.4	17.3-24.6
" castor pomace	22.4	21.5-24.3
" tankage, approximately	19.4	....
" bone meal, approximately	22.7	....
" fish, approximately	22.5	....

The calculation of the cost of nitrogen is less certain in tankage, bone meal and fish, because tankage and fish may contain as much phosphoric acid as nitrogen, and bone seven or eight times as much. Therefore, to calculate cost of nitrogen we have to assume a somewhat arbitrary figure, four cents, for the cost of a pound of phosphoric acid.

It appears that the nitrogen of nitrate of soda has been much cheaper than that of any other quickly available form in our market. Such being the case, it should find wider use for potatoes and for top dressing winter grain or meadows, in short, wherever it can be immediately taken up by a growing crop and where the ground is too cold to permit rapid decay and nitrification of organic matter. On lands which are not at all acid its abundant use on potatoes may increase the prevalence of scab because the removal of the nitrogen by the crop leaves an alkaline base in the soil. Nitrogen in sulphate of ammonia, when its price is nearly the same as that of nitrate-nitrogen, may be found a desirable substitute on potato land.

The writers doubt whether, in spite of the lower cost, it is wise to largely substitute nitrate for organic forms of nitrogen on summer crops. The success of the venture will depend a

great deal on weather conditions. With normal rainfall, sunshine and temperature, we should expect the nitrogen of nitrate to be as effective and probably more effective pound for pound than organic nitrogen. On our light soils, heavy or continued rainfalls cause a very much greater loss of nitrate-nitrogen by leaching than of organic nitrogen or sink the nitrate for a time out of reach of the crop roots.

Phosphoric Acid. "Available" phosphoric acid at retail has cost:

	Average.	Range.
In basic slag meal (15.5 per cent. available)	5.8	5.1-6.3
" precipitated bone phosphate	5.0	....
" acid phosphate	5.3	4.6-6.6

Basic slag meal is alkaline, containing 35 to 50 per cent. of lime, and the most expensive source of available phosphoric acid. The phosphoric acid of basic slag is probably not quite as quick in its action but more lasting in its effects than that of acid phosphate. There are several grades of this meal on the market. The highest grade, 16-18 per cent., is the only one which our farmers can afford to use.

Potash. Water-soluble potash, at retail, has cost as follows:

	Average.	Range.
In carbonate	7.0	....
" "vegetable potash"	8.4	....
" high-grade sulphate	5.2	4.9-5.5
" double manure salt	5.6	....
" muriate	4.37	4.1-4.7
" kainit	5.63	4.6-6.2

The carbonate, "vegetable potash" and sulphates are chiefly used as tobacco fertilizers. The cheaper muriate answers well for most other crops. We have never noticed any ill-effects when it is made part of a potato formula.

The above prices are retail in small lots and not in all cases strictly cash. When bought in mixed car-lots for cash great saving can be effected. Thus acid phosphate, which sold at retail from \$13.00 to \$18.00 per ton, was bought by farmers in mixed car-lots as low as \$16.75. Muriate of potash cost on the average about \$44.40, but in mixed car-lots was bought as low as \$37.50 per ton. The same holds true for mixed fertilizers, and like reductions on their price are made to buyers of car-lots or mixed car-lots for cash in thirty days.

PART II.

SIXTEENTH REPORT ON FOOD PRODUCTS AND FOURTH REPORT ON DRUG PRODUCTS, 1911.

By JOHN PHILLIPS STREET.*

This station is required by law to make examinations of food and drug products, to publish its findings, and to report to the dairy commissioner all cases of adulteration or misbranding which are discovered. Under this law a large number of samples have been bought in various parts of the state and carefully examined, and all cases of adulteration or misbranding reported to the dairy commissioner. The station has no power of prosecution, its duty being to determine the facts and supply expert testimony in case of prosecution.

Seven hundred and twenty-two samples, collected by the station agent, have been analyzed. Of these, 362 were not found adulterated, 232 were adulterated, below standard or misbranded, and fifty-seven were legally labeled compounds. One hundred and sixty-two samples in all were reported to the dairy commissioner, and in forty instances second samples of these brands were bought by him of the same dealers and sent to the station for analysis. Of these, ten were not found adulterated and thirty were adulterated or misbranded. The dairy commissioner and his deputy have also sent a number of samples, chiefly milk, vinegar, butter and soda water syrups, which were taken by them. These will be briefly discussed, leaving the full details and the results of prosecution to be given in the commissioner's report. Of these 514 samples, 182 were not found adulterated, and 311 adulterated, misbranded, or below standard. To summarize: Of 554 samples taken by the commissioner under the law, 341 were found to be either adulterated, misbranded or below standard. The station has been called on for court testimony in nine instances.

In addition to the above, a number of samples of food and dry products have been examined for individuals; these will likewise receive brief mention.

* The analytical work herein reported was done jointly with Messrs. Bailey, Morrison, Roe and Shepard.

I. FOOD PRODUCTS.

CHOCOLATE.

The standards for chocolate are as follows:

"*Chocolate, plain chocolate, bitter chocolate, chocolate liquor, bitter chocolate coatings*, is the solid or plastic mass obtained by grinding cocoa nibs without the removal of fat or other constituents except the germ, and contains not more than three (3) per cent. of ash insoluble in water, three and fifty-hundredths (3.50) per cent. of crude fibre, and nine (9) per cent. of starch, and not less than forty-five (45) per cent. of cocoa fat."

"*Sweet chocolate, sweet chocolate coatings*, is chocolate mixed with sugar (sucrose), with or without the addition of cocoa butter, spices, or other flavoring materials, and contains in the sugar- and fat-free residue no higher percentage of either ash, fibre, or starch than is found in the sugar- and fat-free residue of chocolate."

Crude fibre and starch were not determined because the other chemical data established the substantial purity of these samples. Both the solubility and alkalinity of the ash, however, were

TABLE I.—PLAIN CHOCOLATE NOT FOUND ADULTERATED.

Station No.	Brand.	Serial No.	Price per package, cents.	Weight claimed, grams.	Weight found, grams.
25769	Crimson Brand, Premium Plain Chocolate. Packed for S. S. Adams, New Haven.....	2811	15	...	224
25674	Chocolate Premium No. 1. W. H. Baker, Winchester, Va.....	....	22	227	227
25662	Premium Plain Chocolate. Brewster Cocoa Mfg. Co., Jersey City, N. J.....	....	15	...	225
25458	"East India" Brand Chocolate, Premium No. 1. Prep. expressly for East India Tea Co.....	....	20	...	227
25460	Howco Plain Chocolate. Mfd. for Howland's, Bridgeport.....	2811	20	...	220
25842	Baking and Cooking Chocolate. Huyler's, New York.....	2598	20	...	232
25661	Lowney's Premium Chocolate.....	1761	20	227	226
25647	Premium Chocolate (without Sugar). Henry Maillard, New York.....	....	18	...	240
25459	Mohican Plain Chocolate Premium. Mfd. for The Mohican Co., New York.....	2811	15	...	227
25701	Premium Baking Chocolate. Runkel Bros., New York.....	5	5	113	117

TABLE II.—ANALYSES OF PLAIN CHOCOLATE.

Station No.	Brand.	In Air-dry Material.										In Fat-free Material.			Constants of Fat.	
		Ash.		Alkalinity of Ash.		Nitrogen.	Soluble in Water.			Relative Sedimentation.	Per Cent. of Total Ash Soluble in Water.	Iodide No. (Hanus).	Refractive Index at 40° C.			
		Soluble in Water.	Insoluble in acid (sand).	1 gram of Chocolate.	1 gram of Ash.		Soluble in Water.									
							Cold.	At 65° C.	At 100° C.					Organic Matter Soluble in Cold Water.	Total Ash.	Nitrogen.	Soluble in Cold Water.
		Total.														
25769	Crimson.	3.64	1.48	0.09	109	47.05	2.29	13.52	14.86	17.64	57	6.87	4.34	41	35.44	1.4567
25674	W. H. Baker's.	2.91	1.11	0.03	113	51.20	2.09	12.68	14.70	16.18	48	5.96	4.28	38	36.66	1.4569
25662	Brewster	3.76	1.66	0.10	111	47.90	2.29	14.00	15.68	17.56	60	7.22	4.40	44	34.95	1.4572
25458	East India.	3.65	1.60	0.12	120	49.66	2.46	11.76	12.48	15.22	58	7.25	4.89	44	34.19	1.4569
25460	Howco	3.58	1.60	0.05	119	47.03	2.28	13.36	15.02	16.98	58	6.76	4.30	42	36.99	1.4567
25842	Huyler's	3.39	1.41	0.18	120	49.74	2.35	13.12	14.20	15.92	51	6.74	4.68	45	35.64	1.4567
25061	Lowney's.	3.21	1.24	0.21	133	51.04	2.31	11.02	12.74	14.80	46	6.56	4.72	39	34.15	1.4571
25047	Maillard's	2.94	1.18	0.05	3.58	52.35	2.24	11.04	13.26	14.38	45	6.17	4.70	40	35.22	1.4563
25459	Mohican	3.69	1.61	0.08	120	49.13	2.34	12.90	13.98	16.70	58	7.25	4.60	44	34.25	1.4572
25701	Runkel's.	3.26	1.34	0.07	116	50.46	2.29	11.94	13.46	15.70	51	6.58	4.62	41	35.72	1.4569
Average		3.40	1.42	0.10	116	49.56	2.29	12.53	14.04	16.11	52	6.74	4.55	42	35.32	1.4569

determined and certain constants of the fat; the solubility of the chocolate in water at different temperatures was studied, as well as its rate of sedimentation.

Thirty-four samples were analyzed, ten of plain chocolate, fourteen of sweet chocolate, and ten of milk chocolate.

Plain Chocolate.

The ten samples were remarkably uniform in composition. The highest percentage of ash insoluble in water was 2.16, well below the maximum permitted by the standard. The amount of sand found was small in all cases, ranging from 0.03 to 0.21 per cent. The alkalinity of the ash likewise showed no striking variations. The fat ranged from 47.03 to 52.35, with an average of 49.56 per cent. The iodine number and refractive index of the fat in every case fell well within the established limits for cocoa fat. The nitrogen also showed but slight variations.

The solubility tests showed the relative insolubility of chocolate, even in boiling water. The average solubility in water, at room temperature, was 12.53 per cent., at 65° C., 14.04 per cent., and at 100° C., 16.11 per cent. The relative sedimentation (see methods below) ranged from 48 to 60.

In the fat-free material the variation in ash, nitrogen and water-solubility were within quite narrow limits. The weight of the package was given on the label in only three cases, and was in each case correct.

Sweet Chocolate.

Fourteen samples were analyzed, and wider variations in composition were found, chiefly due to the varying quantities of sugar added. The ash ranged from 0.94 to 2.18 per cent., and the ash insoluble in water from 0.33 to 1.30 per cent., from 40 to 72 per cent. of the ash being soluble in water. The alkalinity of the ash ranged from 1.10 to 2.22 per gram of chocolate, or from 102 to 123 per gram of ash.

The greatest variations were found in the fat and the sugar. The fat ranged from 11.22 to 41.19 per cent., although in twelve samples it lay between 20 and 32 per cent. The sugar, as would be expected, varied almost inversely with the fat. The extremes were 34.45 and 63.05 per cent.

TABLE III.—COMPOUND CHOCOLATE.

Station No.	Brand.	Serial No.	Price per package, cts.	Weight claimed, grams.	Weight found, grams.
<i>Sweet Chocolate.</i>					
25722	Anco Sweet Chocolate. Austin, Nichols & Co., New York, Distributors.....	188	5	...	85
25754	Sweet Chocolate Cinquième. Walter Baker & Co., Ltd., Dorchester, Mass.....	90	5	91	91
25835	German's Sweet Chocolate. Walter Baker & Co., Ltd., Dorchester, Mass.....	90	5	57	55
25691	"Dot" Sweet Chocolate. Walter Baker & Co., Ltd., Dorchester, Mass.....	90	25	227	243
25768	Grand Union Sweet Vanilla Chocolate. Dist. by Grand Union Tea Co., Brooklyn, N. Y.....	....	5	...	49
25461	Howco Sweet Chocolate. Howland's, Bridgeport.....	....	5	91	97
25840	Vanilla Sweet Chocolate. Huyler's, New York.....	2598	15	113	108
25681	Barker's Hasty Lunch Chocolate, Sweetened. Knickerbocker Chocolate Co., N. Y.....	2121	17	...	234
25710	Lowney's Vanilla Sweet Chocolate.....	1761	5	...	51
25843	Chocolat-Menier Santé Fine Vanilla Quality. Menier.....	2676	15	113	115
25697	Sweet Chocolate. The Mohican Co.....	....	6	113	116
25663	Vienna Sweet Chocolate. Runkel Bros., New York.....	5	5	113	113
25762	Instantaneous Chocolate. Stephen F. Whitman & Son, Philadelphia.....	2293	40	...	239
25709	Super Extra XXX Vanilla Chocolate. Stephen F. Whitman & Son, Philadelphia....	2293	10	...	110
<i>Milk Chocolate.</i>					
25741	F. L. Cailler's Genuine Swiss Milk Chocolate*.....	....	15	...	95
25688	Milk Chocolate. Hershey Chocolate Co., Hershey, Pa.....	5262	10	...	82
25654	Jersey Milk Chocolate. Hooton Cocoa and Chocolate Co., Newark, N. J. †.....	151	5	...	42
25841	New Process Milk Chocolate. Huyler's, New York.....	2598	10	...	52
25844	Nestlé's Swiss Milk Chocolate.....	....	10	...	84
25703	Gala Peter Peter's Milk Chocolate. Peter & Kohler's Swiss Chocolate Co., Fulton, N. Y.....	....	10	...	69
25721	Pulver Milk Chocolate ‡.....	....	5	...	60
25702	Stollwerck Gold Brand Milk Chocolate. Stollwerck, Cologne, New York, etc.....	3447	15	...	106
25695	Suchard Milka Chocolate au Lait Concentré. Neuchâtel, Switz.....	....	10	...	65
25847	American Milk Chocolate. H. O. Wilbur & Sons, Philadelphia.....	2208	10	...	...

* Consists solely of the best unskimmed and sterilized Swiss milk, cocoa and sugar.

† Made from genuine Jersey milk, cane sugar, pure cocoa of superior quality.

‡ Consists solely of best cocoa nibs, sugar and sterilized milk.

Owing to the presence of from 34 to 63 per cent. of sugar, which of course is soluble in water even at room temperature, the solubility of the sweet chocolates at the different temperatures is nearly the same. The average solubility at room temperature was 62.10, at 65° C., 62.32, and at 100° C., 63.45 per cent. The solubility of the organic matter other than sugar at room temperature ranged from 3.59 to 8.17, with an average of 4.56 per cent., indicating that on the average about forty per cent. of the sweet chocolate consisted of cocoa mass.

On the sugar-free basis the fat ranged from 53.72 to 66.63, excepting 25681, which contained only 25.23 per cent. With this exception, there was no evidence that any fat had been

TABLE IV.

Station No.	Brand.	In Air-dry Material.								
		Ash.			Alkalinity of Ash.		Fat.	Nitrogen.	Sucrose.	Lactose.
		Total.	Soluble in water.	Insoluble in acid (sand).	1 gm. of Chocolate.	1 gm. of Ash.				
<i>Sweet.</i>										
25722	Anco	1.22	0.60	0.03	1.53	125	24.37	0.88	58.31	0
25754	Baker's	1.34	0.69	0.02	1.55	116	27.90	0.90	55.09	0
25835	German's	1.12	0.60	0.04	1.32	118	28.05	0.81	55.67	0
25691	Dot.	1.68	0.78	0.04	2.06	123	41.19	1.21	34.55	0
25768	Grand Union.....	0.96	0.54	0.04	1.10	115	25.10	0.64	62.33	0
25461	Howco	1.17	0.75	0.05	1.38	118	25.13	0.70	59.55	0
25840	Huyler's	1.13	0.56	0.05	1.38	122	23.35	0.73	63.05	0
25681	Barker's	2.18	0.88	0.03	2.22	102	11.22	1.61	55.53	0
25710	Lowney's	0.99	0.71	0.05	1.15	116	26.60	0.67	59.28	0
25843	Menier	1.58	0.79	0.05	1.75	111	21.90	0.98	59.39	0
25697	Mohican	0.94	0.61	0.04	1.11	118	27.50	0.63	57.88	0
25663	Runkel's	1.06	0.61	0.02	1.29	122	20.14	0.74	62.86	0
25762	Whitman's Instantaneous..	1.61	0.77	0.05	1.84	114	24.60	1.11	54.21	0
25709	Whitman's Vanilla	1.26	0.92	0.05	1.51	120	31.78	0.63	53.01	0
<i>Milk.</i>										
25741	Cailler's	1.56	0.54	0.02	1.19	76	29.95	1.17	48.31	7.28
25688	Hershey's	1.85	0.63	0.02	1.82	98	28.69	1.36	45.81	7.75
25654	Hooton's	1.71	0.66	0.03	2.09	122	32.13	1.19	43.09	3.57
25841	Huyler's	1.67	0.85	0.01	1.93	116	28.77	1.11	49.45	2.25
25844	Nestlé's	1.56	0.61	0.01	1.58	101	28.85	1.17	49.65	6.87
25703	Peter's	1.79	0.82	0.02	2.10	117	33.23	1.42	39.45	6.24
25721	Pulver	2.12	0.83	0.04	2.49	117	26.84	1.44	44.26	8.40
25702	Stollwerck	1.66	0.67	0.04	1.89	114	33.31	1.20	42.45	7.39
25695	Suchard's	1.60	0.53	0.04	1.92	120	32.67	1.29	42.64	7.81
25847	Wilbur's	2.25	0.92	0.00	1.75	78	30.63	1.55	39.49	8.17

removed, although in certain cases it appeared that fat had been added to make it possible to incorporate more sugar with the chocolate. This fat in every case appeared to be cocoa fat. 25681 is not entitled to be called chocolate at all, as about half of the cocoa fat has been removed; it is rather a sweetened cocoa.

On the fat-sugar-free basis the sweet chocolates contained on the average 7.30 per cent. ash, 4.91 per cent. nitrogen and 31.60 per cent. soluble in cold water; on the same basis, the plain chocolates contained 6.74, 4.55 and 24.82 per cent., respectively. The increased solubility of the sweet chocolates was probably due to the fact that in these a smaller amount of chocolate

COMPOUND CHOCOLATE.

Station No.	In Air-dry Material.							In Fat-Sugar-free material.			Per Cent. of Total Ash Soluble in Water.	Constants of Fat.		
	Polarization at 20° C.		Soluble in water.			Organic matter, not Sugar. Soluble in Cold Water.	Relative Sedimentation, corrected for Sugar Content.	Total Ash.	Nitrogen.	Soluble in Cold Water.		Iodine No. (Hanus).	Refractive Index at 40° C.	Reichert-Meißl No.
	Direct.	After Inversion.	Cold.	At 65° C.	At 100° C.									
25722	49.2	— 15.95	63.38	63.34	64.52	4.47	70	7.05	5.08	29.27	49	37.04	1.4569	—
25754	46.4	— 15.40	59.42	60.20	61.26	3.64	47	7.87	5.28	25.45	51	35.73	1.4566	—
25835	47.0	— 15.40	60.16	60.38	61.34	3.89	45	6.89	4.98	27.59	54	35.38	1.4566	—
25691	30.4	— 9.35	41.12	41.96	42.90	5.79	41	6.93	5.00	27.08	46	34.74	1.4563	—
25768	52.5	— 16.83	66.46	67.24	68.10	3.59	40	7.64	5.09	32.84	56	35.03	1.4568	—
25461	50.5	— 15.95	65.40	65.40	66.50	5.10	40	7.63	4.30	38.19	64	33.62	1.4567	—
25840	52.9	— 17.16	67.50	66.78	67.82	3.89	51	8.31	5.38	32.72	50	34.42	1.4563	—
25681	48.8	— 15.40	64.58	65.56	66.98	8.17	79	6.86	4.84	27.22	40	34.50	1.4576	—
25710	50.0	— 16.17	63.84	64.26	65.66	3.85	47	7.01	4.76	32.30	72	38.50	1.4574	—
25843	50.0	— 16.28	65.05	64.86	65.52	4.96	91	8.44	5.23	30.26	50	36.01	1.4569	—
25697	49.2	— 15.51	64.08	64.16	65.56	5.59	47	6.42	4.32	42.41	65	34.63	1.4569	—
25663	52.6	— 17.27	69.40	69.44	70.68	5.93	67	6.23	4.37	38.48	58	34.35	1.4567	—
25762	47.2	— 15.62	59.94	60.06	61.54	4.96	85	7.61	5.23	27.03	48	33.76	1.4566	—
25709	46.1	— 14.42	59.06	59.46	60.02	5.13	38	8.28	4.14	39.78	73	34.14	1.4567	—
25741	45.7	— 8.47	61.64	61.46	62.34	5.51	47	10.78	8.08	41.83	35	35.60	1.4566	6.2
25688	44.0	— 7.48	60.38	60.66	61.66	6.19	24	10.41	7.67	38.44	34	31.41	1.4567	5.9
25654	40.4	— 9.90	54.04	54.28	55.02	6.72	41	8.06	5.61	34.80	39	33.86	1.4567	5.0
25841	43.5	— 12.21	59.26	58.94	59.58	6.71	62	8.56	5.69	38.71	51	33.35	1.4569	3.2
25844	46.5	— 9.20	65.78	64.43	63.52	8.65	28	10.67	8.07	63.30	39	34.42	1.4562	5.6
25703	38.0	— 6.82	52.52	53.66	53.62	6.01	39	8.50	6.73	32.41	46	35.36	1.4566	4.1
25721	43.2	— 6.60	62.09	61.24	61.44	8.54	44	10.36	7.06	45.85	39	35.16	1.4576	3.7
25702	42.4	— 7.04	56.24	56.24	56.64	5.73	36	9.86	7.12	37.99	40	34.08	1.4569	3.7
25695	41.5	— 6.60	57.98	58.14	58.46	7.00	38	9.48	7.63	44.61	33	33.80	1.4562	5.1
25847	39.2	— 5.50	57.12	57.04	56.34	8.54	32	10.37	7.14	43.56	41	35.30	1.4563	5.8

material was subjected to the solvent action of the water than in the plain chocolates.

The relative sedimentation of the sweet chocolates ranged from 40 to 91, the higher figures generally being associated with the lower percentages of fat.

From the standpoint of legality, exception is taken to the following: **25681**, *Barker's Hasty Lunch Chocolate, Sweetened*, which contained 55.53 per cent. sucrose, not indicated in the brand name. It contained only 11.22 per cent. fat, indicating that about one-half of the cocoa fat had been removed. On a slip inside this claim was found: "One ounce of Hasty Lunch Chocolate equals one ounce of Baking Chocolate," a statement which is untrue. It should properly be labeled as a sweetened cocoa.

25843, *Chocolat-Menier, Santé Fine Vanilla Quality*, is misbranded, in that it contained 59.39 per cent. sucrose, the presence of sugar not being indicated in the brand name.

For the same reason, **25762**, *Whitman's Instantaneous Chocolate*, and **25709**, *Whitman's Super-Extra XXX Vanilla Chocolate*, are both misbranded.

The labels of eight of the samples stated the weight of the contents. With the exception of a slight shortage in one sample, these statements were correct.

Milk Chocolate.

Ten samples were analyzed. The fat ranged from 26.84 to 33.31 per cent.; sucrose, from 39.45 to 49.65 per cent., and lactose, from 2.25 to 8.46 per cent. The solubility in water was somewhat lower than that of sweet chocolate, because smaller amounts of sugar were present; in three cases the solubility in boiling water was less than in cold. The relative sedimentation ranged from 24 to 62, the latter value being much higher than any other obtained.

Milk chocolate is a mixture of cocoa mass, milk powder, sugar and cocoa butter. If dried skim milk or casein is substituted for a whole milk powder, the word "milk" should not be used without some qualification. The lactose determinations and the Reichert-Meissl numbers furnish data as to the nature and amount of milk product used. It will be noted that the percentages of lactose are fairly uniform, except in two instances,

where only 2.25 and 3.57 per cent. were found. The sample containing 2.25 per cent. lactose also showed the lowest Reichert-Meissl number, 3.2. These numbers ranged from 3.2 to 6.2. Dubois* has pointed out that by determining the Reichert-Meissl number of the extracted fat, the approximate amount of butter fat in the milk chocolate may be calculated. From these numbers it appears that the samples contained 25.8, 24.6, 20.8, 13.3, 23.3, 17.1, 15.4, 15.4, 21.3, and 24.2 per cent. of butter fat, respectively, in the order followed in the table.

Methods of Analysis.

Ash, Soluble Ash, and Insoluble Ash. Conn. Expt. Stat., Report, 1902, p. 273.

Alkalinity of Ash. Ash two gms. of material, add 20 cc. of $\frac{N}{10}$ hydrochloric acid and 100 cc. of water, boil gently over asbestos, cool, and titrate excess of acid with $\frac{N}{10}$ sodium hydroxid, using methyl orange as indicator. The alkalinity is expressed as the number of cubic centimeters of tenth-normal acid used on the ash of one gram of material.

Sucrose and Lactose. Dubois method. U. S. Dept. Agr., Bur. of Chem., Bull. 137, p. 101.

Fat. U. S. Dept. Agr., Bur. of Chem., Bull. 107 (revised), p. 39, using one gram of material, mixed with asbestos to prevent clogging.

† *Cold Water Extract.* Shake 4 gms. of material in a 200 cc. flask, filled to the mark with cold water, once an hour for eight hours, and allow to stand undisturbed for sixteen hours; filter. Determine soluble matter in 25 cc. of filtrate.

† *Extract at 65° C.* Mix 4 gms. of material with a little water at 65° in a 200 cc. flask; fill flask slightly above mark with water at 65° and maintain at this temperature for thirty minutes, shaking every five minutes. Cool quickly, adjust to mark, mix and filter. Determine soluble matter in 25 cc. of filtrate.

† *Extract at 100° C.* Mix well 4 gms. with 10 to 15 cc. of boiling water in a 200 cc. flask, then add actively boiling water slowly and with constant mixing to a point one to two inches above mark, stopper, invert once and immerse in a bath of vigorously boiling water for three minutes; cool immediately in ice water, adjust to mark, invert once and filter. Determine soluble matter in 25 cc. of filtrate. (This is supposed to give a result comparable with that effected by the three-minute boiling usually prescribed for cocoa.)

Relative Sedimentation. Mix 0.35 gm. of chocolate with a few drops of boiling water in a small beaker, adding a little more water gradually until the chocolate makes a thin paste without lumps, wash into a Hortvet

* Jour. Amer. Chem. Soc., 1907, 29, 560.

† Communicated by letter by C. D. Howard, of the New Hampshire State Board of Health.

tube with boiling water, the total volume being 35 cc. Invert the tube once and centrifuge for one and one-half minutes, allowing ten seconds to come to full speed and ten seconds for stopping. The volume of the sediment is then noted and recorded. The principle of this method was also suggested by Mr. Howard, but we have modified it slightly to meet our conditions. The results, of course, are only relative, and it is essential that the method used be conducted uniformly for a series of tests. This test is a measure of the miscibility of the chocolate or cocoa, and, to a certain extent, also indicates its food value.

CHILI SAUCE.

Of the eight samples examined, four were stated to be free from preservatives, a claim sustained by the analysis; three were guaranteed to contain one-tenth of one per cent. of benzoate of soda; while the fourth bore the following indefinite statement: "the correct amount of Benzoate of Sodium to keep wholesome."

The labels of the samples read as follows:—

25748. *Campbell's Chili Sauce.* Joseph Campbell Co., Camden, N. J.

TABLE V.—CHILI SAUCE

Station No.	Brand.	Price per bottle, cents.	Net weight of contents, oz.						Polarization.	
				Solids.	Insoluble Solids.	Ash.	Sodium Chloride.	Ash less Sodium Chloride.	Direct at 21° C.	After Inversion at 21° C.
25748	Campbell's.....	10	9.3	23.18	2.70	3.07	2.48	0.59	14.40	12.32
25845	Shrewsbury.....	15	8.0	25.75	2.79	5.06	4.56	0.50	-4.80	-5.72
25440	Heinz's.....	25	12.0	33.41	4.39	4.30	3.37	0.93	-0.60	-8.80
25441	Snider's.....	13	9.3	22.42	3.54	4.75	3.70	1.05	-3.00	-4.64
	<i>Average.....</i>	<i>15.8</i>	<i>...</i>	<i>26.20</i>	<i>3.36</i>	<i>4.30</i>	<i>3.53</i>	<i>0.77</i>	<i>.....</i>	<i>.....</i>

TABLE VI.—CHILI SAUCE

25779	Royal.....	15	8.4	25.53	2.79	3.70	3.00	0.70	-0.20	-5.72
25780	Libby's.....	10	12.1	26.86	3.94	5.40	4.26	1.14	-2.60	-6.60
25667	Pride of the Farm	15	9.1	19.16	2.46	3.36	2.60	0.76	-2.60	-4.40
25694	Acme.....	10	10.1	36.56	3.78	5.30	4.22	1.08	0.80	-7.48
	<i>Average.....</i>	<i>12.5</i>	<i>...</i>	<i>27.03</i>	<i>3.24</i>	<i>4.44</i>	<i>3.52</i>	<i>0.92</i>	<i>.....</i>	<i>.....</i>

25845. *Shrewsbury Chili Sauce.* E. C. Hazard & Co., Shrewsbury, N. J.

25440. *Heinz Chili Sauce.* H. J. Heinz Co., Pittsburgh. "Contains no benzoate of soda, other drugs, or artificial preservatives."

25441. *Snider's Chili Sauce.* The T. A. Snider Preserve Co., Cincinnati, O. "Contains tomatoes, granulated sugar, vinegar, salt, onions, garlic and spices. Not artificially colored. Does not contain a chemical preservative."

25779. *Royal Chili Sauce.* The Horton-Cato Mfg. Co., Detroit, Mich. "Made from fresh tomatoes, pure spices, etc. Contains $\frac{1}{10}$ of 1 per cent. Benz. of Soda."

25780. *Libby's Chili Sauce.* Libby, McNeill & Libby, Chicago. "Contains $\frac{1}{10}$ of 1 per cent. Benz. of Soda."

25667. *The Celebrated Pride of the Farm Chili Sauce.* E. Pritchard, New York. "Made from Chili Peppers, Tomatoes, Spices, granulated Sugar and Salt, and with the correct amount of Benzoate of Sodium to keep wholesome; guaranteed free from artificial coloring."

CONTAINING NO SODIUM BENZOATE.

Polarization after Inversion at 86° C.	Sucrose.	Invert Sugar.	Non-Sugar Solids.	Acetic Acid.	Sodium Benzoate.	Water-free Basis.					Color.
						Insoluble Solids.	Ash.	Sodium Chloride.	Ash less Sodium Chloride.	Total Sugars.	
11.66	1.57	*7.15	14.46	0.48	0.00	11.65	13.24	10.69	2.55	†38.40	Natural
....	0.70	18.00	7.05	1.44	0.00	10.83	19.69	17.75	1.94	72.62	"
....	6.20	22.26	4.95	1.92	0.00	13.14	12.87	10.09	2.78	85.18	"
....	1.24	13.88	7.30	1.86	0.00	15.79	21.19	16.49	4.68	67.44	"
....	...	....	8.44	1.43	0.00	12.85	16.75	13.76	2.99	65.91	.....

* Glucose. † Excluding invert sugar, not determined.

CONTAINING SODIUM BENZOATE.

....	4.18	14.34	7.01	0.84	0.09	10.93	14.49	11.75	2.74	72.54	Natural
....	3.03	18.43	5.40	1.32	0.10	14.67	20.10	15.86	4.24	79.90	"
....	1.36	12.96	4.84	0.99	0.17	12.84	17.54	13.57	3.97	74.74	"
....	6.27	17.90	12.39	1.44	0.16	10.34	14.50	11.55	2.95	66.11	"
....	3.71	15.91	7.41	1.15	0.13	12.20	16.66	13.18	3.48	73.39	.....

25694. *Acme Chili Sauce.* The J. Weller Co., Cincinnati, O.
"Prepared with $\frac{1}{1000}$ part of Benzoate of Soda."

The analyses show that chili sauce is a rather more uniform product than ketchup. However, the variations in solids were quite wide, ranging from 19.16 to 36.56 per cent. There were no very striking differences in the content of insoluble solids, ash or sodium chloride. The acidity varied from 0.48 to 1.92, averaging somewhat higher in the samples containing no benzoate of soda. The solids appeared to be measured chiefly by the amount of sugars present; in one sample the sugars made up over 85 per cent. of the dry matter. The average analyses of the non-benzoated and benzoated samples showed none of the striking differences noted last year in ketchups.

Of the benzoated samples, two were illegally sold, **25667** because the label bore no statement of the *quantity* of preservative present, and **25694** because it contained 0.16 per cent. of benzoate while only 0.10 per cent. was claimed.

No foreign color was found in any of the samples. **25748** contained glucose.

CIDER.

The standards for cider are as follows:

"*Apple juice, apple must, sweet cider*, is the fresh fruit juice obtained from apples, the fruit of *Pyrus malus*, has a specific gravity (20° C.) not less than 1.0415 nor greater than 1.0690; and contains in one hundred (100) cubic centimeters (20° C.) not less than six (6) grams, and not more than twenty (20) grams of total sugars, in terms of reducing sugars, not less than twenty-four (24) centigrams nor more than sixty (60) centigrams of apple ash, which contains not less than fifty (50) per cent. of potassium carbonate."

"*Cider, hard cider*, is the product made by the normal alcoholic fermentation of apple juice, and the usual cellar treatment, and contains not more than seven (7) per cent. by volume of alcohol, and, in one hundred (100) cubic centimeters of the cider, not less than two (2) grams nor more than twelve (12) grams of solids, not more than eight (8) grams of sugars, in terms of reducing sugars, and not less than twenty (20) centigrams nor more than forty (40) centigrams of cider ash."

TABLE VII.—ANALYSES OF CIDER AND APPLE JUICE.

Station No.	Brand.	Specific gravity at 15.6° C.	Per cent. of alcohol.		Polarization of Original Liquid at 20° C.		Grams per 100 cc. of Cider.										Benzoic and Salicylic Acids.	
			By weight.	By volume.	Direct.	After inversion.	Solids.	Direct.	After Inversion.	Ash.	Alkalinity of Ash, as K ₂ CO ₃ .	Acidity as Malic.	Potash (K ₂ O).	Phosphoric Acid (P ₂ O ₅).	Tannin.	Original Solids of Juice (calculated).		Pentosans.
25736	Boiled Cider. Vermont Farmer's Co., Springfield, Mass.	1.2387	1.09	1.69	— 135.1	— 137.1	62.14	50.08	50.46	1.378	1.130	3.082	0.774	0.045	.....	.....	0.80	none
25737	Boiled Cider. J. Eames & Sons, Sherborn, Mass.	1.2665	none	none	— 137.7	— 156.1	69.50	53.34	58.08	1.308	1.148	2.774	0.752	0.087	.....	.....	0.95	"
25749	Duffy's Apple Juice. American Fruit Product Co., Rochester, N. Y.	1.0558	1.79	1.90	— 33.1	— 33.6	14.25	11.47	11.66	0.298	0.234	0.643	0.153	0.016	0.070	17.83	.....	"
25750	Centennial Prize Medal Cider. H. Paulding, Huntington, L. I.	1.0249	2.90	3.74	— 21.0	— 20.2	7.74	5.49	5.49	0.234	0.191	0.332	0.113	0.008	0.035	13.54	.....	"
25778	Thompson's Apple Juice. J. A. Thompson & Son, Melrose.	1.0324	2.78	3.62	— 26.3	— 25.5	9.77	7.12	7.07	0.311	0.235	0.389	0.140	0.018	0.262	15.33	.....	"
25850	Newhall's Sweet Apple Cider. Newhall Cider Co., Holyoke, Mass.	1.0206	4.16	5.35	— 20.5	— 20.2	7.24	4.90	4.90	0.254	0.175	0.616	0.125	0.013	0.122	15.46	.....	"

Six samples were analyzed, two labeled "boiled cider," two "apple juice," one "sweet cider," and one simply "cider." With the exception of one sample of "apple juice," all the samples were sold as "cider."

The two samples of boiled cider appeared to be true to name, representing a concentration of about five times. 25736 contained 1.69 per cent. alcohol by volume, with correspondingly less reducing sugars than 25737; the latter also contained sucrose. Neither of these samples contained benzoic or salicylic acid.

25750 must be judged by the standard for cider (hard cider), to which it corresponds in all respects. All the analytical data, however, indicate a rather weak preparation.

The other three samples were labeled as apple juice or sweet cider. 25749 was of normal composition except for the presence of 1.90 per cent. alcohol by volume, which indicates that it is not strictly "non-alcoholic," as its label claims. It is, therefore, mis-branded. 25778 had a specific gravity below the minimum of the standard, and its sugars closely approached the minimum. This is probably due to the fact that it is not an unfermented juice, as it contained 3.62 per cent. of alcohol by volume. 25850 likewise was of low gravity, was below standard in sugars and contained 5.35 per cent. of alcohol by volume.

None of the four samples can be considered as sweet cider, for they all contained alcohol, ranging from 1.90 to 5.35 per cent. by volume. No benzoic or salicylic acid was found in any of the samples.

COCOA.

The standards for cocoa are as follows:

"Cocoa, powdered cocoa, is cocoa nibs, with or without the germ, deprived of a portion of its fat and finely pulverized, and contains percentages of ash, crude fiber, and starch corresponding to those in chocolate after correction for fat removed."

"Sweet cocoa, sweetened cocoa, is cocoa mixed with sugar (sucrose), and contains not more than sixty (60) per cent. of sugar (sucrose), and in the sugar- and fat-free residue no higher percentage of either ash, crude fiber, or starch than is found in the sugar- and fat-free residue of chocolate."

Sixty-two samples were analyzed. The methods of analysis used were the same as those given under chocolate in this report

(see page 109) except for fat the Gottlieb-Roese method was used.* Fifty-two samples proved to be straight cocoa, while ten were compound cocoa, containing starch, sugar, or milk.

In judging the purity of a cocoa its analysis must be compared with that of chocolate, the only differences being that a part of the fat has been removed, and that in some cases the cocoa has been treated with alkali to increase its so-called "solubility." Booth† and Winton‡ have made extended analyses of pure cocoa nibs and pure chocolates and cocoa. The averages secured by them are given below.

	Cocoa Nibs.				Chocolate.		Cocoa.	
	Original Material.		Fat-free.		Orig. Mat.	Winton. Fat-free.	Orig. Mat.	Fat-free.
	Booth.	Winton.	Booth.	Winton.				
Ash	3.11	3.32	6.28	6.66	3.15	6.59	5.49	7.49
Soluble ash	1.28	1.16	2.58	2.33	1.41	2.95	2.82	3.85
Sand	0.06	0.02	0.12	0.04	0.06	0.13	0.24	0.32
Nitrogen	2.24	2.38	4.53	4.77	2.26	4.73	3.33	4.54
Fat	50.50	50.12	....	....	52.19	....	26.69	....
Fiber	2.73	2.64	5.52	5.29	2.86	5.98	4.48	6.11
Starch .....	....	8.07	....	16.18	8.11	16.75	11.14	15.20
Per cent. ash, sol. in water	41	35	....	....	45	....	51	....
Cold water extract	11.40	....	23.00	....	....	....	....	....

It will be noted that on the fat-free basis, which is the only fair basis for comparison, cocoa differs but little in composition from cocoa nibs and chocolate, except for the higher ash and the greater solubility of the ash in water. The above figures are averages and the extremes of Winton's analyses showed a considerable range. For instance, in the fat-free material ash ranged from 5.46 to 8.31, soluble ash from 1.51 to 3.73, nitrogen from 4.47 to 5.12, and percentage of soluble ash from 26 to 45; again the ash showed the greatest variations.

From the above figures a pure cocoa on the fat-free basis should contain from 6 to 7 per cent. ash, of which from 35 to 45 per cent. is soluble in water, from 4.50 to 5 per cent. nitrogen, and from 23 to 26 per cent. cold water extract. Cocos treated with alkali would naturally show higher ash and higher water-soluble ash.

* Conn. Expt. Stat. Report, 1909, p. 192.

† Analyst, 34, 134.

‡ Conn. Expt. Stat., Report, 1902, p. 282.

TABLE VIII.—COCOA.

Station No.	Brand.
25755	Crimson Brand Breakfast Cocoa. Manufactured for S. S. Adams, New Haven.
25813	Carmelo Breakfast Pure Cocoa. Austin, Nichols & Co., New York.
25826	Sunbeam Pure Food Breakfast Cocoa. Austin, Nichols & Co., N. Y., Distributors
25679	Breakfast Cocoa. Walter Baker & Co., Ltd., Dorchester, Mass.
25766	Webb's Pure Cocoa Powder. Walter Baker & Co., Ltd., Dorchester, Mass.
25810	Justice Brand Cocoa. Wm. H. Baker, Inc., Syracuse, New York.
25652	W. H. Baker's Best Cocoa. Winchester, Va.
25653	Best Breakfast Cocoa. A. F. Beckmann & Co., New York.
25756	Royal Dutch Cocoa. Bensdorp & Co., Amsterdam, Holland.
25738	Gold Star Brand Breakfast Cocoa. The Wm. Boardman & Sons Co., Hartford.
25427	L. B. C. Cocoa. Brewster Cocoa Mfg. Co., Jersey City, N. J.
25425	Royal Breakfast Cocoa. Brewster Cocoa Mfg. Co., Jersey City, N. J.
25714	Savoy Breakfast Pure Cocoa. Brewster Cocoa Mfg. Co., Jersey City, N. J.
25803	Autocrat Breakfast Cocoa. Packed for Brownell & Field Co.
25711	Victoria Brand. Packed expressly for H. E. Bushnell, Meriden.
25765	Health Cocoa. J. and W. Cahill & Co., New Haven, Distributors.
25666	Swan Brand Breakfast Cocoa. Clark, Chapin & Bushnell, New York.
25665	Oxford Brand Supreme Quality Breakfast Cocoa. The Danbury Groc'y Co., Danbury
25609	Welcome Dainty Brand Cocoa. Packed for Edward D. Depew & Co., New York.
25764	Economy Brand Cocoa. Packed for M. C. Dingwall's Dairy-Store, New Haven.
25429	Premium Brand Cocoa. Packed for East India Tea Co., Bridgeport.
25767	Grand Union Cocoa. Grand Union Tea Co., Brooklyn, N. Y., Distributors
25713	Grant's Special Cocoa. H. M. Grant, Meriden.
25740	Hall's Pure Soluble Cocoa. Prepared expressly for Edw. E. Hall & Son, New Haven
25675	Amazon Breakfast Cocoa. Hooton Cocoa & Chocolate Co., Newark, N. J.
25430	Howco Breakfast Cocoa. Packed for Howland's, Bridgeport
25788	Huyler's Cocoa.
25783	Old Dutch Pure Soluble Breakfast Cocoa. Ideal Cocoa and Chocolate Co., Lititz, Pa.
25426	White Lily Pure Cocoa. H. Isenburg & Co., Bridgeport
25608	Nabob Breakfast Cocoa. Francis H. Leggett & Co., New York, Distributors
25428	Breakfast Cocoa. The Walter M. Lowney Co., Boston
25646	Breakfast Cocoa. Henry Maillard, New York
25690	Melbourne Australian Brand Pure Breakfast Cocoa. Melbourne Trading Co., Boston
25718	Capitol House Brand Cocoa. Packed for Middletown Cash Grocery, Middletown
25696	Mohican Brand Cocoa. Packed for The Mohican Co., New York
25685	Palmer's Brand Breakfast Cocoa. Packed for R. C. Palmer, Waterbury.
25719	Breakfast Cocoa. Alex. M. Powell, New York
25686	Premium Brand Breakfast Cocoa. Prepared expressly for Premium Trade.
25720	Breakfast Cocoa. Pulver's Chocolate and Chicle Mfg. Co., Rochester, N. Y.
25811	Rallion's Special Breakfast Cocoa. Put up expressly for Rallion the Grocer, Norwich
25712	Semper Idem Breakfast Cocoa. Rockwood & Co., New York

TABLE VIII.—COCOA.

Serial No.	Price per pack- age, cts.	Weight claimed, grams.	Weight found, grams.	Claims of Label.
3289	10	91	98	"Excess of oil has been extracted by the latest improved process."
188	10	20	96	
90	25	227	235	"Of greater strength than cocoa mixed with starch, arrowroot or sugar, and is therefore more economical." "No chemicals."
			224	"The albuminoids are preserved."
90	9	113	115	
6165	20	227	226	"Owing to the removal of oil, it is certainly the most nutritious and wholesome cocoa now manufactured in the world."
5257	10	227	91	"Triple the strength of cocoa as usually prepared." "Preserving in their entirety . . . the nutritive properties of the natural bean."
	20	227	231	"Acknowledged by the leading authorities to be absolutely the purest cocoa made."
	22	227	141	"Double the strength of ordinary grades of cocoa."
	20	227	240	"Full strength and flavor."
2811	15	227	194	"Double the strength of ordinary grades of cocoa."
	18	227	233	"No chemicals used."
	10	227	139	
	25	227	210	"Is extra strong."
1878	10	227	215	"Being made by the special process it preserves . . . the nutritive properties and is rendered treble the strength of cocoas as usually prepared."
	20	227	239	
1878	10	91	89	"Is extra strong."
	10	227	99	
	15	227	232	"Double the strength of ordinary grades of cocoa."
	25	227	254	"Excess of oil extracted by mechanical means only."
	25	227	237	"Excess of oil removed by hydraulic pressure."
	8	227	97	"Double the strength of ordinary grades of cocoa."
	27	227	236	"A nutritious and perfectly soluble food." "The cocoa having the oil removed, becomes at once a healthful aliment to the most delicate stomach."
	25	227	243	"Excess of oil extracted by mechanical means only."
2811	10	227	105	
2598	10	227	71	"Soluble and digestible."
3751	28	227	243	"Soluble."
	20	227	230	"Double the strength of ordinary grades of cocoa."
	10	91	90	"Made in Holland."
1761	10	91	92	"Is unlike any other."
2506	23	227	245	"Excess of oil entirely removed."
1878	25	227	215	"Solubility unequalled." "Pure soluble cocoa."
	22	227	227	"Double the strength of ordinary grades of cocoa."
	10	227	127	"Full strength and flavor."
	25	227	267	"Excess of oil extracted by mechanical means only."
	20	227	232	
	25	227	242	"Excess of oil extracted by mechanical means only."
	20	227	209	"Cocoa is stronger and more economical than chocolate."
1878	23	227	207	"Double the strength of ordinary grades of cocoa."
3289	5	227	55	

TABLE VIII.—COCOA—Continued.

Station No.	Brand.
25700	Pure Breakfast Cocoa. Runkel Bros., New York.....
25833	Sadd's Cocoa. Packed for The T. R. Sadd Co., Willimantic.....
25804	White Rose Brand Cocoa. Seeman Bros., New York, Distributors.....
25739	Alliance Brand Pure Breakfast Cocoa. Packed expressly for Shartenberg & Robinson Co., New Haven.....
25457	Pure Breakfast Cocoa. Prepared expressly for George W. Smith, Bridgeport.....
25793	Standard Cocoa. Standard Tea House, Hartford.....
25733	Stollwerck Cocoa. Stollwerck Bros., New York-Chicago.....
25775	Soluble Cocoa. Ph. Suchard, Neuchatel, Switz.....
25456	Ambassador Brand Breakfast Cocoa. James Van Dyk Co., New York.....
25715	Pure Soluble Cocoa. C. J. Van Houten & Zoon, Weesp, Holland.....
25610	Sold in bulk. Columbia Tea Co., Stamford.....

The following tabulation shows the average composition of all the straight cocoas, of the eight showing high ash and high alkalinity of ash, and of the remaining forty-four not possessing these characteristics.

	Average. All Cocoas.	Average. 44 Cocoas.	Average. 8 Cocoas (high ash and alkalinity).
Ash, total	5.59	5.25	7.49
Ash, sol. in water	2.85	2.32	5.79
Ash, insol. in acid	0.13	0.15	0.03
Alkalinity of ash, 1 gm. of cocoa ...	6.55	6.04	9.36
Alkalinity of ash, 1 gm. of ash	117.0	115.0	125.0
Fat	24.85	24.83	24.99
Nitrogen	3.52	3.52	3.51
Soluble in cold water	19.40	19.34	19.75
Soluble in water, 65° C.	21.52	21.55	21.33
Soluble in water, 100° C.	23.55	23.29	24.99
Organic matter sol. in cold water ..	16.55	17.02	13.96
Relative sedimentation	95.0	96.0	87.0
Per cent. ash sol. in water	49.0	44.0	76.0
<i>Fat-free basis</i>			
Total ash	7.44	6.98	9.99
Nitrogen	4.68	4.68	4.68
Soluble in cold water	25.82	25.73	26.33

TABLE VIII.—COCOA—Continued.

Serial No.	Price per pack- age, cts.	Weight claimed, grams.	Weight found, grams.	Claims of Label.
5	10	91	103	"Superfluous oil removed by most modern process, and which thereby renders the powder more soluble in hot water or milk, and increases the strength threefold compared with chocolate or similar preparations containing sugar, starch or arrowroot." "Physicians recommend Runkel's cocoa."
...	25	227	231	"Double the strength of ordinary grades of cocoa."
722	23	...	257	"Extra strong."
1878	16	227	219	"Excess of oil extracted by mechanical means only."
...	10	113	115	"Double the strength of ordinary grades of cocoa."
...	10	113	122	"Most of the cocoa butter has been eliminated." "Free from alkali." Stamped on side, "Prepared with alkali."
...	25	227	223	"Manufactured by a special process which increases the mineral ingredients about 3½ per cent."
...	45	...	232	
...	10	...	94	
9045	15	...	74	
...	18	227	223	

These averages show that the so-called "soluble" cocoas contain a higher total ash, higher water-soluble ash, and higher alkalinity of ash, as would be expected. They contain about the same amounts of fat and nitrogen as the untreated cocoas. The most striking fact brought out by these averages is that while 1.7 per cent. more of the total cocoa is soluble in boiling water, over 3 per cent. less of organic matter is soluble in cold water. In other words, the apparent slightly increased solubility is due to the added alkali and not to any change in the cocoa mass itself. On the average, the "soluble" cocoas show a lower water-solubility of the cocoa mass than those brands making no claim to superior solubility. In the relative sedimentation tests the untreated cocoas show an average of 96, while the treated show 87, only a little less.

The samples were examined for starch, under the microscope. While cereal starches were detected in a number of samples, the amount present, excepting 25827, where its presence was declared, did not seem sufficient to class the samples as adulterated. In no sample sold as pure cocoa was there sufficient starch to reduce the fat content below the normal.

TABLE IX.—ANALYSES OF COCOA.

Station No.	Brand.	In Air-dry Material.					In Fat-free Material.				Constants of Fat.	
		Ash.	Insoluble in acid (sand).	Alkalinity of Ash.		Fat.	Nitrogen.	Soluble in Water.			Percent of Total Ash Soluble in Water.	Refractive Index at 40° C.
				1 gm. of Cocoa.	1 gm. of Ash.			Cold.	At 65° C.	At 100° C.		
25755	Crimson.....	5.06	0.21	5.88	115	27.53	3.38	18.80	21.32	23.12	38	1.4577
25813	Carmelo.....	5.01	0.24	5.61	112	26.45	3.40	17.88	19.92	21.78	40	1.4574
25826	Sunbeam.....	5.49	0.01	5.98	109	20.20	3.93	19.88	21.94	24.66	37	1.4580
25979	Walter Baker's...	5.25	0.01	5.85	111	27.92	3.53	17.36	19.88	21.36	38	1.4583
25766	Webb's.....	4.82	0.01	5.90	122	26.20	3.55	19.14	20.66	25.10	42	1.4573
25810	Justice.....	5.24	0.27	5.91	113	26.02	3.47	18.86	20.46	22.72	40	1.4577
25952	W. H. Baker's...	4.59	1.72	5.47	119	29.67	3.19	18.02	20.28	21.86	37	1.4585
25653	Beckmann's.....	5.54	0.20	6.35	115	24.50	3.43	19.66	21.68	23.76	44	1.4590
25756	Bensdorp's.....	6.05	0.00	8.49	128	31.37	3.45	18.28	20.24	24.66	79	1.4574
25738	Gold Star.....	8.27	0.03	9.84	119	20.40	3.44	21.28	22.68	26.82	84	1.4580
25427	L. B. C.....	5.25	0.14	6.20	118	24.45	3.48	20.58	22.54	24.38	59	1.4583
25425	Royal.....	4.58	0.03	4.90	107	28.95	3.21	19.02	21.70	23.38	57	1.4590
25714	Savoy.....	5.29	0.19	6.10	115	23.32	3.43	19.32	22.28	23.74	36	1.4574
25803	Autocrat.....	4.83	1.72	5.45	113	26.79	3.52	19.34	21.64	23.32	36	1.4582
25711	Victoria.....	5.68	0.13	6.85	121	24.14	3.62	19.66	21.82	23.50	46	1.4585
25765	Cahill's Health...	4.78	1.91	5.05	118	21.82	3.38	21.37	24.54	26.10	79	1.4583
25666	Swan.....	4.82	1.77	5.75	119	26.67	3.45	18.96	21.26	22.74	37	1.4586
25665	Oxford.....	5.15	0.18	6.23	121	24.54	3.53	19.90	22.32	23.90	45	1.4585
25609	Welcome Dainty...	5.49	0.09	6.57	120	24.85	3.67	19.36	21.54	23.04	52	1.4576
25764	Economy.....	5.52	0.05	6.43	116	23.90	3.65	19.32	21.58	23.28	44	1.4578
25429	Premium (East India).....	5.37	0.20	6.27	117	23.45	3.57	19.48	21.54	23.18	57	1.4590
25767	Grand Union.....	6.08	0.32	6.35	104	23.40	3.63	18.60	20.72	22.32	47	1.4580
25713	Grant's.....	5.51	0.14	6.08	121	22.95	3.57	20.10	22.44	24.24	38	1.4583
25646	Hall's Soluble...	4.33	1.88	5.38	124	29.71	3.04	18.16	21.22	23.58	43	1.4580
25670	Hooton's Amazon.	5.23	0.10	6.10	117	24.60	3.66	19.26	21.28	22.86	43	1.4580
25430	Howco.....	5.14	0.05	6.20	118	23.17	3.64	20.30	22.58	24.18	43	1.4590
25788	Hayler's.....	4.99	0.18	5.84	117	27.21	3.39	18.02	19.64	21.50	42	1.4577
25783	Old Dutch Soluble	9.03	0.02	10.92	121	21.65	3.45	21.36	22.95	26.58	80	1.4578

TABLE IX.—ANALYSES OF COCOA—Continued.

Station No.	Brand.	In Air-dry Material.					In Fat-free Material.				Constants of Fat.	
		Ash.	Insoluble in acid (sand).	Alkalinity of Ash.		Fat.	Nitrogen.	Soluble in Water.			Percent of Total Ash Soluble in Water.	Refractive Index at 40° C.
				1 gm. of Cocoa.	1 gm. of Ash.			Cold.	At 65° C.	At 100° C.		
25426	White Lily.....	5.07	0.07	6.00	118	24.92	3.60	19.74	21.80	22.30	56	1.4585
25608	Nabob.....	6.21	0.06	7.29	117	19.56	4.07	20.28	22.60	26.24	74	1.4583
25428	Lowney's.....	5.49	0.02	6.19	113	21.41	3.79	19.38	21.32	22.64	55	1.4590
25946	Mailard's.....	5.04	1.97	6.07	120	25.65	3.64	18.86	20.56	22.08	37	1.4586
25690	Melbourne.....	5.69	0.10	6.46	107	24.46	3.47	20.12	22.34	24.00	37	1.4582
25718	Capitol House...	5.42	0.15	5.95	110	23.65	3.48	19.56	21.96	23.70	45	1.4587
25696	Mohican.....	5.53	0.24	6.14	111	23.12	3.43	22.64	24.85	26.66	45	1.4587
25685	Palmer's.....	5.57	0.21	6.20	111	23.00	3.54	20.22	22.08	23.80	45	1.4587
25719	Powell's.....	5.09	0.17	6.30	122	22.00	3.68	18.78	21.32	22.86	43	1.4585
25686	Premium.....	5.41	0.16	6.40	118	24.52	3.58	18.68	20.46	21.96	43	1.4585
25720	Pulver.....	5.95	0.37	7.04	118	20.90	3.58	20.12	22.22	24.62	48	1.4585
25811	Rallion's.....	9.25	0.08	12.29	133	21.07	3.37	21.56	22.66	26.52	82	1.4577
25712	Semper Idem.....	4.93	0.28	6.04	122	26.27	3.46	19.76	22.20	24.36	43	1.4587
25700	Runkel's.....	5.38	0.15	6.46	120	25.89	3.62	18.64	20.68	22.60	43	1.4585
25833	Sadd's.....	5.39	0.08	5.88	109	24.68	3.46	19.88	21.90	23.70	45	1.4578
25804	White Rose.....	5.97	0.22	5.83	98	23.76	3.61	18.34	20.30	22.20	37	1.4580
25739	Alliance.....	5.11	0.34	6.15	120	23.31	3.64	19.52	21.94	23.72	44	1.4587
25457	Smith's.....	6.02	0.36	6.43	107	27.67	3.21	19.06	21.34	21.96	44	1.4587
25793	Standard.....	4.63	0.08	5.50	119	26.07	3.63	18.46	20.32	23.72	61	1.4577
25733	Stollwerck.....	5.96	0.05	8.12	126	31.28	3.29	17.64	18.74	23.10	70	1.4572
25775	Suchard's Soluble.	6.44	0.01	8.12	126	31.28	3.29	17.64	18.74	23.10	70	1.4572
25456	Ambassador.....	4.86	1.80	5.45	112	25.40	3.53	20.20	22.76	23.62	37	1.4590
25715	Van Houten's Soluble	8.07	0.01	10.55	131	28.49	3.38	19.12	20.46	22.30	81	1.4573
25610	Columbia Tea Co..	5.20	0.09	5.75	111	26.05	3.53	18.58	20.64	22.00	45	1.4580
	Maximum.....	9.25	0.37	12.29	133	31.37	4.07	22.64	24.85	26.82	84	1.4590
	Minimum.....	4.33	0.00	4.90	98	19.56	3.04	17.36	18.74	21.36	36	1.4572
	Average.....	5.59	0.13	6.55	117	24.85	3.52	19.40	21.52	23.55	49	1.4582

TABLE X.

Station No.	Brand.	Serial No.	Price per package, cents.
25812	Admiral Sweet Cocoa. Stephen L. Bartlett Co., Boston.....	15	
25757	Ralston Health Club Cocoa. Stephen L. Bartlett, Boston.....	25	
25839	Croft's Swiss Milk Cocoa. Croft and Allen Co., Philadelphia.....	3373	25
25706	A. and P. Lunch Cocoa. Packed for The Great Atl. and Pac. Tea Co., New York.....	9244	15
25763	Empire Brand Compound Lunch Cocoa. Melbourne Trading Co., Boston.....	1878	13
25827	Gold Medal Breakfast Cocoa. Packed for Edward Mullan, Putnam... 2811	17	
25664	Best Lunch Cocoa. New Jersey Chocolate Works, Jersey City, N. J... 2811	17	
25777	Phillips Digestible Cocoa. The Chas. H. Phillips Chem. Co., New York... 632	35	
25731	Milk Cocoa. Stollwerck Bros., New York-Chicago.....	10	
25611	Sold in bulk. Columbia Tea Co., Stamford.....	8	

TABLE XI.—ANALYSES

Station No.	Brand.	In Air-dry Material.							
		Ash.			Alkalinity of Ash.		Fat.	Nitrogen.	Sucrose.
		Total.	Soluble in water.	Insoluble in acid (sand).	1 gram of Cocoa.	1 gram of Ash.			
25812	Admiral Sweet.....	2.34	2.18	0.02	3.77	128	7.73	1.42	61.80
25757	Ralston Health Club.....	3.11	2.27	0.01	3.98	128	12.60	1.60	55.07
25839	Croft's Swiss Milk.....	4.71	1.84	0.26	5.44	115	22.06	2.86	15.25
25706	A. and P. Lunch.....	2.07	0.90	0.03	2.32	115	18.37	1.35	51.48
25763	Empire Compound.....	2.62	1.88	0.03	3.35	128	7.60	1.30	63.25
25827	Gold Medal.....	5.10	2.40	0.03	5.93	114	23.80	3.54	0
25664	N. J. Best Lunch.....	2.60	1.14	0.08	2.60	126	12.33	1.45	54.95
25777	Phillips Digestible.....	3.68	2.38	0.04	3.82	104	30.85	2.45	21.98
25731	Stollwerck's Milk.....	5.44	2.01	0.05	6.30	116	20.92	3.89	....
25611	Columbia Tea Co.....	2.59	2.00	0.04	3.28	131	9.00	1.14	67.00

COMPOUND COCOA.

Station No.	Weight claimed, grams.	Weight found, grams.	Claims of Label.
25812	227	235	"Pure sweetened cocoa, free from all such adulterations as starch, rice, flour, etc." "It is readily soluble."
25757	227	227	"Manufactured from the finest cocoa bean, pasteurized milk, sugar and flavor."
25839	...	235	
25706	...	256	"Made of pure cocoa and refined sugar only." "Is perfectly soluble."
25763	...	206	"Composed of our pure cocoa and sugar and nothing else."
25827	227	238	
25664	227	231	"On side in small print, "blended with 10 per cent. of prepared cereal."
25777	227	232	"A superior preparation of cocoa and sugar." "It is perfectly soluble."
25731	...	...	"Compounded of cocoa, sugar, phosphates, with vanilla flavor."
25611	113	107	
			Sold as sweet cocoa.

OF COMPOUND COCOA.

Station No.	In Air-dry Material.								In Fat-Sugar-free Material.				Constants of Fat.		
	Polarization at 21° C.		Soluble in Water.			Organic Matter, not Sugar, Soluble in Cold Water.	Relative Sedimentation, corrected for Sugar Content.	Total Ash.	Nitrogen.	Soluble in Cold Water.	Per cent. of Total Ash Soluble in Water.	Iodine No. (Hanus).	Refractive Index at 40° C.	Reichert-Meißl No.	
	Direct.	After Inversion.	Cold.	At 65° C.	At 100° C.										
25812	54.0	-17.16	70.28	70.78	72.08	6.30	110	9.65	4.66	27.83	74	34.01	1.4583	..	
25757	48.6	-15.18	65.26	65.76	67.54	7.92	100	9.62	4.95	31.52	73	35.57	1.4583	..	
25839	14.6	- 3.52	31.30	32.48	34.28	12.96	103	7.65	4.65	24.09	39	34.78	1.4562	0.0	
25706	45.6	-14.08	60.06	61.80	63.90	8.58	93	6.67	4.48	31.44	44	42.13	1.4578	..	
25763	55.6	-17.16	72.24	73.40	75.24	7.11	109	8.99	4.46	30.84	72	37.29	1.4590	..	
25827	0.0	0.00	19.78	21.96	23.86	17.38	100	6.82	4.65	25.96	46	34.34	1.4576	0.0	
25664	*48.0	*-16.28	64.64	65.80	67.06	8.55	100	6.30	4.43	29.61	55	35.60	1.4590	..	
25777	19.4	- 6.60	32.84	33.88	35.46	8.48	115	7.80	5.19	23.02	65	34.83	1.4573	0.0	
25731	6.0	6.16	31.02	32.64	32.88	....	85	....	....	....	37	37.92	1.4576	3.7
25611	*58.4	*-17.60	74.08	74.52	75.28	5.08	100	10.42	4.75	29.50	80	38.43	1.4586	..	

* Polarized at 18° C.

No adulteration is reported, therefore, in the fifty-two samples sold as cocoa; of these, however, twenty-four were misbranded, and will be discussed in more detail later. Of the ten compound cocoas, three were legally labeled, five were misbranded and two were adulterated.

The adulterated samples were **25757**, *Ralston Health Club Cocoa*, which contained 55 per cent. of sugar, which was not declared, and was also high in ash and alkalinity; and **25731**, *Stollwerck's Milk Cocoa*, which contained glucose.

The chief difficulty with cocoa at the present time seems not to be adulteration but a very marked tendency among the manufacturers to exaggerate the food value, assimilability and digestibility of their products.

Nine samples were claimed on the label to be "double the strength" and three "triple the strength" of ordinary grades of cocoa. The strength of a cocoa depends primarily on the amount of cocoa fat it contains. The fifty-two straight cocoas averaged 24.85 per cent. fat; the nine samples claiming "double" strength ranged from 20.40 to 28.95 per cent. fat, average, 24.24; the three samples claiming "triple" strength ranged from 21.82 to 25.89; average, 24.07. These claims are therefore entirely unjustified.

Claims as to superior "solubility" likewise are exaggerated if not entirely false. Strictly speaking, there is no such thing as a "soluble" cocoa. It has been claimed that the use of alkali increases the solubility. In certain cases cocoas made by this process show a greater miscibility with water, but the fineness of the cocoa powder would seem to exert almost as much influence as the alkali treatment. In the eight samples, whose high ash and ash alkalinity clearly indicate that the Dutch process was used in their manufacture, the water-soluble matter at 100° C. ranged from 22.30 to 26.82; average, 24.99; the water-soluble organic matter ranged from 12.57 to 15.68; average, 13.96, and the relative sedimentation from 74 to 96; average, 87. These figures do not indicate any startling increase of solubility as compared with cocoa made by the usual process.

Misbranded Cocoas.

Below will be found our criticisms of the claims of the samples we have classed as misbranded.

25425, *Brewster's Royal Breakfast*; **25764**, *Dingwall's Economy Brand*; **25713**, *Grant's Special*; **25426**, *Isenburg's White Lily*; **25718**, *Capitol House Brand*; **25833**, *Sadd's Cocoa*, and **25793**, *Standard Cocoa*, all claimed to be "double the strength of ordinary grades of cocoa," which statement is untrue.

25652. *W. H. Baker's Best Cocoa*. "Owing to the removal of oil, it is certainly the most nutritious and wholesome cocoa now manufactured in the world." Less oil has been removed than in most cocoas, and it is not the "most nutritious."

25653. *Beckmann's Best Breakfast Cocoa*. "Triple the strength of cocoa as usually prepared. Preserving in their entirety . . . the nutritive properties of the natural bean." It is not "triple" strength, and the nutritive properties of the bean have not been entirely preserved, as over half of the fat has been removed.

25756. *Bensdorp's Royal Dutch Cocoa*. "Acknowledged by the leading authorities to be absolutely the purest cocoa made." It is not "the purest cocoa made," as it contains an excess of added alkali.

25738. *Boardman's Gold Star Brand Breakfast Cocoa*. "Double the strength of ordinary grades of cocoa." It is not "double" strength, and contains excessive ash and alkalinity.

25711. *Bushnell's Victoria Brand Pure Breakfast Cocoa*. "Is extra strong." It is not "extra strong."

25765. *Cahill's Health Cocoa*. "Being made by the special process it preserves . . . the nutritive properties and is rendered treble the strength of cocoas as usually prepared." It is not "treble" strength, and the nutritive properties are not preserved, as over half of the fat has been removed.

25665. *Oxford Brand Supreme Quality Breakfast Cocoa*. "Is extra strong." It is not extra strong.

25740. *Hall's Pure Soluble Cocoa*. "A nutritive and perfectly soluble food." "The cocoa having the oil removed, becomes at once a healthful aliment to the most delicate stomach." It is not "perfectly soluble," as 81 per cent. is insoluble; only a little over half of the oil has been removed.

25788. *Huyler's Cocoa*. "Soluble and digestible." It is not "soluble," as nearly 87 per cent. is insoluble.

25783. *Old Dutch Pure Soluble Breakfast Cocoa*. It is not "soluble," as over 78 per cent. is insoluble. It contains excessive ash and alkalinity.

25690. *Melbourne Australian Brand Pure Breakfast Cocoa.* "Solubility unequalled." "Pure soluble cocoa." Its "solubility" is not unequalled and it is not soluble, as nearly 80 per cent. is insoluble.

25720. *Pulver's Breakfast Cocoa.* "Cocoa is stronger and more economical than chocolate." The statement is untrue.

25811. *Rallion's Special Breakfast Cocoa.* "Double the strength of ordinary grades of cocoa." It is not "double" strength, and contains excessive ash and alkalinity.

25700. *Runkel's Pure Breakfast Cocoa.* "Superfluous oil removed . . . which thereby renders the powder more soluble in hot water or milk, and increases the strength three-fold compared with chocolate or similar preparations containing sugar, starch or arrowroot." This label is misleading as it implies that chocolate is commonly adulterated with sugar or starch, which is not the case. Its solubility in hot water is considerably less than that of the average cocoa examined.

25739. *Shartenberg and Robinson's Alliance Brand Pure Breakfast Cocoa.* "Extra strong." It is not "extra strong."

25775. *Suchard's Soluble Cocoa.* "Most of the cocoa butter has been eliminated." "Free from alkali." Stamped on side, "Prepared with alkali." It is not "soluble," as over 82 per cent. is insoluble. Most of the cocoa butter has not been "eliminated," as with one exception it contains more fat than any other sample examined. One portion of the label gives the impression that no alkali was used, while an obscure stamping indicates its use. It contains excessive ash and alkalinity.

25715. *Van Houten's Pure Soluble Cocoa.* "Manufactured by a special process which increases the mineral ingredients about $3\frac{1}{2}$ per cent." This statement is correct. The sample, however, is not "pure" cocoa, as it contains excessive ash and alkalinity. It is not "soluble," as nearly 81 per cent. is insoluble.

25812. *Bartlett's Admiral Sweet Cocoa.* "It is readily soluble." It is not "readily soluble," as 30 per cent. is insoluble. It contains excessive ash and alkalinity.

25706. *A. and P. Lunch Cocoa.* "Is perfectly soluble." It is not "perfectly soluble," as nearly 40 per cent. is insoluble.

25839. *Croft's Swiss Milk Cocoa.* The Reichert-Meissl number indicates the presence of no milk fat.

25827. *Mullan's Gold Medal Breakfast Cocoa.* On side in small print "blended with 10 per cent. of prepared cereal." The compound nature of this preparation is not indicated with sufficient prominence.

25664. *Best Lunch Cocoa.* "It is perfectly soluble." It is not "perfectly soluble," as nearly 36 per cent. is insoluble. Its compound nature is not indicated in the brand name as required by law.

Accuracy as to Claimed Weight.

Thirty-five samples claimed a definite weight on the label. In general these claims were satisfied, there being a slight tendency to over-weight. In three samples, however, there were deficiencies of 12, 18 and 20 grams in half-pound packages, equal to from 5 to 9 per cent. Two of these deficiencies occurred in samples bearing the same serial number.

CREAM.

Forty samples were bought at stores in ten cities. There being no cream standard in this state almost any percentage of butter fat may be expected to be found in cream.* The samples ranged from 18.02 to 56.47 per cent. fat, the price for these two extreme samples being the same, 15 cents per half pint. The average content of fat was 37.33 per cent.

Two samples contained sucrate of lime according to Baier and Neumann's test.†

Two samples, both stated to come from Patty's Dairy, and sold by G. H. Moorey and Bull's Head Market, Bridgeport, contained formaldehyde.

In a few samples determinations of ash, alkalinity of ash and lime were made. The results follow:

No.	Ash.	Alkalinity of 100 gms.	
		Ash, cc. $\frac{N}{10}$ H ₂ SO ₄ .	Lime.
25870	0.474	8.37	0.105
25871	0.524	10.97	0.120
25872	0.495	13.47	0.130
25873	0.408	7.64	0.089

* At the last session of the Connecticut legislature 16 per cent. was adopted as the minimum standard in this state.

† Zeit. Nahr. Genussm., 16, 51.

TABLE XII.—CREAM SAMPLED AT STORES.

Station No.	Producer.	Dealer.	Fat.
<i>Bridgeport.</i>			
26781	*Mitchell Dairy	Public Market, 731 E. Main St.	55.69
26782	Dewhirst Dairy	R. W. Parrott	35.28
26783	"	L. Isenberg	35.97
26784	†Patty's Dairy	G. H. Moorey	47.33
25887	Mitchell Dairy	Butter Store, 1360 Main St.	54.45
25888	Dewhirst Dairy	Public Market, State and Bank Sts.	34.91
25889	Roger Farm Dairy	Roger Farm Dairy	42.89
25890	Borden's Condensed Milk Co.	Borden's Milk Depot	36.57
26913	Mitchell Dairy	R. T. Whiting	55.75
26921	†Patty's Dairy	Bull's Head Market	45.78
<i>Hartford.</i>			
26829	Bryant & Chapman	C. N. Dodge	48.34
26830	"	C. H. Strong	48.27
26831	"	Boston Grocery	48.81
26832	"	Tracy's Grocery	48.65
<i>Meriden.</i>			
26874		David Higgins	42.59
26875		L. C. Brown	27.55
26876	Meriden Dairy	City Market	36.00
26877	Oriental Dairy (Booth)	Creamery, 175 Pratt St.	35.67
<i>Middletown.</i>			
26895	Millbrook Farm Dairy Co.	Millbrook Dairy	38.10
26896	"	W. J. Trevithick	20.00
<i>New Britain.</i>			
26819	Hall's Dairy	Miller & Olsen	56.47
26820	Avery's Dairy	Sovereign Trading Co.	26.82
<i>New Haven.</i>			
25870	C. E. Smith	S. S. Adams	36.22
25871	Whitneyville Creamery	M. C. Dingwall	31.55
25872	*M. B. & F. S. Hubbell	F. J. Markle Co., Chapel St.	37.22
25873	Valley Farm Creamery Co.	Paul Jente & Bros.	44.91
25884	Elm Tree Dairy	F. J. Markle Co., Congress Ave.	20.50
25885	Valley Farm Creamery Co.	W. G. Graves & Son	33.07
25886	Oakhurst Farm	E. J. Cullom	41.25
<i>New London.</i>			
26888	Thompson's Dairy	Schwanner's Market	22.59
26889	Brigham Dairy	Delicatessen, 460 Bank St.	24.73
26890	Williams' Dairy	F. H. Davis & Co.	18.02
<i>Norwich.</i>			
26868	Palmer's Dairy	C. W. Hills	25.20
26869	"	H. D. Rallion	21.94
<i>Stamford.</i>			
26805		Samuel Price Co.	35.73
26806	J. H. Bedell Dairy	Stamford Grocery Co.	48.21
<i>Waterbury.</i>			
26845	Dennison's Dairy	Duesler Bros. Co.	31.39
26846	"	Woodruff's Grocery	31.53
26847	Smith's Dairy	Hewitt's Grocery	25.97
26848	Worden's Dairy	Model Market Co.	41.20

* Contained sucrate of lime. † Contained formaldehyde.

FRUIT JUICES AND BOTTLED SYRUPS.

Grape Juice. Seven samples were examined, all of which purported to be pure grape juice, except **25109**, which admitted the addition of a small amount of cane sugar. The samples were of normal and quite uniform composition, except **25107**, which contained almost no sugar. Five of the samples contained no alcohol, one a trace, and **25111** 0.62 per cent. by weight, although it was labeled "strictly non-alcoholic." None of the samples contained sodium benzoate, salicylic acid or saccharin, nor any foreign color.

Lime Juice. Seven samples were examined. In all but one the presence and amount of a chemical preservative was declared on the label and was found on analysis in substantially the amount stated. **24956**, **24991** and **25079** contained 0.10 per cent. of sodium benzoate, as was stated on the label, and **25078**, **25083** and **24957** contained sulphur dioxide not exceeding the amount stated on the label. **24958** contained no chemical preservative.

24956 and **24991** indicated on the label, though not in the brand name, that they were diluted juices, the former claiming only 33 per cent. and the latter 60 per cent. of lime juice. Analysis showed these statements to be correct, although the proper label of such preparations should be "Diluted Lime Juice." Both the solids and acidity indicated their inferior quality. The other five samples were quite uniform in composition, the specific gravity ranging from 1.0337 to 1.0384, the solids from 7.32 to 8.49 and the acidity from 10.50 to 11.25. No added sugar, saccharin, or artificial color was found in any case. **24991** alone showed a trace of alcohol.

Orange Preparations. The labels showed that three of the four samples were compounds, all containing artificial color, and one, sodium benzoate. **25088** contained neither a preservative nor artificial color. None of the samples contained glucose, saccharin, or alcohol.

Raspberry Syrup. Three of the samples were correctly labeled as containing artificial color and sodium benzoate. **25104** was adulterated, as it contained salicylic acid and artificial color, neither of which was declared on the label. None of the samples contained glucose or saccharin. **25091** contained 0.82 per cent. alcohol, the other samples only traces.

TABLE XIII.—FRUIT JUICES AND SYRUPS.

Station No.	Brand.	Price per bottle, cents.	Specific gravity at 15.6° C.	Alcohol by weight.	Solids.	Polarization.			Acidity, (1 gm. = cc. $\frac{1}{N}$ Ba (OH) ₂ .)	Preservatives.			Color.
						Direct.	After Inversion.	Temperature, ° C.		Sodium Benzoate.	Salicylic Acid.	Sulphur dioxide. (Mgms. per 100 gms. of juice.)	
<i>Grape Juice.</i>													
25110	Duffy's Grape Juice Sterilized Unfermented. American Fruit Prod. Co., Rochester, N. Y.	25	1.0754	0	17.02	-5.0	-5.1	20	1.35	0	0	....	Natural.
25121	Armour's Grape Juice, "Top-Notch" Brand, Unfermented. Armour & Co., Chicago.	25	1.0752	0	17.14	-4.6	-5.1	20	1.40	0	0	....	Natural.
25108	Fenner's Chautauqua Grape Juice, Unfermented. The Fenner Grape Juice Co., Westfield, N. Y.	10	1.0740	Tr.	16.63	-5.7	-6.6	20	1.05	0*	0	....	Natural.
25107	Walker's Grape Juice. The Grape Products Co., North East, Pa.	10	1.0701	0	15.92	± 0.0	-0.7	20	1.50	0	0	....	Natural.
25109	Howland's Grape Juice. The Howland Dry Goods Co., Bridgeport.	20	1.0782	0	17.53	-5.0	-5.9	20	1.30	0	0	....	Natural.
25111	Strictly Non-Alcoholic Grape Juice Catawba, Unfermented. Lake Erie Grape Juice Co., Sandusky, O.	30	1.0819	0.62	18.94	-7.0	-7.5	20	1.35	0	0	....	Natural.
25106	Millen's Unfermented Grape Juice. Millen Grape Juice Co., Watkins, N. Y.	10	1.0762	0	17.31	-5.4	-5.5	20	1.50	0	0	....	Natural.
<i>Lime Juice.</i>													
25078	Stone's Lime Fruit Juice. Finsbury Distillery Co., London.	35	1.0384	0	8.49	± 0.0	± 0.0	22	10.50	0	0	*21.8	Natural.
25083	Imperial West Indian Lime Juice. T. A. Hedley, New York.	25	1.0340	0	7.32	+ 0.2	± 0.0	22	11.25	0	0	*9.0	Natural.
24956	West India Lime Juice. J. P. & D. Plummer, Boston.	10	1.0118	0	2.78	± 0.0	± 0.0	22	3.34	*0.10	0	....	Natural.

Notes from labels. ¹ "Small amount of cane sugar added." ² "Preserved with 0.04% sulphurous acid." ³ "Preserved with 0.03% sulphurous acid." ⁴ "Prepared from lime juice, 33%, water, 66%, 0.10% benzoate of soda." * Declared on the label.

TABLE XIII.—FRUIT JUICES AND SYRUPS.—Continued.

Station No.	Brand.	Price per bottle, cents.	Specific gravity at 15.6° C.	Alcohol by weight.	Solids.	Polarization.			Acidity, (1 gm. = cc. $\frac{1}{N}$ Ba (OH) ₂ .)	Preservatives.			Color.
						Direct.	After Inversion.	Temperature, ° C.		Sodium Benzoate.	Salicylic Acid.	Sulphur dioxide. (Mgms. per 100 gms. of juice.)	
<i>Lime Juice (continued).</i>													
24957	8 Rose's Prepared West India Lime Juice, Unsweetened. L. Rose & Co., London.....	35	1.0337	0	8.01	-0.1	± 0.0	22	10.92	0	0	*3.1	Natural.
24958	Rowat's Thistle Brand Unsweetened Lime Juice. Rowat & Co., Glasgow.....	30	1.0371	0	8.31	+0.2	± 0.0	22	11.04	0	0	0	Natural.
24991	8 Banner Brand Jamaica Lime Juice. Simpson Spring Co., South Easton, Mass.....	14	1.0221	Tr.	5.04	+0.1	+ 0.11	22	7.00	*0.06	0	....	Natural.
25079	17 Victor Jamaica Lime Juice. Simpson Spring Co., South Easton, Mass.	25	1.0350	0	7.76	+0.2	+ 0.22	22	10.50	*0.11	0	....	Natural.
<i>Orange Preparations.</i>													
25092	8 Celebrated Clicquot Club Blood Orange. The Clicquot Club Co., Millis, Mass.....	13	1.0498	0	11.08	-0.5	- 3.85	20	....	0	0	....	*Artificial.
25080	9 C. & M. Orangeade. National Fruit Products Co., Boston.....	25	1.3287	0	65.88	+0.9	-17.60	27	....	*0.07	0	....	*Artificial.
25101	10 Simpson Spring Gold Label Orange. Simpson Spring Co., South Easton, Mass.....	10	1.0378	0	9.44	+0.8	- 2.75	20	....	0	0	....	*Artificial.
25088	Blood Orange Nectar. Steele Bros., New Britain...	15	1.2182	0	44.73	-10.0	-14.10	27	....	0	0	....	Natural.
<i>Raspberry Syrup.</i>													
25081	11 C. & M. Fruit Syrups, Raspberry. Curtis & Moore, Boston.....	25	1.2871	Tr.	57.33	-16.0	- 16.1	27	....	*0.04	0	....	*Artificial.

Notes from labels. ⁵ "Preserved with 1.5 grains sulphur dioxide." ⁶ "A mixture of natural lime juice, 60%, Simpson spring water, 40%, 0.10% sodium benzoate." ⁷ "0.10% sodium benzoate." ⁸ "Artificial color." ⁹ "Preserved with $\frac{1}{16}$ of 1% Benzoate of Soda. Artificially colored." ¹⁰ "Artificially colored." ¹¹ "Preserved with 0.10% benzoate of soda; harmless color." * Declared on the label.

TABLE XIII.—FRUIT JUICES AND SYRUPS—Continued.

Station No.	Brand.	Price per bottle, cents.	Specific gravity at 15.6° C.	Alcohol by weight.	Solids.	Polarization.			Acidity, (1 gm. = cc. $\frac{1}{10}$ Ba (OH) ₂ .)	Preservatives.			Color.
						Direct.	After Inversion.	Temperature, °C.		Sodium Benzoate.	Salicylic Acid.	Sulphur dioxide. (Mgms. per 100 gms. of juice.)	
25091	<i>Raspberry Syrup (continued).</i>												
25091	¹² True Fruit Syrup Raspberry. John Matthews, New York.	35	1.3157	0.82	60.24	-17.1	-17.6	27	....	*0.02	0	....	*Artificial.
25094	¹³ Raspberry Syrup. Strohmeier & Arpe Co., New York.	25	1.3416	Tr.	66.96	4.4	-18.7	27	....	*0.03	0	....	*Artificial.
25104	Magnolia "Hallonsaft" Raspberry Syrup. The Swedish Importing Co., Worcester, Mass.	25	1.3383	Tr.	66.17	-8.0	-18.9	27	....	0	Yes	....	Artificial.
25102	<i>Strawberry Syrup.</i>												
25102	¹⁴ Strawberry Syrup Helvetia. Imported by Deforth Bros., New York	45	1.3358	Tr.	64.34	-19.0	-20.79	20	....	0	Yes	....	*Artificial.
25053	Superior Flavored Strawberry Syrup. Eagle Manufacturing Co., New York	10	1.3193	0	60.92	+51.2	+44.99	22	....	0	0	....	Artificial.
25090	¹² True Fruit Syrup Strawberry. John Matthews, New York.	35	1.2170	0	56.75	-16.6	-18.81	22	....	*0.06	0	....	*Artificial.
24975	¹⁵ C. & M. Fruit Syrups, Strawberry. National Fruit Products Co., Boston	24	1.3288	0	56.10	-8.6	-19.69	20	....	*0.04	0	....	Artificial.
25086	Standard Strawberry Syrup. I. Calvin Shafer Co., New York	60	1.2704	3.64	54.99	-15.8	-16.50	22	....	0	0	....	Natural.
25068	¹⁶ "True Fruit" Strawberry Syrup. J. Hungerford Smith Co., Rochester, N. Y.	25	1.3381	0	60.56	-17.4	-19.25	22	....	*0.05	0	....	*Artificial.

Notes from labels. ¹² "Contains harmless color and less than $\frac{1}{8}$ of 1% benzoate of soda." ¹³ "Addition of less than 0.10% benzoate of soda and trifle coloring and citric acid." ¹⁴ "Only prepared with sugar, artificially colored." ¹⁵ "Preserved with 0.10% benzoate of soda." ¹⁶ "Contains vegetable color and less than $\frac{1}{8}$ of 1% benzoate of soda." * Declared on the label.

TABLE XIII.—FRUIT JUICES AND SYRUPS—Concluded.

Station No.	Brand.	Price per bottle, cents.	Specific gravity at 15.6° C.	Alcohol by weight.	Solids.	Polarization.			Acidity, (1 gm. = cc. $\frac{1}{10}$ Ba (OH) ₂ .)	Preservatives.			Color.
						Direct.	After Inversion.	Temperature, °C.		Sodium Benzoate.	Salicylic Acid.	Sulphur dioxide. (Mgms. per 100 gms. of juice.)	
25085	<i>Miscellaneous Preparations.</i>												
25085	¹⁷ C. & M. Fruit Syrups, Ambrosia Punch. National Fruit Products Co., Boston	24	1.3106	0.64		-17.5	-18.90	20	....	*0.04	0	....	Artificial.
25105	Duffy's Apple Juice, Sterilized, Non-Alcoholic. American Fruit Prod. Co., Rochester, N. Y.	20	1.0599	Tr.	11.55	-8.0	-8.69	20	....	0	0	....	Natural.
25112	¹⁸ Bittermead. Jacob House & Son, Buffalo, N. Y.	15	1.0402	0	8.26	-0.3	-2.53	20	....	0	0	....	*Caramel.
24999	Jamaica Ginger Fruit Cordial, Non-Alcoholic. G. C. Hines & Co., Boston	25	1.2342	4.24		-13.6	-14.30	20	....	0	0	....	Natural.
25103	¹⁹ Brooke's Finest Lemons, Sweetened Lemon Juice. C. M. Brooke & Sons, New York	45	1.1108	0.54	22.71	-6.0	-6.05	22	5.00	*0.08	0	....	Artificial.
25093	²⁰ Celebrated Clicquot Club Lemon Soda. The Clicquot Club Co., Millis, Mass.	13	1.0538	0	11.70	-0.3	-2.75	20	....	0	0	....	*Artificial.
25113	²¹ Marrowfood. Marrowfood Co. of New York, N. Y.	25	1.0429	0	9.13	+1.8	-2.86	20	....	0	0	....	....
25084	²² C. & M. Fruit Syrups, Pineapple. National Fruit Products Co., Boston	24	1.3269	0	64.90	+3.6	-18.30	27	....	*0.04	0	....	Natural.

Notes from labels. ¹⁷ "Preserved with 0.10% benzoate of soda." ¹⁸ "Formula: Fluid extract calamus, comp. tinct. gentian, tinct. angostura bark, ext. vanilla bean, prune juice, sol. essence coriander, sol. essence anise, burnt sugar, syrup, fruit acid, carbonated water. Each $\frac{1}{2}$ pint contains 10 minims of the medicinal and flavoring elements." ¹⁹ Preserved with 0.10% benzoate of soda. (Above analysis represents only the liquid portion of the sample, 986 gms., 11 gms. of pulp being filtered off." ²⁰ "Artificial color." ²¹ "Contains with other vegetable tonics Iron in the most assimilable form and the right proportion." ²² "Preserved with 0.10% benzoate of soda." * Declared on the label.

Strawberry Syrup. The labels of four of the samples stated the presence of either artificial color or sodium benzoate, or both. **25102** contained salicylic acid, which was not declared, also a trace of alcohol. **25053** contained glucose and artificial color, not declared; **24975**, artificial color, not declared, and **25086**, 3.64 per cent. of alcohol.

Miscellaneous Preparations. **25085** contained sodium benzoate, declared, and artificial color, not declared. **24999** was misbranded "non-alcoholic," as it contained 4.24 per cent. of alcohol. **25103** contained sodium benzoate, declared, and artificial color, not declared. It contained only 3.20 per cent. of acid, calculated as citric, less than half the standard's requirement.

ORANGE SUGAR.

25087. *Orange Sugar*, for making orangeade. Boyd Fruit Sugar Co., New York. "A compound of pure refined sugar, colored, acidulated and flavored with the best orange product." The sample polarized at 20° C. direct + 96.0, after inversion — 34.1, equivalent to 98.1 per cent. cane sugar. No preservatives were found, but it was artificially colored and, therefore, was adulterated.

GLUTEN PREPARATIONS.

The U. S. standard for gluten flour requires it to be "the clean, sound product made from flour by the removal of starch, and contains not less than five and six-tenths (5.6) per cent. of nitrogen and not more than ten (10) per cent. of moisture."

With the exception of *Granola* and "*C B X*," all the samples examined were sold as gluten preparations and should conform to this standard. *40% Gluten Biscuit* contained more protein than guaranteed. *No. 2 Proto Puffs* was very rich in protein and was relatively low in starch. *Dr. Johnson's Educator Standard Gluten Flour*, *Hoyt's Gum Gluten Granules*, *Hoyt's Gum Gluten Breakfast Food*, *Hoyt's Gum Gluten Flour* and *Hoyt's Gum Gluten Noodles*, all exceeded the requirements of the standard. *Educator Gluten Cookies* was 1.37 per cent. low in nitrogen, and had a very high fat content. The label claimed "a minimum of starch and a high protein content. Delight to diabetics." Neither of the first claims is true, and a material con-

TABLE XIV.—GLUTEN PREPARATIONS.

Station No.	Brand.	Water.	Ether Extract.	Crude Fiber.	Ash.	Protein (N x 6.25).	Nitrogen-free Extract.	Starch.	Nitrogen.
25122	40% Gluten Biscuit. Battle Creek Sanitarium Food Co., Battle Creek, Mich.	8.04	1.20	0.17	1.63	43.25	45.71	35.28	6.92
25129	Granola. Battle Creek Sanitarium Co., Battle Creek, Mich.	6.14	0.80	0.64	2.34	13.88	76.20	45.23	2.22
25132	No. 2 Proto Puffs. The Health Food Co., N. Y.	8.15	1.48	0.22	1.79	52.38	35.98	27.18	8.38
25133	C B X (Cold Blast Extra Flour), 25% Proteine. The Health Food Co., New York	8.71	0.87	0.15	0.51	10.13	79.63	68.85	1.62
25123	Dr. Johnson's Educator Standard Gluten Flour. Johnson Educator Food Co., Boston	7.32	1.40	0.23	0.82	40.13	50.10	40.91	6.42
25130	Educator Gluten Cookies. Dr. Wm. L. Johnson	4.75	15.98	0.31	2.73	26.44	49.79	37.80	4.23
25124	Hoyt's Gum Gluten Granules. The Pure Gluten Food Co., New York	7.48	1.55	0.31	1.46	45.50	43.70	32.27	7.28
25125	Hoyt's Gum Gluten Breakfast Food. The Pure Gluten Food Co., New York	7.48	1.33	0.38	1.23	37.81	51.77	37.89	6.05
25126	Hoyt's Gum Gluten Flour. The Pure Gluten Food Co., New York	8.12	1.62	0.19	1.04	38.25	50.78	42.35	6.12
25127	Hoyt's Gum Gluten Noodles. The Pure Gluten Food Co., New York	8.26	2.36	0.21	1.13	36.56	51.48	42.03	5.85
25128	Gluten Flour (in bulk). D. M. Welch & Son, New Haven	8.73	1.00	0.17	0.70	18.00	71.40	61.61	2.88

taining 50 per cent. of nitrogen-free extract, of which nearly 38 per cent. is starch, may be a very dangerous "delight to diabetics."

The label of *Granola* claimed that "one pound more than equals one pound of best beef in nutrient value." This statement would be equally true of almost any food rich in carbohydrates, and is not a virtue peculiar to this particular preparation. In roast beef about 73 per cent. of the nutriment is due to protein, and 27 per cent. to fat. In *Granola*, only 15 per cent. is due to protein, less than 1 per cent. to fat, and about 84 per cent. to carbohydrates. The comparison of foods as to value, without considering the nature of the nourishment in them, is absolutely futile and misleading.

"*C B X*" *Cold Blast Extra Flour* was clearly misbranded, as it claimed 25 per cent. of protein, and contained only 10.13. It differed very little in composition from ordinary flour, and yet was sold at the rate of 15 cents per pound.

Gluten Flour 25128, sold by D. M. Welch & Son, contained only 2.88 per cent. of nitrogen, about one-half of the amount required by the standard.

The following tabulation shows the cost per package of the different samples, together with the calculated cost per pound.

No.	Net Weight. gms.	Cost per Package. cts.	Cost per Pound. cts.
25122	244	40	74
25129	370	10	12
25132	161	25	71
25133	2350	75	15
25123	1358	38	13
25130	259	25	24
25124	457	20	20
25125	465	20	20
25126	464	15	15
25127	118	15	58
25128	907	16	8

ICE CREAM.

The U. S. standard for ice cream requires a minimum of 14 per cent. of milk fat. Thus far this State has adopted no standard for this product.

This present investigation was undertaken because of sensational reports as to the quality of ice cream sold in New Haven. It was stated that some ice cream contained no fat whatever. Twenty-one samples were analyzed, which contained from 2.0 to 19.0 per cent. of fat; average, 8.56. Only two samples satisfied the U. S. standard. Even based on a standard of 8 per cent. fat, adopted by several of the states, much of the ice cream sold in New Haven is distinctly inferior in fat content. While it is true that some of the lower grade ice cream sold for a considerably lower price, from twenty to thirty cents per quart, this reduction in price, for poorer cream, was far from universal, forty cents being charged for ice cream containing such divergent amounts of fat as 2.0 and 19.0 per cent.

There is some doubt as to the proper minimum standard for fat in ice cream. It would seem, however, that some distinction in name should be used for products of such diverse composition as those here reported.

No boric acid or formaldehyde was found in any sample. All but five of the samples reacted for gelatin.

TABLE XV.—ICE CREAM.

Station No.	Manufacturer.	Flavor.	Cost per qt. cts.	Fat Per cent.
26879	Boston Confectionery Co...	Vanilla	40	19.0
26859	F. A. Atwood Co.	"	40	18.5
26795	D. Boschen	"	40	11.5
26791	New Haven Dairy	"	40	11.0
26860	Chocolate Shop	"	40	11.0
26880	Greek-Amer. Ice Cream Co..	"	30	11.0
26792	The Semon Ice Cream Co...	"	40	10.5
26790	D. Cummings	"	40	10.0
26789	Hillman	"	40	10.0
26788	Olympia Candy Co.	"	30	9.75
26794	Hasselbach	"	50	9.5
26897	*B. Frankel	Vanilla and Chocolate...	40	9.0
26793	Hauff	Chocolate and Water Ice..	40	7.5
26878	Fred Ross	Vanilla	40	6.5
26858	The Harris-Hart Co.	Vanilla and Chocolate...	40	6.0
26907	J. H. Keyes	Vanilla	30	5.5
26908	Rubins	"	20	4.0
26910	†New York Ice Cream Co...	Vanilla and Strawberry...	40	3.0
26909	New Haven Candy Kitchen.	Vanilla	40	2.5
26898	Peter Muti	"	40	2.0
26911	Deveio	"	25	2.0

*Statement of dealer, Alfonso Elposito. †Statement of dealer, Andrew Esposito.

ICE CREAM POWDERS.

Four samples, all made by the same manufacturer, were analyzed. They were as follows:

25070. *Jell-O Ice Cream Powder, Chocolate, a Mixture.*
The Genesee Pure Food Co., LeRoy, N. Y.

25071. *Jell-O Ice Cream Powder, Strawberry, a Mixture, Color and Flavor artificial.*

25072. *Jell-O Ice Cream Powder, Vanilla, Flavor Compounded, a Mixture.*

25073. *Jell-O Ice Cream Powder, Lemon, a Mixture, Color artificial.*

As the labels indicated, with the exception of **25070**, these materials were all more or less artificial in either flavor or color, or both. The chocolate powder contained less sugar and more ash and nitrogen than the others. The low percentages of nitrogen in **25071**, **25072** and **25073**, proved the absence of any appreciable amount of gelatine.

The analyses are given below.

	25070	25071	25072	25073
Water	0.82	0.52	0.52	0.52
Ash	0.53	0.25	0.26	0.26
Sucrose	91.80	97.60	96.20	96.60
Nitrogen	0.25	0.02	0.02	0.02

MILK.

No general examination of milk has been made at this station during the past five years, although within that time about 650 samples have been examined for the dairy commissioner, milk inspectors and others. This year, 124 samples were bought from stores in twelve of the cities of the state, between July 15 and August 20. While this number is not large, and a few of the larger towns had to be omitted because of their distance from New Haven, it is believed that the analyses fairly represent the quality of the milk sold at stores during the time named. In most cases the samples were bought in the bottles delivered from the various dairies, but in twenty-seven cases the samples were dipped from the can by the dealer. This introduces the possible error of improper sampling, but with a very few exceptions these dipped samples compare very favorably with the bottled milk in quality. In certain stores, where dipped samples were bought, extremely dirty conditions prevailed, and it would seem that the ordinances against this practice, now in effect in certain cities, should become universal throughout the state.

The examination has been entirely chemical, chiefly to learn how far store milk conformed with the legal standard, and to determine whether or not chemical preservatives and artificial coloring were used. The legal standard for milk in this state requires a minimum of 11.75 total solids, 8.50 solids not fat, and 3.25 fat. The use of preservatives or coloring is, of course, illegal.

A summary of the results is given in Table XVI, and the detailed analyses in Table XVII. From the summary it appears that of the one hundred and twenty-four samples examined, only forty-two fully met the legal standard, while thirty-three were below standard in solids, seventy-nine in solids not fat, and fifteen in fat. On the average, the samples contained 12.27 per cent. solids and 3.92 per cent. fat.

TABLE XVI.—SUMMARY OF ANALYSES OF MILK BY CITIES.

City.	Number of Samples.	Average percentage total solids.	Average percentage fat.	Below 11.75 per cent. total solids.	Below 8.50 per cent. solids not fat.	Below 3.25 per cent. fat.	Contain boric acid (borax).	Contain formaldehyde.
Bridgeport.....	16	11.41	3.56	8	15	6	0	0
Danbury.....	8	11.54	3.40	6	8	3	0	0
Hartford.....	20	13.04	4.29	0	3	0	0	0
Meriden.....	4	12.56	4.07	0	2	0	0	0
Middleton.....	4	11.79	3.65	3	4	0	0	0
New Britain.....	5	13.16	4.36	0	0	1	0	0
New Haven.....	28	11.98	3.71	11	25	2	0	0
New London.....	7	13.09	4.57	0	4	0	0	0
Norwalk.....	9	12.80	4.31	1	2	2	0	0
South Norwalk.....	7	11.95	3.76	1	6	0	0	0
Stamford.....	7	12.31	3.90	1	4	0	0	0
Waterbury.....	9	12.32	3.94	2	6	1	0	1
Total.....	124	.....	.....	33	79	15	0	1

One sample was found to be skimmed milk and twelve samples had been watered. A number of other samples, which showed a relatively high fat content for the amount of solids present, gave indications of watering, but the methods used could not determine this with certainty. One sample contained formaldehyde; no artificial color was found in any case.

The sample of skimmed milk was sold by a bakery (name unknown) at 1054 East Main Street, Bridgeport.

The following dealers sold watered milk:

G. H. Campana, Bridgeport.
 W. B. Meyer, Bridgeport.
 Delicatessen, 491 Water Street, Bridgeport.
 C. M. Bassett, Bridgeport.
 J. Schiene, Bridgeport.
 David Schneider, Bridgeport.
 Angelo Risi, Bridgeport.
 Mrs. B. Schultz, New Haven.
 J. Beschel, New Haven.
 Justin Holden, Norwalk.
 L. Joseloff, South Norwalk.
 A. Sirica, Waterbury.

TABLE XVII.—MILK SAMPLED AT STORES.

Station No.	Producer.	Dealer.	Specific gravity at 60° F.	Total solids.	Solids not fat.	Fat.	Refraction of Copper Serum at 20° C.
26773	†.....	<i>Bridgeport.</i>					
26774	†.....	S. Sumelovitz	31.1	12.53	8.63	3.9	...
26775	†.....	Bakery, 1054 E. Main St.	30.1	10.90	8.10	2.8	37.0
26776	†.....	G. H. Campana	26.9	10.37	7.37	3.0	35.0
26777	†.....	D. E. McNamara	29.9	12.76	8.26	4.5	...
26778	†.....	W. B. Meyer	28.0	10.87	7.67	3.2	35.9
26779	†.....	Delicatessen, 491 Water St.	27.8	11.50	7.80	3.7	35.4
26780	†.....	C. M. Bassett	27.1	11.97	7.57	4.4	35.5
26912	†.....	J. Schiene	24.4	9.61	6.61	3.0	33.1
26914	†.....	Geo. Cleveland	29.7	11.81	8.41	3.4	...
26915	†.....	Peoples Dairy	30.3	12.37	8.47	3.9	...
26916	†.....	David Schneider	25.9	10.13	7.13	3.0	35.0
26917	†.....	Angelo Risi	27.2	10.45	7.35	3.1	35.8
26918	†.....	Roger Farm Dairy	28.2	11.60	7.80	3.8	36.5
26919	†.....	G. C. Stewart	30.0	11.80	8.20	3.6	...
26920	†.....	Thos. Sullivan	28.5	11.77	7.87	3.9	36.4
	†.....	Borden's Milk Depot	29.6	12.20	8.40	3.8	...
26899	†.....	<i>Danbury.</i>					
26900	†.....	P. McGrath	30.9	12.34	8.34	4.0	...
26901	†.....	Michael De Palmi	29.4	11.46	7.96	3.5	36.5
26902	†.....	Gigliotti Bros.	28.9	10.98	7.98	3.0	36.0
26903	†.....	Fruit Store, 141 Main St.	29.5	11.19	7.99	3.2	36.5
26904	†.....	Peterson's Market	30.3	11.98	8.38	3.6	...
26905	†.....	Joe Solomon	30.1	11.05	8.05	3.0	36.6
26906	†.....	Liberty St. Market	30.2	11.68	8.18	3.5	37.5
	†.....	F. Gigliotti	30.7	11.62	8.22	3.4	37.3

* Dipped from can.

† Skimmed.

‡ Watered.

TABLE XVII.—MILK SAMPLED AT STORES—Continued.

Station No.	Producer.	Dealer.	Specific gravity at 60° F.	Total solids.	Solids not fat.	Fat.	Refraction of Copper Serum at 20° C.
26821	Cooley's Dairy	<i>Hartford.</i>	32.3	13.38	8.08	4.4	...
26822	Burnham's Dairy	I. Gellis	31.2	13.05	8.05	4.4	...
26823	Bryant & Chapman Milk Co.	J. Carosino & Co.	30.1	12.45	8.45	4.0	...
26824	†.....	Tom Rates	30.5	13.11	8.51	4.6	...
26825	†.....	Geo. Bemanto	30.9	12.95	8.45	4.5	...
26826	†.....	Public Market, 1143 Main St.	32.3	13.41	9.21	4.2	...
26827	†.....	Allyn Bros.	33.2	14.35	9.45	4.9	...
26828	†.....	C. N. Dodge	30.0	12.43	8.43	4.0	...
26833	†.....	H. Hershman	30.5	13.46	8.56	4.9	...
26834	†.....	M. Friedman	32.5	12.95	8.85	4.1	...
26835	†.....	N. Barrillo	31.0	12.72	8.62	4.1	...
26836	†.....	P. George	30.9	12.52	8.52	4.0	...
26837	†.....	Windsor St. Grocery	31.1	12.98	8.88	4.1	...
26838	†.....	Frank Denaldo	31.1	13.13	8.63	4.5	...
26839	†.....	S. Lipman	30.7	12.82	8.62	4.2	...
26840	†.....	Scandia Market Co.	32.6	12.78	8.88	3.9	...
26841	†.....	F. Kabinovitz	31.2	12.66	8.56	4.1	...
26842	†.....	Max Ziky	31.4	12.79	8.69	4.1	...
26843	†.....	F. Rates & Co.	32.6	13.91	9.21	4.7	...
26844	†.....	D. F. Burns Co.	31.9	13.00	8.90	4.1	...
26870	†.....	<i>Meriden.</i>					
26871	†.....	R. W. Mueller	34.7	12.54	8.04	3.6	...
26872	†.....	Julius Augur	28.5	12.12	8.12	4.0	...
26873	†.....	Meriden Dairy	30.8	12.45	8.55	3.9	...
26874	†.....	David Higgins	30.0	13.14	8.34	4.8	...

* Dipped from can.

TABLE XVII.—MILK SAMPLED AT STORES—Continued.

Station No.	Producer.	Dealer.	Specific gravity at 60° F.	Total solids.	Solids not fat.	Fat.	Refraction of Copper Serum at 20° C.
26891	Gilbert's Dairy	<i>Middletown.</i> J. H. Cone	29.6	11.73	7.93	3.8	36.3
26892	Tucker's Dairy		29.8	12.47	8.47	4.0	36.3
26893	Millbrook Farm Dairy Co.		29.8	11.56	8.16	3.4	36.5
26894	Millbrook Farm Dairy Co.		29.7	11.41	8.01	3.4	36.6
26814		<i>New Britain.</i> Gaffney Bros.	32.5	11.86	8.76	3.1	...
26815	North End Dairy		31.5	13.02	8.72	4.3	...
26816	Wm. Caudran		31.0	12.92	8.62	4.3	...
26817			29.3	14.41	8.91	5.5	...
26818		<i>New Haven.</i> F. A. White	32.0	13.58	8.98	4.6	...
25857	Guss Pierson		30.5	11.30	8.40	2.9	37.6
25858	Wm. Neubig		27.0	11.75	7.85	3.9	35.8
25859	Cherry Hill Dairy		31.5	12.86	8.96	3.9	38.0
25860	J. F. Dunn	The Waite Grocery	30.0	11.78	8.28	3.5	37.3
25861	*	Charles Geider	29.8	11.70	8.40	3.3	37.4
25862	Whitneyville Creamery	A. Duhan	30.0	11.58	8.28	3.3	37.5
25863	W. H. Davis	F. A. Voelker	29.6	11.89	8.39	3.5	37.0
25864	G. B. Hall	H. Ginzberg	30.9	12.31	8.41	3.0	38.0
25865		C. F. Clark	29.3	11.94	8.14	3.8	37.0
25866	Elm Tree Dairy	Kohn Bros.	28.9	12.49	8.19	4.3	37.1

* Dipped from can.

† Watered.

§ Contained a shrimp and a grasshopper's thigh.

TABLE XVII.—MILK SAMPLED AT STORES—Continued.

Station No.	Producer.	Dealer.	Specific gravity at 60° F.	Total solids.	Solids not fat.	Fat.	Refraction of Copper Serum at 20° C.
25867	Louis Waas	<i>New Haven (continued).</i> F. J. Markle Co.	30.1	11.65	8.25	3.4	37.0
25868	C. E. Smith		29.5	11.29	8.19	3.1	37.4
25869	Whitneyville Creamery		29.9	11.77	8.27	3.5	36.8
25874	*		27.3	13.25	7.85	5.4	36.2
25875	*C. E. Minor		30.3	12.37	8.47	3.9	...
25876	" (H. Weinstein, on cap)		30.9	12.66	8.66	4.0	...
25877	Geo. A. Vogt		28.0	11.25	7.85	3.4	36.6
25878	New Haven Dairy Co.		28.9	11.89	8.09	3.8	37.1
25879	Jacob Cohen		29.9	11.92	8.42	3.5	37.5
25880	J. R. Cummings		29.4	12.39	8.19	4.2	...
25881	Clover Dairy		30.6	12.24	8.64	3.6	...
25882	C. E. Minor		30.1	12.04	8.44	3.6	...
25883	Whitneyville Creamery		30.1	11.63	8.33	3.3	37.1
26768	R. H. Nesbit Co.		29.4	11.68	8.08	3.6	37.5
26769	New Haven Dairy Co.		30.0	12.13	8.33	3.8	...
26770	†Buckholtz Dairy		27.0	11.49	7.69	3.8	36.0
26771	C. E. Smith		27.8	11.68	7.88	3.8	36.4
26772	New Haven Dairy Co.		29.8	12.39	8.49	3.9	...
26881	*	<i>New London.</i> Schwaner's Market	32.4	12.51	8.91	3.6	...
26882	*		28.0	13.82	8.22	5.6	...
26883	*		29.0	13.53	8.73	5.3	...

* Dipped from can.

† Watered.

TABLE XVII.—MILK SAMPLED AT STORES—Continued.

Station No.	Producer.	Dealer.	Specific Gravity at 60° F.	Total solids.	Solids not fat.	Fat.	Refraction of Copper Serum at 20° C.
26884	*	<i>New London (continued).</i>	28.6	14.16	8.36	5.8	...
26885	*		31.2	12.18	8.48	3.7	...
26886	*		31.2	13.33	8.93	4.4	...
26887	*		31.2	12.14	8.54	3.6	...
26803	Middlebrook Dairy	<i>Norwalk.</i>	30.7	13.62	8.62	5.0	...
26804	N. W. Benedict.		31.5	11.76*	8.76	3.0	37.0
26861	*	<i>Norwich.</i>	29.0	14.87	8.87	6.0	...
26862	*†		26.3	10.20	7.10	3.1	34.3
26863	*		30.7	12.51	8.51	4.0	...
26864	*		33.3	12.60	9.20	3.4	...
26865	*		28.5	13.70	8.20	5.5	...
26866	*		32.3	13.42	9.02	4.4	...
26867	*		28.3	12.53	8.13	4.4	...
26796	†Crosby's Dairy	<i>So. Norwalk.</i>	28.6	10.99	7.69	3.3	30.6
26797	Bean's Dairy		29.8	11.88	8.18	3.7	...
26798	Woodruff's Dairy		29.4	12.05	8.35	3.7	...
26799	"	Nelson Hoyt.	29.3	12.18	8.28	3.9	...

* Dipped from can.

† Watered.

TABLE XVII.—MILK SAMPLED AT STORES—Concluded.

Station No.	Producer.	Dealer.	Specific Gravity at 60° F.	Total solids.	Solids not fat.	Fat.	Refraction of Copper Serum at 20° C.
26800	Bean's Dairy	<i>So. Norwalk (continued).</i>	29.3	12.08	7.98	4.1	...
26801	Webb & Jackson.		30.5	11.78	8.38	3.4	...
26802	Borden's Condensed Milk Co.		29.9	12.72	8.52	4.2	...
26807	C. R. Waterbury	<i>Stamford.</i>	30.4	12.30	8.50	3.8	...
26808	"		30.4	12.04	8.24	3.8	...
26809	"		29.6	12.44	8.34	4.1	...
26810	"		30.3	12.59	8.79	3.8	...
26811	"		29.4	12.40	8.20	4.2	...
26812	S. Tompkins	H. Harris	30.0	12.63	8.63	4.0	...
26813	Long Ridge Dairy	J. M. Wassing	28.6	11.74	8.14	3.6	...
26849	*	<i>Waterbury.</i>	31.5	12.79	8.59	4.2	...
26850	*		29.9	11.76	8.36	3.4	37.0
26851	*†		26.3	10.73	7.33	3.4	34.7
26852	*		29.7	12.48	8.28	4.2	...
26853	*		31.5	11.71	8.61	3.1	37.6
26854	*		29.5	13.78	8.48	5.3	...
26855	Worden Dairy		30.5	12.47	8.37	4.1	...
26856	"		30.5	12.49	8.49	4.0	...
26857	George Dreher.	Palace Fruit Store.	31.6	12.71	8.91	3.8	...

* Dipped from can.

† Watered.

‡ Contained formaldehyde.

The sample from A. Sirica, Waterbury, besides being watered, contained formaldehyde. The watered sample from Mrs. B. Schultz, New Haven, was dirty and contained a whole shrimp and the thigh of a grasshopper.

Eight of the watered milks bore either on the bottle or the cap the name of the dairy from which they were bought. Just who is responsible for the added water cannot be determined. If the dairyman is innocent his protection lies in refusing to sell to a dealer who "doctors" his milk. On the other hand, if the dealer is innocent, the facts published herewith should lead him to patronize another dairyman for his own protection.

The quality of milk varied greatly in the different cities. In Hartford, Meriden, New Britain, and New London the milk was exceptionally good, all the thirty-six samples exceeding the standard for solids, and only one being deficient in fat. On the other hand, the milk sold in Bridgeport, Danbury, Middletown and New Haven was distinctly inferior. Of these fifty-six samples, twenty-eight were below standard in solids and eleven in fat. Of the sixteen Bridgeport samples, seven were watered and one was skimmed. If the Hartford stores can sell good milk there is no reason why Bridgeport and New Haven stores cannot do the same.

In the table, all full face figures indicate failure to reach the standard required. It is not intended, of course, to classify the samples so marked as being adulterated. Where actual adulteration was found it is indicated by proper references to the foot notes following the table.

PAPRIKA.

The definition of paprika in the standards is as follows: "Paprika is the dried ripe fruit of *Capsicum annuum* L., or some other large-fruited species of *Capsicum*, excluding seeds and stems." In spite of this definition, which prescribes that only the pod shells shall be used, commercial samples, as a rule, contain the seeds as well, only the stems and placentæ being rejected.

Ground paprika has a deep, red color and a sweetish, mildly pungent flavor. The inferior grades are sometimes artificially colored to give them the appearance of high-grade paprika,

TABLE XVIII.—ANALYSES OF PAPRIKA.

Station No.	Brand.	Cost per package.	Net Weight.		Alcohol Extract.	Ether Extract. Official Method.			Ether Extract. Provisional Method.		Crude Fiber.	Color.
			Claimed.	Found.		Total.	Volatile.	Non-Volatile.	Total.	Iodine No.		
25454	National Brand Pure Paprika. Archibald and Lewis Co., New York.	10	..	2.2	28.71	21.35	0.40	20.95	18.24	114.9	20.17	*Natural.
25824	Pure Hungarian Paprica Sweet Pepper. Austin, Nichols and Co., New York.	15	..	2.5	28.35	14.39	0.39	14.00	11.77	131.2	21.18	"
25809	Allerfeinster Rosen-Paprika legsinomabb. S. J. Benisch, Szegedin, Hungary.	15	..	1.2	27.42	14.40	0.01	14.39	12.93	129.3	19.90	"
25590	Paprika Hungarian Sweet Pepper. Bennett, Simpson and Co., New York.	15	2	2.1	25.71	15.55	0.48	15.07	13.13	133.3	21.42	"
25583	Paprika Sweet Red Pepper. The A. Colburn Co., Philadelphia.	15	..	1.5	27.99	15.40	0.57	14.83	12.87	122.3	19.24	"
25588	Gauntlet Paprika. E. R. Durkee and Co., New York.	10	1	1.0	30.84	15.43	0.38	15.05	12.59	127.0	20.98	"
25613	"	8	3/8	0.9	28.97	14.67	0.39	14.28	11.69	131.4	24.64	"
25585	A. and P. Paprika. The Great Atlantic and Pacific Tea Co., New York.	10	..	1.9	27.04	15.47	0.47	15.00	13.42	129.1	20.48	"
25586	Premier Hungarian Rosen Paprika. Francis H. Leggett and Co., New York.	10	..	1.7	27.92	16.00	0.70	15.30	13.63	123.3	19.39	"
25655	Rosen Paprika with Olive Oil. National Spice Co., New York.	10	..	1.0	25.84	16.09	0.24	15.85	13.63	123.8	20.58	"
25584	Sovereign Spices Paprika. The Union Pacific Tea Co., New York.	15	..	2.8	25.69	16.66	0.24	16.42	14.48	123.2	20.90	"
25455	Ambassador Brand Absolutely Pure Paprika. James Van Dyk Co., New York.	15	..	2.3	24.98	15.10	0.55	14.55	12.05	131.5	21.30	"
25587	Ambassador Brand Absolutely Pure Paprika. James Van Dyk Co., New York.	15	..	2.1	26.16	15.36	0.53	14.83	11.89	130.1	19.52	"
25589	Arrow Mills Pure Paprika. Van Loan, Maguire and Gaffney, New York.	10	..	2.2	30.91	19.28	0.70	18.58	15.73	110.3	18.47	"
25612	Winowitz Brand Hungarian Sweet Pepper.	8	..	1.0	25.97	16.88	0.50	16.38	14.19	129.9	26.71	"

* In the sense that no added color, as such, was present.

and sometimes the color of the poorer grades is intensified by grinding the pods with olive oil. The seeds and the placenta contain certain sharp, pungent properties, which are not desirable in a high-grade article. The finer grades, therefore, consist only of ground selected, well-ripened and highly-colored pods from which the stems and more or less of the seeds have been removed. In the poorer grades, inferior pods are used, from which the seeds or even the stems are not removed; sometimes the seeds and stems of the finer grades are also added. One grade, known as the "Mercantile," is composed entirely of ground stems and other refuse.

Fifteen samples, representing thirteen brands, were analyzed. The chief purpose of the inspection was to ascertain whether or not added oil or artificial color had been employed.

Methods of Analysis.

Alcohol extract. (See U. S. Dept. Agr., Bur. of Chem., Bull. 107 (revised), p. 163.)

Ether extract, official method. Ibid., p. 163.

Ether extract, Provisional method; and Iodine number. (See U. S. Dept. Agr., Bur. of Chem., Bull. 137, p. 81.) The method there given was used with a few modifications as follows: Five grams of material (later two grams, which is better) were desiccated over sulphuric acid for at least twelve hours; Gottlieb tubes were filled to the 75 cc. mark with absolute ether. The desiccated paprika was brushed into the tube and the exact reading on the tube noted. This was allowed to stand for one hour, shaking three times meanwhile for two to three minutes each time. An aliquot of the clear supernatant liquor, equivalent to nearly two grams, was drawn off and the ether distilled off, at low temperature, over an electric plate. The last traces of ether vapor were removed in air by gentle heat, and the flask then heated in a steam oven for thirty minutes, cooled and weighed. The ether extract was then transferred to wide-mouthed bottles with 10 cc. of chloroform, the flasks being dried in a steam oven, cooled, and weighed, obtaining the weight of extract by difference. The iodine number was then obtained by using the Hanus solution.

By reference to Table XVIII, it will be noted that the ether extract obtained by this method was always from 1.50 to 3 per cent. lower than that secured by the official method. It has been shown by Seeker* and others that the long-continued extraction of the official method appears to remove some substance having a small iodine absorption, thus lowering the iodine value of the ether extract of the paprika. It would seem that

the official method gives the truer value for ether extract, but when the iodine number is to be determined, the extract obtained by the provisional method is to be preferred. In our samples the iodine numbers of the official ether extract ranged from 92.1 to 122.2; average, 105.6; those of the provisional ether extract from 110.3 to 133.3; average, 126.0.

Crude fiber. Usual method.

All the samples, except **25655**, which was declared to contain olive oil, were sold as straight paprikas, and the weights claimed on the label were found correct in all cases. The price ranged from 8 to 15 cents for from one to nearly three ounces.

The alcohol extract ranged from 24.98 to 30.91, variations which have no particular significance.

The total ether extract (official) ranged from 14.39 to 21.35, two samples, **25454** and **25589**, having abnormally high percentages, 21.35 and 19.28 respectively. These samples, as will be noted below, had the lowest iodine numbers of any of the samples.

The volatile ether extract (official) ranged from 0.01 to 0.70.

Our chief basis for judging as to the presence of added oil rests on the provisional ether extract and its iodine value. Doolittle and Ogden,* using a somewhat similar method with samples of known origin, found that "paprika produced from the shells alone contains not to exceed 7.50 per cent. of ash, and not to exceed 8.00 per cent. total ether extract, having an iodine number of not less than 127, while paprika made from the whole pods contains not to exceed 7.50 per cent. ash, and not to exceed 13.00 per cent. of total ether extract, having an iodine number of not less than 130."

Using these figures as a basis, it would appear that none of our samples consisted of shells alone. The total ether extract (provisional) ranged from 11.69 to 18.24, while the iodine numbers ranged from 110.3 to 133.3. Without trying to judge these samples too strictly, the high ether extract and the low iodine number of **25454** and **25589** indicate that these samples contained an added oil. **25655** also contained added oil, but its presence was declared on the label.

Crude fiber in the samples ranged from 18.47 to 26.71, the latter figure, obtained in **25612**, appearing to be excessive.

*U. S. Dept. Agr., Bur. of Chem., Bull. 132, p. 116.

*Jour. Amer. Chem. Soc., 30, p. 1486.

ROOT BEER EXTRACT.

Twelve samples were examined. In the absence of a standard for this preparation, no legal objection can be made to any of these samples except **25095**, which contained 0.78 per cent. of sodium benzoate, nearly eight times as much as claimed on the label. The high alcohol content of **25025** and **25069** would certainly not yield a temperance beverage. Glucose appeared to be the sweetening agent commonly employed, as the eight samples polarized all showed its presence. The solid matter in the extracts varied greatly, ranging from 24.76 to 62.14 per cent.; the ash and sugars likewise were very variable.

TABLE XIX.—ROOT BEER EXTRACT.

Station No.	Brand.	Price per bottle, cts.	Specific gravity at 15.5° C.	Alcohol by weight.	Solids.	Ash.	Sodium Benzoate.	Polarization at 19° C.	
								Direct.	After Inversion.
25052	Monarch Brand. A. F. Beckmann & Co., New York.....	10	1.1582	1.77	36.26	1.46	0	15.6	14.0
25025	A. & P. The Great Atl. and Pac. Tea Co., New York.....	10	1.2259	7.68	51.02	1.94	0	*	*
25019	Hires' Household Extract. The Charles E. Hires Co., Philadelphia	15	1.1253	0	29.82	0.42	0	15.2	14.0
25069	Knapp's. The Knapp Extract Co., New York.....	12	1.1142	9.33	29.94	1.06	0	*	*
25096	Kronan's Pure Extract För Svagdricka. Kronan's Extract Co., Worcester, Mass.....	20	1.2702	1.28	62.04	1.55	0	28.0	24.8
25097	Lundin's Condensed Juniper-Ade. Lundin & Co., Chicago.....	20	1.2987	0	62.14	0.46	0	21.8	0.0
25020	Mammoth Brand. Made at Hartford.....	10	1.1090	0.92	25.91	0.30	0	13.6	13.0
25051	Premium Brand. Made at Hartford.....	15	1.1057	0.76	24.76	0.25	0	10.8	9.6
25095	Extract for Svensk Öl. Stroh-meyer & Arpe Co., New York..	15	1.1985	0	43.48	1.24	10.78	30.7	26.9
25582	Svensk-Öl Extract. The Swedish Importing Co., Worcester, Mass.	15	1.1934	0.36	42.92	0.31	0	*	*
25018	Williams' Concentrated. The Williams & Carleton Co., Hartford..	13	1.1374	1.12	32.53	0.36	0	20.0	18.0
25089	UN-X-LD. Packed for Wise, Smith & Co., Hartford.....	12	1.1545	0.32	34.70	1.14	0	*	*

*Insufficient sample left to polarize. †One-tenth of one per cent. claimed on the label.

RELISHES.

Twelve samples were analyzed. With three exceptions, these were labeled as compounds. In two of the three no benzoic or salicylic acid or saccharin was found, and not more than a trace of alum. **25796** contained no benzoic or salicylic acid, but did contain saccharin; its sale, therefore, is illegal. Another sample contained no preservatives, but .02 per cent. of alum was present. The remaining eight samples contained benzoic acid, as declared on the label. Alum was found in traces or up to .048 per cent. in all but two samples. **25795** must be considered as misbranded, for it is "Guaranteed absolutely pure," although it contains sodium benzoate and alum.

SALAD DRESSING.

In the absence of a standard for salad dressing, objection can only be based on the presence of chemical preservatives and coloring matter. It is interesting, however, to note the very wide range in composition of materials of this character.

Four of the twelve samples claimed on the label to be "mayonnaise dressing." The Century Dictionary defines this dressing as "a sauce composed of yolks of eggs and salad oil beaten together with vinegar or lemon juice to the consistency of thick cream, and seasoned with salt, pepper, garlic, etc." A true mayonnaise dressing, then, should at least contain oil, eggs and vinegar. The absence of phosphoric acid in the product would prove that eggs had not been used, although its presence would not necessarily mean that egg solids were present. These four samples contained from 0.32 to 0.61 per cent. phosphoric acid, from 46.05 to 59.40 per cent. of oil, and acetic acid from 1.68 to 1.80 per cent. The use of oil, eggs and vinegar, therefore, seems fairly well established, and these preparations may be properly labeled as mayonnaise dressings. In three of the four, turmeric, a yellow coloring matter, was present. In **25657**, **25692** and **25439** the oil used was cotton seed oil, as indicated by the positive Halphen test and the iodine numbers and refractive indices. In **25656**, while a positive Halphen test was obtained, the lower iodine number and refractive index suggest the possible presence of olive oil as well.

TABLE XX.—

Station No.	Brand.	Price per bottle, cts.	Polarization.		
			Direct.	After Inversion.	Temperature.
25836	Diamond Brand India Relish. A. C. Blenner & Co., New Haven.....	10	0.0	0.0	23
25606	Columbia Sweet Piccalette. Columbia Conserve Co., Indianapolis, Ind.....	15	-6.5	-6.93	23
25796	Pepper Relish 20th Century Brand. F. W. Dixon, East Hartford.....	10	-1.0	-0.33	23
25807	Doyle's Country Club India Relish. The John T. Doyle Co., New Haven.....	10	0.8	-5.28	23
25660	Doyle's Country Club India Relish. The John T. Doyle Co., New Haven.....	10	-3.2	-3.3	23
25683	Heinz India Relish. H. J. Heinz Co., Pittsburgh, Pa.....	15	-6.7	-7.26	23
25814	Diamond Relish. Lutz & Schramm Co., Pittsburgh, Pa.....	10	-8.0	-8.80	23
25798	Pepper Relish. The Silver Lane Pickle Co., Silver Lane.....	10	0.0	0.0	23
25795	Waldorf Brand Relish. Williams Bros. Co., Detroit, Mich.....	10	-5.3	-5.72	23
25672	Williams' Sour Relish. The Williams Bros. Co., Detroit, Mich.....	10	0.0	0.0	23
25443	Wilco Sweet Relish. The Williams Bros. Co., Detroit, Mich.....	10	-2.8	-2.75	23
25837	Relish. Richard Zastrow, New Haven.....	10	0.0	0.0	23

25848, although making no claim to be a mayonnaise dressing, had the characteristics of such a preparation, and was far richer in oil than any of the other samples examined. While the Halphen test indicated the absence of cotton seed oil, the iodine number and refractive index were both too high for olive oil. This sample contained only natural color.

RELISHES.

Aluminum Oxide.	Sodium Benzoate.	Salicylic Acid.	Saccharin.	Claims of Label.
.048	Yes	No	No	"Made of chopped pickles, spices, vinegar, etc. Contains no coloring, and is preserved with $\frac{1}{10}$ of 1 per cent. Benzoate of Soda."
.000	"	"	"	"Composed of Green Tomatoes, Onions, Cabbage, Celery, Mustard, Celery Seed, Pepper, Cloves, Allspice, Cinnamon, White Wine Vinegar, Sugar, Salt, Turmeric, $\frac{1}{10}$ of 1 per cent. sod. benzoate."
.009	No	"	Yes	
.016	Yes	"	No	"Benzoate of Soda $\frac{1}{10}$ of 1 per cent."
.010	"	"	?	" $\frac{1}{10}$ of 1 per cent. of benzoate of soda and $\frac{1}{100}$ of 1 per cent. of saccharine."
.000	No	"	No	"Contains no artificial preservative or coloring matter."
.008	"	"	"	
.002	Yes	"	"	"Preserved with $\frac{1}{100}$ of 1 per cent. Benzoate of Soda."
.010	"	"	"	"Composed of cucumbers, onions, cauliflower, string beans, spices, turmeric, sugar and distilled vinegar, with $\frac{1}{15}$ of 1 per cent. Benz. of Soda and $\frac{1}{2}$ of 1 per cent. alum." Around neck "Guaranteed absolutely pure."
.020	No	"	"	"Contains $\frac{1}{4}$ of 1 per cent. aluminum sulphate."
.028	Yes	"	"	"Contains $\frac{1}{15}$ of 1 per cent. Benzoate of Soda, and $\frac{1}{3}$ of 1 per cent. alum. Composed of cucumbers, onions, cauliflower, string beans, spices, turmeric, sugar and vinegar."
.014	"	"	"	"Put up in Pure Malt Vinegar." Around top of bottle: "Preserved with Spice Vinegar, $\frac{1}{10}$ of 1 per cent. Benz. of Soda and Vegetable Coloring."

25723 likewise had the characteristics of a mayonnaise dressing, cotton seed oil being used, and turmeric being present.

The other six samples were preparations of a very different character. The loss at 100° C., chiefly water, in these ranged from 61.12 to 77.08, oil from 2.37 to 11.43, phosphoric acid from

TABLE XXI.—SALAD DRESSING.

Station No.	Brand.	Price per bottle, cts.	Capacity of bottle, oz.	Loss at 100° C.	Solids.	Oil.	Phosphoric Acid.	Acidity as Acetic.	Extracted Oil.			Boric Acid.	Color.
									Iodine No. Hanus.	Refractive Index at 15.5° C.	Halphen Test.		
25723	Sunbeam Pure Food Salad Dressing. Austin, Nichols & Co., New York.	10	5.0	54.01	45.99	21.88	0.36	1.68	109.6	1.4751	Yes	No	Turmeric.
25659	Campbell's Salad Dressing. Joseph Campbell Co., Camden, N. J.	10	8.6	73.19	26.81	6.88	0.24	0.78	95.1	1.4749	No	No	Natural.
25656	†Durkee's Salad Dressing. E. R. Durkee Co., New York.	10	3.4	38.21	61.79	34.99	0.61	1.80	99.6	1.4726	Yes	No	Turmeric.
25657	†Premium Brand Salad Dressing. East India Tea Co.	15	4.1	53.73	46.27	23.09	0.32	1.68	110.0	1.4744	Yes	No	"
25692	†Green Seal Brand Salad Dressing. Farrington & Whitney, New York.	10	4.8	53.95	46.05	22.55	0.36	1.68	111.7	1.4751	Yes	No	"
25438	My Wife's Salad Dressing. Fred Fear, Chicago.	20	8.1	77.08	22.92	8.10	0.35	1.50	105.3	1.4744	Yes	No	*Naphthol Yellow S.
25732	Haaker's Delicious Salad Dressing. Wm. Haaker & Co., New York.	10	6.5	68.57	31.43	7.82	0.58	1.86	100.0	1.4739	No	No	Turmeric.
25670	Royal Salad Dressing. The Horton-Cato Mfg. Co., Detroit, Mich.	10	5.3	61.12	38.88	11.43	0.58	1.50	96.7	1.4740	No	Yes	"
25848	Howard's Salad Dressing. J. F. Howard, Haverhill, Mass.	25	7.6	38.47	61.53	53.97	0.61	1.56	107.4	1.4735	No	No	Natural.
25669	†Dandy Salad Dressing. Kittredge & Co., Boston.	10	6.1	74.75	25.25	2.37	0.32	1.08	91.9	1.4741	....	No	"
25668	Snider's Salad Dressing. The T. A. Snider Preserve Co., Cincinnati, O.	10	4.2	76.99	23.01	3.42	0.28	1.26	94.4	1.4736	No	No	"
25439	†Sovereign Salad Dressing. The Union Pacific Tea Co., New York.	15	6.4	40.60	59.40	34.12	0.50	1.80	110.6	1.4766	Yes	No	"

* A permitted coal-tar color; color declared on label. † Labeled "Contains $\frac{1}{10}$ of 1% Benzoate of Soda." ‡ Sold as a "mayonnaise" dressing.

0.24 to 0.58, and acetic acid from 0.78 to 1.86 per cent. One was colored with naphthol yellow S, a permitted color, two with turmeric, and in three the color was natural. Eggs appeared to be a component of all the samples. In **25438**, cotton seed oil was present. **25670** contained boric acid.

VINEGAR.

Thirteen samples of vinegar, sold in bottles, were examined. A much more extensive inspection was made later on samples collected by the dairy commissioner (see page 206 et seq.).

The labeling of the samples is shown below:

25684. Genuine Cider Vinegar, with a rich, mellow flavor. Haynes-Piper Co., Boston.

25572. Pure Cider Vinegar. H. J. Heinz Co., Pittsburgh.

25838. Pure Cider Vinegar. A. C. Blenner & Co., New Haven.

25853. A. and P. Brand Pure Cider Vinegar, Clarified. The Great Atlantic and Pacific Tea Co., Jersey City, N. J. (Distributor).

25774. Pure Malt Vinegar. H. J. Heinz Co., Pittsburgh.

25784. Newport Pure Malt Vinegar. The Lathrop Co., Hartford.

25808. Malt Vinegar flavored with Tarragon. Crosse and Blackwell, London, Eng.

25852. Pure Malt Vinegar. Crosse and Blackwell, London, Eng.

25771. Doyle's Distilled Vinegar with Malt Added. The John T. Doyle Co., New Haven.

25854. A. and P. Brand Distilled Spirit Vinegar. The Great Atlantic and Pacific Tea Co., Jersey City, N. J. (Distributor).

25855. Distilled Spirit Vinegar. A. C. Blenner & Co., New Haven.

25717. Spiced Salad Vinegar Distilled. H. J. Heinz Co., Pittsburgh.

25773. White Pickling and Table Vinegar. H. J. Heinz Co., Pittsburgh.

The four samples sold as cider vinegar all satisfied the legal requirements of 4 per cent. acidity and 2 per cent. solids, and if judged by that standard alone, would be passed as cider vinegars. The insufficiency of this standard, however, is well known.

TABLE XXII.—VINEGAR.
(Grams per 100 cc.)

Station No.	Brand.	Specific gravity at 15.6° C.	Alcohol.	Total Acids, as acetic.	Volatile Acids, as acetic.	Solids.	Polarization at 20° C. (°V).	Reducing Sugars.		Ash.		Alkalinity of Water-Soluble Ash, (cc. N. acid).	Phosphoric Acid (mgms. per 100 cc.).	Malic Acid.	Lead No.	Glycerine.	Pentosans.	Per cent. Ash in Total Solids.	Per cent. Ash in Non-Sugar Solids.	Per cent. Reducing Sugars in Total Solids.	Glycerine Ratio.		
25684	Haynes-Piper Cider.	1.0161	..	5.00	4.88	2.55	—	1.21	0.71	0.72	1.83	0.33	0.06	30.4	23.4	0.214	.150	0.29	0.20	12.9	18.0	28.2	8.8
25772	Heinz Cider.	1.0180	0.19	5.36	5.30	2.45	—	3.19	1.17	1.18	1.27	0.32	0.08	29.6	21.2	0.154	.110	0.24	0.16	13.1	25.2	48.2	12.0
25838	Blenner Cider.	1.0163	0.19	4.08	4.02	2.57	—	0.44	0.48	0.51	2.06	0.44	0.09	41.6	30.3	0.174	.152	0.28	0.20	17.1	21.4	19.8	7.9
25853	A. and P. Cider.	1.0148	0.02	4.56	4.32	2.37	—	1.76	0.85	0.89	1.48	0.40	0.06	38.4	23.7	0.101	.148	0.06	0.19	16.9	27.0	37.6	39.1
25774	Heinz Malt	1.0143	..	4.78	4.24	2.37	—	2.20	0.45	0.54	1.83	0.27	0.17	2.6	88.3	.....	.524	...	11.4	14.8	22.8	..
25784	Newport Malt.	1.0127	..	5.88	5.40	2.14	dark	100	0.66	0.75	1.39	0.25	0.15	1.6	68.9	.....	.424	...	11.7	18.0	35.0	..
25808	C. and B. Malt with Tarragon.	1.0136	..	5.56	5.40	2.41	—	2.64	0.78	0.87	1.54	0.54	0.21	17.2	104.1	0.342	.667	...	22.4	35.1	36.1	..	
25852	C. and B. Malt.	1.0179	..	6.12	5.92	2.58	dark	100	0.51	0.61	1.97	0.36	0.16	7.2	86.2	.....	.380	...	14.0	18.3	23.6	..
25771	Doyle Distilled	1.0076	..	4.44	4.36	0.24	±	0.00	0.13	0.13	0.11	0.06	0.03	1.0	2.6	0.074	.002	...	...	...	...	..
25854	A. and P. Distilled	1.0060	..	4.30	4.30	0.14	±	0.00	0.03	0.06	0.08	0.03	0.02	1.0	4.8	0.020	.000	...	...	...	...	..
25855	Blenner Distilled	1.0030	..	3.70	3.70	0.14	±	0.00	0.01	0.03	0.11	0.02	0.01	1.4	0.0	0.067	.000	...	...	...	...	..
25717	Heinz Spiced Salad Distilled.	1.0747	..	5.40	5.40	14.57	—	13.42	10.19	10.24	4.33	3.28	0.08	1.6	17.1	0.121	.180	...	...	...	...	..
25773	Heinz White Pickling.	1.0070	..	5.22	5.20	0.11	±	0.00	0.03	0.03	0.08	0.03	0.02	0.6	1.0	0.054	.000	...	...	...	...	..

25684, by its high reducing sugars and pentosans, indicates the addition of a material high in sugars, such as apple waste. 25772, by its high reducing sugars, high polarization and low non-sugar solids, shows the addition of boiled cider. 25838, while containing a rather high ash and high percentage of pentosans, is passed as cider vinegar. 25853 is high in reducing sugars, high in ash and very low in glycerine. Its analysis indicates the addition of distilled vinegar, or acetic acid, mineral matter and a material high in sugars, such as apple waste. It also contained an unusually high percentage of non-volatile acid.

The standard for malt vinegar requires that it shall be dextro-rotatory, and shall contain not less than 4 gms. of acetic acid, not less than 2 gms. of solids, not less than 0.2 gm. of ash, and an alkalinity of soluble ash equivalent to not less than 4 cc. of decinormal acid per 100 cc. The four samples examined satisfied the standard in acidity, solids and ash. 25774, however, was lævo-rotatory and low in alkalinity, and is not a pure malt vinegar. 25784 was too dark to polarize: its alkalinity was extremely low. 25808 was lævo-rotatory, but it was not sold as pure malt vinegar. 25852 appeared to be genuine.

The only requirement for distilled vinegar in the standard is 4 per cent. acetic acid. The five samples all satisfied this requirement, except 25855, which was slightly below standard. The labeling of 25771 is open to serious objection, as the amount of "malt added" is extremely small, only enough to color the distilled vinegar so as to resemble cider or malt vinegar. There is no legal objection to the sale of distilled vinegar, if sold as such, but Section 2564 of the Connecticut Statutes explicitly forbids the sale of any vinegar to which any coloring matter has been added.

25717 is a most unusual vinegar. It contained 14.57 per cent. of solids, of which 10.24 per cent. was reducing sugars and 3.28 per cent. of ash.

Methods of Analysis.

The usual methods were used for all determinations, except for glycerine and pentosans. For glycerine, the modified method for wines, as given in Bull. 137, U. S. Dept. of Agr., Bur. of Chem., p. 61, was used. For pentosans the official method was used, Bull. 107, U. S. Dept. of Agr., Bur. of Chem., p. 54, 100 cc. of vinegar being taken and 43 cc. of hydrochloric acid (sp. gr. 1.19) added, the distillation then being conducted exactly as directed in the Bulletin.

WORCESTERSHIRE AND OTHER TABLE SAUCES.

Six samples of Worcestershire and fourteen samples of miscellaneous table sauces were examined. In no case was benzoic or salicylic acid found. One sample, 25432, contained saccharin, which was declared on the label. The acidity ranged from 1.14 to 3.72 per cent. acetic acid, and the total sugars from none to 28.8 per cent.

TABLE XXIII.—WORCESTERSHIRE AND OTHER TABLE

Station No.	Brand.
25607	The 20th Century Brand Worcestershire Sauce. Lewis De Groff & Son, New York
25794	Lea & Perrins' Worcestershire Sauce. John Duncan's Sons, New York
25436	Worcestershire Sauce. Holbrook & Co., Stourport, Eng.
25431	John Bull Genuine Worcestershire Sauce. The John Bull Co., Ltd., Hull, Eng.
25770	Westminster Brand Genuine Worcestershire Sauce. Miner, Read & Tullock, N. H.
25432	Worcestershire Sauce. Ralph, Pembroke & Sons, Worcester, Eng.
25437	¹ Brand's International Sauce, The A. G. F. Heublein & Bro., Importers
25785	² The Original Bengal Club Chutney. Crosse & Blackwell, London, Eng.
25435	Celebrated Challenge Sauce. E. R. Durkee & Co., New York
25815	Longfield's Sauce, North of England Brand. The Garret Bergen Co., Brooklyn, N. Y.
25687	Heinz Gold Medal Sauce. H. J. Heinz Co., Pittsburgh
25781	Excelsior Table Sauce. The E. S. Kibbe Co., Hartford
25797	Indian Brand Table Sauce. New England Supply Co., Providence, R. I.
25806	Andrews Brand Sauce. E. Pritchard, New York
25693	Eddy's Brand Old English Style Sauce. E. Pritchard, New York
25442	³ English Royal Relish. J. P. Smith & Co., London and New York
25825	⁴ Snider's Oyster Cocktail Sauce. The T. A. Snider Preserve Co., Cincinnati, O.
25434	Sovereign Sauce. The Union Pacific Tea Co., New York
25433	Deer Brand Table Sauce. H. F. Voss, Brooklyn, N. Y.
25671	The Finest Indian Sauce Waw-Waw. The Waw-Waw Sauce Co., London and N. Y.

¹ Contains 19.67 solids, 3.77 insoluble solids, 4.58 ash and 3.87 sodium chloride.

² Contains 50.39 solids, 4.69 insoluble solids, 3.12 ash and 2.26 sodium chloride.

³ A mustard preparation.

⁴ Contains 20.12 solids, 2.58 insoluble solids, 3.86 ash and 3.10 sodium chloride.

The legality of the claims on the labels is in some cases open to serious doubt. Such claims as "The Only Good Sauce," "Superior to others Best," "Superior to all others," "A fine tonic and digestive," "A wonderful Digestive and Tonic," the manufacturers might have difficulty in substantiating. To label a sauce containing saccharin as "The best sauce extant" is clearly a misstatement of fact.

SAUCES (CONTAINING NO BENZOIC OR SALICYLIC ACID).

Price per bottle, cents.	Acetic acid.	Polarization.			Saccharin.	Claims of Label.
		Direct.	After Inversion.	Temperature.		
10	3.72	3.2	-4.84	22	No	"Pronounced by Connoisseurs to be 'The Only Good Sauce.'"
25	2.82	4.0	-3.74	22	"	
18	3.48	-2.6	-2.20	22	"	"Superior to others Best."
20	2.94	-5.0	-4.84	22	"	
10	3.30	1.8	-5.04	22	"	"The best sauce extant," on back, "Compound-Vinegar, Spices, Saccharine, Salt, Sugar coloring and Vegetables."
10	1.38	0.4	0.00	22	Yes	
45	2.88	0.0	-1.54	21	No	"A fine tonic and digestive."
25	2.46	-8.0	-8.80	21	"	
10	2.70	-4.0	-4.64	22	"	"Superior to all others." "Unequalled by any in the world."
10	3.42	0.2	-2.82	22	"	
15	3.18	-3.4	-2.86	22	"	"Contains tomatoes, granulated sugar, salt, vinegar, onions, garlic, horseradish and spices."
10	3.60	-3.0	-2.64	22	"	
10	3.72	-3.4	-2.64	22	"	"The 20th Century Condiment."
10	3.12	-3.0	-3.30	22	"	
10	3.06	2.0	-2.86	22	"	"Prepared from vinegar, tamarinds, spices, vegetables, salt, lemons, sugar and Chinese soy."
13	...	...	...	...	"
10	1.14	0.0	-4.18	21	"	"A Wonderful Digestive and Tonic." "The Only Digestive Sauce."
15	2.40	0.6	-4.18	22	"	
8	2.52	2.6	-0.44	22	"	"A Wonderful Digestive and Tonic." "The Only Digestive Sauce."
20	2.82	-3.4	-3.08	22	"	

MISCELLANEOUS FOODS

CREAM OF TARTAR. Three samples were analyzed, **25651** and **25823** bought in bulk without the name of the manufacturer, and **25776** made by James P. Smith & Co., New York and Chicago. All the samples were of a high degree of purity.

PREPARED COFFEE. **25849**. *G. Washington Prepared Coffee*. G. Washington Coffee Refining Co. of New York. Sold by John Gilbert & Son, New Haven. Price, 35 cents per can, containing 50 gms. of the preparation. The following chemical data were obtained:

Soluble in cold water	94.84
Ether extract (not fat; probably largely caffeine)	1.16
Total ash	16.25
Water-soluble ash	12.84
Water-insoluble ash	3.41
Nitrogen	3.32
Potash, water-soluble	8.78
Chlorine	Trace.
Carbonic acid in insoluble ash	Present.
Alkalinity of 1 gm. soluble ash	17.13 cc. $\frac{N}{10}$ acid.
Lime in insoluble ash	Present.

The analysis indicates that this material is a finely ground, dried coffee extract.

CEREAL COFFEE. **25134**. *Dr. Johnson's Educator Substitute for Coffee*. Johnson Educator Food Co., Boston, Mass. Sold by R. T. Whiting, Bridgeport. Price, 25 cts. per 379 grams. It contained 5.58 water, 1.88 fat, 8.70 fiber, 2.54 ash, 16.25 protein, 42.57 starch, and 22.48 other carbohydrates. No coffee was detected in the sample.

JAM. **25782**. *Seal Brand Apricot and Apple Jam*. P. J. Ritter Conserve Co., Philadelphia. Sold by Brown, Thomson, & Co., Hartford. "Contains no preservative and no artificial color." Solids, 58.51; polarization at 21° C., direct, +6.80, after inversion, -12.10; benzoic and salicylic acid, none; color, natural. Not found adulterated.

25832. *Strawberry*. Logan, Johnson & Co., Boston. Sold by James M. Young & Son, Willimantic. "Prepared from fresh fruit, granulated sugar, enough corn syrup to prevent crystal-

lization and $\frac{1}{10}$ of 1 per cent. sodium benzoate. Solids, 77.47; polarization at 21° C., direct, +35.60, after inversion, +6.82; benzoic acid, present; color, natural. A legally labeled compound.

25805. *Le Roy Extra Quality Strawberry*. Le Roy Packing Co., Boston. Sold by City Market, New London. Solids, 69.66; polarization at 21° C., direct, +23.20, after inversion, +5.06; benzoic acid, present; color, natural. Adulterated, as it contained glucose and benzoic acid, not declared on the label; misbranded as it is not of "extra quality."

MELTOSE. **25846**. *Sanitas Meltose*. The Kellogg Food Company, Battle Creek, Mich. "A pure carbohydrate and contains 86 calories to the ounce." "Should be substituted for cane sugar, honey, syrup, and all artificially prepared sweets, which produce diabetes," etc. It analyzed as follows: Water, 26.81; ash, 0.46; nitrogen $\times 6.25$, 0.63; reducing sugars as maltose, 47.09; sucrose by Clerget, 2.08; dextrin, 18.80; other carbohydrates by difference, 4.13. A 5 per cent. solution in a 200 mm. tube polarized at 20° C., direct, +32.1, and after inversion, +31.57. Its specific rotation A_D was 111.3°. Our analysis substantially confirms that given on the label. From the label, however, it appears that this preparation is especially recommended as a diabetic food, a recommendation which is not justified by our analysis. That the articles named, sugar, honey, syrup, etc., "produce diabetes" would be startling if true.

CONDENSED SOUPS. Two samples of condensed soup were analyzed, both made by C. H. Knorr, Heilbronn, Germany. **25734**, *Knorr's Readymade Pea Soup (Erbswurst)*, *Knorr's Pea Soup with Bacon*. Price, 10 cts. for 113 gms., about 4 oz. **25735**. *Knorr's Readymade Bean Soup*. Price, 10 cts. for 124 gms., or 4.4 oz.

The analyses were as follows:

	25734	25735	25851
Water	9.58	11.01	6.56
Fat	8.99	6.19	1.67
Ash	14.96	16.01	65.21
Protein (N $\times 6.25$)	21.38	19.31	
Carbohydrates, including fiber, by difference...	45.09	47.48	
Nitrogen	3.42	3.09	3.89
Sodium chloride, calculated from chlorine.....	12.52	12.79	59.48

The samples are condensed foods, apparently true to name. Both samples show the addition of considerable fatty material and common salt to the vegetables specified.

25851. *Steero Bouillon Cubes*, made by American Kitchen Products Co., New York. "A cube makes a cup." "A highly concentrated extract made of Beef and Vegetables." Price 35 cts. per 12 cubes, weighing 52 gms. For analysis see above.

These cubes contain considerable nitrogenous matter and fat. They also contain over half their weight of common salt. At the price charged for twelve cubes one pound of the cubes would cost \$3.05. The six-tenths of a pound of salt contained in this quantity could be purchased separately for about one cent. It is apparent, therefore, that while the bouillon cubes may offer many conveniences in their use, they are a very expensive form of food.

II. DRUG PRODUCTS.

LINIMENTUM CAMPHORÆ.

(*Camphor Liniment.*)

Twenty-three samples of camphor liniment were bought from druggists who in the past had sold this preparation of less than standard quality. Eighteen contained from 18.0 to 25.6 per cent. of camphor, in no case less than 90 per cent. U. S. P. strength, and in only three cases less than 95 per cent. U. S. P. The refractive index at 25° C. ranged from 1.4690 to 1.4716, indicating that cottonseed oil had been used in all cases.

In four of the other samples, the camphor ranged from 12.0 to 17.6 per cent., or from 60 to 88 per cent. U. S. P. strength. These samples were as follows:

No.	Place of Sale.	Camphor %
25447.....	Bridgeport	17.6
25817.....	Norwich	16.1
25648.....	Stamford	15.2
25790.....	Hartford	12.0

Another sample contained 15.7 per cent. camphor and no oil. It was apparently "spirit of camphor."

OLEUM THEOBROMATIS.

(*Oil of Theobroma—Cacao Butter.*)

This oil is commonly known as Cacao or Cocoa Butter. It is much used as an ingredient of cosmetic ointments, as a coating of pills and for preparing suppositories.

The sixteen samples examined satisfied the U. S. P. requirements as to iodine and saponification values. The iodine values ranged from 34.0 to 37.1; average, 35.8; the saponification values from 191.5 to 194.5; average, 193.1.

The cost ranged from ten to twenty cents for two ounces.

TABLE XXIV.—CACAO BUTTER.

Station No.	Brand.	Place of Sampling.	Cost, cents.	Weight.		Iodine Value.	Saponification Value.
				Claimed.	Found.		
				oz.	oz.		
24943	Blooker	Bridgeport.....	10	2	1.9	36.1	193.5
24908	Bensdorf	Hartford	10	2	1.9	35.4	193.5
24909	"	"	20	2	2.0	35.9	193.5
24926	"	"	20	2	2.1	35.3	193.5
24141	"	Meriden.....	20	2	2.0	34.0	193.5
24149	"	New Britain	20	2	2.0	36.4	192.9
24150	Huyler.....	"	20	2	1.7	36.8	194.5
24974	Blooker	New Haven.....	15	2	2.1	35.1	193.5
24992	"	New London.....	20	2	2.0	36.2	192.9
24995	"	Norwich.....	20	2	2.2	36.1	192.5
25021	"	Stamford	10	2	1.8	36.3	192.5
24129	Bensdorf	Waterbury	10*	..	1.0	34.2	192.5
24130	Huyler.....	"	10*	..	0.6	34.8	193.5
24131	Blooker	"	20	2	2.2	37.1	191.5
24132	"	"	20	2	1.9	37.1	192.5
25008	"	Willimantic.....	15	2	1.9	35.7	192.5

*Cost per stick.

COD LIVER OIL AND OTHER EMULSIONS.

Twenty-eight samples were examined. Twenty-two of these were sold as Cod Liver Oil Emulsion with Hypophosphites, one as a plain Cod Liver Oil Emulsion, and five under special proprietary names. Both Cod Liver Oil Emulsion and Cod Liver Oil Emulsion with Hypophosphites are U. S. P. prepara-

TABLE XXV.—COD LIVER OIL AND OTHER EMULSIONS.

Station No.	Brand.	Claims of Label.				Cost per bottle.	Volume of bottle.
		Oil.	Alcohol.	Hypophosphites.	Miscellaneous.		
.....	Laboratory Sample. (U. S. P. except addition of 0.25 cc. H_3PO_4)	%	%	.....	.....	cts.	fl. oz.
25137	American Druggist Syndicate, New York. Premium Emuls. of Pure Norwegian C. L. O. with Hypophosphites.	40	0	Ca, Na.	.....	75	10.2
25488	Carleton & Hovey Co., Lowell, Mass. Father John's Medicine	.....	0	.....	No morphine or poisonous drugs	50	4.3
25138	Cosmopolitan Pharmacy, Bridgeport. Emuls. of C. L. O. with Hypophosphites.	50	4	Ca, Na.	5% glycerine.	50	12.2
25478	Dike Drug Co., New York. Dike's C. L. O. Emuls. with Hypophosphites.	40	0	Ca, Na.	.....	85	12.5
25544	T. P. Gillespie & Co., New Haven. Gillespie's C. L. O. Emuls. with Hypophosphites.	40	0	Ca, Na.	.....	50	12.0
25475	Graeber Pharmacies, Meriden. Emuls. C. L. O. with Hypophosphites.	33 1/3	7	.....	Not U. S. P., 1900.	50	11.7
25477	Halloran's Drug Store, New Britain. Emuls. C. L. O. with Hypophosphites.	33 1/3	7	Ca, Na, K.	Not U. S. P., 1900.	49	11.7
25541	William H. Hull, New Haven. Hull's Emuls. of C. L. O. with Hypophosphites.	25	0	.....	.....	50	15.3
25476	F. M. Kibbe & Co., Meriden. Emuls. C. L. O. with Hypophosphites.	33 1/3	7	Ca, Na, K.	Not U. S. P., 1900.	50	12.2
25513	King Medicine Co., Philadelphia. C. L. O. Emuls. with Hypophosphites.	40	0	Ca, Na.	.....	50	8.3
25486	E. G. Lathrop & Co., Hartford. Emuls. Norwegian C. L. O. with Hypophosphites.	.....	0	Ca, Na.	.....	50	11.3
25820	The Lee & Osgood Co., Norwich. Emuls. of Pure C. L. O. with Hypophosphites.	.....	0	Ca, Na.	.....	75	16.2
25140	John A. Levery & Bro., Bridgeport. Emuls. C. L. O. with Hypophosphites.	40	0	Ca, Na.	.....	65	12.5
25557	Magee's Emuls. of Pure C. L. O. with Extract of Malt and Hypophosphites.	.....	0	Ca, Na.	Malt extract.	100	14.8
25540	New York & London Drug Co., New York. Nyal's Emuls. C. L. O. with Hypophosphites.	40	0	Ca, Na.	.....	75	11.2

TABLE XXV.—COD LIVER OIL AND OTHER EMULSIONS.—Concluded.

Station No.	Brand.	Claims of Label.				Cost per bottle.	Volume of bottle.
		Oil.	Alcohol.	Hypophosphites.	Miscellaneous.		
25136	Will I. Nichols, Bridgeport. Emul. of C. L. O. with Hypophosphites.	33 1/3	7	.....	Not U. S. P., 1900.	50	10.8
25489	The Ozomulsion Co., New York. Ozomulsion.	.....	1 1/2	Ca, Na.	Gualacol and glycerine.	90	16.3
25537	The Chas. H. Phillips Chem. Co., New York. Phillips' Palatable C. L. O. Emuls. with the Soluble Phosphates.	50	0	.....	Sol. of Phillips' Wheat Phosphates-acid (representing those in Wheat), Salicylic acid, Glycerine, Sugar, Gum, Flavoring.	45	5.3
25535	Scott & Bowne, New York. Scott's Emuls. of Pure C. L. O. with Hypophosphites.	.....	0	Ca, Na.	.....	45	6.7
25554	Sharpe & Dohme, Baltimore. Emuls. of C. L. O. with Hypophosphites.	.....	0	Ca, Na.	.....	100	16.2
25536	C. G. Spalding, New Haven. Emuls. C. L. O.	50	0	Ca, Na.	Phosphoric acid 0.4%.	50	15.8
25555	Standard Emulsion Co., New York. Russell Emuls. Mixed Fats, a modified Pancreatic Emulsion.	42	0	.....	Beef suet, cocoanut, peanut and cotton seed oils, oil of cloves, and 0.5% sodium borate.	100	12.0
25492	D. G. Stoughton & Co., Hartford. Emuls. of C. L. O.	50	0	.....	.....	40	6.5
25542	Henry Thayer & Co., Cambridge, Mass. Thayer's Emuls. C. L. O. with Hypophosphites.	33	0	Ca, Na, K.	.....	50	11.7
25139	United Drug Co., Boston. Rexall C. L. O. Emuls. with Hypophosphites.	40	0	Ca, Na, K.	.....	50	13.3
25538	E. Wadewitz, New Haven. Emuls. of Pure Norwegian C. L. O. with Hypophosphites.	.....	0	Ca, Na.	.....	50	11.5
25543	Whitman Chemical Co., Boston. Whitman Emuls. C. L. O. with Hypophosphites.	33 1/3	7	.....	Not U. S. P., 1900.	50	12.3
25576	The Wilson Drug Co., Willimantic. Emuls. of C. L. O. with Hypophosphites.	50	0	Ca, Na.	.....	50	13.2

tions, and should contain about 50 per cent. of cod liver oil by volume.

A sample of the emulsion with hypophosphites was prepared in the laboratory according to the U. S. P. formula, with the single exception of the addition of 0.5 cc. of 85 per cent. syrupy phosphoric acid to facilitate the solution of the hypophosphites. The procedure was as follows: 500 cc. of cod liver oil (sp. grav. 0.9270) were added to 125 gms. of powdered acacia and thoroughly triturated in a mortar to a uniform mixture. 250 cc. of water were added and the mixture further triturated to a complete emulsion, and 4 cc. of oil of gaultheria

TABLE XXVI.—COD LIVER OIL

Station No.	Brand.	Spec. gr. at 15.6° C.	Alcohol by weight.	Oil by weight.	Refractive Index of Oil at 25° C.	Iodine No.	Ash.	Total Phosphoric Acid (P ₂ O ₅)	Phosphoric Acid.
			%	%			%	%	
.....	Laboratory Sample	1.0486	0	43.92	1.4771	137.7	2.25	1.48	Yes
25137	A. D. S.	0.9824	0	39.85	1.4789	137.6	1.98	1.39	No
25488	Father John's Medicine	1.0546	0	36.98	1.4783	149.0	0.76	0.05	..
25138	Cosmopolitan Pharm..	0.9901	4.64*	46.04	1.4795	136.7	0.95	0.55	No
25478	Dike's	1.0181	0	36.82	1.4792	136.2	0.47	0.36	"
25544	Gillespie's	1.0137	0	36.50	1.4763	138.2	0.65	0.37	"
25475	Graeber's	1.0192	5.28*	28.37	1.4798	140.7	1.19	0.74	"
25477	Halloran's	1.0182	5.92*	28.10	1.4798	133.8	1.13	0.71	"
25541	Hull's	1.0118	3.36	23.24	1.4787	135.3	1.96	1.46	Tr.
25476	Kibbe's	1.0207	5.56*	27.84	1.4795	156.1	1.29	0.71	No
25513	King's	1.0152	0	36.50	1.4786	138.7	0.49	0.37	"
25486	Lathrop's	1.0062	2.76	46.71	1.4812	134.4	2.62	2.03	"
25820	Lee & Osgood's.....	1.0444	0	40.30	1.4787	141.0	2.06	1.17	"
25140	Leverly's	1.0156	0	35.54	1.4789	138.4	0.58	0.40	Tr.(?)
25557	Magee's	solid	0	24.27	1.4792	133.0	1.63	0.97	?
25540	Nyal's	1.0172	0	38.28	1.4777	149.8	0.51	0.34	No
25136	Nichols'	1.0160	5.28*	28.47	1.4792	131.2	1.19	0.67	"
25489	Ozomulsion	1.0283	0.64*	37.65	1.4786	158.0	0.66	0.49	"
25537	Phillips'	1.0605	0	44.40	1.4766	137.5	0.65	0.35	Yes*
25535	Scott's	1.0090	0	46.86	1.4795	146.8	2.55	1.85	No
25554	Sharpe & Dohme's	1.0003	2.64	46.44	1.4777	142.4	1.89	1.35	"
25536	Spalding's	1.0175	0	50.39	1.4787	136.9	2.07	1.48	Yes*
25555	Russell's	0.9995	0	34.96	1.4637	66.1	1.58	0.40	?
25492	Stoughton's	0.9965	0	48.15	1.4789	138.2	0.03	Tr.	No
25542	Thayer's	1.0127	0	25.97	1.4786	130.1	3.08	2.29	"
25139	Rexall	1.0242	0	38.86	1.4803	135.2	1.14	0.74	"
25538	Wadewitz'	1.1009	0	30.75	1.4783	140.2	1.88	1.25	"
25543	Whitman's	1.0180	5.56*	27.38	1.4786	132.4	1.30	0.73	"
25576	Wilson's	1.0006	3.28	44.25	1.4757	152.5	1.24	0.76	"

* Claimed on the label.

added. 20 gms. of calcium hypophosphite, and 10 gms. each of potassium and sodium hypophosphites were dissolved in cold distilled water, and 0.5 cc. of 85 per cent. phosphoric acid added to clear the resulting opalescent solution. The volume was then made up to 300 cc., the solution well shaken and filtered. 150 cc. of the filtrate were mixed with 100 cc. of syrup, prepared as directed on p. 435 of the U. S. P., and added to the emulsion, and the whole mass thoroughly mixed in a large evaporating dish.

The analysis of our mixture as thus prepared is shown in Table XXVI.

AND OTHER EMULSIONS.

Hypophosphoric Acid.	Sodium Borate.	Acidity per 100 gms. N (cc.—NaOH) 10	Completeness of Emulsion.	Remarks.
Yes	No			
Yes	No	46	Separation	U. S. P. except addition of 0.25 cc. H ₃ PO ₄ .
"	"	49	"	"
..	"	41	.....	"
Yes	"	12	Sl. separation	Low in hypophosphites.
"	"	45	"	"
"	"	8	Separation	"
"	"	20	Sl. separation	Not claimed to be U. S. P.
"	"	8	No separation	"
"	"	15	Sl. separation	Contains alcohol, not stated on label.
"	"	7	"	Not claimed to be U. S. P.
"	"	9	No separation	Low in hypophosphites.
"	"	48	"	Contains alcohol, not stated on the label.
"	"	39	"	"
"	"	12	Separation	Low in hypophosphites.
?	"	?	.....	Reducing sugars as dextrose before inversion, 14.85%, after inversion, 29.70%.
Yes	"	17	No separation	Low in hypophosphites.
"	"	11	"	Not claimed to be U. S. P.
"	"	15	"	Low in hypophosphites.
No	"	126	Separation	No hypophosphites and only small amount of phosphates; contains salicylic acid.
Yes	"	14	No separation	"
"	"	38	Separation	Contains alcohol, not stated on the label.
"	"	88	"	"
?	0.36*	sl. alk.	No separation	Cod liver oil not claimed, none present; sodium borate present as claimed.
No	No	10	Separation	No phosphates or hypophosphites, none claimed.
Yes	"	14	"	"
"	"	10	"	"
"	"	35	No separation	Low in oil.
"	"	4	"	Not claimed to be U. S. P.
"	"	52	Separation	Low in hypophosphites; contains alcohol, not stated on label.

The following summary shows the average analyses of the fifteen samples sold as U. S. P., of the seven not claimed to be U. S. P., and of the plain emulsion, compared with the laboratory sample.

	Laboratory Sample.	Emulsions sold as U. S. P.	Emulsions not sold as U. S. P.	Plain Emulsion.
Specific gravity	1.0486	1.0170	1.0167	0.9965
Oil	43.92	40.94	27.05	48.15
Refractive index of oil	1.4771	1.4786	1.4791	1.4789
Iodine No. of oil	137.7	140.3	137.1	138.2
Ash	2.25	1.41	1.59	0.03
Total phosphoric acid.....	1.48	0.96	1.04	Tr.
Acidity per 100 gms.	46	32	11	10

The fifteen samples sold as U. S. P., judged by the index of refraction and the iodine number of the separated oil, appear to be made from cod liver oil as claimed. However, they showed wide differences in composition. The specific gravities ranged from 0.9824 to 1.0444, with one exception much lower than that of the laboratory sample. In four cases the low specific gravities were in part due to the presence of alcohol; the use of no syrup or syrup of a low density, or an excessive use of water, would give similarly low gravities. The oil ranged from 30.75 to 50.39, eight of the samples showing a decided deficiency in this essential ingredient. The ash ranged from 0.47 to 2.62, eight samples showing clearly that the required amount of hypophosphites had not been used. The total phosphoric acid ranged from 0.34 to 2.03, eight samples again showing a deficiency in hypophosphites. Phosphoric acid, as such, was found in only one sample, and in this the fact was declared on the label. The acidity of this sample is much higher than any of the other U. S. P. preparations, and is probably due to the phosphoric acid used. Three samples contained alcohol, ranging from 2.64 to 3.28 per cent., which in no case was declared on the label.

The seven samples not sold as U. S. P. preparations can only be judged by comparing their analyses with the claims made for them. With one exception, these samples claim 33 $\frac{1}{3}$ per cent. of oil. We found from 25.97 to 28.47 per cent. by weight. In five of them, 7 per cent. of alcohol was claimed on the label. We found from 5.28 to 5.92 per cent. by weight. One sample claimed 25 per cent. of oil, and 23.24 per cent. was found. It contained 3.36 per cent. of alcohol by weight,

which was not declared on the label. These seven samples contained from 1.13 to 3.08 per cent. of ash, and from 0.67 to 2.29 per cent. of total phosphoric acid, indicating that in all but two cases the amount of hypophosphites added was far below the U. S. P. requirements.

The sample sold as a straight emulsion contained 48.15 per cent. of oil. Its low specific gravity, 0.9965, indicated the absence of the full amount of syrup required by the formula.

Father John's Medicine, although not claimed to be a cod liver oil emulsion, is essentially one, and contained 36.98 per cent. of oil by weight with practically no hypophosphites present.

Magee's Emulsion was a semi-solid preparation, claiming to contain malt extract as well as hypophosphites. It contained 24.27 per cent. of oil by weight, 1.63 per cent. of ash and 0.97 per cent. of total phosphoric acid. It contained reducing sugars as dextrose, before inversion, 14.85 per cent.; after inversion, 29.70 per cent.

Ozomulsion claimed to be an emulsion of cod liver oil, combined with guaiacol, glycerine and hypophosphites. It contained 0.64 per cent. of alcohol by weight, 37.65 per cent. of oil by weight, 0.66 per cent. ash, and 0.49 per cent. of phosphoric acid, indicating about one-third the amount of hypophosphites of the U. S. P. preparations.

Phillips' Palatable Cod Liver Oil Emulsion combined with the Soluble Phosphates claimed 50 per cent. of oil; 44.40 per cent. by weight was found. Its total ash was 0.65 per cent., so that the "soluble phosphates" are present in extremely small amount. The acidity of this material was relatively very high.

Russell's Emulsion Mixed Fats claims no cod liver oil and contains none. It contained 34.96 per cent. of oil by weight whose refractive index was 1.4637 and whose iodine number was 66.1. It contained 0.36 per cent. of sodium borate, somewhat less than claimed on the label. The material had a slightly alkaline reaction.

Comments on the Samples.

Although the U. S. P. preparation requires the use of calcium, sodium and potassium hypophosphites, in only four cases was the potassium salt claimed on the label. In our analyses

no attempt was made to determine the nature of the hypophosphite present, as this was deemed of minor importance.

We make the following criticisms of the samples specified:

25138, 25478, 25544, 25513, 25140 and 25540, were low in hypophosphites.

25541, 25486 and 25554 contained alcohol not declared on the label.

25576 contained undeclared alcohol and was low in hypophosphites.

25538 was low in oil.

Methods of Analysis.

Fat. Gottlieb-Roese method. (See Conn. Expt. Stat., Rept., 1909, p. 192.)

Ash. The cod liver oil used in preparing the laboratory emulsion contained 0.025 per cent., a negligible amount. The acacia contained 3.01 per cent., so that the 125 gms. used contained 3.76 gms. acacia ash, or 0.36 per cent. by weight of the total emulsion. No attempt was made at first to calculate the theoretical amount of ash due to the hypophosphites, because of their well-known tendency to decompose on ignition, and because on igniting them with organic compounds reductions might occur with loss of phosphorus. The ash in the emulsion was determined as follows: Five gms. were weighed into a porcelain capsule, and gently heated over asbestos until the mass began to discolor and decompose. The capsule was then heated in a muffle at low redness until a hard carbonaceous mass remained. This was extracted with hot water, and the filter and contents ignited in the original capsule. Strong ignition did not oxidize the carbon and a black residue persisted. Treatment three times with nitric acid gave a perfectly white ash. The filtrate was added to the capsule, evaporated to dryness, heated to constant weight at dull redness and weighed. A percentage of 2.30 ash was obtained.

Assuming that the hypophosphites used were pure salts, and allowing for the acacia ash, the finished emulsion should contain theoretically 2.27 per cent. ash, which agrees excellently with the determined value, and which somewhat minimizes the theoretical objections referred to above. In view of the above data it was believed that the determination of ash as indicated was a fair measure of the inorganic constituents of the emulsion.

Total Phosphoric Acid. The organic matter of 5 gms. of emulsion is destroyed by digesting with sulphuric acid and potassium sulphate, as in the Gunning method for nitrogen. The residue is boiled with 100 cc. of water, the solution neutralized with ammonium hydroxide and acidified with nitric acid, transferred to a 500 cc. flask, cooled and made up to the mark. From this filtered solution an aliquot of 100 cc., equivalent to 1 gm. of emulsion, is taken, in which phosphoric acid is determined in the usual way with ammonium molybdate.

Test for Phosphoric and Hypophosphorous Acids. Five gms. of emulsion were made up to 200 cc., with water, and filtered. A yellow precipitate, on acidifying with nitric acid and adding ammonium molybdate, indicated the presence of phosphoric acid. The presence of phosphorous or hypophosphorous acid was indicated by the appearance of a white precipitate of mercurous chloride, on acidifying with hydrochloric acid and adding mercuric chloride.

WINE OF THE EXTRACT OF COD LIVER OIL.

The following extracts from a paper in the *Journal of the American Medical Association*, October 13, 1906, p. 1207, describes very clearly the nature and claims of this class of preparations:

"The introduction of cod liver oil as a supposedly easily assimilable nutrient and reconstructive was followed by its extensive use in wasting diseases, especially in phthisis, in the treatment of which it came to be considered almost essential, as it was supposed to possess some mysterious power different from that of other oils. Its unpalatable character led to various devices to render it tasteless and to make it more acceptable to the stomach. Emulsions containing the oil in mixture with other substances were put on the market and served a useful purpose. But the oily nature, imperfectly concealed, was disagreeable to many, and gradually other preparations appeared which attempted to retain the supposed therapeutic virtues of cod liver oil while dispensing with its disagreeable character. This attempt has been carried to the extreme that in many of the cod liver oil preparations now on the market the oil has been entirely eliminated and all that is left of the oil is the name. This is a species of fraud which has been tolerated too long, but which will be kept up so long as physicians are willing to be duped. Some of these articles are said to 'represent' the oil and to possess all its virtues. Others are said to contain oil, while still others are stated to contain 'all the valuable constituents'

"Is cod liver oil to be considered a food or a medicine? A food, certainly. As a food its value will consist in the fats it contains. These fats are more easily oxidizable and are considered more digestible than other fats because of the presence of compounds derived from the liver which favor its emulsification and enable it to penetrate the mucous membrane more easily than other fats. Aside from their nutrient properties we have no evidence that the fats of cod liver oil possess any therapeutic value; if the oil possesses therapeutic qualities they must reside in its non-fatty constituents, and the activity of these non-fatty constituents is not acknowledged by those who have investigated them scientifically. Most pharmacologists believe that whatever virtue there is in cod liver oil depends on its qualities as an easily assimilable fat. On the whole, we must conclude with Cushny that 'cod liver oil has not been shown to have any action apart

TABLE XXVII.—WINE OF THE EXTRACT OF COD LIVER OIL.

Station No.	Brand.	Claims of Label.			Cost per bottle, cts.	Volume of bottle, fl. oz.
		Alcohol.	Hypophosphites.	Miscellaneous.		
25575	Prep. for G. O. Cartier, Willimantic.	16	Ca, Fe, Na, K, Mn.	Malt, Wild Cherry, Hypophos. of Quinine and Strychnine.	50	12.3
25490	Prep. for Goodwin's Drug Store, Hartford.	16	Ca, Fe, Na, K, Mn.	Malt, Wild Cherry, Hypophos. of Quinine and Strychnine.	65	11.8
25539	Katharmon Chem. Co., St. Louis.	8	Ca, Na.	Saccharin, salicylic acid, glycerine.	79	15.8
25558	North American Remedy Co., Philadelphia.	16	Ca, K, Fe, Na, Mn.	Malt, Wild Cherry, Hypophos. of Quinine and Strychnine.	75	15.3
25581	Prep. for Mark N. Sullivan, New Haven.	12	Ca, Na, K, Fe, Mn.	Beef, Malt, Wild Cherry, Hypophos. of Quinine and Strychnine.	75	16.3
25556	Henry K. Wampole & Co., Philadelphia.	17	Ca, Na, K, Fe, Mn.	Malt, Wild Cherry, Hypophos. of Quinine and Strychnine.	100	14.8
25487	less Prep. of the Extract of Cod Liver Made for Wise, Smith & Co., Hartford. Dr. Heckler Brand Palatable Prep. of the Alcoholic Extr. of C. L. Oil, etc.	16	Ca, K, Fe, Na, Mn.	Malt, Wild Cherry, Hypophos. of Quinine and Strychnine.	65	12.0

from that of an easily digested food, and its superiority to some other fats and oils has not been satisfactorily established.

"If, then, the value of cod liver oil depends on the presence of fat as its nutritive constituent, the amount of fat a preparation contains will determine the worth or worthlessness of such a preparation; at all events, a preparation claiming to represent cod liver oil which does not contain fat in some form is fraudulent.

"Some of the so-called cod liver oil preparations are termed extracts of cod liver oil, but are not in fact made from the oil, but from the cod livers instead. They are preparations which, if honestly made, might be worthy of trial, but they are improperly called 'extracts' of cod liver oil, since they do not contain the fat, which is the active constituent of the oil, but the extractives from the liver which may or may not possess therapeutic virtues. So far as we know, however, no satisfactory evidence is forthcoming to indicate that such extractives have any therapeutic value."

The above pronouncement of the official journal of the leading American medical association is unmistakable in its tone. In addition to the above it is interesting to note the definition of "extract" as given in the Century Dictionary:

"A pharmaceutical extract consists of the active principles of a drug, obtained by maceration, percolation or decoction with a suitable menstruum, or by using the expressed juice of the fresh plant and reducing the solution thus obtained to a proper consistency and strength by evaporation. The menstrua used are water, alcohol and ether, or two of these combined, and in some cases aqua ammoniæ, glycerine or hydrochloric or acetic acid is added. . . . Hence 3. A concentration of the principles or elements of anything; a condensed embodiment or representation."

Seven samples of this material were examined. All were labeled to contain alcohol, ranging from 8 to 17 per cent. The alcohol found ranged from 7.50 to 16.59 per cent. by volume, in four cases considerably below the amounts claimed.

No oil was found in any sample.

The extract in six samples ranged from 31.45 to 42.97 gms. per 100 cc. In Hagee's cordial, only 13.18 gms. of extract were found, 10.81 gms. of this consisting of glycerine. The ash ranged from 0.27 to 0.68, Hagee's differing again with a much higher percentage, 1.89. The phosphoric acid ranged from 0.14 to 1.31 per cent., varying quite uniformly with the amount of ash present. All the samples showed a minus polarization, both before and after inversion, except Sullivan's, which polarized plus before and after inversion and at 87° C. This sample contained 8.62 per cent. sucrose and 12.82 per cent. glucose.

None of the other samples contained more than traces of sucrose, except 25556, where 1.11 per cent. was present. Hagee's contained only 1.30 per cent. reducing sugars, calculated as dextrose, while the others contained quite uniform amounts, ranging from 10.84 to 15.02 per cent.

The matter soluble in ether-chloroform, acid solution, ranged from 44.0 to 142.0 mgms. per 100 cc., while that extracted by the same solvents, in alkaline solution, ranged from 2.8 to 17.2 mgms. These extractives are in part alkaloids, probably largely so, especially in the alkaline solution. The large yield of Hagee's in acid solution, 142 mgms., however, was not of an alkaloidal nature, but saccharin and salicylic acid.

Acidity ranged from 17.4 to 39.4 cc. tenth-normal alkali per 100 gms.

Hagee's alone contained salicylic acid and saccharin.

The ash was not tested for potassium or sodium, either one or both of which being probably present as hypophosphites. Iron, calcium and manganese were found in all the samples, except in Hagee's, which contained no manganese.

Quinine and strychnine were detected in all of the samples, except Hagee's and the Narco sample. The latter contained quinine, but strychnine could not be detected in 50 cc. of the sample, although its presence was declared on the label.

TABLE XXVIII.—ANALYSES OF WINE

Station No.	Brand.	Specific gravity at 15° C.	Alcohol by weight.	Alcohol by volume.	Oil.	Extract, gms. per 100 cc.	Ash.	Total Phosphoric Acid as P ₂ O ₅ .	Polarization.		
									Direct.	After Inversion.	Temperature ° C.
25575	Cartier.....	1.1106	7.73	10.83	None	32.61	0.58	0.37	-3.0	-2.86	19
25490	Goodwin.....	1.1045	8.85	12.31	"	31.45	0.68	0.42	-2.8	-2.86	19
25539	Hagee.....	1.0405	5.73	7.50	"	* 13.18	1.89	1.31	-0.6	-0.22	19
25558	Narco.....	1.1506	6.84	9.93	"	42.97	0.65	0.40	-1.8	-2.20	19
25581	Sullivan.....	1.1465	8.09	11.69	"	42.42	0.49	0.23	30.2	+18.7	19
25556	Wampole.....	1.1305	11.64	16.59	"	39.53	0.27	0.14	-1.6	-3.08	19
25487	Heckler.....	1.1047	8.71	12.13	"	31.45	0.67	0.43	-3.0	-3.08	19

*10.81 gms. glycerine per 100 cc.

†Polarized +20.9 at 87° C.=12.82% glucose (+175° V.).

The following statement is made in the *Journal of the American Medical Association*, October 13, 1906, p. 1207:

"The preparations claiming to 'represent' cod liver oil are in liquid form, and if they contain oil it must be one of the following forms:

1. An emulsion of the oil which may be miscible with water, but from which the fat tends to separate and rise to the top. In this form the fat can be seen as globules under the microscope.

2. A solution, resulting from the saponification of the oil, containing a soap which usually will be alkaline in reaction, especially when mixed with water, and from which fatty acids are separated as a precipitate when the solution is acidified.

3. A solution of fatty acids. This will be acid in reaction and will be precipitated by the addition of water, in which the fatty acids are not soluble."

The following tabulation shows the data secured when applying these tests to the samples:

No.	Oil.	Reaction to litmus.	Precipitate on addition of water.	Precipitate on addition of HCl.	Precipitate on addition of HCl, and standing over night.	Pettenkoffer Test for Bile Products.
25575	None.	Acid.	None.	Very Slight.	Flocculent	Negative.
25490	"	"	"	"	"	"
25539	"	"	"	None.	None.	"
25558	"	"	"	Slight.	Flocculent.	"
25581	"	"	"	None.	"	"
25556	"	"	"	Slight.	"	"
25487	"	"	"	Very slight.	"	"

OF THE EXTRACT OF COD LIVER OIL.

Sucrose.	Reducing Sugars as Dextrose.	Mgms. per 100 cc.		Acidity per 100 gms. (cc. $\frac{N}{10}$ NaOH).	Salicylic Acid.	Saccharin.	Metals found in Ash (not tested for Na or K).	Alkaloids found.
		Sol. in ether-chloroform, acid solution.	Sol. in ether-chloroform, alkaline solution.					
Tr.	15.02	66.0	17.2	23.4	None	None	Fe, Ca, Mn.	Quinine, Strychnine.
Tr.	14.28	60.0	11.2	26.2	"	"	Fe, Ca, Mn.	Quinine, Strychnine.
Tr.	1.30	†142.0	3.6	39.4	Yes	Yes	Fe, Ca.	None.
Tr.	10.84	58.0	8.8	20.9	None	None	Fe, Ca, Mn.	§Quinine.
8.62	†12.90	44.0	11.6	17.4	"	"	Fe, Ca, Mn.	Quinine, Strychnine.
1.11	14.02	54.4	2.8	23.0	"	"	Fe, Ca, Mn.	Quinine, Strychnine.
Tr.	12.62	71.6	12.0	25.4	"	"	Fe, Ca, Mn.	Quinine, Strychnine.

†Probably saccharine and salicylic acid.

§No reaction for strychnin in 500 cc. of material.

From these data we conclude, first, that the samples are not emulsions of cod liver oil, for they contain no oil as such. They mix with water without precipitation and therefore cannot contain more than traces of fatty acids. They are all of acid reaction when mixed with water and, on addition of hydrochloric acid, two show none, three very slight and two slight precipitation. On standing over night, strongly acidified, all but Hagee's show a flocculent precipitate. In Table XXVI the amount of this precipitate determined quantitatively is shown to range from 44.0 to 71.6 mgms. per 100 cc. or from .04 to .06 per cent. These figures do not include the Hagee sample with its 142 mgms., or .15 per cent., as this was shown by other tests to consist chiefly of salicylic acid and saccharine. Remembering that these acid extracts obtained with ether-chloroform are in all cases impure products, it is obvious that the maximum amount of saponified fat in these samples cannot exceed .04 or .06 per cent.

These data indicate that none of the samples is entitled to be called a cod liver oil preparation, as none contains either oil or fatty acids and only the merest traces of saponified fat. Hagee's does not even contain this trace.

Furthermore (the Pettenkoffer test giving negative results for bile products in every case), none of the samples is entitled to be called a cod liver product, for no appreciable amount of cod liver extractive is present in any sample.

We are thus obliged to condemn the use of the names under which most of these preparations are sold; it is also important to consider them individually in connection with the specific claims made for each.

25575. *Wine of the Extract of Cod Liver Oil and Iron with Malt and Hypophosphites.* (Prep. for G. O. Cartier, Willimantic.) "A Reconstructive Tonic, Tissue Maker and Nutrient indicated in General Debility, Emaciation, Winter Cough, Bronchitis, Loss of Appetite and as a General Tonic." "This preparation represents the remedial and stimulating principles of the best Norwegian Cod's Liver, freed entirely from the fatty nauseating oil and enhanced medicinally by combination with Extract of Malt, Wild Cherry Bark and the Hypophosphites of Iron, Lime, Soda, Potash, Manganese, Quinine and Strychnine. This preparation agrees with all stomachs and is more palatable and

efficient than plain Cod Liver Oil or any emulsion of Cod Liver Oil." As we have previously stated, leading pharmacologists do not acknowledge that cod liver oil possesses "remedial and stimulating principles" aside from the oil itself. The propriety of claiming that this preparation represents these principles, whose existence is more than doubtful, is certainly questionable. The statement that this wine is more "efficient than Cod Liver Oil or any emulsion of Cod Liver Oil" is glaringly false. The other statements as to its ingredients appear to be true.

25490. *Wine of the Extract of Cod Liver Oil and Iron with Malt and Hypophosphites.* (Prep. for Goodwin's Drug Store, Hartford.) Aside from the name of the druggist the label on this sample is exactly the same in size, type and text as that on **25575**, and the criticisms made apply equally to this preparation.

25539. *Hagee's Cordial of the Extract of Cod Liver Oil Compound.* "Tonic, Stimulant, Alterative, Reconstructive, Nutritive and Digestive." "Each fluidounce represents the extract obtainable from 1-3 fluidounce of Cod Liver Oil (the fatty portion being eliminated), 6 grs. calcium hypophosphite, 3 grs. sodium hypophosphite, 1-16 gr. saccharin, 1-2 gr. salicylic acid (made from oil Wintergreen), with Glycerine and Aromatics." The statement as to hypophosphites appears to be correct. Saccharin and salicylic acid are present as claimed. The qualifying words applied to salicylic acid, "made from oil Wintergreen," are without significance, for salicylic acid is salicylic acid, no matter what its source. Whatever nutritive value this preparation possesses depends upon the alcohol, glycerine and small amount of sugar it contains, and nothing else. The words "Cod Liver Oil" have no proper use in connection with a product like this. It is the weakest preparation of the kind examined and contains saccharin and salicylic acid; it does not even possess the tonic virtues due to the quinine and strychnine contained in the other samples. Its claims are grossly exaggerated.

25558. *Narco Wine of Cod Liver Oil, Alcoholic Extract of the Oil with Malt and Hypophosphites.* "The remedial principles and fat-producing constituents of the best Norwegian Cod Liver Oil, freed entirely from the fatty portion and unpleasant taste of Cod Liver Oil, and enhanced medicinally by combination with Extract of Malt, Wild Cherry Bark and Compound Syrup of the Hypophosphites, containing Lime, Potash, Iron, Soda,

Manganese, Quinine and Strychnine." "This preparation agrees with all stomachs and is more palatable and efficient than pure Cod Liver Oil, or any emulsions of Cod Liver Oil." Inasmuch as cod liver oil is only very slightly soluble in alcohol, an alcoholic extract might be prepared containing practically no oil. The descriptive name used on this preparation, therefore, is a nearer approach to the truth than generally found. However, to state that it contains the "remedial principles and fat-producing constituents" of the oil "freed entirely from the fatty portion" is like saying it contains all the oil except the oil. This claim is false and misleading. The statement that this wine is more "efficient than cod liver oil or any emulsion of cod liver oil" is likewise glaringly false. No strychnine was detected in this sample, although claimed on the label.

25581. *Tasteless Wine of Cod Liver Extract with Beef, Malt and Hypophosphites.* (Prep. for Mark N. Sullivan, New Haven.) "This preparation combines the virtues of cod liver extract (without any disagreeable oily properties) with Beef, Malt, and Hypophosphites. It forms a valuable tonic and nutritive and is useful in coughs, consumption and wasting diseases." No serious objection can be made to this label, aside from the general criticism of the use of the words "cod liver." However, as already pointed out, there appears to be no satisfactory evidence that cod liver extractives, other than the oil, possess any therapeutic value. The sample contains nutriment and possesses tonic properties entirely independent of cod liver. It contains nearly twenty-two per cent. of sugars, over half of which is glucose, but can hardly be recommended as an economical means of obtaining these foods.

25556. *Wampole's Perfected Tasteless Preparation of the Extract of Cod Liver.* "Contains a solution of the extractive obtainable from fresh cod liver, the oily or fatty portion being afterward eliminated. This extractive is combined with Liquid Extract of Malt, Fluidextract of Wild Cherry Bark and Compound Syrup of Hypophosphites (containing Calcium, Sodium, Potassium, Iron, Manganese, Quinine and Strychnine)." In spite of the presence of the different hypophosphites as claimed, the total phosphoric acid in this sample amounts to only 0.14 per cent., so that the amount of hypophosphites present cannot be great. In other respects the label is a reasonably accurate description of the product.

25487. *Dr. Heckler Brand Palatable Preparation of the Alcoholic Extract of Cod Liver Oil with Malt and Hypophosphites.* In essentials this label is the same as those on **25490** and **25575**, although in some respects it is more moderate in its claims. In composition, it closely resembles those samples. Its brand name is scarcely open to criticism, as it only claims to be the "alcoholic extract" of cod liver oil. The statement that it "may be employed in all cases where Cod Liver Oil is indicated" seems like very dangerous advice to a user ignorant of its true character.

HEADACHE PREPARATIONS.

In six of the eight samples examined, acetanilid was claimed on the label, and in two acetphenetidin. **25452** was illegally labeled a

TABLE XXIX.—HEADACHE PREPARATIONS.

Station No.	Brand.	Contents of package.	Price per package.	Guaranty.	Weight of powder in grains.	Acetanilid in powder.	
						Grains.	Per cent.
25650	¹ Dr. Hobson's Headache Wafers. Pfeiffer Chem. Co., Philadelphia.	12 wafers.	cts. 25	139 grs. acetanilid per oz. (=29%). <i>Average</i>	19.64 17.95 18.62 18.74	6.80 6.27 6.41 6.49	34.6
25452	² Ingram's Celero-Caffeine Headache Wafers. F. F. Ingram and Co., Detroit, Mich.	12 wafers.	25	218 grs. acetanilid per oz. (=45.4%). <i>Average</i>	4.68 5.14 4.27 4.70	2.15 2.32 1.92 2.13	45.3
25453	³ Jamieson's Headache Konceals. Prep. for G. A. Jamieson, Bridgeport.	12 wafers.	25	164 grs. acetanilid per oz., or 4½ grs. per powder (=34.2%). <i>Average</i>	9.61 9.44 9.54 9.53	3.85 3.95 3.93 3.91	41.0
25699	Mohegan Headache Wafers. Mfd. for The McCarthy Pharmacy, Waterbury.	3 wafers. (one broken).	10	3½ grs. acetanilid per powder. <i>Average</i>	10.54 9.98 10.26	3.74 3.58 3.66	35.7
25680	Reliable Headache Wafers. Mfd. for E. S. Schoonmaker, Ansonia.	2 wafers. (one broken).	10	5 grs. acetanilid per wafer.	9.02	4.71	52.2
25698	Headache Powders (Dr. Tanner's). Joseph A. Urba, Waterbury.	3 wafers.	10	4 grs. acetanilid per powder. <i>Average</i>	9.98 9.34 9.66	4.09 3.93 4.01	41.5

¹ Contains a large dosage of acetanilid, over 5% in excess of amount claimed.
² Illegally labeled a "cure." Acetanilid guaranty not prominent on label.
³ Acetanilid considerably below guaranty.

"cure," and **25453** was deficient in acetanilid. **25650** and **25730** each contained considerably more than the amount of drug claimed, the dosage in the former seeming to be dangerously high.

When previously examined, in 1908, **25680** bore no guaranty of acetanilid on the label, and **25761** contained acetanilid instead of acetphenetidin. Acetphenetidin is a derivative of acetanilid and only slightly less objectionable for indiscriminate and undirected use. Its dangerous character is less known by the public, hence its frequent substitution for acetanilid in these preparations.

TABLE XXX.—HEADACHE PREPARATIONS.

Station No.	Brand.	Contents of package.	Price per package.	Guaranty.	Weight of powder or tablet in grains.	Acetphenetidin per powder or tablet.	
						Grains.	Per cent.
25761 ¹	Antikamnia Tablets. The Antikamnia Chem. Co., St. Louis.	12 tablets.	25	305 grs. acetphenetidin per oz. (=63.5%). <i>Average</i>	5.41 5.02 5.29 5.24	3.41 3.20 3.56 3.39	.... .... .... 64.7
25730 ²	Halloran's Headache Wafers. Prep. for Halloran's Drug Store, New Britain.	12 wafers.	25	194 grs. acetphenetidin per oz. (=40.4%). <i>Average</i>	9.06 9.20 9.13	4.08 4.67 4.38	.... .... 48.0

¹ Contains 0.29 gr. caffeine per tablet, equal to 5.5%. In 1908 the samples examined contained acetanilid, not acetphenetidin.

² Contains 0.70 gr. caffeine per wafer, equal to 7.5%. The acetphenetidin is 7.6% in excess of the amount claimed.

TINCTURA IODI.

(Tincture of Iodine.)

Twenty samples were examined, all but two from druggists whose iodine tincture had in a previous year been found below standard. The samples contained from 6.29 to 7.63 grams of iodine per 100 cc., no sample showing less than 90 per cent. of U. S. P. strength. The tabulation below shows the great improvement in the quality of the tincture sold by druggists, whose tincture in 1908 and 1909 was far below standard.

SPIRIT OF NITROUS ETHER.

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No.	Grams of Iodine per 100 cc.		No.	Grams of Iodine per 100 cc.	
	1911.	1908 or 1909.		1911.	1908 or 1909.
25786.....	7.63	2.51	25787.....	7.00	....
25816.....	7.55	5.36	25705.....	6.87	5.13
25746.....	7.53	2.26	25752.....	6.84	....
25751.....	7.46	4.05	25673.....	6.72	4.14
25658.....	7.41	5.07	25677.....	6.72	4.84
25829.....	7.28	4.28	25760.....	6.70	5.13
25747.....	7.25	5.40	25726.....	6.67	2.46
25676.....	7.18	3.61	25725.....	6.59	2.68
25727.....	7.15	4.91	25821.....	6.54	5.60
25728.....	7.02	4.05	25649.....	6.29	4.39
Average (18).....				7.03	4.22

From the above figures the usefulness of drug inspection in this state is apparent.

LIME WATER.

(Liquor Calcis.)

Four samples were bought from druggists whose lime water had been found below standard in a previous year. Three of these samples were of full standard strength. The fourth, taken in Naugatuck, contained only a trace of calcium hydroxide, 0.002 per cent., or 1.4 per cent. U. S. P. strength.

SPIRITUS ÆTHERIS NITROSI.

(Spirit of Nitrous Ether.)

The U. S. P. preparation is a 4 per cent. alcoholic solution of ethyl nitrite.

It deteriorates gradually, unless great care is used in keeping and dispensing it. The U. S. P. directs to "transfer the product to small, well-stoppered, dark amber-colored vials, and keep these in a cool place, remote from lights or fire." The pharmacists' responsibility does not end, therefore, with the correct preparation of this drug; care must also be exercised in maintaining its strength and quality. Druggists quite commonly dispense this preparation from ordinary clear-glass shelf bottles, and in many cases no precautions are taken to keep the bottle full and away from the light. It is not believed that this preparation is often intentionally adulterated, but that it is carelessly kept is demonstrated by the analyses in Table XXXII.

TABLE XXXI.—SPIRIT OF NITROUS ETHER.—(PASSED.)

Station No.	Place of Sale.	Price per 4 oz., cts.	Specific gravity at 15.6° C.	Alcohol by weight.	Nitrous Acid.	Acetic Acid.	Ethyl Nitrite.	Per cent. U. S. P. strength.
25000	Norwich.....	25	.8252	89.08	0.06	0.07	3.96	99
24145	Meriden.....	30	.8203	90.93	0.06	0.07	3.80	95
24161	New Haven.....	20	.8207	90.75	0.06	0.07	3.70	93
24990	New London.....	32	.8213	90.54	0.06	0.07	3.62	91
	Made in Laboratory.....	..	.8192	91.17	0.01	0.02	3.80	95

TABLE XXXII.—SPIRIT OF NITROUS ETHER BELOW STANDARD.

Station No.	Place of Sale.	Price per 4 oz., cts.	Specific gravity at 15.6° C.	Alcohol by weight.	Free Nitrous Acid.	Free Acetic Acid.	Ethyl nitrite.	Per cent. U. S. P. strength.
24159	New Britain.....	25	.8252	89.08	0.11	0.07	3.52	88
25039	South Norwalk.....	35	.8239	89.58	0.23	0.07	3.43	86
24989	New London.....	25	.8204	90.86	0.20	0.07	3.40	85
24953	Bridgeport.....	35	.8210	90.64	0.20	0.04	3.34	84
24901	New Haven.....	30	.8256	88.92	0.06	0.07	3.34	84
24126	Waterbury.....	35	.8283	87.85	0.20	0.04	3.34	84
24146	Meriden.....	35	.8234	89.77	0.11	0.07	3.28	82
24971	New Haven.....	20	.8209	90.68	0.14	0.07	2.92	73
25016	Willimantic.....	20	.8214	90.50	0.11	0.07	2.92	73
25064	Danbury.....	35	.8249	89.19	0.29	0.07	2.89	72
24918	Hartford.....	20	.8272	88.28	0.28	0.07	2.72	68
24952	Bridgeport.....	20	.8193	91.25	0.14	0.07	2.70	68
24158	New Britain.....	25	.8219	90.32	0.11	0.07	2.67	67
24127	Waterbury.....	25	.8261	88.72	0.29	0.07	2.65	66
24128	".....	35	.8233	89.81	0.29	0.07	2.55	64
25040	Norwalk.....	30	.8204	90.86	0.12	0.07	2.52	63
25038	South Norwalk.....	25	.8297	87.31	0.40	0.07	2.30	58
25001	Norwich.....	25	.8263	88.64	0.42	0.07	2.26	57
24919	Hartford.....	25	.8214	90.50	0.29	0.07	2.20	55
24125	Waterbury.....	35	.8215	90.46	0.32	0.04	2.20	55
24156	New Britain.....	20	.8234	89.77	0.29	0.07	2.20	55
24930	Middletown.....	25	.8229	89.96	0.34	0.07	1.97	49
24920	Hartford.....	25	.8216	90.43	0.11	0.04	1.81	45
24124	Waterbury.....	25	.8253	89.04	0.14	0.04	1.81	45
24954	Bridgeport.....	35	.8221	90.25	0.31	0.07	1.65	41
24123	Waterbury.....	25	.8231	89.88	0.29	0.07	1.50	38
24921	Hartford.....	35	.8214	90.50	0.14	0.07	1.42	36
25061	Bethel.....	35	.8238	89.62	0.42	0.07	1.19	30
25029	Stamford.....	25	.8424	82.38	0.67	0.07	1.03	26
24157	New Britain.....	20	.8224	90.14	0.11	0.07	0.85	21

It is not an easy matter to make spirit of nitrous ether of full standard strength by the U. S. P. method. A sample made in this laboratory, with the greatest care, contained only 3.80 instead of the required 4 per cent. of ethyl nitrite, but when a sample shows only 60, 50, 30 or 20 per cent. of standard strength, the excuse of difficulties in preparation loses its validity.

Allen has pointed out* that the presence of excess of water greatly favors the destruction of nitrous ether. In only one of our samples, **25029**, was there such an excess, and here the content of ethyl nitrite was only 1.03 per cent. This sample, likewise, had the largest amount of free nitrous acid, 0.67 per cent., still further evidence of the destruction of the ethyl nitrite.

Thirty-four samples were examined, none of which fully met the U. S. P. standard, although four samples were deficient by less than ten per cent. The remaining thirty samples contained from 3.52 to 0.85 per cent. of ethyl nitrite, or from 88 to 21 per cent. U. S. P. strength. Excluding **25029**, already referred to as containing an excess of water, the other thirty-three samples had the following range of composition:

Specific gravity .....	.8193— .8297, ave.....	.8232
Alcohol by weight	87.31 —91.25, ave.....	90.12
Nitrous acid	0.06 — 0.42, ave.....	0.21
Acetic acid	0.04 — 0.07, ave.....	0.07
Ethyl nitrite.....	0.85 — 3.96, ave.....	2.62

The cost of four ounces ranged from 20 to 35 cents, with an average of 27.6 cents.

PEPSIN.

The U. S. P. defines pepsin as follows: "A proteolytic ferment or enzyme, obtained from the glandular layer of the fresh stomach of the hog (*Sus scrofa*, var. *domesticus* Gray), and proved to be capable, when assayed by the process given below (U. S. P. p. 335), of digesting not less than 3000 times its own weight of freshly coagulated and disintegrated egg albumin."

Pepsin can convert natural protein substances into soluble products known as proteoses and peptones. The assay of commercial pepsin is, therefore, based on a determination of this

* Allen's Commercial Organic Analysis, I, 143.

power of conversion, which varies with the period of digestion, temperature, nature of the protein material subjected to its action, the reaction of its solution, and on other conditions difficult to control.

The U. S. P. assay method is open to strong objections. The prolonged period of digestion is inconvenient, the use of fresh egg albumin introduces a reagent of uncertain and variable water content, and the final deposit of undissolved albumin cannot be measured very accurately. In recent years, several methods have been suggested for the determination of the pepsin content of gastric juice, which appear to possess advantages over the U. S. P. method. Among the best of these are the methods suggested by Jacoby and Solms,* Fuld and Levison† and Rose.‡ The Jacoby method is based on the fact that a solution of the protein of the castor bean in salt solution gives a precipitate when a very little acid is added to the solution. When all the protein is converted into soluble products no precipitate forms on adding acid. The Fuld and Levison method depends upon the fact that under the action of acid alone edestin is rapidly changed into edestan,§ which is soluble in very dilute acids containing no dissolved salts. On adding very dilute salt solutions to acid solutions containing edestan a precipitate forms which is not soluble in an excess of salt solution. When pepsin acts on edestan it converts it into products soluble in pure water, hence when all the edestan has been thus converted no precipitate forms on adding salt to its acid solution. In the Rose method pea globulin is substituted for the ricin used by Jacoby.

The method used by us was a combination of the Fuld and Levison and Rose methods, with a few minor modifications. Our thanks are due to Dr. T. B. Osborne of this station, who kindly placed at our disposal some edestin of a high degree of purity, prepared by him from hemp seed.

After much experimental work, the following procedure was adopted:

* Zeit. f. klin. Med., 1907, 64, 159.

† Biochem. Zeit., 1907, 6, 473.

‡ Arch. Intern. Med., 1910, 5, 459.

§ Osborne, Zeit. f. physiol. Chem., 1901, 33, 225.

Prepare accurately a 0.1 per cent. solution of edestin in 0.1 per cent. hydrochloric acid. Weigh 0.25 gm. of the sample of pepsin and triturate in a glass mortar with a small quantity of water. Transfer to a 500 cc. flask and dilute to mark. Mix well and filter, thus obtaining a 1 to 2000 solution of the pepsin. Next, ascertain if suitable dilution of the pepsin has been secured, as follows: Measure from a burette 2 cc. of edestin solution into a small glass vial, add 0.9 cc. of water and 0.1 cc. of pepsin solution (measured from a 2 cc. capillary pipette). Shake and digest at 20° C.* for exactly thirty minutes. Remove from digestion bath, add 0.5 cc. saturated sodium chloride solution and shake. If a slight turbidity is produced the dilution of 1 to 2000 is a suitable one. If the solution is more than slightly turbid another solution should be prepared, containing more pepsin. If the solution is clear less pepsin should be taken. After the proper dilution has been ascertained proceed as follows: To each of a series of four or five small glass vials add 2 cc. of 0.1 per cent. edestin solution from a 25 cc. Schellbach burette. Then add to each from a 5 cc. pipette, graduated in tenths, sufficient water, depending upon amount of pepsin solution added later, to make final volume exactly 3 cc. Then add, as rapidly as possible, measured amounts of the dilute pepsin solution from a small burette, graduated to tenths. Shake and digest for exactly thirty minutes in a water bath at 20° C. Remove and add 0.5 cc. saturated salt solution, shake, and note degree of turbidity. The end point requires some care in judging results, remembering that the end point is *not* a perfectly clear solution, but extremely slight turbidity. The pepsin activity is calculated by the following formula:—

$$\text{peptic activity} = \frac{\text{quantity of pepsin solution used}}{2 \text{ cc. edestin solution} \times \text{pepsin dilution}}$$

Thus, if the proper end point was shown in the vial to which 0.5 cc. of pepsin of 1 to 5000 dilution had been added,

$$\text{peptic activity} = \frac{.5}{2 \times 5000} = \frac{1}{20000}.$$

To obtain a comparison of peptic activity as determined by this and the U. S. P. methods, two samples of pepsin, **23094** and **23147**, were tested by the latter method. They showed a peptic activity of 1 to 3000 and 1 to 1500 respectively. In other words, **23094** was twice as strong as **23147**, confirming the relative values 20,000 and 10,000 obtained by the edestin method. From these tests it appears that a commercial pepsin showing a peptic activity of 20,000 by the edestin test is of the strength required by the U. S. P., namely, 3000.

* Experiments at 35° C. showed no appreciable difference over 20°, and the latter temperature was therefore adopted as being more convenient.

TABLE XXXIII.—POWDERED PEPSIN.

Station No.	Label.	Place of sale.	Price of sample, cents.	Net weight of sample, grms.	Strength of Pepsin.		Per cent. of U. S. P. strength.
					Edestin Test.	U. S. P. Test.	
23202	Extra Strong Po. Pepsin, 1-6000	Norwich...	40	8	40,000	*6,000	200
23094	Pepsin in Powder, U. S. P., 1-3000	Bridgeport	75	25	20,000	3,000	100
23671	Pepsin	New Haven	30	15	17,400	*2,610	87
23104	Pepsin in Powder, U. S. P., 1-3000	Ridgefield ..	40	25	16,000	*2,400	80
23200	Pure Powd. Pepsin	New London	40	15	16,000	*2,400	80
23112	Po. Pepsin	Danbury ...	35	18	14,280	*2,142	71
23668	Powd. Pepsin	New Haven	25	15	13,332	*2,000	67
23024	Pure Pepsine, 1-3000	Bridgeport	25	12	13,332	*2,000	67
23022	Pure Pepsin Powd.	"	25	16	13,332	*2,000	67
22305	Po. Pepsin	Hartford ...	15	15	13,332	*2,000	67
23667	Powdered Pepsin	New Haven	35	23	12,000	*1,800	60
23063	Pow. Pepsin	"	25	15	11,200	*1,680	56
23670	Pure Po. Pepsin, 1-3000	"	30	14	11,200	*1,680	56
22306	Pure Pepsin, U. S. P.	Hartford ...	25	16	10,000	*1,500	50
23147	Powd. Pepsin	Waterbury ..	25	16	10,000	*1,500	50
23139	Pepsin Powder	"	40	20	8,320	*1,248	42
23240	Pepsin, U. S. P.	Willimantic	35	15	8,000	*1,200	40
23034	Po. Pepsin	Stamford ...	25	28	1,810	* 272	9
23176	Pepsin	Winsted	25	1	1,430	* 215	7
23669	Pepsin, U. S. P.	New Haven	30	12	1,250	* 188	6

* Calculated from edestin test (20,000 edestin test = 3,000 U. S. P. test).

Twenty samples of commercial powdered pepsin were tested by this method. All of them were bought in bulk or in broken packages, except **23094**, which was sold in the unbroken original package of its manufacturer, Fairchild Bros. & Foster, New York.

One sample was sold as "extra strong, 1-6000." This showed by the edestin test a peptic strength of 40,000, corresponding to 6000 by the U. S. P. test. Four samples were labeled, "1-3000," while three others were simply labeled "U. S. P." All the other samples, however, were bought as U. S. P. preparations and should conform to the minimum U. S. P. strength of 1-3000.

Of the nineteen samples bought as U. S. P. pepsin, only one was of U. S. P. strength, **23094**, while three were reasonably close, showing strengths of 16,000 to 17,400 by the edestin test, corresponding to 2400 to 2610 by the U. S. P. test, or 80 to 87 per cent. U. S. P. strength. The other fifteen samples ranged from 14,280 to 1250 by the edestin test, corresponding to 2142 to 188 U. S. P. test, or from 71 to 6 per cent. U. S. P. strength.

Great inaccuracy was noted in the weight of certain of the samples as purchased. Although one-half ounce (14 grams) was asked for, with **23202** only 8 gms. was obtained, and with **23176** only 7 gms., while with **23034** a full ounce was obtained, although only half that quantity was asked for. Wide variations in price were also noted. In the nineteen samples sold as U. S. P. the price ranged from 25 to 80 cents per ounce, prices which the table shows were entirely independent of the quality of the pepsin sold, except in **23034**.

TABLE XXXIV.—QUININE PILLS (2 GRAINS).

Station No.	Place of Sale.	No. of Pills in Sample.	Price of Sample, cents.	Average weight of Pill, grains.	Quinine Sulphate, per Pill.	
					Gravimetric.	Volumetric.
					grains.	grains.
24942	Bridgeport	26	20	2.92	1.68	1.54
25448	"	12	10	2.57	1.99	1.96
25449	"	12	10	3.06	1.91	1.91
25450	"	12	10	2.66	1.96	1.94
25451	"	12	10	2.71	1.94	1.90
25067	Danbury	24	10	2.56	1.92	1.84
24910	Hartford	25	20	2.90	1.89	1.88
24911	"	26	20	2.69	2.01	2.01
24925	"	12	10	2.59	1.85	1.80
25800	"	12	10	2.57	1.86	1.83
25801	"	12	10	2.53	1.95	1.95
25802	"	12	10	4.41	2.10	1.96
24139	Meriden	50	25	2.61	1.87	1.83
24140	"	24	15	2.81	1.88	1.80
24934	Middletown	25	10	2.84	1.88	1.94
24147	New Britain	23	10	2.62	1.91	1.84
24148	"	24	20	2.60	2.04	1.98
24902	New Haven	24	10	3.41	1.88	1.83
24972	"	34	15	2.92	2.05	2.05
24973	"	24	20	3.41	1.96	1.98
25742	" (Upjohn's Friable) ..	12	5	2.62	1.85	1.83
25743	"	12	5	3.48	1.75	1.74
25744	"	12	5	2.66	1.76	1.69
25758	"	12	10	2.60	1.92	1.88
24993	New London	24	15	2.64	1.97	1.95
24994	Norwich	25	15	3.40	1.91	1.88
25022	Stamford	24	20	2.63	1.87	1.88
24133	Waterbury	25	20	2.68	2.00	1.98
24134	"	25	15	3.42	1.95	1.93
24135	"	25	15	3.06	2.00	1.93
24136	"	37	25	2.60	1.92	1.90
24137	"	25	20	4.25	1.99	2.07
25009	Willimantic	36	25	4.79	1.87	1.87
	Average .....	..	..	2.98	1.92	1.89

QUININE PILLS.

All of the thirty-three samples examined were sold as 2 grain pills. With a tendency towards a slight deficiency in quinine sulphate, as a rule the samples are very satisfactory. The quinine sulphate found ranged from 1.68 to 2.10 grains per pill by the gravimetric method, and from 1.54 to 2.07 grains by the volumetric method. Only three samples showed a deficiency greater than 10 per cent., **24942** from Bridgeport and **25743** and **25744** from New Haven containing only 1.68, 1.75 and 1.76 grains respectively.

The price ranged from 5 to 10 cents per dozen pills.

COMPOUND EXTRACT OF SARSAPARILLA.

Nine samples of this proprietary preparation were analyzed. According to the labels they are of most complex composition and we have not attempted the almost impossible task of identifying all the ingredients claimed to be present. The following drugs are claimed on the labels of the various preparations: Sarsaparilla, yellow dock, stillingia, burdock, licorice, sassafras, mandrake, buckthorn, senna, black cohosh, pokeroor, wintergreen, cascara sagrada, cinchona bark, prickly ash, alcohol, glycerine and iodides of potassium and iron. Whatever value the vegetable drugs named above possess is due to their power as emetics, purgatives or alteratives.

The dominant vegetable ingredient is, or should be, extract of sarsaparilla; the important active mineral ingredient present is potassium iodide.

Both extract of sarsaparilla and potassium iodide possess remedial powers, especially in syphilitic and scrofulous diseases. Potassium iodide is a powerful drug, which should be used with care. In fact, there has been considerable discussion whether preparations containing it should not be so labeled as to inform the public. Dr. Abbott, referring to sarsaparillas, in the Report of the Massachusetts State Board of Health for 1892, says: "With but few exceptions, they contain a considerable percentage of a very active and powerful remedy—iodide of potassium. . . . The sale of such an article in unlimited quantities by druggists, grocers and others is censurable. More than this, the method

of its sale is dishonest, since the unwary purchaser is led to believe that he is purchasing a harmless vegetable remedy, namely, sarsaparilla. . . . It may be seriously questioned whether the blood of persons who take iodide of potassium continuously is not decidedly impoverished instead of being purified, as is claimed by the manufacturers. It is not uncommon to find persons who have used continuously six, eight or ten pint bottles of these preparations. Unlike sarsaparillas, the iodide of potassium is classed among poisons by nearly every writer upon toxicology."

The following illuminating report of a conversation with the representative of a patent medicine house producing sarsaparilla is thus recorded by Prof. E. F. Ladd in his Report for 1906:

"He stated in my office that a sarsaparilla without potassium iodide, or some similar product, would have very little demand. There must be present, he said, something like potassium iodide, which shall cause the people taking the same to believe that they are being benefited as shown by the crop of pimples when they have continued the use of sarsaparilla for some time; when, as a matter of fact, such treatment is undermining the health. In other words, the manufacturers of this class of patent medicines treat their patients to produce the disease that they may treat the patient further and take from him the money to pay for a remedy which in reality is undermining the health."

Our analyses show these preparations to be of very variable composition.

The labels of five samples claimed from 7 to 27 per cent. of alcohol. **25545** contained 22.52 per cent., although none was claimed; its sale was therefore illegal.

Three samples contained so much glycerine as to interfere seriously with the determination of solids. The others ranged from 3.80 to 52.63 per cent. solids, more than half in the latter consisting of cane sugar in the form of molasses. Such percentages of solids as 3.80 and 4.74 certainly do not indicate a very concentrated preparation; both of these were very high in alcohol.

The percentage of ash ranged from 0.48 to 2.73, except in **25491**, where 9.40 was present. In this sample the ash consisted chiefly of magnesium sulphate, with considerable chlorides and phosphates.

TABLE XXXV.—EXTRACT OF SARSAPARILLA.

Station No.	Brand.	Price per bottle, cents.	Net volume of sample, fl. oz.	Specific gravity at 15.6° C.	Alcohol.		Total Solids.	Ash.	Potassium Iodide.		Polarization at 20° C.		Sucrose.	Glycerine.
					By weight.	By volume.			Per cent.	Grains per fl. oz.	Direct.	After Inversion.		
25548	A. D. S. Sarsaparilla Compound. American Druggists Syndicate, New York	75	10.8	1.0946	0	0	%	%	1.48	7.5	1.2	1.2	%	%
25142	Ayer's Compound Conc. Extr. of Sarsaparilla. J. C. Ayer Co., Lowell, Mass.	85	10.0	1.1523	0	0	*	*	0.64	3.4	0.0	0.0	....	25.71
25512	Our Sarsaparilla. Prep. for E. Callahan, Jr., New London	75	10.0	0.9942	19.04	23.86 ¹	4.74	1.58	1.21	5.6	1.2	0.8	....	53.63
25547	Hood's Comp. Extr. of Sarsaparilla. C. I. Hood Co., Lowell, Mass.	79	10.5	1.0419	11.89	15.60 ²	12.87	1.59	0.91	4.4	-2.2	-2.2	....	....
25141	Jamieson's Comp. Extr. of Sarsaparilla. Prep. for Geo. A. Jamieson, Bridgeport	75	12.0	1.0490	6.59	8.71 ³	11.58	0.49	0.29	1.4	-1.4	-1.4	....	....
25546	Nyal's Spring Sarsaparilla, etc., Comp. New York and London Drug Co., New York	89	12.0	1.1237	0	0	*	1.39	0.71	3.7	3.0	2.8	....	27.78
25311	Sayle's Comp. Extr. of Sarsaparilla. Sayle's Pharmacy, New London	50	10.8	1.0587	20.73	27.68 ⁴	20.04	2.73	0.70	3.4	0.0	-4.4	3.32	....
25545	Rexall Sarsaparilla Tonic. United Drug Co., Boston	50	16.2	1.0053	17.77	22.52 ⁵	3.80	0.48	0	0	-1.4	-1.2	....	....
25491	Wilson's Compound Sarsaparilla. B. O. & G. C. Wilson, Boston	100	16.3	1.3160	3.13	5.19 ⁶	52.63	9.40	0	0	26.4	-9.2	26.84	....

Alcohol guaranty 20%. ² Guaranty, 18%. ³ Guaranty, 10%. ⁴ Guaranty, 27%. ⁵ No alcohol guaranteed. ⁶ Guaranty, about 7%. * Not determined because of presence of large amount of glycerine. † All iodide present calculated as potassium iodide.

All but two samples contained potassium iodide in quantities ranging from 0.29 to 1.48 per cent., or from 1.4 to 7.5 grains per fluidounce.

Five samples had plus or zero polarizations, both before and after inversion, indicating the probable presence of glucose. 25511 contained 3.32 per cent. and 25491 26.84 per cent. of sucrose.

Three samples contained glycerine, ranging from 25.71 to 53.63 per cent.

The labels of these medicines are too prolix to permit of their reproduction here. We will take up the samples in order and point out the truthfulness or falsity of their claims as indicated by our analyses.

25548. *A. D. S. Sarsaparilla Compound*. "A preparation of vegetable substances that eliminates poison from blood and tissues. This is not a patent medicine but a Premium Remedy selected and warranted by an association of 12,000 qualified druggists." This "vegetable" preparation contained 7.5 grains of potassium iodide per fluidounce; it is therefore misbranded. In this material, glycerine has been substituted for alcohol, a change of doubtful efficacy.

25142. *Ayer's Compound Concentrated Extract of Sarsaparilla*. This preparation no longer contains alcohol, as formerly, but does contain 53.63 per cent. of glycerine. The active principle of sarsaparilla is parillin, which is readily soluble in alcohol. A serious doubt arises as to whether the elimination of alcohol from an extract of sarsaparilla does not at the same time wholly or in part prevent the presence of the parillin, its most valuable ingredient. The label claims 4 grs. of potassium iodide per fluidounce; 3.4 grains were found.

25512. *Callahan's Our Sarsaparilla*. Claims to be the "King of all Purifiers." It is an extremely dilute preparation containing only 4.74 per cent. of solids, of which 1.21 per cent. is potassium iodide, or 5.6 grains per fluidounce. It is a highly alcoholic preparation, containing nearly 4 per cent. more than claimed, and its virtues would seem to depend upon alcohol and potassium iodide, rather than on the small amounts of vegetable drugs present.

25547. *Hood's Compound Extract of Sarsaparilla*. "Contains 18 per cent. alcohol, the smallest quantity that will extract

and preserve all the remedial properties of the ingredients." This statement is substantially correct, as regards the amount of alcohol, and the preparation appears to be a genuine extract, as claimed. It contains 4.4 grains of potassium iodide per fluid-ounce.

25141. *Jamieson's Compound Extract of Sarsaparilla.* This, likewise, appears to be a genuine extract, characterized by a rather low content of potassium iodide, 1.4 grains per fluidounce.

25546. *Nyal's Spring Sarsaparilla Compound.* "The cultivation of cheerfulness of mind, purity of life, and habits of cleanliness, greatly conduce to aid the medicine in the cure of disease." This delightful truism cannot be contradicted, but can hardly be considered as a specific recommendation for this particular preparation. As in the A. D. S. and Ayer's compounds, glycerine has been substituted for alcohol, a change of doubtful value. It claims 4.5 grains of iodides of potassium and iron per fluid-ounce; 3.4 grains, calculated as potassium iodide, were found. Glucose appeared to be the sweetener used.

25511. *Sayle's Compound Extract of Sarsaparilla.* This appears to be a genuine extract of very high alcohol content, with 3.4 grains of potassium iodide per fluidounce. It contains about 3 per cent. of sucrose.

25545. *Rexall Sarsaparilla Tonic.* This is the most dilute preparation we examined, as it contained only 3.80 per cent. of solids. It contained 22.52 per cent. of alcohol by volume, which was not declared on the label; it is therefore misbranded. It contained no iodides.

25491. *Wilson's Compound Sarsaparilla.* "Patients should cautiously avoid the use of Beer and Alcoholic Stimulants even in small quantities, which is distinctly calculated to produce the very diseases which they wish to cure." Such advice is most refreshing when connected with a preparation containing 5.19 per cent. of alcohol, more than usually found in beer itself. The compound contains no iodides, but over half of its very high solids consist of cane sugar in the form of molasses.

Determination of Potassium Iodide.

All the samples were first tested qualitatively for iodides by the following method: 10 cc. of the material were treated in a test tube with 2 gms. ammonio-ferric alum, 10 cc. water, 10 cc. sulphuric acid (1-10) and 10 cc. of chloroform; a violet coloration of the chloroform layer indicated iodides.

The distillation method, following out the same reactions as given above,* was tried for the quantitative estimation of iodides with poor success, high results being generally obtained. Shaking out with chloroform from an acid solution and titrating the extract with sodium thiosulphate gave satisfactory results in some samples, but not in others. The method finally used was a modification of that suggested by Hunter.† The following experimental data shows the accuracy of the method. To portions of samples **25545** and **25491**, which were shown to contain no iodides, .050 gm. potassium iodide was added. The recovery was .0498, .0506, .0488 and .0495 gm. with the former, and .0484 and .0484 with the latter. Sample **25491** was an especially severe test of the method, as it contained over 50 per cent. of solids, half of which was sugar. The method as finally used was as follows:

Reagents. Fusion mixture, 138 grams (1 mol.) anhydrous potassium carbonate, 106 grams (1 mol.) anhydrous sodium carbonate, 75 grams potassium nitrate ($\frac{3}{4}$ mol.).

Decinormal solution of sodium thiosulphate.

Starch solution, 0.5 per cent.

Phosphoric acid solution, 1 part 85 per cent. acid to 1 part water.

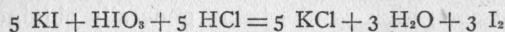
Solution of chlorinated soda, U. S. P., fresh.

Starch potassium iodide paper.

Procedure. Weigh 2 gms. of material on a watch glass, and transfer to a nickel crucible, using a small piece of filter paper to clean the glass, and adding same to crucible. Add gradually 10 to 15 gms. of the fusion mixture and stir thoroughly with a platinum rod. The mass should be in the form of small lumps. Cover the crucible and place over a full flame. In about 10 minutes the contents will have become white and in a pasty condition. Remove crucible and dissolve melt in a beaker with water, heating if necessary. Transfer to an Erlenmeyer flask, the volume of the solution being 150-200 cc., and cool to room temperature. Add 30-40 cc. of fresh chlorinated soda solution and then carefully acidity with phosphoric acid (1-1), keeping flask cool and inclined. Place flask, with funnel in neck, over a flame and boil vigorously for some time after starch potassium iodide paper shows no test for chlorine when moistened and held in the escaping steam. (A little emery previously added prevents bumping.) Remove flask, cool contents, and add about 10 cc. of 10 per cent. potassium iodide solution. Run in immediately from a burette decinormal sodium thiosulphate solution, adding starch solution towards the end of the titration. The reading of the burette divided by six shows

* Schimpf, Manual of Volumetric Analysis, 1909, p. 220.
† Jour. Biol. Chem., 7, 321.

the amount of thiosulphate required by the iodine originally present, according to the following reaction:



Note. It was found necessary to have a distinct excess of phosphoric acid present. Unless such is the case the addition of potassium iodide to the solution, even if acid to litmus, will show no iodine liberated. The addition of more phosphoric acid to such a solution immediately brings out the free iodine.

In case the melt after solution shows much color, due to iron, etc., filtration is advisable.

AQUA HAMAMELIDIS.

(*Hamamelis Water—Extract of Witch Hazel.*)

Extract of witch hazel, according to the U. S. P., contains the volatile products of hamamelis bark, as obtained by distillation, and should contain in the finished product 14.25 per cent. of ethyl alcohol by volume.

The following extract from the U. S. Dispensatory is of interest as indicating the exaggerated idea as to the value of this preparation.

"This water was probably introduced into the British Pharmacopœia and U. S. Pharmacopœia (8th Rev.) on account of the large demand for it, which has grown out of the wide advertisements of a certain proprietary medicine, and the universally recognized need in American families for an embrocation which appeals to the psychic influence of faith. As the tannic acid of hamamelis bark does not come over into the distillate the water is therapeutically a mixture of water and alcohol."

The seventy-six samples examined were tested only for alcohol, wood alcohol and formaldehyde. Neither wood alcohol nor formaldehyde was found in any sample; the ethyl alcohol ranged from 12.23 to 15.76 per cent. by volume, with an average of 14.06 per cent.

Forty-five samples contained over 14 per cent. of alcohol, twenty-six from 13 to 14 per cent., and five less than 13 per cent.

Seven samples only were sold under brand names, representing three manufacturers. The alcohol content of these brands, with the amount guaranteed, was as follows:

No.	Manufacturer.	Alcohol.	
		Claimed.	Found.
25482	Parke, Davis & Co.	15	14.05
25510	Pond's Extract	16	14.70
25495	E. E. Dickinson & Co.....	15	14.09
25517	E. E. Dickinson & Co.....	15	13.84
25565	E. E. Dickinson & Co.....	15	14.21
25568	E. E. Dickinson & Co.....	15	13.86
25572	E. E. Dickinson & Co.....	15	14.72

The cost of four ounces of the samples sold as extract of witch hazel ranged from 5 to 15 cents. The cost of the sample of Pond's Extract was 50 cents for 5.3 ounces.

FOOD AND DRUG PRODUCTS EXAMINED FOR THE DAIRY COMMISSIONER.

Five hundred and fifty-four samples were referred to this station by the dairy commissioner for examination. Since the details regarding them will be found in his report, only a brief summary of the results is here given, excepting in cases where quite complete analytical data were secured, notably, soda waters and vinegars.

Of the whole number of samples examined, 192 were not found to be adulterated, while 341 were adulterated, misbranded, or below standard.

Butter and Butter Substitutes. Of the fifty samples examined, fourteen were butter, twenty-nine were oleomargarine and seven were renovated butter. In many cases the illegality of the sale consisted in the failure to display the required sign when selling oleomargarine, or failure to stamp renovated butter at the time of sale.

Cocoa. Of the nine samples examined, eight were misbranded, and one was an illegally labeled compound.

Cream. The fifteen samples analyzed contained from 20.00 to 50.70 per cent. fat. Formaldehyde was found in samples sold by Isaac Moorey and E. C. Paddock, both of Bridgeport. Eleven samples were examined for sucrate of lime and gelatine, with negative results.

Ice Cream. The sixteen samples analyzed contained from 2.0 to 11.0 per cent. of fat, average, 6.7 per cent. Six samples con-

tained less than 4 per cent. Boric acid was found in no case. One sample of strawberry contained an unpermitted coal-tar color, phloxine or an eosine.

Cream of Tartar. No adulteration was found in the sample examined.

Gluten Flour. A sample sold by D. M. Welch & Son, New Haven, contained only 16.25 protein (2.60 per cent. nitrogen). It was misbranded, as standard gluten flour contains not less than 5.6 per cent. of nitrogen.

Fruit Syrups. "C and M. Fruit Syrup Strawberry," made by National Fruit Products Co., Boston, and sold by Shartenberg & Robinson, New Haven, contained a coal-tar dye, which was not declared on the label.

"Magnolia Hallonsaft, or Raspberry Syrup," made by The Swedish Importing Co., Worcester, Mass., and sold by R. T. Whiting, Bridgeport, also contained an undeclared coal-tar color.

Ketchup. "Star-Brand Tomato Catsup," made by The Warwick Pickling Co., Arctic, R. I., and sold by Karl Bielstzky, New London, was adulterated in that it contained 0.244 per cent. of sodium benzoate, which was not stated on the label.

Lemon Extract. Four samples were found to be of standard strength, containing from 5.20 to 9.50 per cent. of lemon oil. A sample of terpeneless extract contained only 0.40 per cent. of oil, and was artificially colored. Another sample, high in lemon oil, contained an unpermitted coal-tar color.

Mace. The sample analyzed proved to be Bombay mace. It contained 55.05 total ether extract, 53.70 non-volatile ether extract, 2.05 ash, and 0.38 per cent. acid-insoluble ash.

Milk. Two hundred and ninety samples were examined. Of these, eighty-eight conformed to the legal standards, one hundred and thirty-seven were below standard in solids, one hundred and ninety-five in solids not fat and eighty-nine in fat, two hundred and two samples failing to meet the legal requirements in one or more particulars. Seven samples were skimmed, eighty-seven were watered and three were both skimmed and watered.

The skimmed samples were taken in Colchester, Columbia, Franklin and Hartford; the watered samples in Colchester, Bozrahville, Montville, Columbia, Turnerville, Lisbon, Killingly, Stafford Station, Durham, South Manchester, Manchester, Woodbridge, Bridgeport, South Norwalk, West Hartford, East Wea-

TABLE XXXVI.—SODA WATER AND SODA WATER SYRUPS.

Station No.	Flavor.	Solids.	Polarization.			Preservative.	Saccharin.	Color.	Flavor.
			Direct.	Invert.	Temperature °C.				
6030	<i>Birch Beer.</i> Frankel Bottling Works.....	3.11	2.2	—	27	None	Yes	Natural	Natural.
6042		7.03	6.0	0.77	27	"	None	"	"
6033	<i>Cherry Soda.</i> Rosie Alderman.....	10.85	10.7	—	27	"	"	Coal tar	Artificial.
6016	<i>Ginger Ale.</i> Star Bottling Works.....	2.29	2.3	0.55	28	"	"	Natural	Natural.
6025		0.18	—	0.0	28	"	Yes	"	Capsicum.
6029		4.63	4.7	0.99	27	"	"	Coal tar	Natural.
6043		6.98	6.7	1.87	27	"	None	Coal tar	Natural (?)
6048	Gilhuly's Bottling Works.....	3.40	3.1	0.66	23	"	Yes	Natural	Natural.
6052	<i>Lemon Soda.</i> Isaac Koplowits.....	10.72	7.1	—	28	Benz. acid (Tr.)	None	Natural	Natural.
6059	<i>Orangeade Syrup.</i> Sidney Negbaur.....	76.68	52.2	—17.38	23	Benz. acid	"	* Tropeolin O.	Natural.
6055		68.73	59.2	—20.02	23	"	"	"	"
4901	<i>Orangeade.</i> J. S. Coburn.....	.....	9.2	—3.50	20	"	"	Coal tar	"
6054		13.01	11.2	—3.41	23	None	"	"	"
6058		12.25	8.7	—2.42	23	"	"	* Tropeolin O.	"

* Unpermitted coal-tar color.

TABLE XXXVI.—SODA WATER AND SODA WATER SYRUPS.—Continued.

Station No.	Flavor.	Solids.	Polarization.			Preservative.	Saccharin.	Color.	Flavor.
			Direct.	Invert.	Temperature °C.				
6051	<i>Pineapple Soda.</i> Carl Goldhammer.....	13.11	11.0	— 3.63	28	Benz. acid	"	Natural	Natural.
6039	<i>Raspberry Stock.</i> Clark Extract Co.....	58.03	— 15.0	— 16.06	26.5	"	"	"	"
4895	<i>Raspberry Soda.</i> John Clancey .....	.....	1.5	— 1.10	20	.....	Yes	Coal tar	.....
4898		.....	1.6	— 1.00	20	.....	"	"	.....
6017	<i>Root Beer.</i> Star Bottling Works.....	3.86	4.0	— 0.70	28	None	None	Natural	Natural.
6044	<i>Sarsaparilla.</i> Crystal Springs Bottling Co.	7.05	5.6	— 0.11	27	"	"	"	"
6037a	<i>Strawberry Syrup.</i> Dina Yonker	40.52	40.2	— 11.55	27	"	Yes	*Acid magenta	Artificial.
6040		61.50	— 1.8	— 17.27	27	Benz. acid	None	Natural	Natural.
6060a		66.67	— 11.16	— 16.06	23	"	"	"	"
4851	<i>Strawberry Soda.</i> Crystal Springs Bottling Co. ....	.....	0.5	— 1.10	20	.....	Yes	Coal tar	.....
4899		.....	0.5	± 0.0	20	.....	"	"	.....
6015		2.85	2.7	— 0.55	28	None	"	Amaranth	Artificial.

* Unpermitted coal-tar color.

TABLE XXXVI.—SODA WATER AND SODA WATER SYRUPS.—Concluded.

Station No.	Flavor.	Solids.	Polarization.			Preservative.	Saccharin.	Color.	Flavor.
			Direct.	Invert.	Temperature °C.				
6018	<i>Strawberry Soda (continued).</i> Star Bottling Works.....	26.59	22.4	7.04	28	None	Yes	Amaranth	Artificial.
6019		9.63	7.5	— 2.53	28	"	None	Coal tar	"
6021		12.04	12.3	— 3.30	28	"	Yes	*Acid magenta	"
6022		7.50	7.0	— 1.87	28	"	"	Amaranth (?)	"
6023		0.03	0.2	± 0.0	28	"	"	"	Artific'l (?)
6026		8.35	5.7	— 2.09	28	"	None	"	"
6027		14.05	14.2	— 2.53	28	(?)	Yes	Natural	Natural.
4804		.....	3.6	— 1.10	20	.....	"	Coal tar	.....
6028		4.16	4.3	— 0.55	27	None	None	Amaranth	Artificial.
6034		6.02	6.4	— 1.54	27	"	None	*Acid magenta	"
6036		2.91	2.7	— 0.66	27	"	Yes	Amaranth	"
6037		10.64	4.6	— 2.75	27	"	"	*Acid magenta	"
6038		4.40	9.3	— 1.10	27	"	None	"	"
6045		12.05	3.1	— 1.00	20	Benz. acid	Yes	Coal tar	"
4897		.....	3.2	— 1.10	28	.....	"	"	.....
6047		3.36	7.3	— 2.20	23	None	None	Amaranth	Artificial.
6049		9.75	8.4	— 2.53	28	"	"	Coal tar	Artific'l (?)
6050		9.99	2.9	— 0.55	23	"	None	Amaranth (?)	Artificial.
6057		3.07	18.0	— 5.50	23	Benz. acid	Yes	Amaranth	"
6060		20.02					None	Natural	Natural (?)

* Unpermitted coal-tar color.

togue, Wethersfield, Naugatuck, Norwalk, Branford and Glastonbury. The watered samples averaged 9.79 per cent. solids, two samples containing only 6.57 and 7.26 per cent.

Condensed Milk. A sample of Van Camp's Evaporated Milk contained 28.77 per cent. solids and 9.35 per cent. fat.

Molasses. The two samples examined showed no adulteration.

Olive Oil. The six samples examined contained neither cottonseed, sesame or peanut oil.

Soda Water and Soda Water Syrups. Forty-six samples were examined, all collected in New Haven. They included two orangeade syrups, one raspberry stock, three strawberry syrups, two birch beers, five ginger ales, three orangeades, two raspberry sodas, twenty-three strawberry sodas, and one each of cherry, lemon and pineapple soda, and one root beer and one sarsaparilla.

The samples were examined chiefly for the presence of chemical preservatives, saccharin and artificial color and flavor. The detailed analyses are given in Table XXXVI.

Ten samples contained benzoic acid, twenty saccharin, thirty-one artificial color and twenty artificial flavor. Of the forty-six samples, only six contained no benzoic acid, saccharin or artificial color or flavor. These included one birch beer, two ginger ales, one root beer, one sarsaparilla and one strawberry soda.

Of the thirty-one artificially colored samples, four contained Tropaeolin O, and five acid magenta, both unpermitted coal-tar colors. Eight contained amaranth, a permitted color, and thirteen contained coal-tar colors, probably mixed colors, which we did not identify with certainty. Two of these, however, failed to give the reactions of the three permitted red shades.

One sample of ginger ale contained capsicum.

While seven permitted colors are allowed by government regulation to be used in food products, it must not be forgotten that a declaration of the presence of these colors is necessary to make the sale of the product legal. The use of an unpermitted color is illegal, whether declared or not, and in the future the same will be true for saccharin. The proof of the presence or absence of a permitted color is relatively simple, and it does not seem that it should be obligatory for the chemist to identify the unpermitted color used. The mere fact that a permitted color has not been employed furnishes sufficient grounds for food official or

prosecuting officers to bring action against the seller of the product, provided, of course, he has a sincere intent to enforce the law. Aside from the question whether or not the coal-tar dye used is injurious to health, its presence conceals inferiority or permits imitation of a natural product, which, under the law, constitutes adulteration or misbranding or both.

There is not one of the samples containing a permitted coal-tar color which is not illegal in some other respect.

To summarize: Of the forty-six samples examined, forty were adulterated as follows:

7	contained benzoic acid.
2	" " " and unpermitted color.
1	" " " and artificial flavor.
8	" saccharin.
1	" " and unpermitted color.
8	" " and artificial flavor.
3	" " and " " and unpermitted color.
2	" unpermitted color.
4	" " " and artificial flavor.
4	" artificial flavor.

It is an indisputable fact that the soda waters and soda water syrups sold in this state are grossly adulterated with chemical preservatives, saccharin and artificial colors and flavors. While the samples herewith reported were taken only in New Haven, our experience in our two general inspections of the past shows that these inferior preparations are not confined to that one city. In 1899 and 1902 the station made a very complete examination of these products and laid before the prosecuting authorities and the public the facts just as it found them. It is interesting, and at the same time a matter for regret, to note that certain manufacturers whom we find in the present inspection to be selling adulterated soda waters, were reported by us in 1899 and 1902 as selling products similarly adulterated. By publishing its findings the station has done its duty, in fact all that it is permitted to do under the law, and it would seem that public sentiment should demand a proper enforcement of the law against the sale of these adulterated drinks.

Lemonade Sugar. 5117. *The Original Lemonade Sugar, colored.* The F. A. Atwood Co., New Haven. "Take one teaspoonful of Lemonade Sugar and three of granulated to each glass of ice water, stir until dissolved." Oil of lemon was

present, citric acid, 13.73 per cent., no sulphuric, hydrochloric or phosphoric acid present; polarization at 25°, direct 77.2, after inversion —24.2, equivalent to sucrose 77.9 per cent. Color, probably naphthol yellow.

Candied Apples. **6056.** Sold by Dominick Rosso, New Haven. It consisted of natural apples, somewhat mouldy on the inside, coated over with sugar and colored red. The sugar coating polarized at 28°, direct 94.1, after inversion —28.05, equivalent to 94 per cent. sucrose. No benzoic, salicylic or boric acids, or saccharin was present. The color used was probably amaranth.

Colors and Flavors for Soda Waters.

6032. *Strawberry Red.* Frankel Bottling Works, New Haven. Consisted of a permitted coal-tar color, amaranth.

6024. *Strawberry Color.* Frank Mosca, New Haven. Consisted of an unpermitted coal-tar color, either fast scarlet or amaranth B.

6041. *Red Color.* Clark Extract Co., West Haven. Consisted of a permitted coal-tar color, Ponceau 3 R.

6020, 6047a, 6053. *Red Color.* Louis Lapides, Gilhuly's Bottling Works, and J. M. Botvinik, respectively. Consisted of a permitted coal-tar color, amaranth.

6031. *Imitation Strawberry Essence.* Frankel Bottling Works, New Haven. Solids, 2.52 per cent., polarization at 27°, direct 1.3, after inversion —0.33, no preservative or saccharin present, colored with coal-tar color, artificial flavor.

6038a. *Imitation Flavor Strawberry.* H. Baron & Co., New York. Sold by Charles Duschnitsky, New Haven. Colored with an unpermitted coal-tar color, acid magenta, and artificially flavored.

6048a. *Caramel Coloring.* Gilhuly's Bottling Works, New Haven. Consisted of caramel as stated.

5142. *Fruit Red No. 1.* National Extract Co., New York. Taken at Torrington Creamery. Consisted of a permitted color, amaranth.

Vanilla Extract. One sample of vanilla extract was found not to be adulterated. Another sample, labeled Providence Brand, Vanilla Flavor, Providence Extract Co., Providence, R. I.,

and sold by A. W. Smith, Danielson, contained 0.272 per cent. vanillin and 0.07 per cent. coumarin. It was adulterated with coumarin and caramel and probably contained synthetic vanillin.

Vinegar. Seventy-three samples were analyzed. It has long been recognized that the simple determination of acidity and solids gives but little useful information as to the genuineness of a cider vinegar. It requires but little skill on the part of the vinegar chemist to manipulate a vinegar so that it shall contain 4 per cent. acidity and 2 per cent. solids. The determination of reducing sugars, ash, alkalinity of soluble ash and phosphoric acid are of some value in judging the purity of a vinegar, but here, again, the manipulation of the vinegar chemist comes into play, and, a purely factitious vinegar may give analytical data in close agreement with that obtained with genuine vinegars. Recent work by the Bureau of Chemistry, of the United States Department of Agriculture, has shown that the determination of glycerine and pentosans gives very useful information as to the purity of a cider vinegar. A large number of analyses of cider vinegars made by the generator process show that in no case was less than 0.24 per cent. of glycerine present. A cider vinegar, therefore, showing appreciably less than this amount of glycerine must be judged with suspicion. It has also been shown that the pentosans in a genuine cider vinegar rarely exceed 0.15 to 0.17 per cent. A higher figure than that indicates the addition of apple waste (skins and cores) or the use of second pressings.

The amount of non-sugar solids present is also of value. A genuine cider vinegar rarely shows less than 1.50 per cent. A value much lower than this indicates the addition of water, distilled vinegar (or acetic acid), or boiled cider. The presence of the last-named material would be further shown by a high percentage of reducing sugars in the solids.

It is not possible in this report to discuss in detail the results secured. Table XXXVII (pages 206 et seq.), however, gives the full analytical data, and below will be found a summary of our findings. The methods of analysis used were furnished the writer in private correspondence by Dr. R. E. Doolittle of the New York laboratory, and have been adopted as provisional methods by the Association of Official Agricultural Chemists. They are too lengthy for publication here.

Summary of Results.

Cider Vinegar. Twenty-seven samples were analyzed in detail, while in nine, duplicate brands, only acidity and solids were determined. Of these only four, **6203**, **6236**, **6248** and **6254**, fully satisfied the standard and proved to be genuine cider vinegars. **6262** was a genuine vinegar, slightly below standard in solids; **6222** likewise was genuine, but was incompletely acetified and therefore was low in acidity; it contained over 3 per cent. of alcohol.

The analyses of **6208**, **6235** and **6264** showed that second pressings had been added to otherwise genuine cider vinegars.

In **6216**, **6220**, **6228**, **6231** and **6234** the high reducing sugars and pentosans indicated the use of apple waste, or dried apples.

6202, **6227** and **6237** showed excessive dilution with water.

6212 was low in glycerine and probably contained some boiled cider.

6214 and **6240** were mixtures of cider and distilled vinegars, boiled cider and added mineral matter.

6224 was low in acidity and high in alcohol, indicating incomplete acetification. Second pressings or material high in sugars, partly fermented, had been added.

6244 was low in solids and indicated that distilled vinegar, second pressings and mineral matter had been added.

6230 was a mixture of cider and distilled vinegar and second pressings partially fermented.

6232 showed addition of distilled vinegar and material high in sugars.

6218 showed the addition of boiled cider.

6247 showed the addition of distilled vinegar.

6270 was low in acidity and solids; distilled vinegar added.

Of the nine duplicate brands of cider vinegar, eight satisfied the standard for acidity and solids, while one was low in solids. The complete analysis of duplicate samples of these nine brands showed only one of them to be genuine cider vinegar.

Other Vinegars. Twenty-three samples of distilled or spirit vinegar, twelve of compound vinegar, and one each of syrup and wood acid vinegar were analyzed. The analyses are shown in Table XXXVIII. Twenty of the distilled vinegars satisfied the legal standard of 4 per cent. acidity; the other three showed

slight deficiencies. **6211** and **6221** were sold by the dealers as "white wine" vinegar.

The twelve samples sold as compound vinegars were essentially colored distilled vinegars. The percentage of solids found shows that no considerable amount of molasses or syrup vinegar was present in any case. The labeling is clearly deceptive. Three of these samples were deficient in acidity, **6250** notably so.

The sample of wood-acid vinegar was deficient in acidity. It was nothing more than dilute acetic acid.

Camphor Liniment. Samples bought of D. W. Tracy, Hartford, and The City Pharmacy, Stamford, contained only 4.3 and 16.5 per cent. of camphor, respectively, or only 21.5 and 82.5 per cent. of the required U. S. P. strength.

Cod Liver Oil Emulsions. A sample sold by Daskum & Gyde, Waterbury, contained 3.32 per cent. alcohol by weight, and was therefore adulterated. Another sample sold by J. A. Leverty & Bro., Bridgeport, was below standard in hypophosphites, containing only 0.37 per cent. of phosphoric acid, about one-fourth the proper amount.

Headache Wafers. A sample of "Ingram's Celero Caffeine Headache Wafers," made by F. F. Ingram & Co., Detroit, and sold by Edward Toucey, Bridgeport, was analyzed. On a separate label on the side of the package was the guaranty. "Contains 218 grains acetanilid to the ounce," or an equivalent of 45.4 per cent. acetanilid. The weights of the wafers and the actual amounts of acetanilid present in each were very variable, although the percentage content of acetanilid was fairly constant. No acetphenetidin was present. The details are given below.

Wafer.	Wgt. of wafer contents. grams.	Acetanilid per wafer.		Per cent.
		grams.	grains.	
1.....	.0478	.0228	0.35	47.7
2.....	.2622	.1233	1.90	47.0
3.....	.0598	.0295	0.45	49.3
4.....	.3508	.1608	2.47	45.8

Opium. A suspected sample sold by Hong Heong Lou & Co., Bridgeport, proved to be opium.

Spirit of Nitrous Ether. Nine samples were examined, all of which were below U. S. P. standard, ranging from 0.25 to

TABLE XXXVII.
(Grams per

Station No.	Brand.	Manufacturer.	Specific gravity at 15.6° C.	Alcohol.
6230	Pure Cider Vinegar, Conn. Standard	Ford Allen, Chittenango Station, N. Y.	I.0163	0.05
6222	"	F. S. Armstrong, Franklin, Conn.	I.0099	3.05
6224	Cider Vinegar.	Said to be George E. Bates, Scotland.	I.0132	2.28
6235	Beech-Nut Brand Cider Vinegar.	Beech-Nut Packing Co., Canajoharie, N. Y.	I.0167	0.16
6264	Cary's Pure Cider Vinegar.	W. W. Cary & Sons, Lyonsville, Mass.	I.0158	0.17
6208	Pure Cider Vinegar	S. R. Deyo Co., Kingston, N. Y.	I.0159	0.12
6248	Pure Cider Vinegar, 40 grains.	Egypt Vinegar Product Co., Egypt, N. Y.	I.0160	0.18
6270	Pure Cider Vinegar.	Empire Bottling Works, Newark, N. J.	I.0125	0.18
6244	Cider Vinegar.	H. Erdman's Sons, Philadelphia.	I.0128	0.31
6247	The Old Mill Brand Cider Vinegar	Fairchild's & Hegany, Danbury, Conn.	I.0096	1.41
6237	Pure Cider Vinegar.	Mfd. for Fleischmann Vinegar Works, N. Y.	I.0123	0.67
6216	Bon-Ton Brand Pure Cider Vinegar, 45 grains.	Haynes, Piper Co., Boston.	I.0189	0.14
6220	Guaranteed Pure Cider Vinegar, 4%	"	I.0175	0.13
6228	" " " " 45 grains	"	I.0175	0.01
6231	Guaranteed Pure Cider Vinegar, Standard Test.	"	I.0163	0.20
6218	Pure Apple Cider Vinegar Fermented	H. J. Heinz Co., Pittsburgh, Pa.	I.0165	0.07
6236	Crescent Brand Pure Cider Vinegar, 45 grains.	Charles Hirsh & Co., New York.	I.0139	0.71
6232	Pure Cider Vinegar.	Mfd. for Humphrey-Cornell Co., New London, Conn.	I.0156	0.26
6212	Pure Apple Cider Vinegar.	F. E. Jewett & Co., Lowell, Mass.	I.0152	0.40
6234	Best Apple Vinegar, 40 grains.	S. R. & J. C. Mott, Bouckville, N. Y.	I.0158	0.08
6202	Cider Vinegar.	New England Vinegar Works, Boston	I.0144	0.35
6214	Extra Old Farm Orchard Brand Cider Vinegar.	Place Bros., Oswego, N. Y.	I.0166	0.20
6240	Cider Vinegar.	M. H. & M. S. Place, Oswego, N. Y.	I.0165	0.16
6254	Pure Cider Vinegar.	Put up for Morris Spirt, Waterbury, Conn.	I.0125	1.27
5203	Pure Cider Vinegar, XXX.	J. A. Thompson & Son, Melrose, Conn.	I.0124	1.25
6262	"	"	I.0106	1.67
6227	Pure Apple Cider Vinegar, 4%.	York State Fruit Co., Fairport, N. Y.	I.0140	0.30

CIDER VINEGAR.
100 cc.)

Total Acids as acetic.	Solids.	Polarization at 20° C. (V.).	Reducing Sugars.		Non-Sugar Solids.	Total Ash.	Alkalinity of Water-Soluble Ash (cc. $\frac{N}{10}$ acid).	Phosphoric Acid (mgms. per 100 cc.).	Glycerine.	Pentosans.	Per cent. Ash in Total Solids.	Per cent. Ash in Non-Sugar Solids.	Per cent. Reducing Sugars in Total Solids.	Glycerine Ratio.
			Direct.	After Inversion.										
4.10	2.29	+0.8	0.93	0.92	1.36	0.356	40.4	22.1	0.10	0.24	15.6	26.2	40.6	21.3
3.48	2.47	-1.0	0.53	0.51	1.94	0.353	42.2	19.8	0.31	0.12	14.3	18.2	21.5	12.2
3.12	3.14	±0.0	0.62	0.61	2.52	0.339	40.6	23.3	0.36	0.22	10.8	13.5	19.7	8.5
4.76	2.34	-1.0	0.85	0.84	1.49	0.312	30.4	26.0	0.27	0.17	13.3	20.9	36.3	9.4
4.24	2.49	-2.0	0.97	0.96	1.52	0.260	30.0	15.0	0.22	0.11	10.4	17.1	39.0	10.4
4.06	2.37	-0.2	0.72	0.74	1.63	0.302	31.0	21.2	0.25	0.28	12.7	18.5	31.2	8.6
4.02	2.43	-0.4	0.73	0.72	1.70	0.367	35.0	25.9	0.23	0.18	15.1	21.6	30.0	9.5
3.92	1.64	-1.2	0.56	0.56	1.08	0.250	26.6	18.4	0.16	0.13	15.2	23.1	34.1	8.2
4.12	1.69	-0.8	0.64	0.64	1.05	0.270	28.2	24.2	0.09	0.09	16.0	25.7	37.9	7.7
4.32	1.24	-0.6	0.27	0.27	0.97	0.273	29.8	19.5	0.16	0.05	22.0	28.1	21.8	19.7
4.00	1.82	-0.4	0.58	0.57	1.24	0.247	23.6	19.3	0.20	0.14	13.6	20.0	31.9	12.4
4.52	2.93	-2.0	1.00	1.00	1.93	0.350	36.8	26.8	0.24	0.22	11.9	18.1	34.1	10.0
4.22	2.69	-0.6	0.98	0.95	1.71	0.301	32.2	25.9	0.29	0.29	11.2	17.6	36.4	7.7
4.64	2.59	-0.2	0.74	0.73	1.85	0.313	34.4	23.9	0.31	0.23	12.1	16.9	28.6	7.7
4.16	2.44	-0.2	0.74	0.74	1.70	0.300	32.8	22.1	0.29	0.22	12.3	17.6	30.3	7.8
4.72	2.21	-1.4	1.05	1.05	1.16	0.292	32.0	21.0	0.20	0.11	13.2	25.2	47.5	12.3
4.36	2.20	-1.0	0.52	0.53	1.67	0.354	36.2	27.4	0.29	0.17	16.1	21.2	24.1	9.3
4.24	2.24	-1.0	0.89	0.89	1.35	0.355	42.4	19.9	0.14	0.09	15.8	26.3	39.7	16.7
4.28	2.32	-0.6	0.80	0.83	1.49	0.331	38.2	16.4	0.19	0.13	14.7	22.2	35.8	12.9
4.12	2.27	-0.8	0.87	0.87	1.40	0.279	30.6	22.1	0.24	0.26	12.3	20.0	38.3	9.0
4.00	1.73	-0.8	0.58	0.59	1.14	0.252	27.2	13.8	0.21	0.10	14.6	22.1	34.1	10.7
4.54	2.28	-1.4	1.13	1.22	1.06	0.323	29.6	33.0	0.09	0.10	14.2	30.5	53.5	27.3
4.00	2.63	-2.2	1.50	1.52	1.11	0.369	33.6	24.5	0.08	0.09	14.0	33.2	57.8	26.5
4.24	2.18	-1.0	0.53	0.52	1.65	0.290	32.8	22.7	0.25	0.11	13.3	17.6	24.3	11.5
4.20	2.10	-0.8	0.47	0.47	1.63	0.293	30.8	20.6	0.29	0.12	14.0	18.0	22.4	9.8
4.08	1.82	-0.4	0.40	0.39	1.42	0.291	29.2	20.2	0.30	0.08	16.0	20.5	22.0	10.3
4.26	1.84	-1.0	0.65	0.63	1.19	0.257	26.8	17.2	0.30	0.15	14.0	21.6	35.3	7.9

3.51 per cent. of ethyl nitrite, or from 6 to 88 per cent. U. S. P. The details follow:

Dealer.	Spec. grav. at 15.6° C.	Ethyl Nitrite.	Per cent. U. S. P.
C. E. Pickard & Co., Bridgeport.....	.8224	2.57	64
J. J. Hickey & Co., Willimantic.....	.8256	3.16	79
C. E. Miller, Hartford.....	.8156	3.36	84
J. R. Halloran, New Britain.....	.8227	3.43	86
City Drug Store, New Britain.....	.8225	2.67	67
The Miller-Hanson Drug Co., New Britain..	.8171	3.51	88
Arcade Drug Store, New Britain.....	.8178	0.25	6
Edward P. Weed, Norwalk.....	.8144	3.09	77
Frank H. Baxter, South Norwalk.....	.8157	2.65	66

Quinine Pills. Sample of "Gelatine Coated Pills Quinine Sulphate, 2 grains, Beekman Brand" made by Schiefflin & Co., New York, and sold by Charles Fleischner, New Haven, was found to be of standard quality. The average content of two lots of five pills was 1.99 and 2.05 grains quinine sulphate per pill.

"Snuff." Three samples suspected of containing cocaine contained none of that drug or of eucaine. They contained a mixture of alkaloids, which gave characteristic reactions for morphine or its salts, and some of the reactions for heroin, the acetyl derivative of morphine.

MISCELLANEOUS MATERIALS SENT BY PRIVATE INDIVIDUALS.

Milk. Twenty-one samples were tested, of which sixteen satisfied the legal standard, two were below standard and three were watered. The latter contained 9.66, 9.45 and 9.33 per cent. solids. Two samples tested for formaldehyde showed none of that preservative. In addition to these the milk of the individual cows of a herd of twenty-eight were tested for fat. This ranged from 2.1 to 6.3 per cent., only four cows showing less than the legal standard.

Cream. Nineteen samples were tested. These contained from 17.0 to 61.6 per cent. fat. One sample contained sucrose of lime. Its analysis was fat 21.0 per cent., ash 0.56, lime .151 and alkalinity of ash (100 gms.) 18.0 cc. $\frac{N}{10}$ sulphuric acid. No chemical preservatives were found.

Buttermilk. The sample examined contained no chemical preservative.

Butter. Five samples were examined, four of which were undoubtedly genuine butter. A fifth sample showed peculiar white areas in the print, which had a somewhat tallowy or lardy flavor. The white and normal portions were analyzed separately as follows:

	Reichert-Meissl No.	Refraction at 25° C.
White portion	31.0	51.0
Normal portion	30.2	51.0

These figures indicated no adulteration. Seerkowitsch suggests (Vol. 2, p. 832) that "on exposure to light, butter loses its yellow color and acquires a tallowy ("lardy") smell and taste."

Coffee. Two samples were examined. One contained a trace of coffee, but was largely leguminous; the other contained no coffee, and consisted chiefly of a legume, differing from that found in the first sample.

Fish. A sample of fresh fish was tested for preservatives with negative results.

Flour. A sample of graham flour contained 10.56 per cent. of protein; no other starch than wheat was present; the small amount of the seed coats of corn cockle (*Agrostemma githago*) present did not indicate intentional adulteration. Two samples of "Wholesome Brownish Flour" were examined. It was claimed to be useful in preventing constipation. No agar-agar or mineral drug was present. It contained 11.75 per cent. protein, 1.86 per cent. ash and 0.45 per cent. phosphoric acid.

Ice Cream. Four samples contained 10.0, 11.0, 11.5 and 13.25 per cent. fat; a fifth sample contained no chemical preservatives.

Jam. A sample of quince jam contained no chemical preservative.

Maple Sugar. The sample examined analyzed as follows: Polarization at 25° C. direct, 84.2; after inversion, -27.28, equivalent to sucrose 85.65; total ash, 1.13; ash soluble in water, 0.66; ash insoluble in water, 0.47; alkalinity of 100 gms. soluble and insoluble ash 59 cc. and 84 cc. $\frac{N}{10}$ hydrochloric acid, respectively; Winton lead No. 1.90; ratio insoluble to soluble ash, 1 to 1.4. The sample was passed as probably pure.

Molasses. The sample examined polarized at 21° C. direct, 25.8; after inversion, -12.32, equivalent to sucrose 28.84 per cent.; water, 26.96 per cent. It was a very dark colored molasses, low in sugar and high in water.

Olive Oil. The two samples contained no cottonseed, sesame or peanut oil.

Soda Water. This sample was sent by a New Haven newspaper. It analyzed as follows: Solids, 5.17; polarization at 25° C. direct, 4.7; after inversion, -1.4, equivalent to sucrose 4.69 per cent.; flavor, artificial; colored with acid magenta (an unpermitted color); no saccharin, benzoic acid or salicylic acid present.

Vinegar. Thirteen samples were examined for solids and acidity; seven satisfied the legal standards, two were low in solids, two in acidity and two in both solids and acidity.

Alfalfa Bread. The sample contained 20.48 per cent. water, 2.65 ash, 10.62 protein, 0.95 fiber, 63.98 nitrogen-free extract and 1.32 fat.

Dried Egg. Made by the National Bakers Egg Co., Sioux City. It contained 8.81 per cent. water, 35.05 fat, 44.13 protein, 3.42 ash, 2.42 phosphoric acid, no boric acid, and natural color. The analysis indicates it to be a genuine egg product.

Brandy. The sample showed a specific gravity of .9440 at 15.6° C. and 46.86 per cent. alcohol by volume, just about the minimum strength allowed by the U. S. P.

Rum. The sample was too small for a complete examination. It showed a specific gravity of .9485 at 15.6° C. and 39.42 per cent. alcohol by volume. No methyl alcohol was present.

Whisky. A sample of Glengarry Scotch whisky analyzed as follows: Specific gravity at 15.6° C. 0.93978; extract, 156.7 gms. per 100 liters; acidity, 29.4 gms. acetic per 100 liters; esters, 54.56 gms. ethyl acetate per 100 liters; no methyl alcohol.

Abortion Medicine. This medicine was claimed to prevent abortion in cows. Qualitative tests showed lead, sodium, iron, acetic acid, carbonates, and borates. There was found the equivalent of 19.36 lead acetate, 57.49 per cent. sodium biborate, and 73.32 per cent. insoluble in alcohol. The following assumed composition was calculated:

19.36 lead acetate.
57.49 sodium biborate.
15.83 sodium carbonate and iron oxide.
7.32 soluble in alcohol (other than lead acetate).

Elixir Glycerophosphates Comp. A New Haven man had a prescription, our number 25560, calling for a proprietary prepara-

tion of this medicine, filled at a local drug store. On taking the medicine he showed many of the symptoms of strychnine poisoning and for a day was in a very serious condition. Suspecting that the druggist had either made a mistake or had substituted another preparation, he had his physician write another prescription, which he had filled at the same drug store, our number 25561. The two preparations were very unlike in appearance and were brought to us for examination. 25560 showed .0338 gm. total alkaloids per 20 cc., 25561, .0138 gm. Qualitative tests on the residues showed the presence of strychnine and quinine in both samples. Our attempt to separate these alkaloids by the oxalate method was unsuccessful, but the action of the residues with absolute alcohol and ether and the characteristic crystalline residue in the first sample indicated that there was much more strychnine in 25560 than in 25561. In the latter the quinine seemed to predominate. Chemical methods failing to separate the alkaloids, physiological tests with frogs were used. Our thanks are due to Prof. L. B. Mendel, of Yale University, who kindly permitted us to use his frogs and his laboratory for this purpose.

It is well known that frogs are susceptible to strychnine. It was believed that if comparable amounts of our two preparations, based on their total alkaloidal content, were administered to frogs under similar conditions, and unequal toxic effects were produced, the relative toxicity of the two preparations might be established.

The original preparation, 25560, was diluted with distilled water, the dilutions corresponding to $\frac{1}{5}$, $\frac{1}{10}$, $\frac{1}{15}$, $\frac{1}{25}$ and $\frac{1}{75}$ of the original strength. The following table shows the volume of original solution contained in the respective dilutions and the amounts of total alkaloids in solution per cc. of the dilute solutions:

	Original Solution. cc.	Total Alkaloids. gm.
1 cc. of dilution, $\frac{1}{5}$	0.200	.000338
1 cc. of dilution, $\frac{1}{10}$	0.100	.000169
1 cc. of dilution, $\frac{1}{15}$	0.067	.000113
1 cc. of dilution, $\frac{1}{25}$	0.040	.000068
1 cc. of dilution, $\frac{1}{75}$	0.013	.000022

From the dilute solutions, 0.5 cc. was administered to the frog, injecting into the dorsal lymph sac. The frog was then immediately placed under a bell-jar, allowing the entrance of sufficient

air for respiration, the time taken and the effects of the injection noted, comparing department with a normal frog. The following results were noted:

Frog.	Weight of Frog. gms.	Dilution of Orig. Material.	Total Alkaloids. gms.	Result of Injection.
1.....	33	$\frac{1}{8}$	.000169	Tetanized in 14 min.
2.....	36	$\frac{1}{25}$	.000034	{ Tetanic spasm in 83 min.; recovered in 125 min.
3.....	30	$\frac{1}{75}$	.000011	
4.....	24	$\frac{1}{15}$	.000057	Tetanized in 54 min.
5.....	33	$\frac{1}{10}$	.000085	Tetanized in 36 min.

The rate of tetanization varied directly with the strength of the injection. The characteristic symptoms of strychnine poisoning were observed, and the presence of this alkaloid was thus definitely established.

A series of tests were then conducted, using similar amounts of total alkaloids from the two prescriptions. **25561** was diluted with water so that 1 cc. of the diluted solution corresponded very closely with the total alkaloid content of the $\frac{1}{8}$ dilution of **25560**, so that 0.5 cc. of **25560** diluted contained .000169 gm. and the same amount of **25561** diluted .000149 gm. of total alkaloids. The results of these tests follow:

Frog.	Weight of Frog. gms.	Sample No.	Dilution.	Total Alkaloids. gms.	Result of Injection.
6.....	34	25561	$\frac{2}{5}$	.000149	{ Slightly tetanized in 56 min.; completely tetanized in 68 min.
7.....	39	25560	$\frac{1}{8}$	.000169	

Frog 6, twenty-four hours after the injection, recovered, was able to maintain itself on its hind legs, jumped well and on removal to the tank swam easily. Frog 7, after twenty-four hours, was still tetanized. Similar results were secured with two other frogs where .000198 gm. total alkaloids from **25560** and .000166 gm. from **25561** were administered.

These experiments seemed to demonstrate that **25560** was more toxic to frogs than **25561**, and that the two preparations differed considerably in their alkaloidal content.

TABLE XXXIX.—SUMMARY OF RESULTS OF EXAMINATION OF FOOD AND DRUG PRODUCTS IN 1911.

	Not found *Adulterated.	*Adulterated or below standard.	Compound.	Total number examined.
<i>Sampled by Station.</i>				
Chocolate	10	4	20	34
Chili Sauce	4	2	2	8
Cider	2	4	0	6
Cocoa	28	31	3	62
Coffee	1	..	..	1
Coffee Substitute	1	..	..	1
Cream	36	4	..	40
Cream of Tartar	3	..	..	3
Fruit Juices	13	8	15	36
Gluten Preparations	8	3	..	11
Ice Cream .....	..	..	..	21
Ice Cream Powders	1	..	3	4
Jam	1	1	1	3
Meltose .....	..	..	..	1
Milk	42	82	..	124
Orange Sugar .....	..	1	..	1
Paprika	12	2	1	15
Root Beer Extracts .....	..	1	..	12
Relishes	2	2	8	12
Salad Dressings .....	..	1	2	12
Sauces .....	..	..	..	20
Soups, Condensed .....	..	..	..	3
Vinegar	5	6	2	13
Camphor Liniment	18	5	..	23
Cocoa Butter	16	..	..	16
Cod Liver Oil Emulsions	17	11	..	28
Cod Liver Oil Wines	0	8	..	8
Headache Preparations	4	4	..	8
Tincture Iodine	20	..	..	20
Lime Water	3	1	..	4
Spirit Nitrous Ether	4	30	..	34
Pepsin	5	15	..	20
Quinine Pills	30	3	..	33
Sarsaparilla Extract .....	..	3	..	9
Extract Witch Hazel	76	..	..	76
Total	362	232	57	722
<i>Sampled by Dairy Commissioner.</i>				
Candied Apples .....	..	..	..	1
Butter and Butter Substitutes	14	36	..	50
Cocoa	0	9	..	9
Colors and Flavors	8	2	..	10
Condensed Milk	1	..	..	1
Cream	13	2	..	15
Cream of Tartar	1	..	..	1
Fruit Syrups .....	..	2	..	2
Gluten Flour .....	..	1	..	1
Ice Cream .....	..	1	..	1
Ice Cream Cones .....	..	1	..	1
Ketchup .....	..	..	..	1
Lemonade Sugar .....	..	..	..	1

* Also includes misbranding.

TABLE XXXIX.—SUMMARY OF RESULTS OF EXAMINATION OF
FOOD AND DRUG PRODUCTS IN 1911—*Continued.*

	Not found *Adulterated.	*Adulterated or below standard.	Compound.	Total number examined.
<i>Sampled by Dairy Commissioner (continued).</i>				
Lemon Extract.....	4	2	..	6
Mace.....	..	1	..	1
Milk.....	88	†202	..	290
Molasses.....	2	..	..	2
Olive Oil.....	6	..	..	6
Soda Water and Soda Water Syrups.....	6	40	..	46
Vanilla Extract.....	1	1	..	2
Vinegar.....	35	26	12	73
Camphor Liniment.....	..	2	..	2
Cod Liver Oil Emulsions.....	..	2	..	2
Headache Wafers.....	..	1	..	1
Spirit Nitrous Ether.....	..	9	..	9
Opium.....	..	..	..	1
Quinine Pills.....	1	..	..	1
"Snuff".....	..	..	..	3
Total.....	180	†341	12	554
<i>Sampled by Private Individuals.</i>				
Abortion Medicine.....	..	..	..	1
Alfalfa Bread.....	..	..	..	1
Brandy.....	1	..	..	1
Butter.....	5	..	..	5
Buttermilk.....	1	..	..	1
Chicken Crop.....	..	..	..	1
"Cobalt".....	..	..	..	1
Coffee.....	..	2	..	2
Cream.....	18	1	..	19
Dried Egg.....	1	..	..	1
Elixir Glycerophosphates Comp.....	..	..	..	2
Fish.....	1	..	..	1
Flour.....	3	..	..	3
Ice Cream.....	5	..	..	5
Insecticides.....	..	..	..	8
Jam.....	1	..	..	1
Maple Sugar.....	1	..	..	1
Milk.....	40	9	..	49
Molasses.....	..	1	..	1
Olive Oil.....	2	..	..	2
Rat Poison.....	..	..	..	1
Rum.....	..	..	..	1
Soda Water.....	..	1	..	1
Stomach Contents.....	..	..	..	4
Vinegar.....	7	6	..	13
Whisky.....	..	..	..	1
Miscellaneous.....	..	..	..	3
Total.....	86	20	..	130
Total from all sources.....	628	593	69	1406

* Also includes misbranding. † Includes 60 samples below standard in solids—not fat.

MISCELLANEOUS EXAMINATIONS.

The following examinations have been made from time to time and are printed now as a matter of record.

A sample of what was supposed to be 4 per cent. acetic acid solution was sent to be tested; it contained 3.58 per cent.

The contents of the stomach of a man, who had died under suspicious circumstances, were examined for wood alcohol with negative results.

The contents of three cows' stomachs were examined for arsenic with negative results.

A sample of green weed leaves, suspected of being covered with a poison, were examined and paris green was found.

A bottle, found in the room of a man who had died suddenly, was sent by a coroner, the contents to be tested for methyl alcohol; none was found.

A sample of "rat poison" contained 0.22 per cent. total phosphorus, 0.13 per cent. phosphorus soluble in carbon bisulphide, reducing sugar and glucose present, no arsenic found.

The crop of a chicken, suspected of having been poisoned, was found to contain much arsenic. A sample of soil, taken from the place where the chicken had been feeding, contained .009 per cent. metallic arsenic, equivalent to .012 per cent. arsenious oxide.

A sample of so-called "Cobalt," intended for use as an insecticide, contained 94.61 per cent. total arsenic, water-soluble arsenic (1 day) 11.28, (10 days) 16.46. It contained no chlorides, sulphates, reducing sugars or saccharin.

Ortho-Arsenite of Zinc. This material, made by the California Spray Chemical Co., was tested for water-solubility. After twenty-four hours 1.60 per cent. solids was dissolved and 0.495 per cent. arsenious oxide.

Cut Worm Food. This material, made by Geo. L. Warncke & Co., Cannon Station, was found to consist chiefly of brown middlings and arsenate of lead.

Arsenate of Lead. These analyses were made in 1908 and 1909, and are published now as supplementing those given in our Bulletin 157. They do not necessarily represent the quality of the products offered by the different manufacturers at the present time. Sample 20920 was much drier than is usual with this material.

No.	Manufacturer.	In Material as Analyzed.				In Water-free Material.	
		Water.	Arsenic Oxide.	Lead Oxide.	Undetermined.	Arsenic Oxide.	Lead Oxide
20564	Grasselli Chem. Co. ...	40.70	15.24	.....	.....	25.70	.....
22163	Grasselli Chem. Co. ...	45.57	15.38	37.25	1.80	28.26	68.43
22382	Thomsen Chem. Co. ...	51.73	13.81	32.04	2.42	28.61	66.38
22701	Thomsen Chem. Co. ..	45.76	16.10	35.71	.....	29.68	65.84
20920	Disparene	36.61	18.80	42.05	.....	29.66	66.34
20913	Unknown .....	.....	12.44	.....	.....	.....	.....

PART III.

COMMERCIAL FEEDING STUFFS

BY E. H. JENKINS AND J. P. STREET.*

THE LAW REGULATING THEIR SALE.

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 one of the cereals or from buckwheat, and feed ground from whole grain and sold directly from manufacturer to consumer.

Section 4592 requires that every package of concentrated commercial feeding stuff shall bear a statement giving the name and address of manufacturer or importer, the number of net pounds in the package, the name of the article and the percentage of protein and fat contained in it.

The penalty prescribed for violation of the statute is not more than \$100 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 fashion, 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."

The dairy commissioner is charged with the enforcement of the statute.

In compliance with these requirements the following report has been prepared. The utmost brevity of discussion of work is made necessary by the limit imposed by law on the size of the report.

* The analytical work here described has been done by Messrs. Street, Bailey, Morrison, Roe and Shepard. The report has been prepared mainly by Mr. Street.

During the fall of 1911 the station sampling agent visited fifty-six towns and villages of this State and collected 212 samples of feeds as prescribed by law. The results of the chemical and microscopical examination of these samples are here given and discussed and the chemical analyses are given in Table III.

There are also sixty-one analyses of samples sent by individuals.

OIL SEED PRODUCTS.

Cotton Seed Meal, Sampled by the Station.

Of the ten samples analyzed all substantially satisfied their guaranties except **27217**, which was 1.88 per cent. low in protein. The average composition was practically the same as last year, but the selling price was \$1.65 less per ton.

Cotton Seed Meal, Sampled by Purchasers.

Twelve samples of *Dixie Brand*, Humphreys, Godwin & Co., Memphis, were uniformly guaranteed 38.62 per cent. protein. These were **25929**, sent by E. A. Root, East Granby; **25997** and **27263**, sent by C. G. Lawton, Brooklyn; **26093**, sent by Theo. Wachter, Winsted; **26129**, sent by A. E. Potwin, East Windsor; **27241**, sent by D. W. Ives, Wallingford; **27255**, sent by J. W. Alsop, Avon; **27260**, sent by H. R. Stone, Southbury; **27869**, sent by W. E. Wheelock, Quinebaug; **27258** and **27259**, sent by The Coles Co., Middletown; and **27261**, sent by H. B. Coger, Botsford. These contained 42.56, 41.25, 39.38, 42.63, 41.19, 38.19, 38.25, 40.69, 41.25, 41.69, 40.75 and 42.19 per cent. protein, respectively, practically satisfying the guaranty in all cases. It is obvious that the guaranty gives no very definite idea of the amount of protein, being that of a low-grade article with only 6.2 per cent. of nitrogen while the larger number of these samples have 6.6 per cent. or more. Such a low guaranty is "safe" for the seller, but not very exact for the buyer. The difficulty of getting from the mills any accurate statement of the quality of their output has been mentioned on page 25. To give a statement which is very far below the actual composition is not meeting the legal requirement. How wide a variation is permissible has not yet been determined.

27833, Humphreys, Godwin & Co., Memphis, sent by D. W. Ives, Wallingford, contained 38.88 per cent. protein.

25962, Humphreys, Godwin & Co., Memphis, guaranty 41 per cent. protein, sent by Rockville Milling Co., Rockville, contained 40.75 per cent. protein.

27253, sent by Humphreys, Godwin & Co., Memphis, contained 37.63 per cent. protein.

27013, sent by The Coles Co., Middletown, without guaranty, contained 39.25 per cent. protein.

25928, and **26294**, *Owl Brand*, F. W. Brode & Co., Memphis, guaranty, 41 per cent. protein, sent by The Coles Co., Middletown, contained 41.56 and 43.62 per cent. protein, respectively.

25931, National Feed Co., St. Louis, guaranty 41 per cent. protein, sent by F. D. Lawton & Son, Unionville, contained 42.37 per cent. protein.

25936, J. E. Soper Co., Boston, guaranty 41 per cent. protein, sent by Wheeler & Co., Bridgeport, contained 42.44 per cent. protein.

26988, sent by The C. W. Campbell Co., Westerly, contained 37.94 per cent. protein.

27029, Memphis C. S. P. Co., Memphis, guaranty 41 per cent. protein, sent by M. D. Leonard & Co., Watertown, contained 39.63 per cent. protein.

27030, and **28022**, S. P. Davis, Little Rock, Ark., guaranty 41 per cent. protein, sent by Wm. H. Hammond, Hampton, and F. U. Wadhams, Torrington, contained 38.88 and 41.88 per cent. protein, respectively.

27240, W. Newton Smith, Baltimore, Md., guaranty 41 per cent. protein, sent by H. K. Brainard, Thompsonville, contained 38.50 per cent. protein.

27864, Farmers Cotton Oil Co., Americus, Ga., guaranty 41 per cent. protein, sent by J. W. Alsop, Avon, contained 37.56 per cent. protein.

Cotton Seed Feed Meal.

The sample analyzed was slightly below guaranty in fat. Its selling price is \$3.80 less per ton than that of standard cotton seed meal, yet it contains only a little more than half as much protein and fat and two and one-half times as much fiber. It is a mixture of hulls and meal. While in the South such a mixture is much used as feed, Connecticut farmers cannot afford to pay freight on hulls for such a purpose.

Linseed Meal, Sampled by the Station.

The four samples of old process meal analyzed satisfied their guaranties. The average price of this meal is \$2.75 per ton higher than last year.

Oil Cake Feed.

A sample of this imported feed, made by J. Bibby & Sons, Liverpool, and sent by W. A. Hamblin, Suffield, had the following percentage composition:

Water	7.03
Ash	8.69
Protein	20.31
Fiber	8.69
Nitrogen-free extract	46.99
Fat	8.29

Two samples of the same material, sent by F. N. Platt, one labeled Horse Feed and the other Dairy Feed, contained 20.25 and 21.06 per cent. of protein, respectively.

This is not a pure linseed meal, as is shown by its high ash, and nitrogen-free extract and low protein content.

WHEAT PRODUCTS.

Atlantic Gluten Feed.

This material, though sold as "Gluten Feed," is a wheat, not a corn, product. The two samples analyzed satisfied their guaranties.

Wheat Bran.

Of the twenty-six samples, five had no guaranty of composition as required by law. These were **27090**, *Higginsville Bran*, **27055**, *Maple Leaf Bran*, **27216**, *Miner-Hillard Bran*, **27052**, *Niagara Bran*, and **27097**, *Voigt's Bran*. These were, however, of average quality. When their attention was called to the matter, most of the manufacturers of wheat feeds were ready to brand their goods in a way to comply with the Connecticut law. In one or two cases the manufacturers implied that it was not their business to give a guaranty as they were not bound in any way by the Connecticut law. The law of course only regulates sales within Connecticut. It is the jobber or retailer in this State who is held responsible for the proper marking of packages. Almost all manufacturers, however, mark the goods which they ship with

the required guaranty, thus relieving the local dealer from the necessity of putting extra tags or labels on all packages which he sells. Connecticut dealers should, therefore, for their own protection buy goods which are shipped from the factory with the statement of guaranty attached.

The remaining twenty-one samples satisfied their guaranties, except **27125**, *Hecker's Choice Bran*, which was 0.67 per cent. low in fat.

Wheat Middlings.

Of the thirty samples, three had no guaranty of composition as required by law. These were **27099**, *Atlantic White Middlings*, **27053**, *Niagara Middlings*, and **27086**, *Stott's White Middlings*, all of which were of good quality.

Of the remaining twenty-seven samples, **27092**, *Barber's Fancy Low Grade Middlings*, was 1.75 per cent. below guaranty in protein and 1.84 per cent. below in fat; **27182**, *Stott's Choice Middlings*, was 0.87 per cent. below its protein guaranty.

Wheat Feed.

Of the twenty-nine samples, three did not bear the guaranty required by law. These were **27224** and **27054**, *Perfect Mixed Feed*, and **27213**, *Monarch Mixed Feed*, all of which were of standard quality.

Of the remaining twenty-six, **27230**, *Winona Mixed Feed*, **27094**, *Manhattan Mixed Feed*, and **27172**, *Queen Mixed Feed*, were 0.44, 0.26 and 0.62 per cent. below their fat guaranties.

Red Dog Flour.

The sample analyzed, **27201**, *Ben Hur Red Dog Flour*, was 0.56 per cent. below guaranty in protein and 0.89 per cent. below in fat.

Wheat bran, middlings and feed showed average increased prices over those of 1910, of \$3.14, \$3.03 and \$3.24, respectively.

Wheat Products, Sampled by Purchasers.

26993, *Valley City Michigan Pure Wheat Bran*, sent by H. E. Clark, Middlebury, contained 16.00 per cent. protein, 1.76 per cent. below its guaranty. **26991**, *Elmco Wheat Bran*, sent by Theo. A. Stanley, contained 17.88 per cent. protein. **27871**,

Empire Mixed Feed, Powell & Co., Philadelphia, sent by M. D. Stanley, New Britain, contained 8.46 per cent. water, 4.47 ash, 15.38 protein, 5.73 fiber, 62.01 nitrogen-free extract and 3.95 fat.

A sample of *Red Dog Middlings*, **26973**, sold without guaranty, and sent by F. S. Kellogg, Danbury, analyzed as follows: water, 12.01, ash, 0.56, protein, 6.50, fiber, 0.47, nitrogen-free extract, 79.13, and fat, 1.33 per cent. It contained only about one-third the protein and one-fourth the fat usually found in red dog flour of good quality.

MAIZE PRODUCTS.

Maize Meal.

The single sample received contained 8.88 per cent. protein.

Maize (Grain).

26029, sent by Abner Hendee, New Haven, and **26455**, sent by F. B. Newton, Plainville, contained 12.19 and 9.54 per cent. of water, respectively.

Gluten Feed.

Seven brands of true gluten feed were found on sale in the State, and eleven samples of these brands were analyzed.

All the samples satisfied their protein guaranties, the average, 25.93 per cent., exceeding the average guaranty by 3.48 per cent. One sample of *Crescent*, **26927**, and one of *Globe*, **27103**, were slightly below their guaranty in fat; but the protein in both was about 4 per cent. in excess of the guaranty. Both samples of *Cream of Corn* were branded as artificially colored.

Hominy Feed.

Fourteen samples were analyzed. **27163**, *Hardy's Hominy Chop*, had no guaranty as required by law. **27059**, *Wirthmore Hominy Feed*, was 1.09 per cent. below its fat guaranty. The two samples of *Ideal Hominy Feed* showed very different percentages of fat (4.95 and 10.15), **27128** being 2.05 per cent. below, and **27077** being 2.45 per cent. above guaranty. **27225**, *Capital Hominy Feed*, was 0.87 per cent. below its protein guaranty. All three of the samples of *Miner-Hillard's Steam Cooked Hominy Feed*, **27137**, **27177** and **27040**, were below guaranty in fat, the deficiencies being 1.26, 1.50 and 1.90 per cent.

respectively. **27095**, *Payne's Hominy Chop*, was 0.34 per cent. below its fat guaranty.

Cob Meal.

The single sample analyzed contained only 1.88 per cent. protein and 0.30 per cent. fat. It was made in Kentucky and would not be worth the freight from the place of manufacture as a feed.

Maize Red Dog Flour.

This sample, although the label stated it was made from corn, was improperly labeled "Red Dog Flour," a name which by long trade usage signifies a low-grade wheat flour. It satisfied its guaranty, but its protein content is only about half that of standard red dog flour, while its fat is somewhat higher. It is in reality a hominy feed.

Corn and Cob Meal.

Four samples were sent by H. N. Goddard, Simsbury, for protein determinations. **26345**, *White Cap Yellow Dent*, **26346**, *Yellow Dent*, **26347**, *Red Flint*, and **26348**, *Yellow Flint*, contained 8.31, 8.31, 8.44, and 9.06 per cent. protein, respectively.

Corn Feed or Screenings.

The sample, **26657**, was sent by Fred Lyman, Manchester, price, \$14.60 to \$15.60 per ton. It contained:

Water	9.81
Ash	1.32
Protein	8.19
Fiber	8.68
Nitrogen-free extract	70.32
Fat	1.68

RYE PRODUCTS.

Two samples of middlings and one of feed satisfied their guaranties. One sample of middlings, **27067**, was 0.87 per cent. below its protein guaranty.

BUCKWHEAT PRODUCTS.

The two samples analyzed were of very different quality. **27158** was very high grade and satisfied its guaranty. **27170**, which did not bear the required guaranty, contained 9.31 per

cent. less protein and 2.75 per cent. less fat than 27158. The deficiency in quality was due to incomplete separation of the flour, as the hulls were not excessive.

A sample of *Buckwheat Feed*, 27234, The Birkett Mills, Penn Yan, N. Y., sent by C. W. Hutchinson, Hebron, contained 16.25 per cent. protein and 3.99 per cent. fat. The quantity of hulls in this sample was very excessive.

OAT PRODUCTS.

Oats (Grain).

26140, sent by J. J. & F. Ahern, Hartford, contained 8.2 mgms. of sulphur dioxide per 100 gms. of grain. The practice of sulphuring oats to bleach them so that they will sell in a higher grade has become quite general. Horses sometimes refuse to eat bleached oats and in some cases the use of bleached oats for seed has been the cause of failure. Bleaching is likely to impair if not entirely destroy the vitality of the seed.

Ground Oats.

The single sample analyzed was of excellent quality.

Oat Hulls.

The one sample, sold as such, contained 6.75 protein, 3.13 per cent. fat and 24.53 per cent. fiber. The protein was 1.56 per cent. below guaranty.

BARLEY PRODUCTS.

Malt Sprouts.

26937, *Ballantine's Malt Sprouts*, did not bear the required guaranty, although it was of excellent quality. One sample of *American Malting Co.'s Malt Sprouts*, 27112, was slightly below guaranty in fat.

The five samples averaged 26.45 per cent. protein with an average cost of \$26.60. In this era of high prices the use of this relatively cheap high-grade feed is worthy of every dairyman's careful consideration.

A sample of the *American Malting Co.'s* make, 27236, sent by A. N. Beard, Milford, and guaranteed 25 per cent. protein, 1.90 per cent. fat and 14 per cent. fiber, contained water, 6.44, ash, 6.51, protein, 12.50, fiber, 21.09, nitrogen-free extract, 52.26,

and fat, 1.20 per cent. It had only half the amount of protein guaranteed and one and a half times as much fiber. The amount of barley hulls in it was very excessive.

Dried Brewers' Grains.

All of the six samples analyzed satisfied their guaranties. This feed as a rule is underguaranteed, especially in protein. The samples averaged 29.84 per cent. protein and 7.25 per cent. fat, while the average guaranties were only 23.83 and 5.5 per cent. respectively. The average price of the feed was \$28.83, and it is certainly one of the cheapest high-grade feeds on the market.

Dried Distillers' Grains.

27113, *Ajax Flakes*, contained 0.81 per cent. less protein and 27189, *Continental Gluten Feed*, contained 1.75 per cent. less protein than was guaranteed. *Ajax Flakes* and *Continental Gluten Feed* are high-grade products of quite similar composition. The Biles' product is a much lower grade material, and \$8.50 less per ton is asked for it. "Gluten Feed" is a misnomer when applied to Distillers' Grains.

MISCELLANEOUS FEEDS.

Dried Beet Pulp.

This material, a by-product of sugar beet factories, is a comparatively new feed in this State. It is a carbohydrate rather than a protein feed. Feeding experiments in other states have demonstrated its value, as its carbohydrates appear to be present in a very assimilable form.

The three samples analyzed satisfied their guaranties.

Dried Molasses Beet Pulp.

This feed is simply *Dried Beet Pulp* to which about 10 per cent. of molasses has been added.

The single sample examined satisfied its guaranty.

Alfalfa Meal.

The single sample examined satisfied its guaranty.

Wheat and Corn Feed.

27215, "Colonial Middlings," is not middlings in the trade usage of that term, which properly applies only to a wheat product.

This is a mixture of wheat and corn by-products. It does not meet its guaranteed fat content by 0.63 per cent. Its selling price, \$34.00 per ton, is \$1.13 higher than the average of wheat middlings and it contains 4 per cent. less of protein and three-quarters of 1 per cent. less of fat.

Corn and Oat Feeds.

Two samples of true provender, that is, ground corn and oats, were analyzed, and both were of good quality.

Chop Feeds.

Here are included those feeds which are chiefly mixtures of corn and oats products, some brands also containing small amounts of common salt. In some cases the "oats" are chiefly oat hulls. On the average they contain about three times as much fiber as true provender. *Haskell Stock*, *Monarch Chop* and *Winner Chop Feed* contain hominy. All of the twelve samples analyzed satisfied their guaranties except 27145, *Victor Feed*, in which the fat was slightly below its guaranty. The high percentages of fiber in 27105, 27082, 27087, 27206, 26935 and 27145, indicate the use of considerable hulls in these mixtures.

Wheat and Corn Cob Feeds.

Two of the three samples analyzed were sold as *Mixed Feed*, a name properly belonging by trade usage only to mixtures of wheat bran and middlings. The tags accompanying all the samples stated that they were composed of "wheat bran, ground corn, cob meal." All the samples satisfied their guaranties, but contained 2 per cent. less protein than the same brands had last year. They sold for \$4.50 less per ton than genuine wheat feed, and contained less than three-fifths as much protein.

Proprietary Horse Feeds.

Seven samples were analyzed. 27122, *Bonnie Horse Feed*, had 1.31 per cent. less of protein, and 27079, *Algrane Horse Feed*, 0.87 less of protein and 0.44 per cent. less of fat than was guaranteed. The other five samples satisfied their guaranties.

Buffalo Horse Feed contains cracked corn, whole oats and wheat and corn products.

Bonnie Horse Feed, *Algrane Horse Feed*, and *V-B Horse Feed* contains corn, oats and wheat products, the second also containing some salt.

Husted Steam Cooked Feed contains whole and cracked corn, whole oats and rolled wheat.

Purina Feed contains cracked corn, oats, dried brewers' grains, alfalfa and hominy and salt.

Schumacher's Special Horse Feed contains cracked corn, whole oats, barley and oat products, and salt.

Proprietary Dairy and Stock Feeds.

Sixteen samples were analyzed. 27006, *Blatchford's Calf Meal*, had somewhat less than the guaranteed amount of protein. 27048, *Wirthmore Balanced Ration Feed*, was 0.26 per cent. low in fat. 27185, *Daisy Dairy Feed*, was 0.91 per cent. low in fat, with 2.5 per cent. excess of protein. 27165, *Blue Ribbon Dairy Feed*, was 0.87 per cent. low in protein and 1.02 per cent. low in fat. 27034, *Quaker Dairy Molasses Feed*, was 1.31 per cent. low in protein. 27073, *Schumacher's Calf Meal*, was 1.12 per cent. low in protein and 0.76 per cent. low in fat. 27231, *V-B Dairy Feed*, was 4.25 per cent. low in protein. The remaining samples substantially satisfied their guaranties.

Sucrene Dairy Feed contains cotton seed meal, oats and barley products, malt sprouts, wheat screenings, molasses and salt.

Union Grains Biles' Ready Ration contains wheat and corn products, distillery residues, malt sprouts, cotton seed and linseed meals and salt.

Blatchford's Calf Meal contains linseed, cotton seed and leguminous meals, wheat products, fenugreek and salt.

Unicorn Dairy Ration contains distillers' grains, wheat and corn products, barley residues, malt sprouts, cotton seed and linseed meals.

Wirthmore Balanced Ration contains wheat bran, malt sprouts, barley residues, corn products, cotton seed and linseed meals and a small amount of oat hulls.

Wirthmore Stock Feed contains hominy and oat products.

White Cross Stock Feed contains corn, oats, wheat and barley products and salt.

Daisy Dairy Feed contains corn and oat products, alfalfa, wheat screenings, cotton seed meal, molasses and salt.

Husted Molasses Feed contains corn and oat products, cotton seed and linseed meals, molasses and salt.

Blue Ribbon Dairy Feed contains corn, oats and wheat products, malt sprouts, cotton seed meal and molasses.

Quaker Dairy Molasses Feed contains oat and flax products, wheat screenings, cotton seed meal, molasses and salt.

Schumacher's Calf Meal contains ground oats, wheat products, linseed meal and casein (statement of manufacturer).

Schumacher's Stock Feed contains corn, oats, barley and wheat products, salt and a small amount of cotton seed meal.

Protena Dairy Feed contains corn products, dried brewers' grains, alfalfa, cotton seed meal, wheat screenings and salt.

V-B Dairy Feed contains corn, oats and wheat products, and linseed and cotton seed meals.

Dairy Feeds, Sampled by Purchasers.

A sample of *Sucrene Dairy Feed*, 27033, guaranty 16.50 per cent. protein and 3.50 per cent. fat, sent by G. F. McArthur, Newtown, contained 11.46 per cent. water, 8.35 ash, 17.38 protein, 11.46 fiber, 47.40 nitrogen-free extract and 3.95 fat.

Another sample of this same feed, 27001, sent by H. E. Botsford, Bridgeport, was examined for weed seeds. A few seeds of pigweed were found and occasional seeds of foxtail and smart weed.

Proprietary Poultry Feeds.

Thirteen samples was analyzed. 27121, *Bonnie Dry Mash*, and 27159, *Purity Poultry Mash*, did not bear guaranties as required by law. 27130, *Eaton's Perfection Mash Mixture*, was 1.87 per cent low in protein. 27116, *Park & Pollard's Dry Mash Feed*, was 3.75 per cent. low in protein. The other eleven samples satisfied their guaranties.

Buffalo Poultry Feed contains corn, hominy, wheat, rolled oats and gluten feed.

Wirthmore Poultry Mash contains corn, oats and wheat products, and alfalfa.

Perfection Mash Mixture contains corn, wheat and oats products, alfalfa, kaffir corn, animal matter, charcoal, bone, salt and milk albumen (statement of manufacturer).

Bonnie Dry Mash contains wheat, oats and corn products, millet and animal matter.

Purity Poultry Mash contains wheat bran, corn, alfalfa, meat scrap and salt.

H. O. Poultry Feed contains wheat bran, corn, oats, hominy and probably some gluten feed.

Husted Laying Mash contains wheat and corn products, rolled oats and cotton seed meal.

Park & Pollard's Dry Mash Feed contains corn, wheat, oats, barley, alfalfa, bone, animal matter and salt.

Park & Pollard's Growing Feed contains corn, wheat and barley products, bone, animal matter and salt.

Park & Pollard's Fattening Feed contains corn, oats and wheat products, salt and a little cotton seed meal.

Purina Chicken Chowder Feed contains corn, wheat, alfalfa, charcoal, animal matter, salt and possibly a little linseed meal.

American Poultry Feed contains corn, barley, wheat and oats products, and cotton seed meal.

V-B Mash for Laying Hens contains corn, oats and wheat products, alfalfa, animal matter and linseed meal(?).

Poultry Feeds, Sampled by Purchasers.

26272, *Our Own Lay Mash*(?), The Rugg and Faber Co., Seymour, sent by the manufacturers, contained 17.88 per cent. protein. 25989, "*Chicken Feed*," sent by C. A. Cowles, Plantsville, contained 20.75 per cent. protein.

Beef Scrap.

The single official sample, 27110, *Shay's Beef Scrap*, did not bear the required guaranty, but the manufacturer, when attention was called to it, arranged for suitable tags.

Beef Scrap, Sampled by Purchasers.

26076, *Meat and Bone Chicken Scrap*, sent by S. M. Crowell, Middletown, contained 3.27 per cent. water, 43.06 per cent. ash and 36.63 per cent. protein. 26106, *Darling's Beef Scrap*, guaranty 55 per cent. protein, 26107, *Frisbie's Beef Scrap*, guaranty 40 per cent. protein, and 26108, *Breck's Beef Scrap*, guaranty 43 per cent. protein, all sent by P. G. Hawley, South-

bury, contained 57.50, 39.06 and 40.81 per cent. protein, respectively. **27008** and **27009**, *Shay's Beef Scrap*, sent by S. M. Crowell, Middletown, contained 42.19 and 32.50 per cent. protein, respectively. **27018**, *Beef Scrap*, sent by F. H. Rolf, Guilford, contained 8.94 per cent. water, 34.99 ash, 39.38 protein, 1.14 fiber, 3.54 nitrogen-free extract and 12.01 fat.

Cracker Waste.

27027, sent by C. M. Jarvis, Berlin, contained 7.38 per cent. water, 1.57 ash, 7.75 protein, 0.54 fiber, 67.56 nitrogen-free extract and 15.20 fat.

Summary.

The following table shows the number of samples analyzed, the number sold without the required guaranty, and also the number which failed to meet the manufacturer's guaranty.

Kind of Feed.	No. of Samples.	No. with Guaranty.	No. Without Guaranty.	*Low in		
				Protein.	Fat.	Both.
Cotton Seed Meal	10	10	..	I	..	..
Cotton Seed Feed Meal	I	I	..	..	..	..
Linseed Meal	4	4	..	..	..	..
Wheat Gluten Feed	2	2	..	..	..	..
Wheat Bran	26	21	5	..	I	..
Wheat Middlings	30	27	3	I	I	I
Wheat Feed	29	26	3	..	3	..
Gluten Feed	11	11	..	..	..	..
Hominy Feed	14	13	I	..	6	..
Rye Products	4	4	..	..	..	..
Buckwheat Middlings	2	I	I	..	..	..
Malt Sprouts	5	4	I	..	I	..
Dried Brewers' Grains	6	6	..	..	..	..
Dried Distillers' Grains	3	3	..	I	..	..
Dried Beet Pulp	4	4	..	..	..	..
Provender	2	I	I	..	..	..
Corn and Oat Feeds and Chop Feeds.	12	12	..	..	I	..
Wheat and Corn Cob Feeds.....	3	3	..	..	..	..
Horse Feeds	7	7	..	I	I	..
Dairy and Stock Feeds	16	16	..	2	3	I
Poultry Feeds	13	11	2	2	..	..
Beef Scrap	I	..	I	..	..	..
Miscellaneous Feeds	4	4	..	I	I	..
Feeds not requiring guaranty	3	..	3	..	..	..
Total	212	191	21	9	18	2

*Deficiencies of less than one per cent. protein and 0.25 per cent. fat are ignored in this tabulation.

Digestibility of Feeding Stuffs by Ruminants.

Table I shows the digestion coefficients, or percentages of the food elements which are digestible by neat cattle (Lindsey's Compilation, 17th Report Mass. (Hatch) Agrl. Station, 1911, page 29 *et seq.*).

Some of these figures are the results 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 I.
DIGESTION COEFFICIENTS.

	Protein.	Fiber.	Nitrogen-free Extract.	Fat.
Cotton Seed Meal	84	35	78	94
Linseed Meal, new process	84	74	80	89
Linseed Meal, old process	89	57	78	89
Corn Meal	67	..	92	90
Hominy Meal	65	67	89	92
Gluten Feed	85	87	90	81
Wheat Bran	77	39	71	63
Wheat Middlings	77	30	78	88
Wheat Feed	78	62	77	87
Rye Feed	80	..	88	90
Oats	77	31	77	89
Buckwheat Middlings	85	17	83	89
Malt Sprouts	80	34	69	100
Dried Distillers' Grains	73	95	81	95
Dried Brewers' Grains	81	49	57	89
Provender	71	48	83	87
Wheat and Corn Cob Feed.....	63	28	71	92
Dried Beet Pulp	64	84	91	..
Oat Hulls	62	32	33	92
Cob Meal	17	65	60	50

The Average Composition, Digestibility and Selling Price of Commercial Feeds.

Table II contains a summary of the facts given in more detail in Table III, and shows, first, the average composition of these feeds as determined by the present inspection, arranged according to their protein content; second, the amount of digestible matter in each feed, as far as we have been able to calculate it; and

third, the average retail prices of the feeds in October and November last.

The feeds are tabulated in six groups. The following statement gives the average number of pounds of digestible protein, fiber and nitrogen-free extract, and fat purchasable for one dollar in each of these groups:

Digestible Nutrients Purchasable for One Dollar.

Group.		Protein.	Fiber and Nitrogen-free Extract.	Fat.
1	Containing over 30 per cent. protein	17.1	20.8	3.2
2	" 25 to 30 "	14.2	28.2	3.0
3	" 20 to 25 "	12.7	34.0	2.2
4	" 15 to 20 "	8.5	33.4	3.1
5	" 10 to 15 "	5.0	33.4	3.3
6	" less than 10 "	4.0	41.1	1.5

The variations in the amounts of digestible fat supplied in the different groups are small, but the differences in the other two food compounds are marked. Protein is by far the more expensive of these two, more than one-sixth of it being nitrogen, the element most generally lacking in our soils, most expensive to buy in fertilizer, and most necessary to "balance" the feeding rations of our stock.

If the feeder is mainly concerned in getting protein for his grain feed, he certainly cannot afford to buy feeds of the last three groups containing less than 20 per cent. of total protein. But even if he wishes to buy starchy food, he can get more for the same money in group three than in four or five and only one-sixth less than in six.

In this era of high prices economy demands that the feeder shall give the closest attention to the cost of the feeds he buys. Table II shows that for \$27.00 per ton he may buy feeds containing from 10 to 26 per cent. of protein; again for from \$32.00 to \$33.00 he may buy feeds ranging from 9 to 41 per cent. of protein. Failure to observe this lack of relation between cost and the needed nutriment supplied may explain why in many cases the dairy business is no longer profitable.

TABLE II.—AVERAGE COMPOSITION OF FEEDS AND SELLING PRICE.

TABLE II.—AVERAGE COMPOSITION OF FEEDS												
	In 100 pounds of feed are contained pounds of					In 100 pounds of feed are contained pounds of digestible					Cost per ton.	
	Water.	Ash.	Protein (N x 6.25).	Fiber.	Nitrogen-free Extract.	Ether Extract (fat).	Protein.	Fiber.	Nitrogen-free Extract.	Fat.		
<i>I. Protein over 30 per cent.</i>												
Cotton Seed Meal.....	6.88	6.41	40.84	8.56	29.13	8.18	34.3	3.0	22.7	7.7	\$32.80	
Linseed Meal, old process.....	8.79	5.84	35.13	7.75	35.84	6.65	31.3	4.4	28.0	5.9	42.75	
Buckwheat Middlings, high grade.....	10.00	4.68	32.50	7.34	37.09	8.48	27.6	1.2	30.7	7.5	32.00	
Gluten Feed, Atlantic.....	6.21	0.93	30.94	1.05	60.13	0.74	26.3	0.8	53.5	0.6	33.50	
<i>II. Protein 30-25 per cent.</i>												
Dried Brewers' Grains.....	7.13	3.16	29.84	12.74	39.88	7.25	24.2	6.2	22.7	6.5	28.83	
Gluten Feed, Continental.....	5.78	4.29	29.25	7.49	39.59	13.60	21.4	7.1	32.1	12.9	34.00	
Ajax Flakes.....	6.62	5.13	29.19	8.98	38.56	11.52	21.3	8.5	31.2	10.9	33.00	
Unicorn Dairy Ration.....	7.04	3.48	28.29	8.60	46.43	6.16	...	...	...	...	33.00
Gluten Feed, Globe.....	7.33	3.93	27.66	6.57	52.01	2.50	23.5	5.0	46.3	2.1	31.50	
" " Buffalo.....	8.77	4.85	27.00	6.39	49.85	3.14	23.0	4.9	44.4	2.6	32.25	
" " Crescent.....	8.92	5.43	26.50	6.64	50.13	2.38	22.5	5.0	44.6	2.0	33.00	
Malt Sprouts.....	8.00	5.84	26.45	11.96	46.33	1.42	21.2	4.1	32.0	1.4	26.60	
Wirthmore Balanced Ration.....	7.38	4.84	26.44	9.58	47.02	4.74	...	...	...	...	32.00
Gluten Feed, Cream of Corn.....	7.38	3.65	25.57	6.55	54.24	2.61	21.7	5.0	48.3	2.2	32.00	
" " Clinton.....	10.01	1.06	25.31	7.35	52.81	3.46	21.5	5.6	47.0	2.9	32.00	
<i>III. Protein 25-20 per cent.</i>												
Union Grains, Biles' Ready Ration...	7.52	5.41	24.31	8.50	46.41	7.85	...	...	...	...	33.00
Blue Ribbon Dairy Feed.....	7.13	6.92	24.13	11.00	47.34	3.48	...	...	...	...	32.00
Gluten Feed, Cedar Rapids.....	8.81	1.04	23.25	6.53	57.08	3.29	19.8	5.0	50.8	2.7	32.00	
" " Bay State.....	5.62	1.13	23.19	6.78	60.25	3.03	19.7	5.2	53.6	2.5	30.00	
Buckwheat Middlings, low grade.....	12.06	2.60	23.19	5.17	51.25	5.73	19.7	0.9	42.5	5.1	31.00	
Cotton Seed Feed Meal.....	6.71	4.84	22.69	21.20	39.80	4.76	...	...	...	...	29.00
Husted Molasses Feed.....	10.33	6.74	22.25	8.24	47.95	4.49	...	...	...	...	31.00
Protina Dairy Feed.....	8.40	6.53	20.94	13.64	45.61	4.88	...	...	...	...	32.00
<i>IV. Protein 20-15 per cent.</i>												
V-B Dairy Feed.....	8.32	3.20	17.75	8.92	57.00	4.81	...	...	...	...	34.00
Daisy Dairy Feed.....	7.81	8.11	17.56	12.15	52.28	2.09	...	...	...	...	30.00
Wheat Middlings.....	9.97	4.23	17.32	5.92	57.45	5.11	13.3	1.8	44.8	4.5	32.87	

TABLE II.—AVERAGE COMPOSITION OF FEEDS AND SELLING PRICE—Continued.

	In 100 pounds of feed are contained pounds of					In 100 pounds of feed are contained pounds of digestible					Cost per ton.
	Water.	Ash.	Protein (N x 6.25).	Fiber.	Nitrogen-free Extract.	Ether Extract (fat).	Protein.	Fiber.	Nitrogen-free Extract.	Fat.	
Rye Feed.....	11.33	3.29	17.19	3.60	61.43	3.16	13.8	...	54.1	2.8	\$32.00
Wheat Mixed Feed.....	9.19	5.39	16.95	7.18	56.47	4.82	13.2	4.5	43.5	4.2	31.52
Sucrene Dairy Feed.....	9.92	12.41	10.55	12.41	48.96	3.92	...	...	...	...	28.00
Red Dog Flour.....	10.55	6.28	16.44	3.10	63.15	4.11	...	...	...	...	34.50
Wheat Bran.....	8.58	6.28	16.22	9.22	54.81	4.89	12.5	3.6	38.9	3.1	29.79
Rye Middlings.....	10.23	3.55	16.09	4.17	62.72	3.24	...	...	...	...	30.33
Biles' Rye Distillers' Grains.....	6.31	1.23	15.69	13.61	55.20	7.96	11.5	12.9	44.7	7.6	25.00
<i>V. Protein 15-10 per cent.</i>											
Quaker Dairy Molasses Feed.....	7.86	7.56	14.69	15.25	50.64	4.00	...	...	...	...	27.00
Purina Feed.....	9.70	4.86	13.56	10.11	57.71	4.06	...	...	...	...	30.00
Ground Oats.....	8.55	3.30	12.94	8.47	61.93	4.81	10.0	2.6	47.7	4.3	35.00
Bonnie Horse Feed.....	9.25	3.12	12.69	7.11	62.99	4.84	...	...	...	...	34.00
Buffalo Horse Feed.....	6.74	3.08	11.88	8.31	65.53	4.46	...	...	...	...	32.00
Husted Steam-cooked Feed.....	9.37	2.07	10.93	4.29	69.12	4.52	...	...	...	...	36.00
V-B Horse Feed.....	8.26	3.30	10.63	9.61	63.63	4.57	...	...	...	...	30.00
Hominy Feed.....	8.81	2.43	10.55	3.80	67.19	7.22	6.9	2.5	59.8	6.7	32.86
Schumacher's Stock Feed.....	7.63	3.75	10.31	9.92	64.39	4.00	...	...	...	...	32.00
White Cross Stock Feed.....	9.90	3.22	10.31	4.01	67.86	4.70	...	...	...	...	36.00
Wirthmore Stock Feed.....	8.03	3.36	10.19	7.00	65.97	7.45	...	...	...	...	33.00
Algrane Horse Feed.....	8.25	3.50	10.13	9.39	65.17	3.56	...	...	...	...	32.00
<i>VI. Protein under 10 per cent.</i>											
Wheat and Corn Cob Feed.....	8.37	3.72	9.88	14.64	60.24	3.15	6.2	4.1	42.8	2.9	27.00
Maize Red Dog Flour.....	9.04	1.98	9.75	1.94	70.34	6.95	...	...	...	...	32.00
Provender (Ground Corn and Oats).....	10.37	1.75	9.69	3.18	70.65	4.36	6.9	1.5	58.6	3.8	37.50
Schumacher's Special Horse Feed.....	9.10	3.18	9.44	7.16	67.49	3.63	...	...	...	...	33.00
Dried Beet Pulp.....	6.69	3.59	9.08	18.79	61.33	0.52	...	...	...	...	28.00
Corn and Oat Feeds.....	8.56	3.40	8.90	9.17	65.64	4.33	5.8	15.8	55.8	...	30.42
Corn Meal.....	11.52	1.49	8.88	1.58	72.24	4.29	5.9	...	...	...	32.00
Dried Molasses Beet Pulp.....	8.40	4.06	8.88	17.74	60.39	0.53	5.7	...	...	...	29.00
Oat Hulls.....	5.97	6.53	6.75	24.53	53.09	3.13	4.2	...	...	...	...
Cob Meal.....	6.96	1.22	1.88	32.45	57.19	0.30	0.3	21.1	17.5	2.0	...

NOTES REGARDING THE YIELD OF ALFALFA.

By E. H. JENKINS.

After many failures we have now a sufficient number of successes on a considerable scale to prove that alfalfa can be grown in Connecticut under proper conditions, on a variety of soils, that it is reasonably hardy, that as a soiling crop it takes the place of "summer pasture" which very often amounts to little or nothing, and while it is not easy to hay it in all seasons, fair success has followed curing it under caps even in "catching" weather.

Among other things needing further study is to find out, with some accuracy, how much it will yield in our climate year after year, what is its composition here and what is its effect on the land in the course of years. Estimates need to be followed by weights.

Through the kindness and coöperation of Col. C. M. Jarvis of Berlin, who has some 80 acres in alfalfa and is aiming at 300 acres, we have weighed and analyzed the alfalfa crops this year from a measured acre on his farm. After a fine corn crop the piece had been seeded down and staid in grass for six years, receiving from time to time a top dressing of manure. In 1908 it gave a good crop of timothy but in 1909 the crop was poor.

In the spring of 1910 the land was well dressed with manure and sown to alfalfa. In the spring of 1911 one-half of the acre was top-dressed with manure which did not increase the crop on that part of the field.

It was cut three times, June 27, August 12 and October 12. In judging the yield it is to be considered that the summer was very dry, resulting generally in very short crops.

The yields, in pounds per acre, of feed and of plant food in each cutting and in the whole crop were as follows:

	First Cutting.	Second Cutting.	Third Cutting.	Total.
Water.....	632	565	800	1997
Ash.....	418	116	158	692
Protein.....	831	190	339	1360
Fiber.....	1533	325	418	2276
Nitrogen-free Extract.....	2022	442	669	3133
Fat.....	106	25	36	167
Total.....	5542	1663	2420	9625

[Continued on page 256.]

TABLE III.—ANALYSES OF COMMERCIAL FEEDS

Station No.	BRAND.	RETAIL DEALER.
OIL SEED PRODUCTS.		
<i>Cotton Seed Meal.</i>		
27132	Dove Brand. F. W. Brode & Co., Memphis, Tenn.	Danbury: Keeler Grain Co.
26931	Owl Brand. F. W. Brode & Co., Memphis, Tenn.	Simsbury: R. H. Ensign
27173	Buckeye. Buckeye Cotton Oil Co., Cincinnati, O.	Willimantic: H. A. Bugbee
27197	" " " " " " " " " " " "	Middlefield: A. E. Miller
27217	Central Oil & Fertilizer Co., Cordele, Ga.	Waterbury: Spencer Grain Co.
27101	Dixie Brand. Humphreys, Godwin & Co., Memphis, Tenn.	New Haven: R. G. Davis
27065	Selden. Memphis Cottonseed Products Co., Memphis, Tenn.	Wallingford: Gallagher Bros.
27186	Dirigo Brand. W. Newton Smith, Baltimore, Md.	Thompsonville: H. K. Brainard
27160	Prime. J. E. Soper Co., Boston.	Danielson: Young Bros. Co.
27168	Pioneer. " " " " " " " " " " " "	Willimantic: E. A. Buck Co.
		Average guaranty
		Average of these 10 analyses
		Average digestible
<i>Cotton Seed Feed Meal.</i>		
27148	Creamo Brand. Tennessee Fiber Co., Memphis, Tenn.	Yantic: A. R. Manning
		Guaranty
<i>Linseed Meal, Old Process.</i>		
27081	American Linseed Co., New York	New Britain: C. W. Lines Co.
27221	Kelloggs & Miller, Amsterdam, N. Y.	New Milford: G. T. Soule
27107	Guy G. Major Co., Toledo, O.	Shelton: Ansonia Flour & Grain Co.
27211	Metzger Seed & Oil Co., Toledo, O.	Hartford: G. M. White & Co.
		Average guaranty
		Average of these 4 samples
		Average digestible
WHEAT PRODUCTS.		
<i>Atlantic Gluten Feed.</i>		
27120	Atlantic Starch Works, Westport	Westport: Manufacturer
27205	" " " " " " " " " " " "	Middletown: Meech & Stoddard
		Average guaranty
		Average of these 2 analyses
		Average digestible
<i>Wheat Bran.</i>		
27051	Pennant Rich. Allen Baker Comm. Co., St. Louis	Branford: S. V. Osborn
27076	Sunlight Winter. American Cattle & Poul. Food Co., Binghamton, N. Y.	Meriden: Grain & Feed Co.
27209	Badger. Berger Crittenden Mill. Co., Milwaukee, Wis.	Hartford: L. C. Daniels Grain Co.
27204	Bernet, Craft & Kauffman Mill. Co., St. Louis	Middletown: Meech & Stoddard
27156	Jersey. Geo. C. Christian, Minneapolis, Minn.	Moosup: T. E. Main & Sons
27151	Newport. Chas. M. Cox Co., Boston.	Yantic: A. R. Manning
26933	Coarse. Crookston Mill. Co., Crookston, Minn.	Collinsville: Collinsville Grain Co.
27089	Coarse. Eagle Roller Mill Co., New Ulm, Minn.	Plainville: Eaton Bros.

SAMPLED IN 1911.

Station No.	POUNDS PER HUNDRED.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Fat.)	
27132	7.40	6.68	41.19	7.29	29.36	8.08	\$35.00
26931	7.44	6.18	43.81	6.46	28.11	8.00	33.00
27173	5.67	6.79	44.44	7.28	27.97	7.85	32.00
27197	6.23	6.31	41.06	8.20	29.99	8.21	32.00
27197	7.95	5.67	39.25	9.10	28.87	9.16	34.00
27217							
27101	6.11	5.87	38.69	11.34	30.27	7.72	32.00
27065	8.11	6.98	40.63	8.65	27.77	7.86	33.00
27186	8.64	6.46	38.25	9.95	27.88	8.82	31.00
27160	6.22	5.61	38.56	10.63	30.71	8.27	32.00
27168	5.06	7.58	42.50	6.65	30.42	7.79	34.00
			39.36			6.28	
	6.88	6.41	40.84	8.56	29.13	8.18	32.80
			34.3	3.0	22.7	7.7	
27148	6.71	4.84	22.69	21.20	39.80	4.76	29.00
			22.00			5.00	
27081	7.98	5.70	36.63	7.38	35.62	6.69	45.00
27221	10.27	4.84	35.81	7.57	34.24	7.27	45.00
27107	8.15	6.58	32.38	8.98	37.44	6.47	39.00
27211	8.77	6.25	35.69	7.06	36.08	6.15	42.00
			31.25			5.25	
	8.79	5.84	35.13	7.75	35.84	6.65	42.75
			31.3	4.4	28.0	5.9	
27120	5.70	0.96	33.44	0.91	58.39	0.60	33.00
27205	6.72	0.91	28.44	1.19	61.87	0.87	34.00
			27.00			0.50	
	6.21	0.93	30.94	1.05	60.13	0.74	33.50
			26.3	0.8	53.5	0.6	
27051	8.50	7.30	15.63	9.65	54.19	4.73	28.00
27076	8.59	6.66	15.13	7.68	57.34	4.60	32.00
27209	9.24	6.65	16.25	9.84	53.51	4.51	31.00
27204	8.94	6.48	16.81	9.30	54.01	4.46	29.00
27156	7.99	6.07	15.94	9.57	55.33	5.10	28.50
27151	6.82	7.03	16.06	9.13	56.10	4.86	28.00
26933	10.07	5.77	16.44	9.38	53.03	5.31	31.00
27089	9.07	6.51	15.75	10.60	52.92	5.15	30.00

TABLE III.—ANALYSES OF COMMERCIAL FEEDS

Station No.	BRAND.	RETAIL DEALER.
WHEAT PRODUCTS.—Continued.		
<i>Wheat Bran.</i>		
27222	Lucky. Federal Milling Co., Lockport, N. Y.	<i>New Milford:</i> Geo. E. Ackley Co.
27167	Gwinn's. Gwinn Milling Co., Columbus, O. . . .	<i>Putnam:</i> Bosworth Bros.
27125	Choice. Hecker-Jones-Jewell Mill Co., New York	<i>Greenwich:</i> J. P. Johnson
27090	Higginsville Milling Co., Higginsville, Mo. . . .	<i>Plainville:</i> Eaton Bros.
27161	Anchor. Kemper Mill & Elev. Co., Kansas City, Mo.	<i>Danielson:</i> Young Bros. Co.
27080	L. K. Bran	<i>New Britain:</i> C. W. Lines Co.
27055	Maple Leaf Milling Co., Canada	<i>Guilford:</i> Morse & Landon.
27216	Miner-Hillard Mill. Co., Wilkesbarre, Pa.	<i>Waterbury:</i> D. L. Dickinson & Son
27171	Coarse. New Ulm Milling Co., New Ulm, Minn.	<i>Willimantic:</i> H. A. Bugbee
27052	Niagara Falls Milling Co.	<i>Guilford:</i> G. F. Walter
27118	Northwestern Cons. Mill. Co., Minneapolis, Minn.	<i>Norwalk:</i> Holmes, Keeler & Seleck
27060	Peninsular Mill Co., Flint, Mich.	<i>No. Haven:</i> Coöperative Feed Co.
27131	Pillsbury's, Minneapolis, Minn.	<i>Ridgefield:</i> S. D. Keeler
27039	Russell Miller Milling Co.	<i>Cheshire:</i> G. W. Thorpe
27047	Stott's, Detroit, Mich.	<i>Plantsville:</i> C. O. Cowles
27097	Voigt Milling Co., Grand Rapids, Mich.	<i>New Haven:</i> R. G. Davis
27180	Bigjo. Wabasha Mill. Co., Wabasha, Minn. . . .	<i>Stafford Springs:</i> G. L. Dennis
27045	Coarse. Washburn-Crosby Co., Minneapolis, Minn.	<i>Plantsville:</i> T. B. Atwater
		Average of these 26 analyses
		Average digestible
<i>Wheat Middlings.</i>		
27099	*White. Atlantic Macaroni Co., Long Island City, N. Y.	<i>New Haven:</i> R. G. Davis
27154	Ballard's Ship Stuff. Ballard & Ballard, Louisville, Ky.	<i>Norwich:</i> Norwich Grain Co.
27104	Banner. Banner Milling Co., Buffalo, N. Y. . .	<i>Ansonia:</i> Flour & Grain Co.
27092	Fancy Low Grade. Barber Milling Co., Minneapolis, Minn.	<i>Bristol:</i> W. O. Goodsell
27226	Claro. Claro Milling Co., Lakeville, Minn. . .	<i>Winsted:</i> E. Manchester & Sons
27194	Wirthmore. Chas. M. Cox Co., Boston.	<i>Suffield:</i> Arthur Sikes
27123	Standard. Wm. G. Crocker, Minneapolis, Minn.	<i>So. Norwalk:</i> M. T. Hatch
27135	White. Duluth Superior Mill. Co., Duluth, Minn.	<i>Danbury:</i> F. C. Benjamin & Co.
27166	Lucky. Federal Milling Co., Lockport, N. Y. .	<i>Putnam:</i> Bosworth Bros.
27202	Ben Hur Standard. Hennepin Mill. Co., Minneapolis, Minn.	<i>Middletown:</i> Meech & Stoddard
27057	Standard Fine. Hubbard Mill. Co., Mankato, Minn.	<i>Guilford:</i> Morse & Landon
27044	Seal of Minn. Standard. New Prague Flouring Mill Co., New Prague, Minn.	<i>Plantsville:</i> T. B. Atwater
27053	Niagara Falls Milling Co.	<i>Guilford:</i> G. F. Walter
27178	White. Northwestern Consolidated Mill. Co., Minneapolis, Minn.	<i>Stafford Springs:</i> G. L. Dennis

* Statement of dealer.

SAMPLED IN 1911—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. (Fat.)	
27222	9.57	6.24	16.69	9.65	52.64	5.21	30.00
27167	8.16	5.75	17.44	7.56	56.61	4.48	30.00
27125	9.36	6.28	15.94	8.72	55.37	4.33	32.00
27090	8.00	7.24	15.31	8.60	56.22	4.63	30.00
27161	8.24	6.55	16.06	8.80	55.91	4.44	28.00
27080	8.61	5.56	16.81	9.49	54.25	5.28	31.00
27055	9.24	5.36	15.63	9.67	54.81	5.29	29.00
27216	9.22	6.16	15.56	8.53	56.47	4.06	32.00
27171	6.81	6.16	17.06	9.19	55.32	5.46	28.00
27052	8.70	6.74	15.00	11.54	53.29	4.73	30.00
27118	8.15	6.29	16.69	9.36	54.35	5.16	30.00
27060	9.03	5.89	16.00	8.71	55.95	4.42	29.00
27131	9.02	6.43	16.00	10.17	53.28	5.10	30.00
27039	7.74	6.24	19.63	8.84	51.91	5.64	28.00
27047	8.44	5.79	16.94	8.37	55.10	5.36	30.00
27097	8.34	5.70	15.13	8.11	58.40	4.32	29.00
27180	9.40	5.69	16.06	8.91	54.35	5.59	30.00
27045	7.71	6.76	15.88	10.29	54.34	5.02	31.00
.....	8.58	6.28	16.22	9.22	54.81	4.89	29.79
.....	.....	.....	12.5	3.6	38.9	3.1	.....
27099	11.27	3.72	17.75	5.79	55.90	5.57	31.00
27154	8.93	3.90	17.56	4.62	60.44	4.55	32.00
27104	10.18	4.16	17.75	5.65	56.99	5.27	33.00
27092	9.88	1.93	16.25	1.30	67.48	3.16	31.00
27226	10.47	5.17	18.06	7.21	53.43	5.66	31.00
27194	10.68	4.14	17.06	5.46	57.50	5.16	35.00
27123	10.00	4.88	17.31	7.12	55.17	5.52	32.00
27135	10.40	4.09	17.63	5.75	56.60	5.53	34.00
27166	9.16	4.62	19.00	7.09	54.39	5.74	32.00
27202	10.12	4.88	17.13	7.13	55.64	5.10	31.00
27057	10.23	5.13	17.44	8.68	52.76	5.76	32.00
27044	8.87	4.35	19.06	5.25	56.27	6.20	33.00
27053	9.42	5.12	17.19	8.91	54.03	5.33	33.00
27178	9.59	4.93	16.75	8.22	54.75	5.76	33.00

TABLE III.—ANALYSES OF COMMERCIAL FEEDS

Station No.	BRAND.	RETAIL DEALER.
	WHEAT PRODUCTS.—Continued. <i>Wheat Middlings.</i>	
27061	Peninsular Milling Co., Flint, Mich.	No. Haven: Coöperative Feed Co.
27187	Pillsbury's A, Minneapolis, Minn.	Thompsonville: H. K. Brinard.
27041	" B, " " " " " " " " " "	Cheshire: G. W. Thorpe.
27219	" XX Daisy, " " " " " " " " " "	New Milford: G. T. Soule.
26936	Bixota. Red Wing Mill. Co., Red Wing, Minn.	New Haven: W. E. Crittenden.
27196	Standard. Russell Miller Milling Co.	Middlefield: A. E. Miller.
27182	Climax. David Stott, Detroit, Mich.	So. Manchester: G. W. Strant.
27085	Pennant. " " " " " " " " " "	Plainville: F. B. Newton.
27086	White. " " " " " " " " " "	Plainville: F. B. Newton.
27228	White. Thompson Milling Co., Lockport, N. Y.	Torrington: D. L. Talcott.
27164	Choice. Valley City Mill. Co., Grand Rapids, Mich.	Putnam: F. M. Cole.
26934	Bigjo. Wabasha Milling Co., Wabasha, Minn..	Unionville: F. D. Lawton.
27192	Flour. Washburn-Crosby Co., Minneapolis, Minn.	Suffield: Spencer Bros.
27049	Standard. Washburn-Crosby Co., Minneapolis, Minn.	East Haven: F. A. Forbes.
27106	Star. Western Star Mill. Co., Salina, Kan.	Shelton: Ansonia Flour & Grain Co.
	<i>Mixed Feed.</i>	Average of these 29 analyses. Average digestible
27091	White Satin. Barber Milling Co., Minneapolis, Minn.	Bristol: W. O. Goodsell.
27230	Winona. Bay State Mill. Co., Winona, Minn..	Torrington: D. L. Talcott.
27210	Vermont. Chapin & Co., Milwaukee, Wis.	Hartford: G. M. White & Co..
27062	Regent. Chas. M. Cox Co., Boston.	No. Haven: Coöperative Feed Co.
27176	" " " " " " " " " "	Colchester: M. Klingon.
27056	Boston. Duluth Superior Mill. Co., Duluth, Minn.	Guilford: Morse & Landon.
27223	Lucky. Federal Milling Co., Lockport, N. Y..	New Milford: Geo. E. Ackley Co.
27068	Garland. Garland Milling Co., Greensburgh, Ind.	Wallingford: E. E. Hall.
27169	H. L. Halliday Mill. Co., Cairo, Ill.	Willimantic: E. A. Buck Co..
27094	Manhattan. Hecker-Jones-Jewell Mill. Co., New York	New Haven: R. G. Davis.
27172	Queen. Hecker-Jones-Jewell Mill. Co., New York	Willimantic: H. A. Bugbee.
27038	Sunshine. Hunter-Robinson-Wenz Mill. Co., St. Louis	Hamden: I. W. Beers.
27190	Kehlors Milling Co., St. Louis.	Hazardville: A. D. Bridge's Sons.
27108	Crescent. Kemper Mill & Elev. Co., Kansas City, Mo.	Derby: Peterson-Hendee Co..
27136	Snowflake. Lawrenceburg Roller Mills Co., Lawrenceburg, Ind.	Bethel: Johnston & Morrison.
27150	Pennant. National Milling Co., Toledo, O.	Yantic: A. R. Manning.
27224	Perfect. Niagara Falls Milling Co.	New Milford: Geo. E. Ackley Co.
27054	" " " " " " " " " "	Guilford: G. F. Walter.
27133	Fancy. Pillsbury's, Minneapolis, Minn.	Danbury: Keeler Grain Co..

SAMPLED IN 1911—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. (Fat.)	
27061	10.32	3.69	16.94	4.68	59.77	4.60	32.00
27187	10.11	4.19	17.81	5.09	58.07	4.73	34.00
27041	8.54	5.53	15.50	9.99	55.28	5.16	32.00
27219	10.76	3.48	17.88	3.17	59.94	4.77	36.00
26936	10.27	4.71	18.88	6.23	54.04	5.87	31.00
27106	10.39	5.05	17.75	7.11	54.12	5.58	31.00
27182	9.90	4.38	17.13	6.04	57.26	5.29	35.00
27085	9.59	4.29	17.69	5.47	57.85	5.11	33.00
27086	10.55	3.14	17.13	3.70	61.22	4.26	35.00
27228	10.31	3.60	15.69	5.28	60.92	4.20	34.00
27164	8.87	3.89	16.31	4.50	61.51	4.92	33.00
26934	9.80	4.64	18.19	7.29	54.19	5.89	33.00
27192	10.12	4.25	17.13	5.96	57.39	5.15	35.00
27049	8.68	4.83	17.00	7.70	56.48	5.31	30.00
27106	10.86	3.34	19.38	3.33	59.21	3.88	34.00
.....	9.95	4.26	17.45	6.00	57.20	5.14	32.80
.....	.....	.....	13.3	1.8	44.8	4.5	.....
27091	9.60	4.82	16.81	6.52	57.00	5.25	32.00
27230	11.08	4.62	17.19	6.14	56.41	4.56	33.00
27210	9.69	4.82	16.94	6.11	57.70	4.74	33.00
27062	10.29	5.40	16.56	8.23	53.77	5.75	29.00
27176	7.50	4.96	15.31	7.89	59.21	5.13	32.00
27056	9.75	4.92	16.56	8.39	55.10	5.28	31.00
27223	9.65	5.16	17.94	7.04	55.60	4.61	31.00
27068	9.30	5.69	16.44	7.06	57.39	4.12	30.00
27169	7.71	5.12	16.75	6.76	59.38	4.28	32.00
27094	9.00	5.43	16.69	7.61	56.53	4.74	29.00
27172	9.13	5.85	15.88	8.45	55.81	4.88	31.00
27038	7.42	5.78	19.31	7.23	55.60	4.66	30.00
27190	9.63	5.86	16.38	7.09	56.27	4.77	31.00
27108	8.75	5.60	16.31	7.37	57.72	4.25	31.00
27136	9.33	5.86	17.06	6.91	56.24	4.60	32.00
27150	7.03	5.02	16.75	6.28	59.16	5.76	32.00
27224	8.34	5.16	16.69	7.19	57.64	4.98	32.00
27054	9.30	4.81	16.69	7.29	57.12	4.79	33.00
27133	10.06	5.06	17.19	6.26	56.56	4.87	33.00

TABLE III.—ANALYSES OF COMMERCIAL FEEDS

Station No.	BRAND.	RETAIL DEALER.
	WHEAT PRODUCTS.—Continued. Mixed Feed.	
27093	Fanchon. Quality Mills, Enterprise, Kas.	Bristol: W. O. Goodsell.
27096	Occident. Russell Miller Milling Co.	New Haven: R. G. Davis.
27078	Gold Mine. Sheffield King Mill. Co., Minneapo- lis, Minn.	New Britain: C. W. Lines Co.
27144	Try-Me. Sparks Milling Co., Alton, Ill.	New London: P. Schwartz Co.
27179	Wabash. " " " Terre Haute, Ind.	Stafford Springs: G. L. Dennis
27213	Monarch. F. W. Stock & Son, Hillsdale, Mich.	Hartford: Smith Northam Co.
27084	Honest. David Stott, Detroit, Mich.	Plainville: F. B. Newton
26925	Farmers' Favorite Cow. Valley City Mill Co., Grand Rapids, Mich.	Torrington: F. U. Wadhams
27229	Waggoner-Gates Mill. Co., Independence, Mo.	Torrington: D. L. Talcott
27191	Superior. Washburn-Crosby Co., Minneapolis, Minn.	Suffield: Spencer Bros.
	Red Dog Flour.	Average of these 29 analyses
27201	Ben Hur. Hennepin Mill. Co., Minneapolis, Minn.	Average digestible
	MAIZE PRODUCTS. Gluten Feed.	Middletown: Meech & Stoddard
27071	*Bay State. J. E. Soper, Boston.	Meriden: A. Grulich
		Guaranty
		Digestible
27043	Buffalo. Corn Products Refining Co., New York	Cheshire. G. W. Thorpe.
27129	" " " " " " "	Springdale: Monroe & Palmer ..
		Average guaranty
		Average of these 2 analyses
		Average digestible
27199	Cedar Rapids. Douglas & Co., Cedar Rapids, Iowa.	Middletown: Meech & Stoddard
		Guaranty
		Digestible
27139	Clinton. Clinton Sugar Refining Co., Clinton, Iowa.	Mystic: Grain & Feed Co.
		Guaranty
		Digestible
27046	+Cream of Corn. American Maize Products Co., New York.	Plantsville: C. O. Cowles
27127	+Cream of Corn. American Maize Products Co., New York.	Stamford: W. L. Crabb
		Average guaranty
		Average of these 2 analyses
		Average digestible
27147	Crescent. Corn Products Refining Co., New York.	New London: Beebe & Bragaw
26927	Crescent. Corn Products Refining Co., New York.	Torrington: F. U. Wadhams
		Average guaranty
		Average of these 2 analyses
		Average digestible

* Statement of Dealer.

† Labelled "Colored."

SAMPLED IN 1911—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. (Fat.)	
27093	8.58	5.76	19.50	7.22	54.60	4.34	32.00
27096	9.96	4.68	18.94	7.18	53.84	5.40	30.00
27078	9.04	5.10	16.56	7.06	57.64	4.60	32.00
27144	9.57	5.39	17.69	7.30	55.62	4.43	30.00
27179	9.84	7.86	16.75	6.99	53.90	4.66	32.00
27213	9.37	5.34	17.63	7.85	54.21	5.60	34.00
27084	9.28	5.51	16.31	7.05	57.01	4.84	33.00
26925	10.16	5.26	16.13	6.54	57.33	4.58	32.00
27229	8.48	6.21	16.38	6.99	57.21	4.73	31.00
27191	9.80	5.28	16.19	8.09	56.18	4.46	32.00
.....	9.19	5.39	16.95	7.18	56.47	4.82	31.52
.....	....	....	13.2	4.5	43.5	4.2	....
27201	10.55	2.65	16.44	3.10	63.15	4.11	34.50
27071	5.62	1.13	23.19	6.78	60.25	3.03	30.00
.....	....	....	23.00	....	....	3.00	....
.....	....	....	19.7	5.9	54.2	2.5	....
27043	8.48	4.87	25.94	6.68	51.26	2.77	31.50
27129	9.05	4.83	28.06	6.11	48.44	3.51	33.00
.....	....	....	23.00	....	....	2.50	....
.....	8.77	4.85	27.00	6.39	49.85	3.14	32.25
.....	....	....	22.9	5.6	44.9	2.5	....
27199	8.81	1.04	23.25	6.53	57.08	3.29	32.00
.....	....	....	20.00	....	....	3.00	....
.....	....	....	19.8	5.7	51.4	2.7	....
27139	10.01	1.06	25.31	7.35	52.81	3.46	32.00
.....	....	....	20.00	....	....	3.00	....
.....	....	....	21.5	6.4	47.5	2.8	....
27046	7.02	2.99	25.94	6.90	54.67	2.48	32.00
27127	7.75	4.31	25.19	6.20	53.82	2.73	32.00
.....	....	....	23.00	....	....	2.50	....
.....	7.38	3.65	25.57	6.55	54.24	2.61	32.00
.....	....	....	21.7	5.7	48.8	2.1	....
27147	8.56	5.03	25.94	7.00	50.98	2.49	33.00
26927	9.28	5.83	27.06	6.28	49.28	2.27	33.00
.....	....	....	23.00	....	....	2.50	....
.....	8.92	5.43	26.50	6.64	50.13	2.38	33.00
.....	....	....	22.5	5.8	45.1	1.9	....

TABLE III.—ANALYSES OF COMMERCIAL FEEDS

Station No.	BRAND.	RETAIL DEALER.
MAIZE PRODUCTS.—Continued.		
<i>Gluten Feed.</i>		
27058	Globe. Corn Products Refining Co., New York	Guilford: Morse & Landon
27103	" " " " " "	Ansonia: Flour & Grain Co.
		Average guaranty
		Average of these 2 analyses
		Average digestible
<i>Hominy Feed.</i>		
27142	M. F. Baringer, Philadelphia	New London: Arnold Rudd Co.
		Guaranty
27126	Buffalo Cereal Co., Buffalo, N. Y.	Stamford: W. L. Crabb
26932	" " " " " "	Collinsville: F. W. Konold
		Average guaranty
		Average of these 2 analyses
27059	Wirthmore. Chas. M. Cox Co., Boston	No. Haven: Cooperative Feed Co.
		Guaranty
27128	Ideal. Elevator Milling Co., Springfield, Ill.	Springdale: Monroe & Palmer
27077	" " " " " "	Kensington: S. E. & W. G. Brown
		Average guaranty
		Average of these 2 analyses
27163	*Chop. R. J. Hardy & Sons, Boston	Danielson: Young Bros. Co.
		Guaranty
27225	Capital. Hunter-Robinson-Wenz Mill. Co., St. Louis	Canaan: Ives & Pierce
		Guaranty
27137	Steam-cooked. Miner-Hillard Mill. Co., Wilkes-barre, Pa.	Westerly: C. W. Campbell
27177	Steam-cooked. Miner-Hillard Mill. Co., Wilkes-barre, Pa.	Colchester: M. Klingon
27040	Steam-cooked. Miner-Hillard Mill. Co., Wilkes-barre, Pa.	Cheshire: G. W. Thorpe
		Average guaranty
		Average of these 3 analyses
27155	*Patent Cereal Co., Geneva, N. Y.	Moosup: T. E. Main & Sons
27036	" " " " " "	Hamden: I. W. Beers
		Average guaranty
		Average of these 2 analyses
27095	Chop. Wm. H. Payne & Son, New York	New Haven: R. G. Davis
		Guaranty
		Average guaranty of 14 hominy feeds
		Average of 14 analyses
		Average digestible
<i>Corn Meal.</i>		
27184	Ground by Little & McKinney, Manchester	Manchester:
		Digestible
<i>Cob Meal.</i>		
27200	A. Waller & Co., Henderson, Ky.	Middletown: Meech & Stoddard
<i>Maize Red Dog Flour.</i>		
27152	Chas. A. Krause Mill. Co., Milwaukee, Wis.	Norwich: Chas. Slosberg
		Guaranty

* Statement of dealer.

SAMPLED IN 1911—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. (Fat.)	
27058	8.14	4.07	27.69	6.58	50.82	2.70	30.00
27103	6.53	3.78	27.63	6.57	53.20	2.29	33.00
			23.00	.....	.....	2.50	....
			27.66	6.57	52.01	2.50	31.50
	7.33	3.93	23.5	5.7	46.8	2.0	....
			10.25	4.14	65.77	8.09	34.00
27142	9.20	2.55	9.00	.....	.....	6.00	....
			10.56	3.69	66.16	7.40	32.00
27126	9.85	2.34	10.31	3.50	66.21	7.33	32.00
26932	10.26	2.39	10.00	.....	.....	7.00	....
			10.44	3.59	66.18	7.37	32.00
	10.05	2.37	10.63	3.99	66.87	6.41	32.00
27059	9.59	2.51	9.50	.....	.....	7.50	....
			11.25	3.62	68.44	4.95	35.00
27128	9.40	2.34	11.25	4.49	62.78	10.15	34.00
27077	8.28	3.05	11.00	.....	.....	7.35	....
			11.25	4.05	65.61	7.55	34.50
	8.84	2.70	10.56	4.35	65.65	8.44	32.00
27163	8.22	2.78	.....	.....	.....	.....	....
			10.13	4.52	67.94	7.41	35.00
27225	7.56	2.44	11.00	.....	.....	7.00	....
			10.25	3.40	68.59	6.24	33.00
27137	9.23	2.29	10.75	3.44	68.71	6.00	33.00
27177	8.81	2.29	10.00	2.74	72.51	5.60	32.50
27040	7.25	1.90	10.00	.....	.....	7.50	....
			10.33	3.19	69.94	5.95	32.83
27155	9.14	2.31	10.69	3.70	66.32	7.84	32.00
27036	8.93	2.29	10.31	3.79	67.12	7.56	32.00
			10.00	.....	.....	7.00	....
			10.50	3.74	66.72	7.70	32.00
27095	7.67	2.46	10.81	3.83	67.57	7.66	32.00
			11.00	.....	.....	8.00	....
			10.19	.....	.....	7.21	....
	8.81	2.43	10.55	3.80	67.19	7.22	32.86
			6.9	2.5	59.8	6.7	....
27184	11.52	1.49	8.88	1.58	72.24	4.29	32.00
			5.9	.....	66.5	3.9	....
27200	6.96	1.22	1.88	32.45	57.19	0.30	....
27152	9.04	1.98	9.75	1.94	70.34	6.95	32.00
			8.50	.....	.....	5.00	....

TABLE III.—ANALYSES OF COMMERCIAL FEEDS

Station No.	BRAND.	RETAIL DEALER.
RYE PRODUCTS.		
27050	Middlings. Boutwell Mill. & Grain Co., Troy, N. Y.	<i>East Haven</i> : F. A. Forbes.....
27067	Middlings. Miner-Hillard Mill. Co., Wilkes-barre, Pa.	<i>Wallingford</i> : E. E. Hall.....
27175	Middlings. Washburn-Crosby Co., Minneapolis, Minn.	<i>Colchester</i> : M. Klingon.....
27088	Feed. Osceola Mill & Elev. Co., St. Croix Falls, Wis.	<i>Plainville</i> : Eaton Bros.....
BUCKWHEAT PRODUCTS.		
27158	Middlings. Quinebaug Grist Mill, Danielson...	<i>Danielson</i> :
27170	Middlings. Miner-Hillard Mill. Co., Wilkes-barre, Pa.	Digestible <i>Willimantic</i> : H. A. Bugbee..... Digestible
OAT PRODUCTS.		
<i>Ground Oats.</i>		
27174	Ground by H. A. Bugbee, Willimantic.....	<i>Willimantic</i> :
OAT HULLS.		
27198	Canadian Cereal & Mill. Co., Toronto, Ont.	Digestible <i>Middletown</i> : Meech & Stoddard.....
BARLEY PRODUCTS.		
<i>Malt Sprouts.</i>		
27037	American Malting Co., Buffalo, N. Y.	<i>Hamden</i> : I. W. Beers.....
27112	" " " "	<i>Bridgeport</i> : Vincent Bros.....
27208	" " " "	<i>Hartford</i> : L. C. Daniels Grain Co.
		Average guaranty
		Average of these 3 analyses
26937	*P. Ballantine & Sons, Newark, N. J.	<i>New Haven</i> : W. E. Crittenden..
26928	M. G. Rankin & Co., Milwaukee, Wis.	<i>New Haven</i> : J. T. Benham.....
		Guaranty
		Average of these 5 analyses
		Average digestible
Dried Brewers' Grains.		
27149	Anheuser-Busch Brew. Asso., St. Louis	<i>Yantic</i> : A. R. Manning.....
27117	Farmers' Feed Co., New York	Guaranty
		<i>Norwalk</i> : Holmes, Keeler & Seleck
27214	Bull Brand. Farmers' Feed Co., New York....	Guaranty
27134	Peerless. Penn. Grain & Feed Co., Philadelphia	<i>Waterbury</i> : D.L. Dickinson & Son
27100	Providence Brewing Co., Providence, R. I.	Guaranty
27195	Pilsner. Rosekrans-Snyder Co., Philadelphia..	<i>Danbury</i> : F. C. Benjamin & Co.
		Guaranty
		<i>New Haven</i> : R. G. Davis.....
		Guaranty
		<i>Suffield</i> : Arthur Sikes.....
		Guaranty
		Average of these 6 analyses
		Average digestible

* Statement of dealer.

SAMPLED IN 1911—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. (Fat.)	
27050	10.60	3.56	16.38	4.05	62.22	3.19	31.00
27067	11.00	3.14	14.13	3.43	65.26	3.04	29.00
27175	9.09	3.94	17.75	5.03	60.71	3.48	31.00
27088	11.33	3.29	17.19	3.60	61.43	3.16	32.00
27158	10.00	4.68	32.50	7.34	37.00	8.48	32.00
27170	12.06	2.60	27.6	1.2	30.7	7.5	....
27170	....	....	23.19	5.17	51.25	5.73	31.00
27170	....	....	19.7	0.9	42.5	5.1	....
27174	8.55	3.30	12.94	8.47	61.93	4.81	35.00
27198	....	....	10.00	2.6	47.7	4.3	....
27198	5.97	6.53	6.75	24.53	53.09	3.13	....
27037	7.58	6.15	25.88	14.36	44.79	1.24	25.00
27112	8.66	5.85	26.06	11.61	46.13	1.69	25.00
27208	6.41	5.58	26.31	12.89	47.48	1.33	29.00
27208	....	....	23.67	....	....	1.33	....
27208	....	....	26.09	12.95	46.13	1.42	26.33
26937	7.55	5.86	26.09	12.95	46.13	1.42	26.33
26937	8.02	6.17	28.75	9.73	45.96	1.37	27.00
26928	9.33	5.44	25.25	11.23	47.28	1.47	27.00
26928	....	....	25.00	....	....	1.50	....
26928	....	....	26.45	11.96	46.33	1.42	26.60
26928	....	....	21.2	4.1	32.0	1.4	....
27149	7.30	3.64	28.94	13.70	39.35	7.07	30.00
27117	....	....	24.00	....	....	7.00	....
27117	7.07	2.85	29.19	12.40	40.69	7.80	30.00
27214	....	....	27.00	....	....	6.00	....
27214	5.89	2.99	30.06	12.23	41.11	7.72	30.00
27134	....	....	22.00	....	....	6.00	....
27134	8.46	3.15	31.06	11.90	37.75	7.68	27.00
27100	....	....	23.00	....	....	4.00	....
27100	7.51	3.23	30.06	12.93	39.82	6.45	26.00
27195	....	....	22.00	....	....	5.00	....
27195	6.53	3.12	29.69	13.30	40.57	6.79	30.00
27195	....	....	25.00	....	....	5.00	....
27195	....	....	29.84	12.74	39.88	7.25	28.83
27195	....	....	24.2	6.2	22.7	6.5	....

TABLE III.—ANALYSES OF COMMERCIAL FEEDS

Station No.	BRAND.	RETAIL DEALER.
BARLEY PRODUCTS.—Continued.		
<i>Dried Distillers' Grains.</i>		
27113	Ajax Flakes. Ajax Mill. & Feed Co., Buffalo.	Bridgeport: Vincent Bros.
		Guaranty
27227	Rye. The J. W. Biles Co., Cincinnati, O.	Digestible
		Winsted: E. Manchester & Sons
		Guaranty
27189	Continental Gluten Feed. Continental Cereal Co., Peoria, Ill.	Digestible
		Hazardville: A. D. Bridge's Sons
		Guaranty
MISCELLANEOUS FEEDS.		
<i>Dried Beet Pulp.</i>		
26926	Michigan Sugar Co., Alma, Mich.	Torrington: F. U. Wadhams.
		Guaranty
27035	Owosso Sugar Co., Owosso, Mich.	Hamden: I. W. Beers
26930	" " " " " "	Granby: N. J. Trench
		Average guaranty
		Average of these 3 analyses
		Average digestible
<i>Dried Molasses Beet Pulp.</i>		
26924	Michigan Sugar Co., Saginaw, Mich.	Torrington: F. U. Wadhams
		Guaranty
<i>Alfalfa Meal.</i>		
27181	Albert Dickinson Co., Chicago	Rockville: Edward White.
		Guaranty
MIXED FEEDS.		
<i>Corn and Oats Feeds and Chop Feeds.</i>		
27188	Provender. Ground by A. D. Bridge's Sons, Hazardville.	Hazardville:
27069	Bufceco Stock Feed. Buffalo Cereal Co., Buffalo, N. Y.	Meriden: A. Grulich
		Guaranty
27105	Chop Feed. Buffalo Cereal Co., Buffalo, N. Y.	Shelton: Ansonia Flour & Grain Co.
		Guaranty
27153	Stock Feed. W. H. Haskell & Co., Toledo, O.	Norwich: Chas. Slosberg.
		Guaranty
27162	Purity Special Stock Feed. The Wm. S. Hills Co., Boston	Danielson: Young Bros. Co.
		Guaranty
27082	De-Fi Feed. The H. O. Co., Buffalo, N. Y.	New Britain: C. W. Lines Co.
		Guaranty
27087	New England Stock Feed. The H. O. Co., Buffalo, N. Y.	Plainville: F. B. Newton.
		Guaranty
27064	Monarch Chop Feed. Husted Milling Co., Buffalo, N. Y.	Wallingford: Gallagher Bros.
		Guaranty
27203	Steam Cooked Feed. Imperial Grain & Mill. Co., Toledo, O.	Middletown: Meech & Stoddard
		Guaranty
27206	Korn-Oato Feed. Meech & Stoddard, Middletown.	Middletown: Meech & Stoddard
		Guaranty
26935	Boss Feed. Quaker Oats Co., Chicago	New Haven: W. E. Crittenden.
		Guaranty

SAMPLED IN 1911—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. (Fat.)	
27113	6.62	5.13	29.19	8.98	38.56	11.52	33.00
	.....	.....	30.00	.....	.....	11.00	.....
	.....	.....	21.3	8.5	31.2	10.9	.....
27227	6.31	1.23	15.69	13.61	55.20	7.96	25.00
	.....	.....	16.00	.....	.....	5.00	.....
	.....	.....	11.5	12.9	44.7	7.6	.....
27189	5.78	4.29	29.25	7.49	39.59	13.60	34.00
	.....	.....	31.00	.....	.....	13.50	.....
	.....	.....	21.4	7.1	32.1	12.9	.....
26926	7.39	3.94	9.31	18.67	60.22	0.47	29.00
	.....	.....	8.00	.....	.....	0.40	.....
27035	5.40	3.45	9.63	18.89	62.03	0.60	27.00
26930	7.27	3.37	8.31	18.80	61.75	0.50	28.00
	.....	.....	8.00	.....	.....	0.50	.....
	6.69	3.59	9.08	18.79	61.33	0.52	28.00
	.....	.....	5.8	15.8	55.8	.....	.....
26924	8.40	4.06	8.88	17.74	60.39	0.53	29.00
	.....	.....	9.00	.....	.....	0.50	.....
27181	8.24	10.83	15.19	26.55	37.57	1.62	35.00
	.....	.....	12.00	.....	.....	1.00	.....
27188	11.56	1.75	9.56	3.63	69.23	4.27	37.00
27069	9.20	2.60	9.19	7.90	65.81	5.30	32.00
	.....	.....	8.00	.....	.....	4.00	.....
27105	8.51	3.52	8.25	12.03	63.94	3.75	29.00
	.....	.....	7.00	.....	.....	3.00	.....
27153	6.44	2.71	9.50	6.11	69.20	6.04	32.00
	.....	.....	8.00	.....	.....	4.00	.....
27162	7.59	2.73	9.69	7.20	68.84	3.95	30.00
	.....	.....	10.00	.....	.....	3.25	.....
27082	7.37	4.96	8.31	14.81	61.25	3.30	28.00
	.....	.....	8.00	.....	.....	3.00	.....
27087	7.79	4.50	8.88	10.17	64.63	4.03	31.00
	.....	.....	9.00	.....	.....	4.00	.....
27064	9.00	4.17	9.75	7.14	64.02	5.92	30.00
	.....	.....	7.50	.....	.....	3.50	.....
27203	9.17	1.76	9.81	2.74	72.08	4.44	38.00
	.....	.....	8.50	.....	.....	4.00	.....
27206	10.75	3.07	8.44	9.50	64.52	3.72	31.00
	.....	.....	7.00	.....	.....	3.00	.....
26935	9.10	3.28	8.94	8.99	65.67	4.02	31.00
	.....	.....	8.00	.....	.....	3.00	.....

TABLE III.—ANALYSES OF COMMERCIAL FEEDS

Station No.	BRAND.	RETAIL DEALER.
<i>MIXED FEEDS.—Continued.</i>		
27145	Corn and Oats Feeds and Chop Feeds. Victor Feed. Quaker Oats Co., Chicago	New London: P. Schwartz Co. Guaranty
27109	White Diamond Feed. Quaker Oats Co., Chicago	Milford: E. L. Oviatt. Guaranty
27083	Winner Chop Feed. David Stott, Detroit, Mich.	Plainville: F. B. Newton. Guaranty
<i>Wheat and Corn.</i>		
27215	*Colonial Middlings, Hilliard Mill Co., Wilkes- barre, Pa.	Waterbury: D. L. Dickinson & Son
<i>Wheat and Corn Cob Feeds.</i>		
27157	Sterling Mixed Feed, Indiana Mill Co., Terre Haute, Ind.	Danielson: Quinebaug Grist Mill
27098	Kennebec Feed. J. E. Soper Co., Boston	New Haven: R. G. Davis
27070	Blue Grass Mixed Feed. A. Waller & Co., Hen- derson, Ky.	Meriden: A. Grulich
		Guaranty of above feeds
		Average of these 3 analyses
		Average digestible
<i>Proprietary Horse Feeds.</i>		
27074	Horse Feed. Buffalo Cereal Co., Buffalo, N. Y.	Meriden: Grain & Feed Co.
27122	Bonnie Horse Feed. Manuel T. Hatch, So. Nor- walk	Guaranty
27079	Algrane Horse Feed. The H. O. Co., Buffalo, N. Y.	So. Norwalk: Manuel T. Hatch. Guaranty
27102	Steam Cooked Feed. Husted Mill Co., Buffalo, N. Y.	New Britain: C. W. Lines Co. Guaranty
27143	Purina Feed. Ralston Purina Co., St. Louis ...	New Haven: R. G. Davis
26929	Schumacher's Special Horse Feed. Quaker Oats Co., Chicago	Guaranty
27111	V-B Horse Feed. Vincent Bros., Bridgeport...	New London: Arnold Rudd Co. Guaranty
		Granby: N. J. Trench
		Guaranty
		Bridgeport: Vincent Bros.
		Guaranty
<i>Proprietary Dairy and Stock Feeds.</i>		
27218	Sucrene Dairy Feed. American Milling Co., Chicago	Thomaston: L. E. Blackmer ..
27138	Union Grains, Ready Ration. The J. W. Biles Co., Cincinnati, O.	Guaranty
27066	Calf Meal. Blatchford's Calf Meal Factory, Wau- kegan, Ill.	Westerly: C. W. Campbell
27042	Unicorn Dairy Ration. Chapin & Co., Milwau- kee, Wis.	Guaranty
27220	Unicorn Dairy Ration. Chapin & Co., Milwau- kee, Wis.	Wallingford: E. E. Hall.
		Guaranty
27048	Wirthmore Balanced Ration Feed. Chas. M. Cox Co., Boston	Cheshire: G. W. Thorpe.
27146	Wirthmore Stock Feed. Chas. M. Cox Co., Boston	New Milford: G. T. Soule.
		Guaranty
		Average of these 2 analyses ..
		East Haven: F. A. Forbes.
		Guaranty
		New London: Beebe & Bragaw. Guaranty

* See page 227.

SAMPLED IN 1911—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. (Fat.)	
27145	9.33	3.44	8.19	10.48	65.84	2.72	28.00
			7.00			3.00	
27109	9.52	2.67	8.63	7.38	68.46	3.34	31.00
			8.00			3.25	
27083	8.15	3.12	9.06	8.30	65.53	5.84	32.00
			8.00			4.00	
27215	10.45	3.02	13.44	3.83	64.89	4.37	34.00
			12.00			5.00	
27157	7.39	3.91	10.06	14.49	60.70	3.45	28.00
27098	9.25	3.55	9.75	14.42	59.80	3.23	26.00
27070	8.48	3.71	9.81	15.02	60.22	2.76	27.00
			9.00			2.00	
	8.37	3.72	9.88	14.64	60.24	3.15	27.00
			6.2	4.1	42.8	2.9	
27074	6.74	3.08	11.88	8.31	65.53	4.46	32.00
			10.00			4.00	
27122	9.25	3.12	12.69	7.11	62.99	4.84	34.00
			14.00			4.00	
27079	8.25	3.50	10.13	9.39	65.17	3.56	32.00
			11.00			4.00	
27102	9.37	2.07	10.63	4.29	69.12	4.52	36.00
			9.00			4.00	
27143	9.70	4.86	13.56	10.11	57.71	4.06	30.00
			12.50			4.00	
26929	9.10	3.18	9.44	7.16	67.49	3.63	33.00
			9.26			3.25	
27111	8.26	3.30	10.63	9.61	63.63	4.57	30.00
			9.00			3.00	
27218	9.92	8.29	16.50	12.41	48.96	3.92	28.00
			16.50			3.50	
27138	7.52	5.41	24.31	8.50	46.41	7.85	33.00
			24.00			7.00	
27066	9.08	5.05	24.25	5.47	50.70	5.45	70.00
			25.00			5.00	
27042	6.60	3.28	30.94	7.81	45.88	5.49	33.00
27220	7.48	3.69	25.63	9.39	46.99	6.82	33.00
			26.00			5.50	
27048	7.04	3.48	28.29	8.60	46.43	6.16	33.00
	7.38	4.84	26.44	9.58	47.02	4.74	32.00
			26.00			5.00	
27146	8.03	3.36	10.19	7.00	63.97	7.45	33.00
			9.00			4.00	

	First Cutting.	Second Cutting.	Third Cutting.	Total.
Nitrogen	133	30	54	217
Phosphoric Acid	33	7	11	51
Potash	83	25	56	164

The analysis of each crop is given below and also the average composition of the three cuttings together:

	First Cutting.	Second Cutting.	Third Cutting.	Average of the three.
Water	11.40	34.00	33.04	20.75
Ash	7.55	7.00	6.54	7.19
Protein	15.00	11.46	14.01	14.13
Fiber	27.66	19.48	17.26	23.65
Nitrogen-free Extract ...	36.48	26.57	27.64	32.54
Fat	1.91	1.49	1.51	1.74
	100.00	100.00	100.00	100.00

Calculated Water-Free:

Ash	8.52	10.59	9.77	9.04
Protein	16.93	17.39	20.92	17.81
Fiber	31.22	29.51	25.78	29.85
Nitrogen-free Extract ...	41.17	40.26	41.27	41.10
Fat	2.16	2.25	2.26	2.20
	100.00	100.00	100.00	100.00

Four samples of soil were drawn in different places on this acre field and as many from an acre strip adjoining which had received the same tillage and treatment until 1910 when it was cultivated and in 1911 was planted to potatoes with commercial fertilizers. The percentage of moisture and nitrogen in the two soils on November 5 after abundant fall rains were:

	Under Alfalfa.	Under Potatoes.
Moisture in six inches surface soil	20.49	18.06
" " next six inches of soil	18.72	15.94
Nitrogen in surface soil	0.251	0.251
" " subsoil	0.125	0.088

It is hoped that these same data may be gathered yearly from this land. Facts for a single year are of course not very conclusive. The following things are worth noting:

The acre produced 4.8 tons of hay in one year.

The first cutting yielded more than the two later cuttings together.

The first cutting was very dry; the second and third, as the analyses show, were too moist to put in the barn. They were stacked in the yard and there was some slight loss from moulding.

The three cuttings have somewhat different composition: the first, being probably somewhat more mature, has, in the water-free substance, a somewhat lower percentage of protein and higher percentage of fiber than the later cuttings.

The following statement compares the amount and character of feed and also the quantities of nitrogen, phosphoric acid and potash in this crop of alfalfa, with the average amounts in three tons of mixed meadow hay or three tons of red clover; yields which would be considered large for the summer of 1911. The figures represent pounds per acre.

	Alfalfa.	3 tons Meadow Hay.	3 tons Red Clover.
Ash	692	318	570
Protein	1320	474	906
Fiber	2276	1668	1446
Nitrogen-free Extract ...	3133	2568	2076
Fat	167	132	102
Nitrogen	217	86	133
Phosphoric Acid	51	19	28
Potash	164	97	145

Alfalfa yielded considerably more of every feed ingredient (400 more pounds of protein) than a good clover crop and vastly more than meadow hay.

The merits and the defects of alfalfa and the methods of getting it established on farms have been discussed many times by the writer in farmers' meetings and in print. It is not our purpose to further discuss those matters here but only to give some definite figures regarding the yield of the crop.

Two other samples of alfalfa hay have been analyzed; 27005 is the first cutting on the Station's Centerville field, 27023 is the fourth cutting from one of Mr. C. M. Jarvis' large fields. The figures are as follows:

	27005 As harvested.	27005 Water-free.	27023 As harvested.	27023 Water-free.
Water	11.12	.....	29.82	.....
Ash	8.53	9.60	6.59	9.39
Protein	17.31	19.48	16.80	23.94
Fiber	22.86	25.72	15.81	22.53
Nitrogen-free Extract ...	37.93	42.67	29.41	41.90
Fat	2.25	2.53	1.57	2.24
	100.00	100.00	100.00	100.00

A sample of alfalfa meal, 25956, bought by C. M. Jarvis, contained 14.50 per cent. protein.

BEAN PODS AND STRAW.

26030 and **26031**. The sample was sent by Fred. Lyman of Manchester, who states that it represents a car lot from a New York State shipper, who "claimed a large per cent. of protein." The cost is \$13.50 per ton delivered. He reports that cows eat the pods ravenously but discard the straw.

The sample was carefully divided by us into pods and fine leaves, which make up 56 per cent. of weight of the sample, and stems, 44 per cent. Their composition is as follows:

	Pods and Leaves.	Stems.	Composition of the Whole.	Average Clover hay.
Water	5.98	4.65	5.40	15.0
Ash	8.82	5.52	7.36	7.6
Protein	5.88	6.25	6.04	13.2
Fiber	26.39	44.47	34.35	24.2
Nitrogen-free Extract ...	51.97	38.44	46.03	37.4
Fat	0.96	0.67	0.82	2.6
	100.00	100.00	100.00	100.0

Good clover hay Mr. Lyman can buy for \$17.00. Obviously there can be no profit in paying \$13.50 for bean pods and straw.

AMOUNT OF WATER IN THE CORN CROP AT HARVEST.

A sample of ears of corn from L. S. White, Collinsville, 27239, was from a crop of 8435 lbs. of ears from a measured acre, of which 6690.64 lbs. was shelled corn and 1744.36 lbs. was cob. The shelled corn contained 27.9 per cent. of water and the cob 43.93 per cent.

The stover from this crop contained at harvest 56.87 per cent. of water.

PART IV. ELEVENTH REPORT

OF THE

STATE ENTOMOLOGIST OF CONNECTICUT

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

I transmit herewith my eleventh annual report as State Entomologist of Connecticut.

As is the custom, the financial statement covers the state fiscal year, but otherwise the report covers the calendar year of 1911.

Respectfully submitted,

W. E. BRITTON,

State Entomologist.

REPORT OF THE RECEIPTS AND EXPENDITURES OF THE STATE ENTOMOLOGIST
FROM OCTOBER 1ST, 1910, TO SEPTEMBER 30TH, 1911.

Insect Pest Account.

RECEIPTS.

From E. H. Jenkins, Treasurer	\$3,000.00
Account of 1910, balance	1,091.96
Sale of electrotypes	1.79
	<hr/> \$4,093.75

EXPENDITURES.

For Field, office and laboratory assistance:	
B. H. Walden, salary	\$1,080.00
A. B. Champlain, salary	930.00
D. J. Caffrey, salary	180.82
E. B. Whittlesey, salary	364.00
Other assistance	94.15
	<hr/> \$2,648.97

Printing and Illustrations	\$ 87.65
Postage	62.73
Stationery	14.03
Telegraph and telephone	1.25
Express, freight and cartage	11.08
Library	109.15
Laboratory apparatus and supplies	78.62
Office supplies	46.75
Traveling expenses	267.53
Balance, cash on hand	765.99
	<hr/>
	\$4,093.75

Gypsy Moth Control Account.

RECEIPTS.

From E. H. Jenkins, Treasurer	\$4,000.00
Account of 1910, balance	17.95
	<hr/>
	\$4,017.95

EXPENDITURES.

For Salary, labor, board of scouts, etc.:	
D. J. Caffrey, salary	\$ 749.18
Labor, board of scouts, etc.	2,320.05
	<hr/>
	\$3,069.23
Printing and illustrations	257.96
Tools and supplies	207.34
Telegraph and telephone	1.68
Express, freight and cartage	16.94
Rental of storehouse	28.50
Traveling expenses	267.33
Balance, cash on hand	168.97
	<hr/>
	\$4,017.95

Memorandum:—This account of the State Entomologist has been duly audited by the State Auditors of Public Accounts.

DEPARTMENT PUBLICATIONS.

By W. E. BRITTON.

- Tenth Report of the State Entomologist (Part IX of the Station Report for 1909-10); 56 pages, 14 text figures, 8 plates; 9000 copies distributed in March, 1911.
- Report of Committee on Injurious Insects; Proceedings Connecticut Pomological Society, 1911, p. 27. 4 pages.
- The Leopard Moth as a Pest of Apple Nursery Stock; *Journal of Economic Entomology*, Vol. IV. p. 298, June, 1911. 1 page, 1 plate.
- A Hemipterous Fisherman; *Entomological News*, Vol. XXII. p. 372, October, 1911. 1 page.
- The Pyralid, *Omphalocera dentosa* Grote, a Pest of Barberry Hedges; *Journal of Economic Entomology*, Vol. IV. p. 521, December, 1911. 4 pages, 1 plate.

- Vacation Notes in the Adirondacks; *Journal of Economic Entomology*, Vol. IV. p. 544, December, 1911. 2 pages.
- How to Get Rid of Ants; Special Bulletin, September, 1911. 1 page. 1000 copies.
- How to Get Rid of Flies; Special Bulletin, September, 1911; 2 pages. 1000 copies.
- The Brown-Tail Moth; Special Bulletin. Colored placard showing and describing brown-tail moth and its injury. 3000 copies. September, 1911.

By W. E. BRITTON AND B. H. WALDEN.

- Guide to the Insects of Connecticut; Bulletin 16, State Geological and Natural History Survey. Hartford, 1911.
- Part I. General Introduction. 38 pages, 3 figures, 5 plates. By W. E. BRITTON.
- Part II. The Euplexoptera and Orthoptera of Connecticut. 129 pages, 63 figures, 6 plates. By B. H. WALDEN.

By W. E. BRITTON AND G. P. CLINTON.

- Tests of Summer Sprays on Apples and Peaches (Part VII. of Station Report of 1909-10). 35 pages, 8 plates. February, 1911. 9000 copies.
- Tests of Summer Sprays on Apples and Peaches in 1910; Connecticut Farmer, Jan. 28, 1911. 1 page.

By W. E. BRITTON AND G. A. CROMIE.

- The Leopard Moth; Bulletin 169 of this Station. December 1911. 24 pages, 6 figures, 8 plates. 3000 copies.

By B. H. WALDEN.

- The Locust Borer; *Connecticut Farmer*, July 15, 1911.

By A. B. CHAMPLAIN.

- Some Carabidæ Taken in Connecticut; *Psyche*, Vol. XVIII. p. 35, February, 1911. 2 pages.
- Notes on Coleoptera from Connecticut; *Psyche*, Vol. XVIII. p. 170, October, 1911. 4 pages.

PERSONNEL OF DEPARTMENT STAFF.

W. E. BRITTON, PH.D.	<i>State and Station Entomologist.</i>
B. H. WALDEN, B.AGR.	<i>Assistant.</i>
DONALD J. CAFFREY, B.S.	<i>Assistant.</i>
ALFRED B. CHAMPLAIN*	<i>Assistant.</i>
MISS E. B. WHITTLESEY	<i>Stenographer.</i>

Mr. B. H. Walden, who has been in the department since March, 1902, has continued as general assistant and has been in charge of all work during my absence. Mr. D. J. Caffrey has remained in charge of all gypsy and brown-tail moth field work,

* Resigned September 30th.

and has also aided in the inspection of nurseries, this work coming at a time when he was not needed on the gypsy moth work just mentioned. Mr. Alfred B. Champlain, who began as assistant April 1st, 1910, resigned, to take effect September 30, 1911, to accept a new position in the Division of Economic Zoology, Harrisburg, Pa. His place has not yet been filled, but it will be necessary to obtain someone for it before the opening of next season. Mr. J. K. Lewis, a student of the Massachusetts Agricultural College, was employed from the latter part of February until September 9th, to help inspect imported stock and in the gypsy moth work at Wallingford. Local help was chiefly employed in the gypsy moth field work at both Wallingford and Stonington.

A. W. Yates of Hartford and H. W. Coley of Westport have also continued as apiary inspectors, being paid by the day.

Miss E. B. Whittlesey has continued as stenographer, working half of each day in this department. During her vacation the letters were written by Miss Ruth I. Meeker.

All of the persons mentioned have been faithful and efficient, and the success of the work is in large measure due to them.

CHIEF LINES OF WORK.

The activities of the department for the season have been directed along the lines required by law in regard to suppressing the gypsy moth at Stonington and Wallingford, and the brown-tail moth in Windham County; the inspection of apiaries and of growing nursery stock, and of orchards on request. All imported stock that can be classed as hardy trees and shrubs that could be found has been examined for pests. This work is not required by law, and there is no provision for it, but on account of the brown-tail nests found on such stock brought in from France during 1909 and 1910, it seemed necessary to continue the inspection for the protection of the state.

Much time and effort were expended in the summer spraying work in cooperation with the botanical department. This work was carried on in eleven different orchards, and about 688 apple and 231 peach trees were sprayed with various substances, mostly commercial and home-made preparations of lime and sulphur, and including several other preparations, to note the effect upon insect troubles and plant diseases, as well as upon the foliage. In gathering data to show the results of these experiments, it was

necessary to count and score 93,000 apples and 24,000 peaches. A full account of these tests will be published as Part V of this report.

Several minor experiments and studies have been carried on during the year, namely: trials of various substances applied to young pine trees to prevent damage by the weevil, *Pissodes strobi* Peck; life history studies on *Omphalocera dentosa* Gr., a moth whose larva is a pest of barberry hedges, the result of which has been published in an article in the Journal of Economic Entomology for December, 1911, page 521; a sawfly damaging a blackberry plantation near New Haven; the leopard moth and its injuries to shade trees, Bulletin 169 (also contained in this report), by W. E. Britton and G. A. Cromie, superintendent of trees in the city of New Haven.

Mr. Champlain reared four hymenopterous parasites of the genus *Pezomachus* from spiders' eggs found under stones, etc., and an undescribed Buprestid beetle of the genus *Agrilus* from galls on hop hornbeam.

In response to a request sent to this office, Mr. Walden, during his vacation in August, examined a large salt marsh area in Eastern Massachusetts, and recommended treatment to rid the locality of mosquitoes. Mr. Walden has in several cases given advice regarding, and occasionally personal supervision of, fumigation to destroy insect pests in dwellings and storehouses.

Thirty-eight orchards, gardens and greenhouses have been examined during the year and advice given regarding treatment.

The collection has been materially increased during the year by the work of members of the department staff.

The manuscript of a check-list of the insects of Connecticut, consisting of over 400 typewritten pages, prepared by W. E. Britton, has been finished and awaits publication as a bulletin of the State Geological and Natural History Survey.

Considerable time has been given to work of an educational nature, such as institute talks and exhibits at fairs.

On the station farm at Mount Carmel, purchased a year ago, about four acres were planted last spring to apples and peaches for experimental purposes, and this orchard will be used jointly by the entomological and botanical departments for testing various sprays and other kinds of treatment for insect and fungous troubles.

SUMMARY OF INSPECTION AND OFFICE WORK FOR 1911.

- 289 samples of insects received for identification.
 54 nurseries inspected.
 51 regular certificates granted.
 5 parcel certificates granted.
 38 orchards and gardens examined for insects.
 854 boxes and packages imported nursery stock examined.
 162 apiaries containing 1571 colonies inspected.
 84 apiaries containing 431 colonies found infested with European foul brood and treated.
 2672 letters written on official work.
 66 mail and express packages sent out.
 14 addresses made before granges, farm institutes and civic organizations.

EXHIBITS.

The entomological department furnished a part of the general exhibit made by the station at six agricultural fairs in September and October and also a two days' exhibit on the station grounds, October 27th and 28th. The places and dates of the exhibits were as follows:

Connecticut Fair, Hartford,	Sept. 4-9
Norfolk Agricultural Association, Norfolk,	Sept. 14-15
Windham County, Brooklyn,	Sept. 19-21
State Fair, Berlin,	Sept. 25-30
Danbury Fair, Danbury,	Oct. 2-7
Stafford Fair, Stafford Springs,	Oct. 10-12
Station Grounds, New Haven,	Oct. 27-28

About 1500 square feet of table space was covered by the exhibit of the entomological department, besides numerous photographs and charts hung on the walls and over the center table. Additional space was occupied at the exhibit on the station grounds, because the exhibit of another department had to be shown at Boston at the same time, and the entomological department supplied material to fill a portion of the vacant space.

The appearance of a part of the entomological exhibit is shown on Plate I. Its chief features were special exhibits of the gypsy moth and measures for controlling the pest; the brown-tail moth; foul brood disease of bees; the leopard moth; the seventeen-year locust and its distribution in Connecticut in 1911; malarial and non-malarial mosquito wrigglers; twenty or more species of living caterpillars; cases illustrating garden

insects, forest insects, shade tree insects, fruit insects; a large display of the more striking and common insects of Connecticut in all orders; many life-history sets of injurious species in Riker mounts; plaster casts of fruit, and fresh fruit attacked and injured by insects and fruit kept perfect by spraying; insecticides and spraying apparatus. All objects, cases and special exhibits were explained by uniform printed labels.

To keep labels in their proper place, supply fresh food for caterpillars, answer questions and explain the exhibits and methods of control, required the constant presence of one or more entomologists, and the preparation of the material took far more time and attention than the exhibition of it.

ENTOMOLOGICAL FEATURES OF 1911.

The weather conditions must be considered as bearing some relation to the scarcity or abundance of insect life. The season of 1911 was characterized by one of the most severe droughts ever known, and many plants, even orchards and woodland trees, were injured in various places by it, and the yield of field crops greatly diminished. Specimens of leaf scorch were sent to the station from all parts of the state. Many injurious insects, especially grasshoppers, white grubs and aphids, cause more damage in dry seasons, due in part, no doubt, to the comparative absence of certain fungous and bacterial enemies which require moisture for their development.

The green apple aphid, *A. pomi* DeG., and the rosy apple aphid, *A. sorbi* Kalt., were both more abundant than in 1910, and in some cases the latter caused a severe check to the development of the fruit. This species is especially prone to attack bearing trees, and is usually found on the fruit clusters.

Cut worms caused much damage, and there were many complaints and inquiries regarding them.

The chinch-bug, *Blissus leucopterus* Say, normally rather rare in Connecticut, seemed to be more abundant than usual, and many specimens were taken in the sweeping done in general collecting.

Canker worms were abundant locally, as they have been for many years. In fact, they do much damage somewhere each year, but do not continue to be abundant in the same locality more than three or four years. At the station grounds, where the fall

canker worm has been abundant for about four years, it is now diminishing, and probably it will be six or seven years before it again does serious damage. Apple orchards in the vicinity of Newtown and Danbury were stripped of their leaves, and the writer noticed much damage in North Haven, Wallingford and Mount Carmel. In the station orchard at Mount Carmel and in the orchards of Mr. W. W. Stevens of Northford and Mr. B. O. Jones of Centerville, where we conducted spraying tests, some damage was done before the first spraying. Mr. Walden observed them upon elm and apple trees at Middletown, and injuring apple foliage in Woodbridge. Specimens and complaints were also received from Fitchville and New Milford. Early spraying with lead arsenate, say before the middle of May, will of course prevent injury.

The maple leaf-stem sawfly, *Priophorus acericaulis* MacG., was more prevalent than for several years, not only around New Haven, but specimens of its work were received from Glastonbury, Meriden and Derby, and letters describing it, from several other localities. A brief account of the life history of this insect and the damage caused by it will be found on page 305.

The season brought to notice the great damage to the shade trees of towns and cities along the coast caused by the leopard moth, *Zeuzera pyrina* Linn. The moths, especially the males, were common around electric arc lights about July 1st, and Mr. Champlain caught several of them. The destruction of the trees was the reason for investigating this pest, and Bulletin 169 was issued in December. It gives a full account of the insect, with history and treatment, and is reproduced on page 317 of this report. Examples of this insect and its work were shown at the station grounds October 27th and 28th.

Probably the most important entomological feature of 1911 was the appearance of Brood II of the periodical cicada or seventeen-year locust. The species was scheduled to appear in Connecticut, and we were on the lookout for it. There were many exaggerated newspaper stories regarding this curious insect, but we were able to obtain fairly complete records of its distribution and occurrence, much more so probably than have ever been made of any previous occurrence of this or any other brood in the state. The insect aroused much popular interest, and a case, showing the different stages, with injury to trees, and a map showing its

distribution in the state, was exhibited at the fairs. See page 296 of this report for an account of the periodical cicada or seventeen-year locust.

Mr. Walden found an apparently new pest of cultivated blackberries in a field in Highwood near New Haven, and he made a partial study of the insect, which proved to be a sawfly of the family Lydidae. Publication is withheld until the life-history data are more complete.

Good progress was made in suppressing the gypsy moth in the state. No caterpillars were found at Stonington, and at Wallingford the number was not great. The scouts examined the northeast corner of the state during February and March, and found that the brown-tail moth had spread westward from where it was found last year, in Putnam and Thompson, into the towns of Woodstock and Pomfret, and southward into Killingly. By far the worst infestation was in the city of Putnam. We may fairly expect this insect to extend itself four or five miles further each year until the whole state is infested, but the work of the men in cutting off and burning the winter nests must necessarily check it. An account of this work is given on page 281 of this report.

Adults were reared from larvæ feeding on barberry, and proved to be a pyralid moth, *Omphalocera dentosa* Gr. This was made the subject of a brief article in the Journal of Economic Entomology, which is included in this report, page 292.

Late in September there was a swarm of the brown cotton moths, *Alabama argillacea* Hubn., in New Haven and other Connecticut towns. It seems that there was a heavy migration of the adults of this insect from the cotton fields of the South, where it was unusually abundant. A note on page 340 further explains this phenomenon.

The bud moth, *Tmetocera ocellana* Schiff., was rather abundant and caused some damage in the apple orchards on the station farm and on the farms of Mr. C. K. Andrews at Mount Carmel and Mr. W. W. Stevens of Northford, where spraying experiments were conducted. Specimens were also received from Greenwich, West Cheshire, Mystic, New Britain, East Windsor and Union, and Mr. Walden observed its work on an orchard in Woodbridge. Early spraying with lead arsenate is the remedy. An account of this insect may be found in the Report of this Station for 1909, page 353.

The spiny elm caterpillar, *Euvanessa antiopa* Linn., was probably more abundant throughout the state than since 1906. Many persons find the larvæ, and take them to be gypsy moth caterpillars, though the latter are clothed with stiff, simple hairs instead of branched spines. The spiny elm caterpillar feeds in clusters, usually on elm, poplar or willow, and is described in the Report of this Station for 1906, page 260. Specimens of the insect were received during the season from Cobalt, Manchester, Salisbury, South Willington, Botsford, Hartford, East Woodstock, Farmington, Norwalk, Mystic, New Haven and Branford.

The elm leaf beetle, *Galerucella luteola* Mull., was very abundant in cities and towns where the trees were not sprayed. The dry season was especially favorable to this insect, which is destroyed in large numbers by a fungus if moisture is abundant during the latter part of July, the pupating season. Specimens were received from New Hartford, Pine Meadow, Stamford and Noroton.

The birch bucculatrix, described in the last report (1910, p. 701), which defoliated birch trees over a large area of the state in 1910, was present in 1911, but in no instance was it as abundant or causing such complete defoliation.

The woolly maple leaf scale, *Phenacoccus acericola* King, is increasing as a pest of sugar maples in cities and towns, and in New Haven and Hartford it is now necessary to practice control measures to hold it in check.

The San José scale, *Aspidiotus perniciosus* Comst., is no longer feared by the commercial orchardists, and it seems to be on the wane in many parts of the state, especially on old trees. On young orchard and nursery trees, however, it multiplies rapidly, and Mr. F. A. Bartlett writes that 1911 seems to have been a particularly good year for the San José scale, and that trees which seemed to be nearly free last spring are now badly infested.

The white pine weevil, *Pissodes strobi* Peck, was especially prevalent during the season, and is damaging forest plantations throughout the state, though more destructive in some sections than in others. The treatment generally recommended is to cut out the leaders and either destroy them before the insects emerge or place them in a cage covered with wire gauze to permit the escape of any parasites, but not of the beetles. Some preliminary tests of various substances for the purpose of preventing infesta-

tion were made last season, and are reported on page 307 of this report. It is hoped that a careful study can be made of this insect under Connecticut conditions in the near future.

INSPECTION OF CONNECTICUT NURSERIES.

Fifty-four nursery inspections were made during the calendar year, and fifty-one regular certificates granted. Two inspections were made of each of three nurseries, one inspection in the spring and the other at the regular time in the fall.

In addition to the regular nurseries, a number of private individuals who wished to send shipments of native plants, fruit stock or ornamental shrubs into other states found that they could not do so without a certificate of inspection. In order to meet such demands, it has been our practice to examine the stock and issue a certificate to be attached to each car, box, bale or package, and applying only to the contents thereof. As a rule, there are but few cases of this sort. Five such certificates were issued in 1911.

The annual inspection of growing nursery stock was commenced September 2d, and on account of delays occasioned by stormy weather and making exhibits at the fairs, was not completed until about the middle of November. The work was done by Messrs. Walden, Champlain, Caffrey, Lewis and Britton.

Most of the nurseries were freer from San José scale even than last year, due to the care and treatment given the growing stock by the owners and managers. Though it is true that the scale is less injurious than formerly, especially on old trees, it will soon cover young trees and trees in nursery rows if they become infested and are not treated. In the larger fruit nurseries of this state it is now the general practice to spray the growing trees with a miscible oil or lime-sulphur mixture. The budsticks are fumigated or dipped in oil mixture, and in one large nursery the stocks are treated with lime-sulphur in spring before the newly-set buds start. More or less spraying is also done with Scalecide during summer to check aphids, leaf-hoppers and scale insects. Such treatment of course is expensive, but results in a cleaner and better growth of stock, little of which needs to be destroyed at inspection time, and it pays in the end.

The list of nurserymen receiving certificates in 1911, which is given below, contains more names than last year. Of the last

year's list one has dropped the nursery business, and three new ones have entered it. Two nurseries have changed hands, and are included under new names. Three regular nurseries were omitted from the list last year because the treatment prescribed by the state entomologist had not been carried out by the end of the year covered by the report. These are all reinstated. One new nursery, inspected for the first time in the spring of 1911, changed hands before the annual fall inspection and both names are included in the list. Though the list contains 48 names, there are but 47 nurseries.

LIST OF NURSERY FIRMS IN CONNECTICUT RECEIVING CERTIFICATES IN 1911.

Name of Firm.	Location.	Certificate issued.	Number of certificate.
Atwater, C. W.	Collinsville	Sept. 26,	424
Barnes Brothers Nursery Co.	Yalesville	Oct. 17,	434
Beattie, Wm. H.	New Haven	Nov. 22,	462
Bowditch, J. H.	Pomfret Center	Sept. 29,	425
Brainard Floral & Nursery Co.	Thompsonville	Nov. 2,	443
Braley & Co., S. A.	Burnside	Nov. 9,	453
Bretschneider, A.	Danielson	Nov. 7,	450
Brooks Brothers	Westbrook	Dec. 5,	465
Burroughs, Thos. E.	Deep River	Oct. 3,	426
Burr & Co., C. R.	{ Manchester, Buck- land, Durham }	Oct. 6,	427
Chapman, C. E.	North Stonington	Oct. 31,	441
Comstock & Lyon	Norwalk	Oct. 11,	431
Conine Nursery Co., F. E.	Stratford	Oct. 6,	428
Conn. Agricultural College	Storrs	Nov. 21,	461
Conn. Agr. Experiment Station, Forest Nursery (S. N. Spring, State Forester, New Haven)	{ New Haven, Ham- den, and Rain- bow }	Nov. 16,	459
Conway, W. B.	New Haven	Oct. 28,	439
Cross Highway Nurseries	Westport	Nov. 14,	457
Dehn & Bertolf	Greenwich	Oct. 17,	433
*Doorly, C. C.	Sound View	May 31,	419
Dwyer, John E.	Manchester	Oct. 9,	429
East Rock Park Nursery (G. X. Amrhy, Supt. of Parks)	New Haven	Sept. 18,	422
Elm City Nursery Co.	New Haven	Sept. 18,	421
Gardner's Nurseries (2)	Cromwell	Nov. 4,	447
Hilliard, H. J.	Sound View	Dec. 8,	466
Houston & Sons, J. R.	Mansfield Depot	Nov. 16,	458
Hoyt's Sons, Stephen	New Canaan	Sept. 25,	423
Hubbard & Co., Paul M.	Bristol	Nov. 7,	451

* Succeeded by Mr. Hilliard.

Name of Firm.	Location.	Certificate issued.	Number of certificate.
Hunt & Co., W. W.	Hartford	Oct. 11,	430
Kellner, H. H. (2)	Danbury	Oct. 16,	432
Kelsey & Sons, David S.	West Hartford	Nov. 4,	448
Keney Park Nursery (G. A. Parker, Supt. of Parks)	Hartford	Nov. 11,	456
Malone, Est. of Geo. W.	New Haven	Nov. 29,	463
Mount Carmel Forestry and Nurs- ery Co.	Mt. Carmel	Nov. 3,	445
Munro, Charles	New Haven	Oct. 28,	438
Northeastern Forestry Co.	Cheshire	Nov. 3,	444
New Haven Nurseries	New Haven	Oct. 24,	436
Phelps, J. Wesson	Bolton	Nov. 1,	442
Pierson, A. N.	Cromwell	Sept. 2,	420
Platt Co., The Frank S.	New Haven	Nov. 20,	460
Purinton, C. O.	Hartford	Nov. 3,	446
Ryther, O. E.	Norwich	Oct. 28,	440
Schleichert, F. C.	Bridgeport	Dec. 1,	464
Scott, J. W.	Hartford	Oct. 26,	437
Sierman, C. H.	Hartford	Nov. 6,	449
Stanhope, B. P.	{ Old Lyme (address Niantic) }	May 19,	418
Streckfus, H. P.	Litchfield	Nov. 10,	455
Turner, Charles	Hartford	Oct. 21,	435
Vidbourne & Co., J.	Hartford	Nov. 7,	452
Woodruff, C. V.	Orange	Nov. 9,	454

INSPECTION OF IMPORTED NURSERY STOCK.

By W. E. BRITTON AND B. H. WALDEN.

As recorded in the Reports of this Station for 1909, page 328, and 1910, page 667, several winter nests of the brown-tail moth have been brought into Connecticut on nursery stock imported from foreign countries, especially France, and had these nests not been found and destroyed it is probable that at least two infested centers in the central and western portions of the state would have become established. As no federal legislation had been enacted covering the matter, it devolved upon each state to protect its own interests by causing such stock to be inspected and the pests destroyed. Consequently, in 1911, an attempt was made to inspect all woody nursery stock coming into the state as in the two preceding years, and we asked the nursery men to coöperate by informing us promptly on the receipt of stock at their nurseries in the following circular letter:

NEW HAVEN, CONN., Jan. 19, 1911.

Dear Sir:—Two years ago thousands of nests of the Brown-tail Moth, *Euproctis chrysorrhæa* Linn., were brought into the United States on nursery stock from France, and in the absence of any system of Federal inspection, this infested stock was shipped into nearly all of the Eastern States. Fifty-two of these nests were found on stock shipped into Connecticut, out of 224 boxes and packages examined. Again last year 14 nests were found on stock shipped from France to three Connecticut nurseries, five out of 707 boxes and packages being infested. If such stock is not inspected, the Eastern nurseries will soon become infested and the business seriously injured.

I therefore request you to notify me at once of any importations received from any foreign country during the fall or winter, or of any shipments expected this spring, so that an inspection can be made. Please hold all boxes and packages without unpacking until an inspector can reach your nursery. We will examine the stock as promptly as possible after receiving notice that the goods have arrived at your nursery.

Very truly yours,

W. E. BRITTON,
State Entomologist.

NOTICES REGARDING IMPORTED STOCK.

Notices were received from the Bureau of Entomology at Washington, D. C., of the arrival of goods at port of entry in most cases. The New York State Department of Agriculture kindly notified us of several shipments, as did officials of a few other states, and in one or two cases notice was received direct from the customs officials. Some stock arrived, however, and was inspected, of which no notice was received except from the importing nurseryman. In a number of cases the notice was so incomplete or contained such errors as to make it impossible to trace the stock. These shipments were usually consigned to private parties, for planting on their own or their friend's estates, but were just as liable to bring in pests as though consigned to regular nurserymen. In several instances nurserymen in other states, on receiving large importations, reshipped certain boxes and packages, without inspecting or repacking, into Connecticut. Several notices regarding such cases were received from the New York State Department of Agriculture.

INCREASE IN IMPORTED STOCK.

The amount of nursery stock brought into this country from abroad is rapidly increasing each year, presumably because on account of cheap labor it can be grown there cheaper than here.

For many years fruit stocks for root grafting or budding have been imported and we should expect that the rarer varieties of flowering and ornamental trees and shrubs would be brought into the United States from the older countries. But all kinds of nursery stock are now being imported, even such common and easily grown species as California privet and Japanese barberry. Most of this stock imported, however, comes in small sizes, and the nurseryman grows it for one or more seasons before selling it. In addition to the regular nursery importations, thousands of Manetti rose seedlings, azaleas, Easter lilies, bay trees, lily of the valley and flowering bulbs are brought into Connecticut each year by florists not engaged in nursery business. But, as the customs officials are not conversant with the differences, they are supposed to notify the Bureau of Entomology of the arrival of all living plant material. No attempt was made in Connecticut to inspect bulbs, lily of the valley pipes, or herbaceous stock.

The increase is shown by the number of boxes and parcels inspected during the past three years.

Year.	Number of boxes and parcels inspected.
1909	306
1910	707
1911	854

SOURCES OF IMPORTED NURSERY STOCK.

Holland still leads, with France second, as a source of nursery stock brought into Connecticut. Probably this holds true in about the same proportions for the Northeastern United States. There is also a large increase in stock from Belgium, England and Japan. The number of boxes, etc., examined from each country is shown below.

Country.	Number of boxes bales and parcels.
Holland	449
France	154
Japan	109
England	91
Scotland	2
Belgium	15
Ireland	14
Germany	2
Miscellaneous	18
Total	854

PESTS FOUND: A RUST ON JUNIPERS FROM JAPAN.

No brown-tail nests or gypsy moth egg-masses were found on imported stock this year, though on several trees portions of the web remained, showing that the stock had been infested and the nests removed before shipping. Gypsy moth egg-masses were found in New York and possibly some other states.

In shipments received at two Connecticut nurseries from Japan, 55 plants of *Juniperus chinensis* var. *compacta* and 49 plants of *Juniperus tachibayaku* were infested with a rust identified by Dr. Clinton, botanist of this station, as *Gymnosporangium Japonicum* Syd. This rust showed as orange-colored gelatinous pustules on the stems. It has another stage which is a well recognized and quite injurious disease of pomaceous fruit trees in Japan.

All the plants mentioned above were obviously infested, and were burned. Others of the same kinds in the same shipments were planted out and isolated from pomaceous fruit trees to be watched by Dr. Clinton, and destroyed if found diseased.

LEGISLATION.

Attempts to secure national legislation providing for the inspection of imported nursery stock have been continuous for the past fourteen years. Action has been delayed on account of a pressure of other matters, but more especially by the legislative committee of the National Nurserymen's Association, which objected to certain features of the measures proposed. A history of the whole subject would be out of place here, but various bills have been introduced, modified, rejected, or action postponed. At first it was planned to have the stock inspected at ports of entry, but this was found impracticable, and the idea was abandoned. Even this feature of federal inspection has now been dropped, and the work will probably be left for the States, even if the bill now before Congress is passed. At the meeting of the Official Horticultural Inspectors in Washington, December 28th and 29th, a conference was held with representatives of the inspectors, nurserymen, and Bureau of Entomology, and certain changes in the bill now before Congress were agreed upon, and all promised to help get action upon it. Copies of this bill as amended have not been distributed but the measure provides for a system of permits and notification that will be much more efficient than the present practice. In that respect at least it will be a benefit.

It seems almost necessary, therefore, to continue the inspection of plant material brought into Connecticut from foreign countries, though the inspection of such stock in 1911 necessitated 115 trips, and consumed time equivalent to ninety days, or the working days of nearly three and one-half months for one man. The cost of the work, including salary and traveling expenses, amounted to more than \$500.00, and some financial provision should be made by the state to cover the expenses of the work.

INSPECTION OF APIARIES IN 1911.

The law passed by the legislature in 1909 provided for the inspection of apiaries on complaint in order to suppress the bacterial diseases commonly known as "foul brood." One season's work had been done under this law, and the results published in my last report (Report of this Station for 1909-1910), page 669.

Five hundred dollars was the amount of the appropriation for this work for the period of two years, but as there was no restriction on the amount to be used each year, and as there was a demand for inspections, the money was all used in 1910. Consequently there were no funds for inspection work in 1911, and the Connecticut Beekeepers' Association introduced a resolution asking the legislature to make an increased appropriation and also to make part of it available for use in 1911. Though this resolution was somewhat changed by the committee on agriculture, to which it was referred, and the appropriation greatly reduced, the following measure was passed:

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. The sum of nine hundred dollars is hereby appropriated to be paid out of any money in the treasury not otherwise appropriated, for carrying out the provisions of Chapter 185 of the public acts of 1909, concerning the suppression of contagious diseases among bees; said moneys to be available as follows: one-third thereof upon the passage of this act, one-third during the year 1912, and one-third during the year 1913.

Section 2. This act shall take effect from its passage.

Approved May 25, 1911.

Thus three hundred dollars became immediately available, and duly accredited vouchers amounting to \$299.94 were paid by the State Treasurer for the inspection work done between May 25th