Lime-sulphur solution is more frequently recommended, the dilute strength (1-50) being necessary for summer use. It is said to kill by contact, but it is slow in doing its work, and acts over a considerable period of time. The self-boiled mixture is recommended by some (4, page 34), and the addition of flour-paste to dilute lime-sulphur by others (6). Kerosene emulsion (8, page 208) and Scalecide are also encountered in recommendations for red spider control.

In Oregon (2, page 87), one of the most effective controls appears to be afforded by a combination of nicotine sulphate and lime-sulphur or scalecide. It is thought that the eggs are not killed by winter strength lime-sulphur, but observations on the citrus mite indicate that the continued action finally kills a large per cent. of the mites, after hatching.

TABLE I

LABORATORY TESTS OF VARIOUS INSECTICIDES ON THE EUROPEAN RED MITE

Material Used.	Number killed.	Number alive.	Per Cent. killed.	Examination after.	Date.
Sulphur dust	1	12	7.6	6 hrs.	July 28
" "	1	18	5.2	24 hrs.	July 28-29
" "	19	45	29.6	48 hrs.	July 28-30
Lime sulphur 34° Bé					
1 gal.-43¼ gals...	7	6	53.8	6 hrs.	July 28
"	17	3	85.0	24 hrs.	July 28-29
"	79	28	73.8	48 hrs.	July 28-30
Borax Soap 2 lbs.,- and 40% Nicotine Sulphate ¾ pint					
50 gals.	15	3	83.3	6 hrs.	July 28
"	26	1	96.2	24 hrs.	July 28-29
"	114	5	95.7	48 hrs.	July 28-30
Borax Soap 6 lbs.- 50 gals.	33	0	100.0	6 hrs.	July 28
"	20	2*	90.9	24 hrs.	July 28-29
"	141	6	95.9	48 hrs.	July 28-30
Borax Soap 4 lbs.- 50 gals.	23	2	92.0	12 hrs.	July 28-29
Amalie Auto Soap 4 lbs.-50 gals.	15	5	75.0	12 hrs.	July 28-29
6 lbs.-50 gals.	12	5	64.1	12 hrs.	July 28-29
Check No. 1	3	21	12.5	6 hrs.	July 28
"	5	21	19.2	24 hrs.	July 28-29
"	55	321	14.6	48 hrs.	July 28-30
Check No. 2	1	29	3.3	12 hrs.	July 28-29

*Young larvae recently hatched.

Material used.	Number killed.	Number alive.	Per Cent. killed.	Examination after.	Date.
Fels Naphtha Soap					
4 lbs.-50 gals.	18	0	100.0	6 hrs.	July 28
"	15	0	100.0	24 hrs.	July 28-29
Star Soap					
4 lbs.-50 gals.	21	0	100.0	6 hrs.	July 29
"	23	2	92.0	24 hrs.	July 29-30

TABLE II

RESULTS OF FIELD TESTS IN THE PLANT BROTHERS' ORCHARD Branford, Conn.

Treatment.	Killed.	Alive.	Per Cent. killed.	No. of trees used.
Soap 4 lbs.-50 gals.	125	139	47	24
Soap 2 lbs. and 40% Nicotine Sulphate 1 pint-50 gals.	69	75	48	24
Check	66	119	36	24
Dust				
90% Sulphur	No difference could be seen			
10% Arsenate of lead	between check and treated			
3% Nicotine sulphate	blocks.			35

All treatments in Table II were made July 28, 1920.

Welcome borax soap was used, and Black Leaf 40. Dusting was done about noon. The counts were made by selecting twigs at random from trees in the center of the block and examining with a binocular. The examination was made August 5, and also several weeks later. No counts were made at the later date.

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THE APPLE AND THORN SKELETONIZER IN CONNECTICUT.

Hemerophila pariana Clerck.

This is an European species which has recently become established in this country. It first appeared in Westchester County, N. Y., and its presence in the United States was mentioned by Doctor E. P. Felt in a Scientific Note in the Journal of Economic Entomology, Vol. 10, page 502, August 1917. Later a full illustrated account giving habits, descriptions, partial life history and bibliography appeared in the Thirty-third Report of the New York State Entomologist for the year 1917, and it is from this publication that the chief facts were gleaned for use in the present paper.

Doctor Felt had warned us to be on the watch for the insect in Fairfield County, Connecticut, because he had observed it very near the Connecticut border in Westchester County, N. Y., but the first report of its occurrence within the state was made over

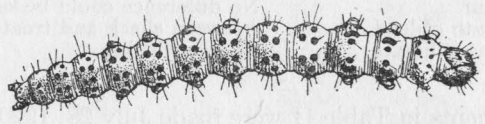

Figure 7. Larva of apple and thorn skeletonizer, six times enlarged. (After Felt, Cornell Extension Bulletin 27, 1918.)

the telephone in the autumn of 1920 by Mr. F. A. Bartlett of Stamford, who stated that the insect was quite abundant in the vicinity of Belle Haven, Greenwich. At my request he gathered some material and sent for examination. This reached the laboratory November 13. From Doctor Felt's published descriptions, we were able to identify it as *Hemerophila pariana* Clerck. On November 18, Messrs. Walden and Zappe of this department visited the locality and gathered more material from which an adult moth emerged on December 7. According to Mr. Bartlett, the insect occurs in the towns of both Greenwich and Stamford. Belle Haven is situated in the southwestern part of Greenwich adjacent to the town of Rye, N. Y.

Nature of Injury.

The caterpillars feed upon the upper surface of the leaves sometimes entirely skeletonizing them, but often leaving a portion untouched at each margin at the base of the blade. Each larva spins a light web over the center of the leaf, curling the leaf upward and drawing together the margins especially toward the tip. The

extent of injury varies from only slight feeding to entire skeletonization and is shown on Plate X, a.

The leaves are not webbed together like the nests of the fall web-worm. In the worst infested sections of Westchester County, N. Y., some of the unsprayed orchards are completely defoliated.

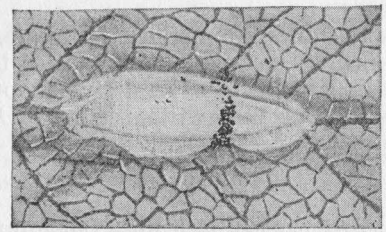

Figure 8. Cocoon of apple and thorn skeletonizer on leaf, twice natural size. (After Felt, Cornell Extension Bulletin 27, 1918.)

Distribution.

According to Doctor Felt, this insect has been recorded from England, France, Germany, the Balkan Peninsula, Bithynia and western Asia including Turkestan.

In America it is known to occur only in Westchester and Rockland Counties in the State of New York, and in Greenwich and Stamford, Fairfield County, in Connecticut It is not known how long the insect has been established in the United States or how it was introduced here, but the probabilities are against rapid dissemination, though its range in Europe and Asia indicates that the insect may be able to maintain itself over a greater portion of the United States and southern Canada.

Figure 9. Pupa of apple and thorn skeletonizer, six times enlarged. (After Felt, Cornell Extension Bulletin 27, 1918.)

Life History.

The life history has not been completely worked out in this country, but the data collected by several entomologists in Europe indicate that there are at least two and probably three generations each year. It is thought that the insect passes the winter in both the adult and pupa stages, the former in any shelter, and the latter in the cocoon on the leaf. Doctor Felt reports much variation in the development of the insect at Irvington, N. Y., as very small and full-grown larvae were both found together in September and early October. Probably the larval or feeding stage lasts from

four to six weeks. As injured leaves seem to be rather uniformly distributed over the tree and throughout the orchard, it is suggested by Doctor Felt that the moths may deposit a few eggs near the base of each leaf. Particularly when abundant, the moths seem to oviposit on nearly every leaf.

In Europe the adults are found on the flowers of the Compositae, especially goldenrod.

Though the insect shows a preference for apple, the list of food plants in Europe includes also pear, hawthorn or thorn, mountain ash, birch and possibly willow. Several Hymenopterous parasites have been reported by European writers and one, *Dioctes obliteratus* Cresson, has been reared in New York State.

Description.

Larva:—Length nearly one-half inch when full-grown, greenish-yellow in color with black, tubercular spots varying greatly in size and bearing hairs. Head amber, with irregular dark-brown line at the lateral dorsal angle adjoining the first thoracic segment. Antennae yellowish brown, legs pale yellow.

Pupa:—Length, about one-fourth of an inch, rather stout, dark bronzy yellow, head dark-brown. The white silken cocoon is about five-eighths of an inch long and one-fourth of an inch broad, fastened to the upper surface of the leaf, frequently along the mid-rib. The pupa can be seen faintly, and before the moth emerges, wriggles partly out from the cocoon, the pupal shell often projecting from it. (See Plate X, b.)

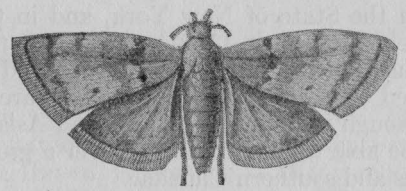

Figure 10. Adult of apple and thorn skeletonizer, four times enlarged. (After Felt, Cornell Extension Bulletin 27, 1918.)

Adult:—Wing-spread of slightly less than half an inch, grayish-brown to dark brown usually with purplish tinge, fore-wing marked with a rather broad broken angulate dark band near basal third, and another less distinct but more regular dark band crossing the wing near the distal fifth. Area between these bands is grayish but variable in color, and usually marked by one or more dark spots near the costal margin. The head, thorax and abdomen are covered with dark brown scales shading into or mottled with yellowish-brown or purplish-brown and quite variable. Rear wings dark fuscous. Both wings margined with purple fringe. Under side lighter with two whitish spots on costal margin of fore-wings.

Illustrations of the larva, cocoon, adult moth and the injured leaves are shown in figures 7-10 and on Plate X, a. and b.

Control Measures.

As the larvae feed upon the upper surface of the leaf, timely and thorough applications of lead arsenate will probably readily control this pest. It may be necessary to spray rather late in summer in order to check the late brood. It is reasonably certain that such measures will forestall injury in orchards, where the owners make a practice of spraying, but there are so many neglected trees throughout Connecticut that there is great danger that the insect will subsist upon them and gradually become distributed all over the state. If all trees in and around the infested region could be sprayed in this manner, it would be an effective check on the spread of this insect.

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THE SINUATE PEAR BORER.

Agrilus sinuatus Olivier.

This European beetle causes serious injury to pear trees in France and Germany, and was first discovered in this country in New Jersey in 1894. Apparently it was introduced in nursery stock. It seems to have spread rather slowly and in 1915 Doctor Felt* reported that the insect was known to occur in several localities in New York State. The first indication of its occurrence in Connecticut was on May 29, 1917, when we received from Mr. G. S. Brown, Norwalk, a piece of bark from a pear tree which seemed to show the work of this insect, and a note to that effect was printed in the Station Report (1917, page 361). On a visit to Stamford on June 24, 1920, the writer examined a small pear orchard on Strawberry Hill, where many of the trees were attacked, injured, and some of them seriously deformed by this insect. According to Mr. F. A. Bartlett of Stamford, considerable injury has been noticed by him in the pear orchards in Stamford and Greenwich.

Mr. H. B. Weiss† in 1914, reported the insect as being present in Essex, Union, Middlesex and Bergen Counties in New Jersey, and states: "While it is true that it is not abundant every year, it is customary to run across its work in the northern part of the state. In spite of the fact that it is no longer destructive, it is evidently holding its own in a small way and spreading somewhat."

All varieties of pear are infested. The Bartlett seems to be preferred, and the Keiffer, though attacked, is not seriously injured.

Character of Injury.

The larva, which is one of the flat-headed borers, makes a long narrow and winding burrow under the bark chiefly in the sapwood.

*Report of the Entomologist of New York, 31, page 78, 1915.
†Journal of Economic Entomology, Vol. 7, page 251, 1914.

These burrows are rather conspicuous, especially in young trees having a smooth bark. The nearly-grown larvae make burrows which are much larger than those made by the first-season larvae and consequently they are more conspicuous. Trees of all ages are attacked and injured. Small trees are sometimes girdled and killed by intersecting burrows, and large trees are weakened and sickly often losing branch after branch, and finally die. Many instances were noticed where the galleries had killed the bark on one side of a branch while the other side appeared healthy.

Life History and Habits.

The adult beetles appear late in May and during June, and deposit their eggs in the crevices of the bark. These eggs hatch in early July and the grubs begin their sinuous tunnels which are very narrow at first but gradually increase in diameter as the grubs grow. On the approach of winter, the grub stops feeding and rests in its burrow until spring, then continues its work. The second summer the grubs are much larger and of course the burrow corresponds in size. The zigzag or sinuous course which is downward is very pronounced. The bark over the burrows is somewhat depressed, blackened and often cracked, so that an infested tree can usually be recognized at a glance. Smith* states that in no case has he ever seen a complete girdling by a single larva, but where two or more larvae happen to work in the same branch, their galleries often meet and if a small branch or a small tree, it may result in a complete girdling and that part above the injury dies. This is more apt to happen the second season than the first. In September of the second season the larva eats its way into the wood about one-fourth of an inch and makes a cell or enlarged burrow lengthwise the stem. At the opposite end of this cell the grub eats its way to the bark and plugs both ends of its cell with sawdust. In this chamber it passes the winter, gradually contracting in length, and pupating in the cell the following April. The location of this pupal cell is visible in young trees or in the smaller branches of large trees, as the bark is somewhat sunken and blackened, the blackening extending into the wood and probably being due to a fungus. The beetle then emerges through a semicircular hole in the bark.

According to Doctor Felt† the studies of Doctor H. Glasgow of the New York Agricultural Experiment Station at Geneva, N. Y. show that the beetles feed readily upon the foliage. This habit may make it possible to control the pest by the use of arsenical sprays applied late in May or just before the beetles emerge. The adults are found flying about on sunny days or resting upon the bark of the trunk or branches.

*New Jersey Agricultural Experiment Station Report for 1894, page 558.
†Report New York State Entomologist, 31, page 79, 1915.

Description.

Larva:—Length, about one and one-half inches when full-grown; very flat, white or yellowish, head small and brown, with prominent mandibles. The first thoracic segment is much enlarged about twice as broad as the abdominal segments and having somewhat the appearance of a large head, but flattened like the other segments; first five abdominal segments have parallel sides, but second and third thoracic and last three abdominal segments have rounded or angular sides which are not parallel.

Adult:—Length, about one-third of an inch, breadth about one-fifth of its length, slender like the other Buprestid beetles belonging to the genus *Agrilus*. In color it is bronzy brown, shining, but with the surface granulated and punctured.

Both larva and adult have the appearance shown in figure 11.

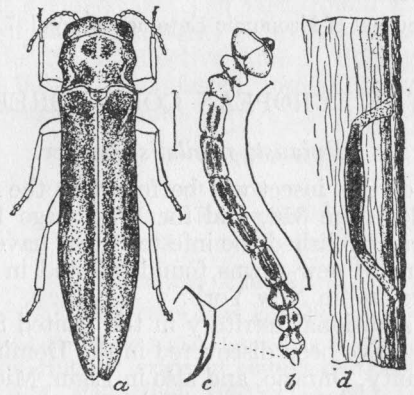

Figure 11. Sinuate pear borer. *a*, adult beetle; *b*, larva; *c*, anal fork of larva; *d*, pupal cell in solid wood—all enlarged. (After Smith, Report New Jersey Agricultural Experiment Station for 1894.)

Control Measures.

All trees infested to such an extent that their value has been destroyed should be cut and burned. The worst infested branches or portions of a tree may also be pruned off and burned. In certain cases the pupal chamber as indicated by the sunken and discolored area may be cut open and the insect destroyed with the knife.

If the foliage be kept covered with arsenate of lead during the latter half of May and June, no doubt many of the adults will be killed in feeding upon the leaves.

Possibly washes of lime-sulphur and arsenate of lead applied to the bark before the beetles emerge may repel them so that they will seek other trees on which to oviposit, but this cannot be ascertained except by a long series of careful experiments.

The trees should be well fertilized and kept in a vigorous and growing condition, as they will not be so soon overcome by the attacks of this insect.

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THE EUROPEAN CORN BORER.

Pyrausta nubilalis Hubner.

An account of this insect will be found in the Reports of this Station for 1918, page 316, and for 1919, page 170. Since the latter Report was published the infested areas have been extended by the discovery of new towns found infested in Massachusetts, New Hampshire and in New York.

Besides this additional territory in the United States, two new infested centers have been discovered in the Dominion of Canada, in Welland County, Ontario, and also in Elgin, Middlesex County, and a part of Oxford County in western Ontario.

SCOUTING IN 1920.

Early in 1920, we received from the Bureau of Entomology at Washington the record of shipments of broom corn imported from Austria a few years ago, and consigned to two broom factories in Connecticut, one at Thompsonville in the town of Enfield, and the other at New Hartford. On April 26, Messrs. Zappe and Walden visited New Hartford and examined the cornstalks and stubble in eight fields around the factory. On April 29 they visited Thompsonville and inspected ten cornfields in the vicinity of the factory. No traces of the European corn borer were found in either case.

Members of the department staff have during the year examined many corn fields in different parts of the state, and have investigated many complaints and reports regarding borers in corn. As a rule these reports apply to the stalk borer *Papaipema nitela* Guen., or to the corn ear worm *Heliothis obsoleta* Fabr. (See Report for 1919, pages 180 and 188 respectively) both of which were quite abundant in 1920 as well as in 1919.

So far the European corn borer has not been found in Connecticut, and none of the appropriation of $10,000.00 made by the

General Assembly for the suppression of this insect should it occur here, has been expended.

STATE QUARANTINE.

The Federal Horticultural Board established Quarantine No 43, against the European corn borer, under date of March 15, 1920. In the Report of this Station for 1918, page 323, was published the text of the first quarantine order issued by Connecticut under authority granted by Section 2106 of the General Statutes, the quarantine bearing the date of September 20, 1918. As this order applied only to shipments of corn from the infested section of eastern Massachusetts, and as portions of New Hampshire, New York and Pennsylvania had been found infested after the establishment of the quarantine, a revised order was issued as Quarantine Order No. 3, effective June 1, 1920, prohibiting shipments of plants liable to be infested from all known infested areas in the United States, as follows:—

STATE OF CONNECTICUT
OFFICE OF
AGRICULTURAL EXPERIMENT STATION
NEW HAVEN, CONN.

Quarantine Order No. 3.

Effective June 1, 1920.

Whereas a very destructive insect, known as the European Corn Borer *Pyrausta nubilalis* Hubner, exists in certain portions of the States of Massachusetts, New Hampshire, New York and Pennsylvania, and threatens the corn growing industry of the country; and whereas there is grave danger that this insect may be brought into this State by the transportation of infested plants or parts of plants from the infested area:—

Therefore, pursuant to the provisions of Section 2106 of the General Statutes, it is hereby ordered that no corn on the ear, stover, or other parts of the corn plant, broom corn, including all the parts of the stalk, celery, green beans in the pod, beets with tops, spinach, rhubarb, oat and rye straw as such or when used in packing, cut flowers or entire plants of chrysanthemum, aster, cosmos, zinnia, hollyhock, and cut flowers or entire plants of gladiolus, and dahlia, except the bulbs thereof, without stems, shall enter Connecticut from the infested areas mentioned below, unless each shipment, car, box, bale, or package bear a valid certificate issued by an authorized Federal inspector, stating that the contents thereof have been examined and found free from infestation by the European Corn Borer. These restrictions do not apply to dry shelled kernels or cooked and preserved products, or products grown in non-infested territory passing through infested areas in transit.

INFESTED AREAS.

Massachusetts: Barnstable, Bourne, Brewster, Dennis, Eastham, Falmouth, Harwich, Orleans, Provincetown, Sandwich, Truro, Wellfleet, Yarmouth, in Barnstable County; Amesbury, Andover, Beverly, Boxford, Danvers, Essex, Georgetown, Gloucester, Groveland, Hamilton, Haverhill, Ipswich, Lawrence, Lynn, Lynnfield, Manchester, Marblehead, Merrimac, Methuen, Middleton, Nahant, Newbury, Newburyport,

North Andover, Peabody, Rockport, Rowley, Salem, Salisbury, Saugus, Swampscott, Topsfield, Wenham and West Newbury in Essex County; Arlington, Bedford, Belmont, Billerica, Burlington, Cambridge, Carlisle, Chelmsford, Concord, Dracut, Everett, Framingham, Lexington, Lincoln, Lowell, Malden, Medford, Melrose, Natick, Newton, North Reading, Reading, Somerville, Stoneham, Sudbury, Tewksbury, Tyngsboro, Wakefield, Waltham, Watertown, Wayland, Weston, Wilmington, Winchester and Woburn in Middlesex County; Avon, Braintree, Brookline, Cohasset, Holbrook, Milton, Quincy, Randolph, Wellesley and Weymouth in Norfolk County; Abington, Brockton, Duxbury, Hanover, Hanson, Hingham, Hull, Kingston, Marshfield, Middleboro, Norwell, Plymouth, Pembroke, Rockland and Scituate in Plymouth County; Boston, Chelsea, Revere and Winthrop in Suffolk County.

New Hampshire: Kingston, Plaistow and Seabrook in Rockingham County.

New York (Eastern): Albany, Cohoes, Colonie and Guilderland, in Albany County; Johnstown and Perth in Fulton County; Amsterdam, Florida and Mohawk, in Montgomery County; Brunswick, North Greenbush and Troy, in Rensellaer County; Ballston, Charlton, Clifton Park, Galway, Malta, Milton, Saratoga Springs and Stillwater in Saratoga County; Glenville, Niskayuna, Princetown, Rotterdam and Schenectady, in Schenectady County; Esperance in Schoharie County. New York (Western): Dayton, Perrysburg and Persia, in Cattaraugus County; Hanover, Pomfret, Dunkirk and Sheridan, in Chautauqua County; Brant, Collins, Cheektowaga, Eden, Evans, Hamburg and North Collins in Erie County.

Pennsylvania: North Girard in Erie County.

The regulations of this quarantine order are subject to modification to include additional territory, if such is found infested and in general will be interpreted as conforming to, rather than as being at variance with the regulations of the Federal Horticultural Board.

Quarantine order No. 1 relating to this insect, and issued September 20, 1918 is hereby revoked.

This order shall take effect June 1, 1920.

Approved.

M. H. Holcomb,
Governor.

E. H. Jenkins,
Director Connecticut Agricultural Experiment Station.

Since issuing this Quarantine Order, No. 3, the following new towns have been found infested with the European corn borer:—

Massachusetts: East Bridgewater, Wareham, Whitman, Lakeville and West Bridgewater in Plymouth County; Canton, Dedham, Needham and Medfield in Norfolk County; Maynard, Westford, and Sherborn in Middlesex County; New Bedford in Bristol County.

New Hampshire: Hampton, North Hampton, Portsmouth and Rye in Rockingham County.

New York: Mayfield and Broadalbin in Fulton County; Glen and Charlestown in Montgomery County; Knox in Albany County; East Greenbush, Poestenkill and Schaghticoke in Rensselaer County; Duanesbury in Schenectady County; Middleburg, Schoharie and Wright in Schoharie County; Amherst, East Hamburg, West Seneca and Tonawanda in Erie County; Arkwright, Portland, Villenova, and Westfield in Chautauqua County.

The Federal Horticultural Board has issued four amendments to Quarantine No. 43, to cover these additional infested towns, the fourth bearing the date of October 23, 1920.

THE PEAR AND CHERRY SLUG.

Caliroa cerasi Linn.

The presence of brown slimy slugs or snail-like larvae is often noticed, feeding upon the upper surface of the leaves of pear and cherry. The green tissue may be eaten in patches or over the entire leaf, only the skeleton and lower epidermis remaining. Not infrequently small trees in nurseries and newly-set orchards are completely defoliated.

The author of this mischief is a small sawfly known as the pear or cherry slug, *Caliroa cerasi* Linn., sometimes listed as *Eriocampoides limacina* Retzius. It is an European species which feeds

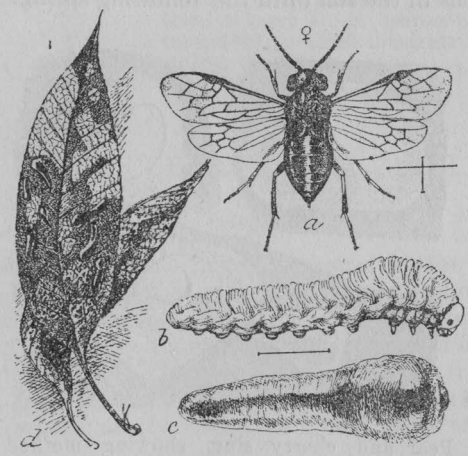

Figure 12. Pear and cherry slug. *a*, adult sawfly, female; *b*, larva with slime removed; *c*, larva in normal state; *d*, leaves and larvae, natural size; *a*, *b*, *c*, much enlarged. (After Marlatt, Circular 26, Division of Entomology, U. S. Department of Agriculture.)

upon a large number of different plants in Europe. It has been known in this country for more than two centuries but here attacks chiefly pear and cherry.

In Connecticut there are two generations each year, the eggs for the first being laid about the middle of May. The eggs are laid in the leaf from the under side, and by means of the ovipositor a cut is made between the lower epidermis and the upper epidermis, and also through the latter around the place where the egg is deposited. These cut places may be seen from the upper side and appear like small blisters. In each blister an egg is laid. The eggs hatch in about two weeks, and the young larva which is at first white, escapes through a crescent-shaped cut to the upper

surface and soon becomes covered with a brownish slime or coating which it carries until the last moulting stage. (See figure 13.)

The larva is much enlarged in the thoracic portion from which the abdomen tapers toward the tail giving it somewhat the appearance of a "bull-head" or tadpole. These brown slimy creatures are much wrinkled transversely, and present a very disgusting appearance. They pass through five stages: at the last moult, the brown slimy covering disappears and in the fifth or final larval stage, the slugs are yellow. They are now through feeding and soon go into the ground two or three inches and make cells in the soil in which they transform within six to eight days. The adults emerge in about ten days and soon lay eggs for the next generation. A part of the first-brood larvae do not transform but remain unchanged in their cocoons in the soil until the following spring. The eggs for

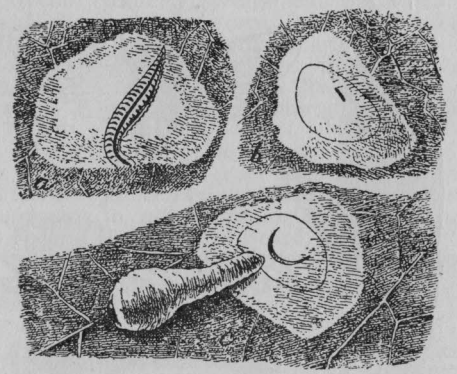

Figure 13. Pear and cherry slug, showing method of ovipositing and emergence of larva: *a*, cutting of cell with ovipositor beneath epidermis; *b*, the same after egg has been deposited; *c*, the same after emergence of larva—all enlarged. (After Marlatt, Circular 26, Division of Entomology, U. S. Department of Agriculture.)

the second brood are laid in July and August, and it is this brood which causes most of the injury in Connecticut.

Though there are usually two generations each year in the northern states, there are said to be three generations in the latitude of Washington, D. C.

This species is parasitzed by a minute four-winged fly, but so far as known this parasite has not been reared in Connecticut.

The adult of the pear and cherry slug is a small sawfly, 6 mm. in length, with black head, body, legs and antennae. The wings are smoky with black veins. (See figure 12.)

The specimens in the Station collection are from New Haven and South Windsor, but it is reasonably certain that the species occurs throughout the state. Larvae or characteristic injury have

been received from Hartford, West Hartford, Southington, Meriden, Wallingford, Norwich, Old Mystic, and South Norwalk. Our nursery inspectors have observed this insect in many other places in the state.

As regards remedies, spraying with lead arsenate will prove the most satisfactory in the nursery and orchard. The larvae may be killed, however, by spraying or dusting the leaves with fresh hellebore. Dusting with air-slaked lime or even with fine road dust will suffocate many of them.

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THE CURRANT STEM GIRDLER.

Janus integer Norton.

A brief account of this insect appeared in the Report of this Station for 1896, page 238, recording its occurrence in Windham in that year. But as this Report has long been out of print, and as the insect has been observed many times and in many places since, it is mentioned here. It was also received from Meriden in 1920. Mr. Zappe examined a currant patch at Norwood, Hamden, on June 6, where nearly every twig had been severed by this insect.

The adult is one of the sawflies (Order Hymenoptera) and a slender species about half an inch in length. Both sexes have black head and thorax. The male has a brownish-yellow abdomen, but basal half of the female abdomen is reddish-orange and distal or posterior half, black.

The female punctures the soft tender shoot of the currant, by means of a saw-toothed ovipositor, and places a yellowish egg in the pith. This egg is elongated oval in shape. Above the egg the shoot is girdled by means of a series of transverse cuts with the ovipositor. The girdling usually occurs about three-fourths of an inch above the egg, but the distance may vary from half to an inch.

The stem is usually not cut entirely, but wilts and soon breaks off, leaving the stubs. Some of the tips break off and fall at once. The injury is shown in figure 14, and on Plate XII, a.

The egg hatches in about eleven days, and the larva feeds on the pith, excavating a tunnel seldom over six inches long, and packing if full of excrement in the rear. About the first of September the

larva becomes full grown, hollows out the lower end of its burrow, and gnaws its way outward to the bark. In this enlarged chamber, the larva encloses itself in a silk cocoon in which it passes the winter. In the spring the larva changes to a pupa and the adult emerges during the latter half of May. The adult, larva and pupa are shown in figures 15 and 16.

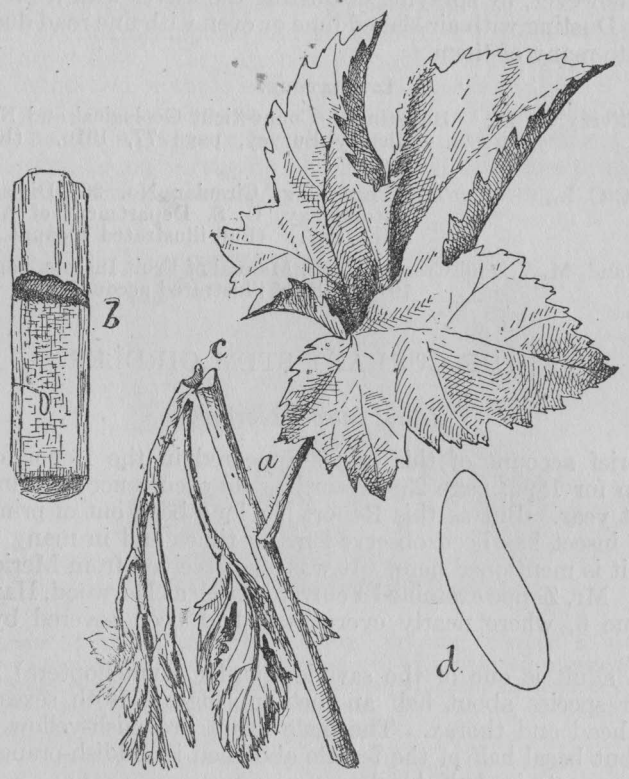

Figure 14. Currant stem girdler: *a*, egg puncture; *b*, section of stem showing egg in pith; *c*, severing of terminal shoot by female; *d*, egg — greatly enlarged. (After Marlatt, Insect Life, vols. vi and vii, Division of Entomology, U. S. Department of Agriculture.)

This insect was first described in print by Norton* under the name of *Cephus integer* in 1861, but the following year Fitch† published a description of the same species under the name of *Janus flaviventris*. Writers have used the name of *Phylloecus integer* and *P. flaviventris*, but according to the rules of priority

*Proc. Boston Soc. Nat. History, Vol. VIII, p. 224.
†Seventh Rept. on Insects of New York, p. 852.

Norton's name stands, and from the latest accepted scheme of classification, the insect belongs in the genus *Janus*.

In Connecticut this insect has been collected or observed in Windham, Canaan, New Haven, Hamden, Cheshire, Meriden, New London, Greenwich and Hartford. Undoubtedly it occurs throughout the state.

The currant stem girdler is probably a native of North America where it formerly bred in wild currants. Now it attacks the cultivated species, especially *Ribes rubrum*, often causing considerable injury. In nurseries and where the wood is used for

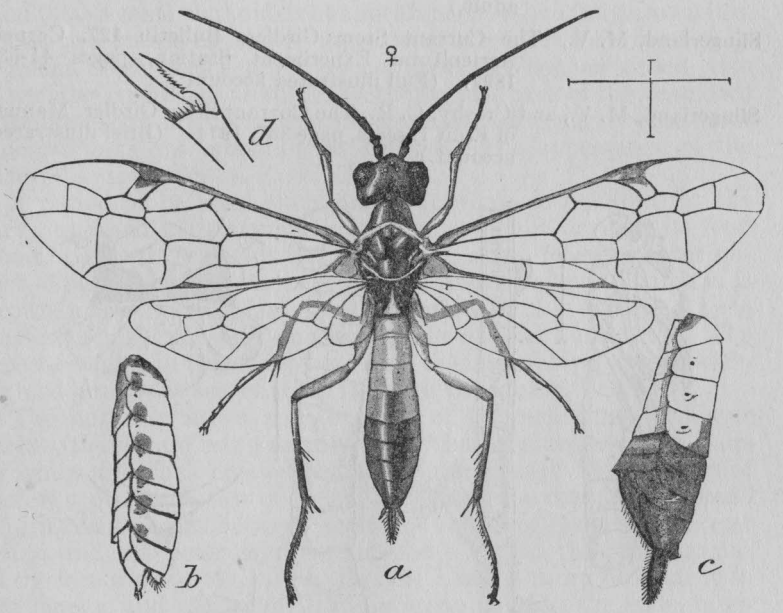

Figure 15. Currant stem girdler: *a*, adult female; *b*, lateral view of male abdomen; *c*, lateral view of female abdomen; *d*, apex of anterior tibia of female—all greatly enlarged. (After Marlatt, Insect Life, vols. VI and VII, Division of Entomology, U. S. Department of Agriculture.)

cuttings the insect is considered more of a pest than in fruiting plantations.

About the only remedial measures to be recommended are those of gathering and burning the tips containing the insect. If the girdled canes are cut back one or two inches in June, the tips will drop to the ground, soon become dry and the newly hatched larvae will be destroyed. Failing to do this, the tips of the infested canes can be gathered and burned in the fall or early spring. If these measures are practiced thoroughly for a few seasons, the injury will be much lessened.

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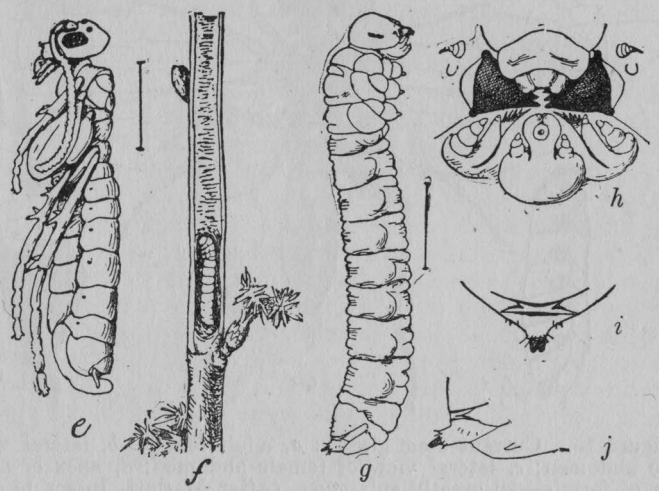

Figure 16. Currant stem girdler: *e*, pupa; *f*, larva in twig; *g*, larva; *h*, mouthparts of larva; *i*, dorsal view of tip of abdomen; *j*, lateral view of same—all enlarged. (After Marlatt, Insect Life, vols. VI and VII, Division of Entomology, U. S. Department of Agriculture.)

THE CELERY CATERPILLAR OR FENNEL WORM.

Papilio polyxenes Fabr. (*asterias*).

A yellowish-green caterpillar, more or less prominently marked cross-wise with black is often seen feeding upon the leaves of celery, carrots, parsnip, parsley, fennel, or in fact almost any plant of the family Umbelliferae. Though never very abundant, one often finds several of these caterpillars on a short row in the garden. Sometimes they are quite destructive to young plants, especially celery.

Few observers recognize this caterpillar as the larva of the common black swallow-tail butterfly which may be seen here and there, everywhere, at certain periods of the season.

The eggs are one millimeter in diameter, globular, smooth, and yellow changing to reddish-brown. They are laid on the upper side of the leaves of the host plants, and hatch in about ten days. At first the young caterpillar is black with the rear end white, and a white band across the middle, but it moults five times and after each moult has a somewhat different appearance. When fully grown it is about two inches in length, green with the front margin of each segment black enclosing six yellow spots. When disturbed, this caterpillar pushes out from the prothorax just back of the head, two hornlike scent organs and a disagreeable odor may be noticed. These organs are probably for defense. The appearance of the caterpillar is shown on Plate XI, a.

A period of between three and four weeks is required for the larva to reach maturity and during this time it devours its food plant. Then it suspends itself to a leaf, stem, fence or other object of support which happens to be in the vicinity. The pupa is brown marked with black and dark green and is attached by a button of silk at the tail and by a girdle around the thorax. The insect remains in this state from nine to sixteen days, except when formed late in the season when it passes the winter.

The butterfly has a wing-expanse of between three and four inches, the female being usually larger than the male. Both pairs of wings are black crossed near the outer margin by two rows of yellow spots and a row of yellow lunules on the margin. A broad bluish band occurs between the rows of yellow spots on the rear wings and this color even extends faintly upon the rear margins of the fore wings. As a rule the blue band is more prominent in the female, and the yellow is more pronounced in the male, often appearing as solid bands on the rear wings, but great variations occur. At the inner angle of the rear wings there is an orange spot with a black center. Each of the rear wings bears a black tail-like appendage. Thorax and abdomen are black, marked with yellow spots. Plate XI, b, shows the appearance of this butterfly.

There are two generations in the northern states and at least three in the South. In the North the butterflies emerge in May and June from over-wintered pupae.

The species occurs throughout North America from southern Canada into South America as far as Venezuela and also in the West Indies.

Regarding control measures, hand picking is the usual and best method for the home garden. In large fields of carrots or parsnips where the tops are not to be eaten or fed to domestic animals,

spraying or dusting with lead arsenate may be practised in case the insect appears in great numbers.

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THE GRAPE BERRY MOTH.

Polychrosis viteana Clemens.

The chief cause of wormy grapes in Connecticut is this insect which occurs in the eastern portion of the United States and Canada, and westward as far as Illinois. The berries in a cluster are often webbed together, caused by the second-brood larvae leaving one set of berries and going into another. In some New York vineyards injuries are recorded which amount to a loss of from 25 to 50 per cent. of the total crop. In one case even 90 per cent. of the crop was ruined.

The grape berry moth undoubtedly occurs throughout the state; it has been sent to the Station from Sharon, Norwich, Mystic, Clinton and New Haven. It is a native American species and probably infested the wild grapes in this country before any vineyards were planted.

The adult is a small moth, having a wing-spread of slightly less than half an inch, of purplish-brown color, the fore wings marked or mottled with patches of darker brown. Rear wings are smoky-brown shading to whitish at the base.

In New York State the grape berry moth has two complete generations and a partial third one, the winter being passed in the pupa state on the old leaves on the ground. In making this cocoon portions of the leaves are cut and the edges rolled over and a silken case is formed inside the roll.

The moths emerge the first half of June and are thought to lay their eggs on the stems of the blossom clusters. Be this as it may, the first brood of caterpillars are at work at the time the grapes blossom, and make a scanty web among the blossom buds, and feed somewhat upon the buds often destroying a dozen or more in a cluster. They continue to feed during the month of June and also destroy many of the newly-set berries. The caterpillars of the first brood become mature soon after July 1, and make their cocoons by rolling up flaps of the leaves as has been described above. In a period varying from twelve to fourteen days the moths emerge

leaving their empty pupa shells projecting from the cocoons. They soon lay eggs on the berries or perhaps some of them on the stems, and the larvae of the second brood gnaw their way into the berries, usually entering near the stem or where two berries touch each other. The infested berries show a dark reddish spot around each entrance hole, and as the larvae feed inside the berries these spots enlarge until perhaps half the berry is discolored. (See Plate XII, b).

The young larva is whitish, with a blackish head, but as it grows the body changes to a dark olive green or brownish color, and often a purplish tinge is apparent. Thoracic shield and legs also become blackish. The larva is active and when disturbed wriggles out of the berries and spins down on a silken thread. The feeding period in the berries lasts about three weeks.

According to Goodwin* two thorough sprayings at the right time and with the proper materials will control this pest and ensure fruit nearly free from infestation. He recommends a Bordeaux mixture made after the 2-3-50 formula, to which four pounds of paste arsenate of lead and two pounds of dissolved soft soap have been added. The first treatment should be made just after the vines blossom, when the young berries are about one-eighth of an inch in diameter. The second application should be made about seven weeks after the first, or just before the eggs have been laid for the second-brood larvae. In Ohio this comes between August 2 and 12, but the exact time may be determined for each locality by placing in a jar about July 20, some wormy grapes with grape leaves on top of the berries: a piece of cheese cloth should be tied over the top of the jar and the jar placed out of doors in the shade. The spray should be applied ten days after the larvae first begin to make their cocoons on the leaves, and for this application six instead of four pounds of paste arsenate of lead should be used.

The vineyard should be intelligently pruned, cultivated, fertilized and sprayed properly for the other insect and fungous pests in order to produce a perfect crop.

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*Bulletin 293, Ohio Agricultural Experiment Station, 1916.

MOSQUITO WORK, SEASON OF 1920.

By S. T. Sealy.

During the season of 1920, a constant patrol has been maintained on all of the drained salt marsh areas in the towns of Fairfield, Orange, New Haven, East Haven, Branford, Guilford and Madison, an approximate total of 5,000 acres. This means that at no time have the drainage ditches been allowed to become clogged or choked for any appreciable length of time. This patrol has kept the water in circulation and the surface drained, thereby reducing mosquito breeding to a minimum. It has also shown the need of supplementary ditches, which we have installed, to take off water which the original ditching did not fully care for.

Except for a few high tides in the fall, the season as a whole has been comparatively dry, making conditions somewhat better for mosquito elimination work than in previous wet seasons.

The mosquitoes which have been most troublesome this season have come, not from the drained marshes, but from adjoining ones where no drainage ditches have been installed, and from the "rain barrel" mosquito which breeds in any standing water about dwellings or in inland pools.

The writer states this as a fact, since he has made it a point to spend one day each week with the men doing the maintenance work in the different towns. At no time has any intensive breeding been found on drained areas. As soon as surface breeding was located it was immediately drained to the nearest ditch.

Fairfield.

The work at Fairfield has been carried on by Mr. Nicholas Matinck with an average crew of two men to assist him. As Mr. Matinck has been engaged in this kind of work for the past few years, his efficient methods have made the Fairfield marshes almost mosquito proof. In addition to the salt marsh work the town officers of Fairfield have authorized and paid for, from town funds, considerable work in the upland sections; such as oiling, draining, and cleaning fresh water streams, brooks, ponds, etc.

New Haven, East Haven, Orange.

In the towns of New Haven, East Haven and Orange, a crew of four men, part of the time and two men the remainder of the time, have been at work keeping the ditches clean, the outlets free and the water in circulation. This crew started at West Haven and worked around the harbor to East Haven, going over the same route when the circuit was completed.

The tide gates constructed by the City of New Haven at Congress Avenue Bridge have been completed and are doing excellent work. The marsh north of the gates has been dry all the season, thereby eliminating the breeding of salt marsh mosquitoes on this area.

Branford.

The work at Branford has been under the direct supervision of Mr. L. E. Rice. The defective tide gates at Indian Neck have kept the marsh in a very wet condition causing a small amount of breeding in the upper end of the swamp. These gates will be put in repair as soon as it is determined what the state is going to do in regard to road and bridge; as gates are now hung on the bridge it would not be practicable to repair them at present.

A sand bar has formed at the mouth of the creek below the gates, stopping the flow of water. It is planned to remove this obstruction next season.

Guilford.

Mr. Frank Blatchley has patrolled and maintained the marshes of Guilford in perfect condition. He also repaired the tide gate at Shell Beach, which was damaged by last winter's storms.

Madison.

The State Park Commission has maintained the ditches on the state property in good shape and hundreds of feet of new ditches have been installed for mosquito drainage by Mr. Joseph P. Synnott, who was in charge of the work for the Commission. Only a few days this season have visitors at the State Park been annoyed by mosquitoes, and then only when the prevailing winds have been from the east, blowing hordes of mosquitoes over from Clinton.

Mr. Russell Bartlett has had charge of the work in Madison that was not controlled by the Park Commission, and has maintained the marshes in excellent condition. The most trouble was along the beach caused by sand filling the main outlet ditch; this sand had to be dug out very frequently.

New Work.

On June 4, 1920, a contract was let to Eaton, Brown & Simpson, Inc., 90 West Street, New York City, to drain for mosquito elimination sixty acres at Groton Long Point, Connecticut. They installed 28,000 feet of 8 x 20 ditch and built a bridge over the main outlet to the bay, for the sum of $1,000.00, three-quarters of which was subscribed by the members of the Groton Long Point Association.

As there are no other marsh lands in the near vicinity of Groton, the inhabitants are not likely to be troubled with mosquitoes from now on.

On September 14, 1920, at the request of Mr. J. Frederick Jackson, Director Bureau of Engineering, State Health Depart-

ment, an inspection was made at Lydall's Brook, Manchester, Conn. Light breeding was found in Union Pond and along the brook as far as Fould's Paper Mills. The settling tanks used to catch the waste water from the mills were found to be prolific breeders of mosquitoes (*Culex pipiens*). When these tanks overflow into the brook, the larvae are scattered along all the way to Union Pond, causing the people in the near vicinity to be pestered by mosquitoes. The State Department of Health is working on this matter, and will very likely plan some way to abate this nuisance.

COST OF MAINTENANCE AND NEW WORK, SEASON 1920.

Maintenance:	Madison	$265.63
	Guilford	578.14
	Branford	376.90
	East Haven	68.42
	New Haven	386.95
	Orange	474.66
	Fairfield	1,397.76
		$3,548.46
New Work:	Groton	250.00
Supervision*		2,401.43
Total		$6,199.89

MISCELLANEOUS INSECT NOTES.

Stalk Borer:—The stalk borer *Papaipema nitela* Guen., was present and ruined an occasional stalk of corn and potatoes, but was not nearly so prevalent as in 1919. Specimens were received from Danbury, Ridgefield, Derby, Milford, West Haven, New Haven, Hamden, New Hartford, Middletown and Hartford.

The Bud-Moth Injuring Apples:—One species found injuring the mature fruit in the orchard of Mr. William F. Platt, Milford, was the bud moth *Tmetocera ocellana* Schiff. The dark brown larva occurred with other leaf-rollers, several species of which were feeding upon the surface of the fruit.

Green Clover Worm:—The green clover worm *Plathypena scabra* Fabr., which was so prevalent in 1919 causing injury nearly everywhere throughout the eastern United States, did not injure beans at all in Connecticut in 1920. By making a thorough search in my own garden, I managed to find a few larvae, but the feeding which they did was unnoticeable.

Pine Tube Moth:—The pine tube moth *Eulia pinatubana* Kearfott, mentioned on page 201, and shown on Plate XXXII, of the Report of this Station for 1919, was reported as being rather

*Supervision includes salary and traveling expenses of Deputy in Charge, first cost, insurance and upkeep of automobile.

abundant around Stamford in 1920. Late in the fall three samples were received from Norwalk, Sound Beach and Stamford. If ornamental pines are infested sufficiently to endanger their foliage, or even their appearance the trees should be sprayed with lead arsenate.

Periodical Cicada or Seventeen-Year Locust:—Brood II of this interesting insect was scheduled to appear in 1920 in Suffield and in Tolland, Conn. Several correspondents and entomologists were warned to watch for it, and though they did so, the reports were all negative. I have yet to learn of anyone who collected or observed this insect in Connecticut in 1920.

Corn Ear Worm:—The corn ear worm *Heliothis obsoleta* Fabr., was received from Mystic, Milford, Middlebury and New Canaan. In one field in Mystic about half the crop was damaged. This insect usually attacks late maturing corn, especially sweet corn, and feeds on the soft kernels chiefly at the tips of the ears. Sometimes it works down the side of the ear and eats some of the kernels near the base. It is a much more serious pest farther south than it is in Connecticut. In New Jersey it is controlled by dusting the corn silk with powdered sulphur and dry lead arsenate, equal parts.

Sesiid Borers:—On July 1, 1920, Mr. Zappe visited a garden at 260 Howard Avenue, New Haven, and found apple trees infested with Lepidopterous larvae boring in the branches and doing considerable damage. Some material was brought to the laboratory, and on July 16, an adult clear-wing moth emerged. This proved to be *Sesia pyri* Harris, a species having a wing expanse of less than three-fourths of an inch, and transparent wings with black margins. It rarely causes serious injury, as the larva burrows in the bark but does not penetrate the sapwood.

A similar borer was received, June 11, from the Elm City Nursery Company in a stem of Rhododendron. On June 23, the adult emerged. It is a similar though different species from the preceding, but has not yet been identified.

Oriental Peach Moth:—No larvae of this insect could be found in 1919 by Mr. Zappe, at the place where it infested peach fruits in 1918 near Stamford (see Report of this Station for 1918, page 299) and on June 20, 1920, Messrs. Zappe and Britton in company with Mr. W. O. Filley, Forester of this Station, and Mr. F. A. Bartlett of Stamford, visited the same premises. It is true that some of the trees had died and had been removed and others had been severely pruned. Though there was little fruit to become infested, we examined the twigs of several trees and found no signs of injury. Doctor T. J. Headlee informs the writer that the Oriental peach moth has been unusually destructive in New Jersey the past season.

Red Banded Leaf-Roller:—In harvesting and scoring the fruit in the experiments in dusting and spraying in the orchard of Mr. William F. Platt, Milford, described in the preceding pages of this Report, many of the apples were gnawed on the surface, especially where covered by a leaf or another apple, and in some cases in the stem or calyx cavities. At least three insects were responsible for this injury: (1) the bud moth mentioned on page 176, (2) the lesser apple worm, *Enarmonia prunivora* Walsh, and (3) the red banded leaf-roller *Eulia velutinana* Walker. The last seemed to be the most abundant and the injury was apparently done late in the season. The injury shown on Plate VI, a, was sufficiently serious to warrant another and later treatment to prevent it.

Juniper Scale:—On August 4, 1917, a twig of common red cedar *Juniperus virginiana*, infested with the juniper scale *Diaspis carueli* Targ.-Tozz., was received from Danbury. On March 11, 1920, Mr. A. S. Peterson, New Rochelle, N. Y., sent to the Elm City Nursery Company a branch of a cultivated juniper *Juniperus pfitzeriana*, well infested with this scale. It is a scale with shell nearly circular, and occurs on the leaves sometimes in great numbers, as is shown on Plate XIII, b. The female shell is very convex, gray or dirty white, often covered with a sooty deposit. The male is small, elongated, narrow with parallel sides, with a median ridge or carina, and white in color.

Apparently little is known regarding the life history of this insect, or how best to hold it in check. Probably it will do little harm to trees in their native habitat, but should it infest choice ornamental specimens, it can doubtless be controlled by several applications between June 1 and September 1, of either kerosene emulsion, or nicotine solution and soap, given in the form of a spray.

The Elm Leaf-Miner:—On June 14, elm leaves were received from Miss Charlotte B. Norton, Lakeville, Conn., which showed the characteristic mines and feeding injury of a sawfly known as the elm leaf-miner *Kaliofenusa ulmi* Sundewall. More material was requested and received a few days later. This was placed in the breeding cages and possibly next summer some adults may be obtained. The larvae are miners between the upper and lower epidermal layers of the leaves, and frequently there are several larvae in a leaf and the mines run into each other making a large blister, sometimes involving the entire leaf. These blisters are very conspicuous, showing almost as plainly from beneath as from above, and have the appearance indicated by Plate XIII, a. The badly injured leaves drop, but those slightly injured remain upon the tree, the mined areas falling out leaving holes. In aggravated cases trees are nearly defoliated by July 1, but later new leaves appear and the trees regain their normal appearance. Of course such attacks weaken the trees and render them very

unsightly. As is the case with the elm leaf beetle, the European species of elm are preferred to the American elm.

This is the first evidence that the elm leaf-miner is present in Connecticut, though it has been known to injure elms in and around Albany*, N. Y., for more than twenty years. The adult is a small sawfly only three millimeters long, and the eggs are laid in the leaves during the latter half of May and June. There is only one brood each year.

A number of experiments in controlling this insect have been conducted by Professor G. W. Herrick† of Cornell University. He found that when a tree was sprayed thoroughly with 40 per cent. nicotine solution and laundry soap, just as the mines begin to show, all larvae were killed.

Ox Warbles:—On May 15, three larvae were received from Mr. B. K. Allen of Saybrook, with the statement that they had been squeezed from a cow's back. It is not unusual for cattle to have "grubs" under the skin on their backs. The infestation is most noticeable in late winter or early spring, and a series of lumps may be felt or often seen. These lumps increase in size and finally discharge their inmates which go into the ground to pupate and later emerge as two-winged flies, more or less covered with yellow hairs somewhat resembling bees. (See Plate XV, a.) These flies are known as "bot-flies" or "warble flies" and annoy cattle and horses in the pasture in summer, laying their eggs upon the hairs of the legs or body. The eggs are licked off by the animals and taken into the stomach where they obtain nourishment. The larvae of the horse-bot, *Gastrophilus equi* Clark, are attached to the wall of the stomach and when finally mature pass out of the animal with the excrement. But those in cattle make their way through the stomach wall and other tissues, finally reaching the skin upon the back. Two species, *Hypoderma bovis* DeGeer, and *H. lineata* DeVillers, are known to attack cattle and both occur in Connecticut. They cause considerable injury by annoying the animals, and "warbled" hides are much less valuable than perfect ones.

There is no good remedy. Grubs beneath the skin may be squeezed out or treated with mercurial ointment. Where possible it is advisable to keep the animals well cleaned and brushed and to prevent them from licking themselves.

A closely allied species, *Oestrus ovis* Linn., is the well-known sheep-bot, the larva of which infests the nasal cavities in sheep.

Other closely related species belonging to the genus *Cuterebra*, infest rabbits and are occasionally found in cats. On October 2, a

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*M. V. Slingerland, Cornell Agr. Expt. Station, Bulletin 233, page 50, 1905.

†*Ibid*, Bulletin 333, page 510, 1913.

large larva was received from Vernon, which had been squeezed from a hole through the skin on the side of a kitten six months old.

A Curious Form of Injury to Dahlias by the European Giant Hornet:—On September 21, two adults of the European giant hornet, *Vespa crabro* Linn., were received from Miss Emily Slocombe of 555 Townsend Avenue, New Haven, with a statement that these hornets had killed two dahlia plants and injured several more by eating off the bark. On September 25, Messrs. Walden and Garman visited the premises. They saw five or six large plants which had been badly chewed by the hornets as shown on Plate XIV, b. Seven of these large hornets were around one plant and seemed to return to it even after having been driven away. The sap oozed out of the injured plants, fermented, and many adults of the bumble flower beetle *Euphoria inda* Linn., were feeding upon the sour sap. It was suggested to the owner that the stems of the injured plants be sprayed with lead arsenate.

This insect has long been known to gnaw the bark from hard wood twigs often girdling them, but this is the first instance coming under our observation in which it has attacked herbaceous stems. A note regarding the giant hornet and its habit of girdling twigs may be found in the Report of this Station for 1916, page 144.

On October 9, specimens of the European giant hornet were received from Mr. E. Vanderwerken, of Stamford, who writes that Italians and Japanese both regard the species as a great menace to bee keeping, as the adults kill honey bees in great numbers. We have made no observations to confirm this statement.

This hornet is a native of Europe, and was first noticed around New York City some twenty-five years ago, from where it has spread gradually into Connecticut and throughout New Jersey.

It was first collected in Connecticut at New Haven, June 13, 1900, and specimens have been received at the office many times in recent years from Greenwich, Stamford, Darien, Plantsville, Hamden and New Haven. It is shown on Plate XIV, a.

Leaf-Roller on Tartarian Honeysuckle:—In the Report of this Station for 1918, page 342, mention is made of a larva feeding on Tartarian honeysuckle, from which was reared on July 18, a moth belonging to the genus *Harpipteryx* and apparently undescribed. The larvae were rather abundant in the writer's garden in 1920 webbing together and feeding upon the tender terminal leaves. Several adult moths were reared, emerging on July 1. A brief description follows:—

Larva.—15-18 mm. in length; 1.5 mm. thick at fifth abdominal segment, from which it tapers towards both extremities, the taper being greater though less abrupt toward the head: lateral and ventral surfaces leaf-green with a lighter blue-green stripe adjoining dark median stripe, and short diagonal lighter stripes above the spiracles: two longitudinal dorsal stripes, purplish to chocolate brown, separated only by a faint narrow line of lighter color. Head grayish-green, faintly marked and mottled with light-brown, bearing brown hairs. Legs and prolegs green like dorsal surface; anal prolegs prominent. Each segment bears a number of short brown hairs or bristles. Wriggles like a Pyralid, and spins down on a silk thread.

Cocoon.—About 18 mm. in length; 3 mm. thick for two-thirds its length; tapering equally at both ends to a sharp point. Whitish or straw-color. Fastened to a leaf.

Adult.—Wing-spread 20-22 mm. Fore wings chestnut-brown with a conspicuous cream-colored rear margin: near the outer end of this marginal band there extends forward and outward a pointed streak of the same color ending just beyond the disk. Fore wings extended at tips and curved backward forming recurved hooks. A cream-colored dorsal patch on thorax extends over head and palpi: antennae filiform, whitish but annulated with brown or black. Rear wings blackish or smoky-brown with lighter fringe. Abdomen, legs and under surface colored about like rear wings.

Since rearing this moth in 1918, Doctor William Barnes has published* an illustration of an European species *Harpipteryx xylostella* Linn., which appears to be the same as our specimens. Some of our material was therefore sent to Doctor Barnes, who reports it to be the European species *H. xylostella.*

Illustrations of the larva, cocoon and adult may be found on Plate XV.

ILLUSTRATIONS.

All plates are from photographs from the following sources:—Plates IV, V, and X by W. E. Britton; Plate IX, b, and d, by M. P. Zappe; Plate IX, c, by K. F. Chamberlain; Plate XIII, b, by Philip Garman; all others by B. H. Walden. The text figures are from drawings as follows:—Figure 4, map drawn by A. E. Moss; Figure 5, plan of orchard experiments, drawn by E. M. Stoddard; Figure 6, by Philip Garman; Figures 8, 9, 10 and 11, after Dr. E. P. Felt, Cornell Extension Bulletin 27; Figure 11, after J. B. Smith, New Jersey Agricultural Experiment Station; Figures 12, 13, 14, 15 and 16, after C. L. Marlatt, Bureau of Entomology, U. S. Department of Agriculture.

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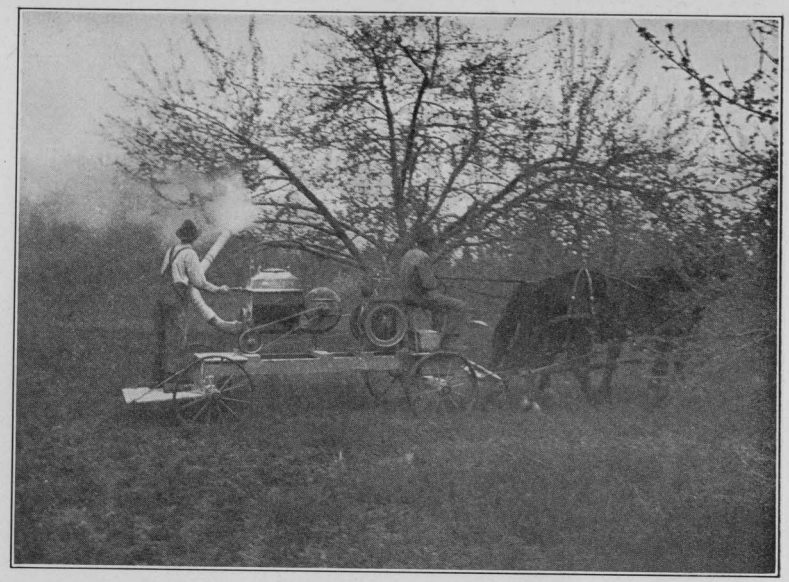
*Contributions to the Natural History of the Lepidoptera of North America, Vol. IV, page 246, Plate XXVIII, figure 12, 1920.

INDEX

a. Front view of outfit.

b. Rear view.

DUSTING IN APPLE ORCHARD.



a. Side view of dusting outfit.

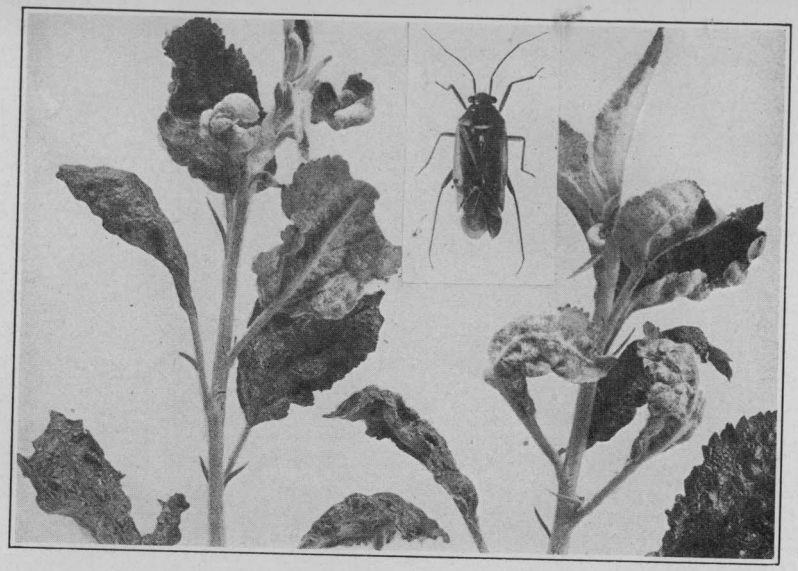
b. Spraying outfit used in Platt's orchard.

DUSTING AND SPRAYING IN APPLE ORCHARD.

a. Work of red banded leaf-roller on fruit, natural size.

b. Spraying potatoes to kill aphids, at Woodmont.

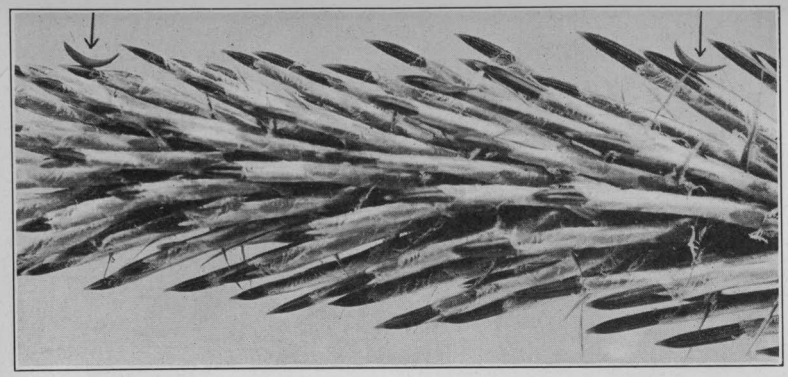
INJURY TO APPLES: SPRAYING POTATOES.



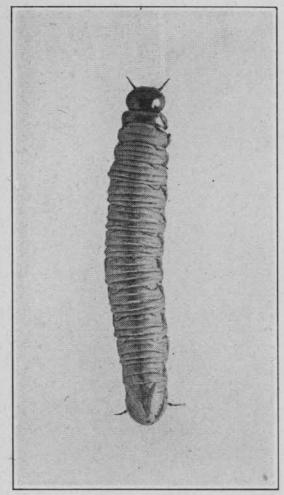
a. Apple trees injured by the false red bug.
Leaves natural size, bug nearly three times enlarged.

b. Half-grown apples showing red bug injury.

FALSE APPLE RED BUG.

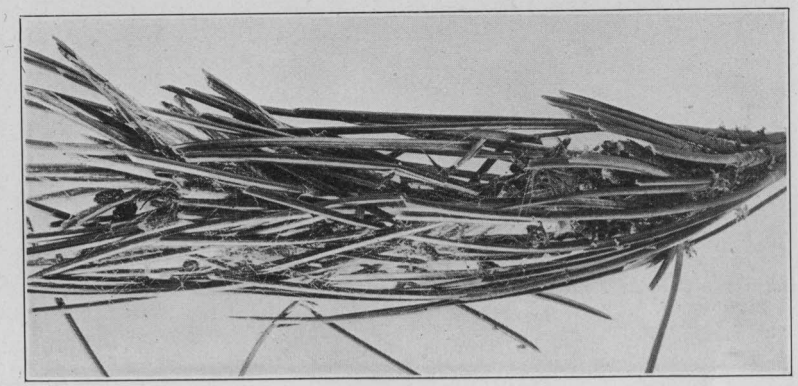


a. Crescent-shaped eggs on developing needles, twice natural size.



b. Larva, twice natural size.

c. Larva feeding in cluster of needles, natural size.



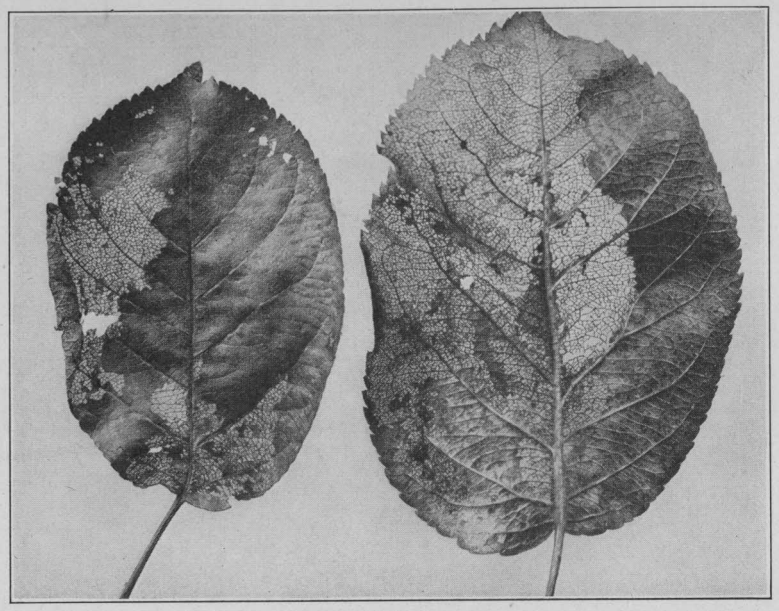
d. Cluster of needles webbed together in characteristic fashion by the larva, natural size.

SAWFLY ON AUSTRIAN PINE.

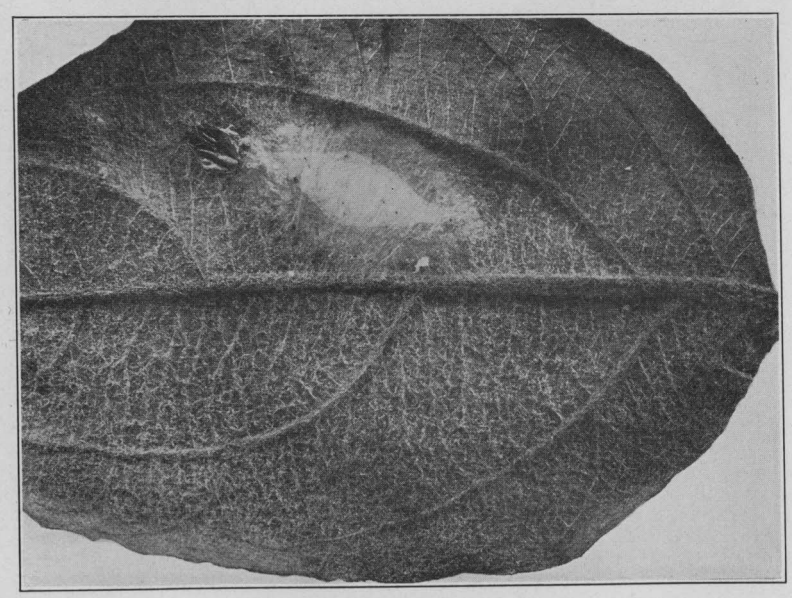
a. Infested apple tree which has lost much foliage from the attacks of the mite.

b. Eggs on calyx end of apple, and on twig, three times enlarged; insert, same from twig, enlarged about ten times.

EUROPEAN RED MITE.

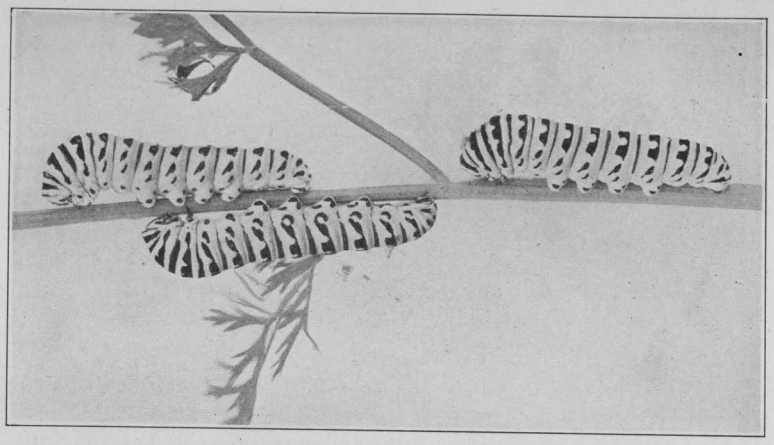


a. Characteristic injury of larvae on apple leaves, somewhat reduced.

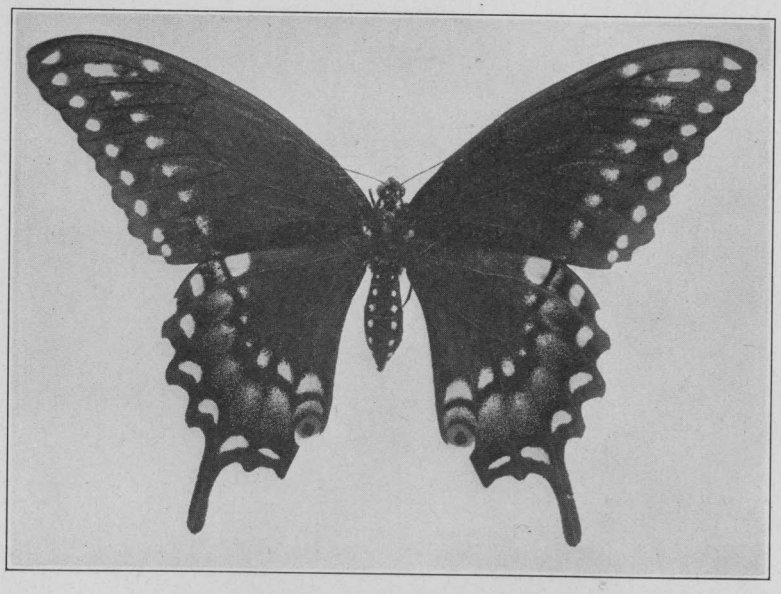


b. Cocoon on under surface of apple leaf, twice natural size.

APPLE AND THORN SKELETONIZER.



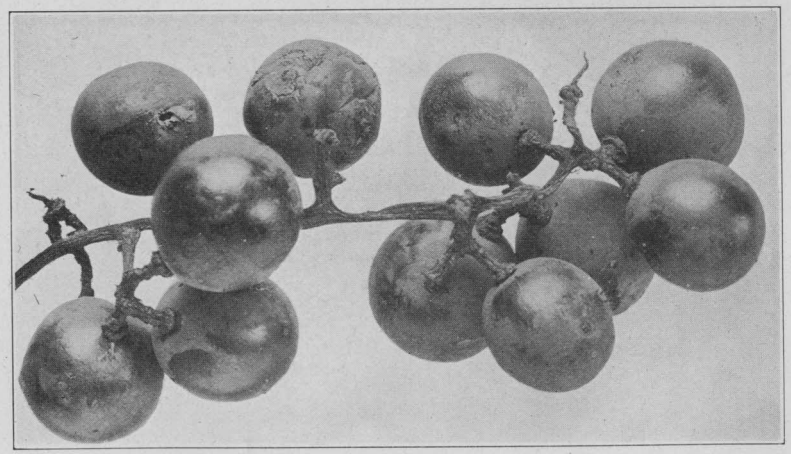
a. Larvae feeding upon carrot, natural size.



b. Adult, known as the black swallow-tail butterfly; female, natural size.

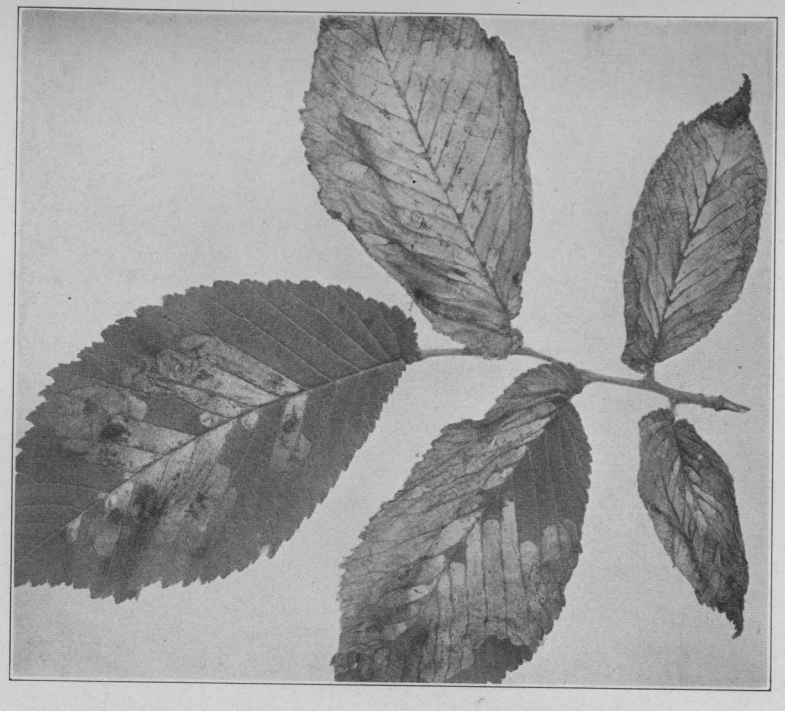
CELERY CATERPILLAR.

a. Work of currant stem girdler, in severing tip of new shoot. Egg is laid just below the cut. Natural size.

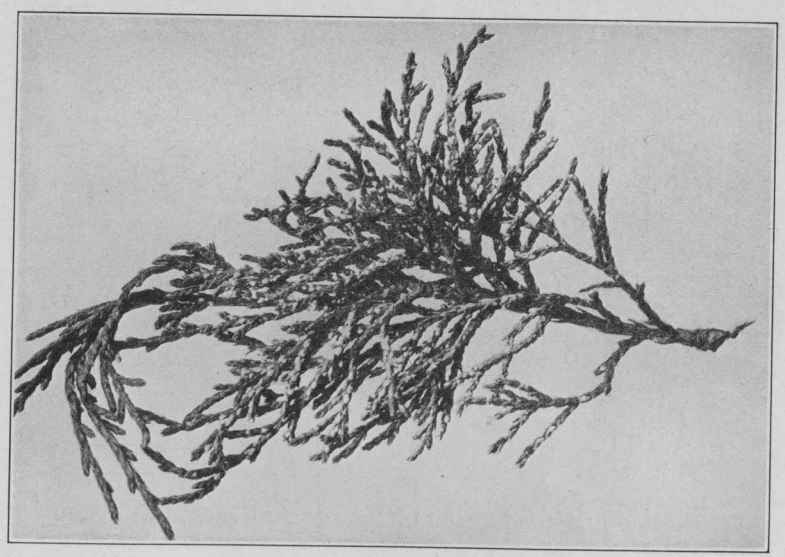


b. Cluster of grapes infested by larvae of the grape berry moth. Natural size.

CURRANT STEM GIRDLER AND GRAPE BERRY MOTH.

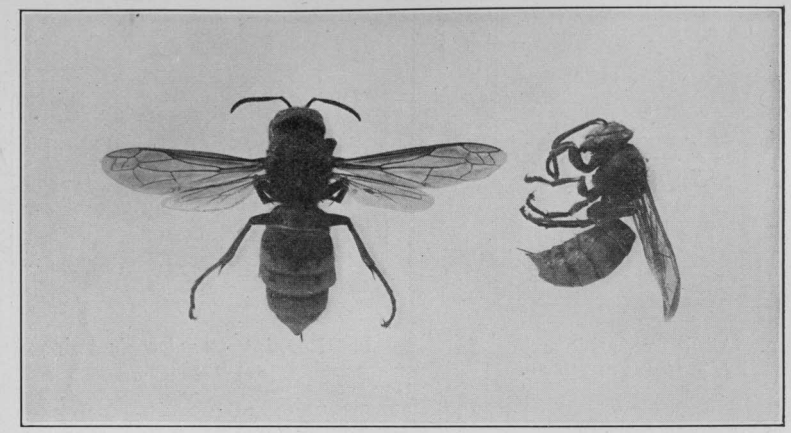


a. Characteristic injury of elm leaf-miner, somewhat reduced.

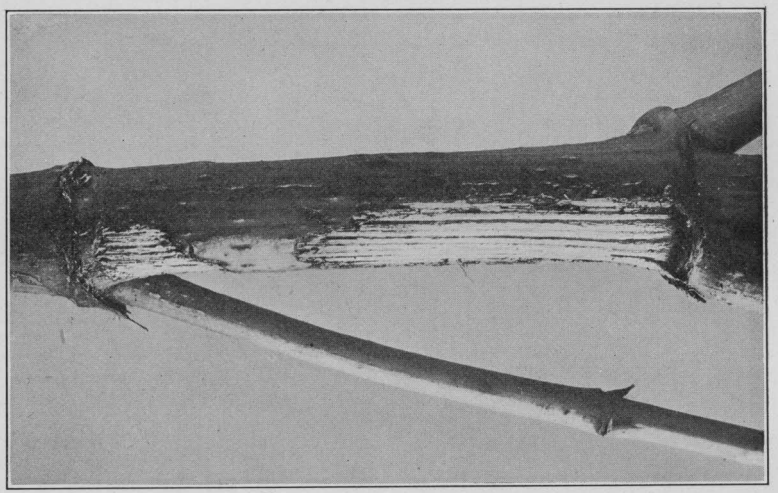


b. Juniper twig, showing scales on leaves, natural size.

ELM LEAF-MINER AND JUNIPER SCALE.



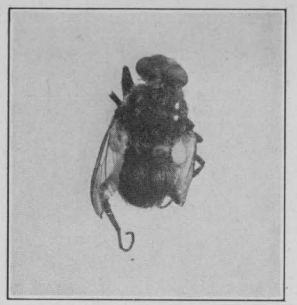
a. Adult hornets, dorsal and lateral views, natural size.



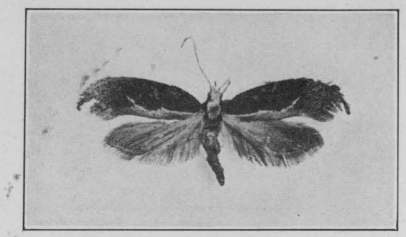
b. Dahlia stem gnawed by hornets, somewhat reduced.

EUROPEAN GIANT HORNET.

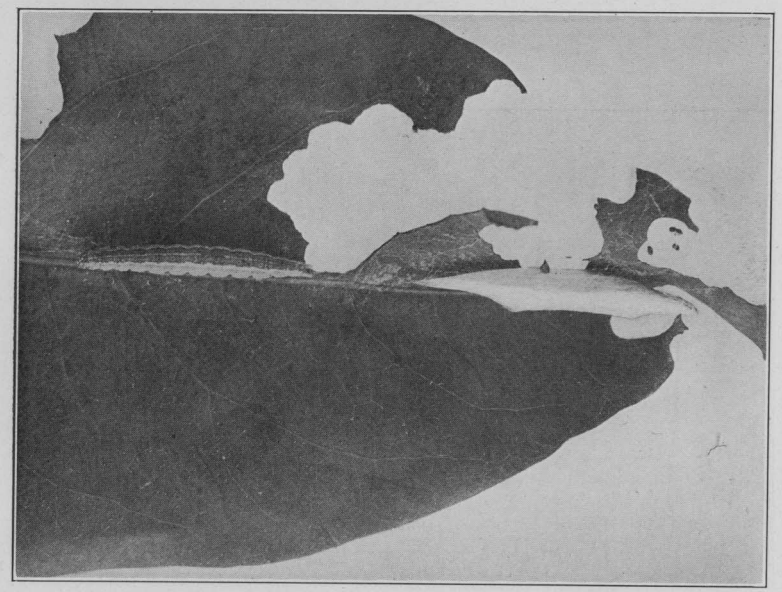
PLATE XV.



a. Adult ox warble or bot fly, twice natural size.



b. *Harpipteryx xylostella*, twice natural size.



c. Larva and cocoon of *Harpipteryx xylostella*, twice natural size.

OX WARBLE OR BOT FLY, AND HARPIPTERYX ON TARTARIAN HONEYSUCKLE.

Connecticut Agricultural Experiment Station

NEW HAVEN, CONN.

BULLETIN 227 FEBRUARY, 1921

BEING THE

Twenty-Fifth Report

ON

Food Products

AND

Thirteenth Report on Drug Products.

By E. M. BAILEY.

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February, 1921.

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Vegetable Growing.
———————

Press of The Wilson H. Lee Company.

CONTENTS.

FOODS, ETC.

DRUGS, ETC.

The Twenty-fifth Report on Food Products and the Thirteenth Report on Drug Products, 1920.

By E. M. Bailey.

The inspection and analysis of foods, drugs and miscellaneous materials made by this station during the past year are presented in this report which marks the twenty-fifth year of food inspection and the thirteenth of drug inspection in this State. The study of methods for the determination of caffein, principally in tea, has been continued and a new proceedure devised for the rapid and accurate estimation of this constituent. An examination of laundry and toilet soaps has been made, and a number of new and interesting diabetic foods have been analyzed. A larger number than usual of alcoholic liquors have been tested, chiefly for wood alcohol, on account of the panic created by the sale of a quantity of "poison whiskey" the alcohol of which was found to be entirely methyl (wood) alcohol.

As for several years past the volume of work done for the Dairy and Food Commissioner has been relatively large. Milk, ice cream, carbonated beverages and drug preparations are the items of chief importance.

An exhibit showing different phases of the laboratory work was prepared as a part of the Station exhibit at the Farmers' Week Fair in Hartford; and a number of papers have been written for presentation at meetings of various associations.

Co-operation with the Association of Official Agricultural Chemists in the study of methods of analysis, with the American Medical Association on matters pretaining to diabetic foods and with the Society of Cotton Oil Chemists in the examination of check cottonseed meals and fertilizers has been continued.

Credit for the analytical work involved is due entirely to Messrs. Andrew, Shepard, Edmond, Nolan and Merwin. Mr. Andrew has shared with the writer much of the court work called for by the Dairy and Food Commissioner.

I. FOODS.

CARBONATED SOFT DRINKS, ETC.

One hundred and eighty-nine samples of soft drinks, cereal beverages, etc., have been submitted by the Dairy and Food Commissioner. They are grouped according to the examinations made of them as follows:

Examined for saccharin 131; saccharin detected in 53.
Examined for capsicum 44; capsicum detected or indicated in 43.
Examined for alcohol 14; alcohol found in excess of 0.5 per cent. in 10.

The presence of saccharin in any normal food constitutes adulteration in this State. Section 2438 of Chapter 128 of the General Statutes declares an article of food to be adulterated "if any substance has been mixed and packed with it so as to reduce or lower or injuriously affect its quality or strength." Also "if it contains any added poisonous or other added deleterious ingredient which may render such article injurious to health."

While beverages of the soda water type are not drunk primarily for their food value, they possess a food value by virtue of the sugars they contain. Saccharin has no food value but its sweetening power is about 500 times greater than that of ordinary sugar. The addition of saccharin necessarily reduces the food value of any article of food in which it is used as a substitute for sugar; and it is, moreover, a substance which may render food injurious to health.[1] In spite of the growing sentiment against this illegal sweetener among the better class of bottlers it is still used to a considerable extent in the State chiefly, if not entirely, by local establishments.

Saccharin was found in the following samples:

D. C. No.	Brand.		Manufacturer or Dealer.
15119	Strawberry Soda.	*Ansonia:*	Crystal Bottling Works.
17208	Lemon Soda.		G. Soventino.
17223	Cream Soda.	*Bridgeport:*	American Bottling Co.
17219	Cream Soda		Central New York Bottling Co.
17216	Cream Soda.		Gottlieb Luippold.
17221	Strawberry Soda.		Greater New York Bottling Co.
15123	Orange Soda.		Grey & Lights.
17231	Cream Soda.		Hallett Mineral Water Co.
17218	Cream Soda.		Standard Bottlings Works.
15122	Raspberry Soda.		West End Bottling Works.
17235	Raspberry Soda.		West End Bottling Works.
16188	Strawberry Soda.	*Bristol:*	Elco Beverage Co.
15385	Orange Soda.	*Danielson:*	H. B. Hargraves.

[1] Food Inspection Decision 142, U. S. D. A.

D. C. No.	Brand.		Manufacturer or Dealer.
16161	Strawberry Soda.	*Hartford:*	United Bottling Works.
16159	Strawberry Soda.		Anthony P. Zazzaro.
16160	Lemon Soda.		Anthony P. Zazzaro.
17779	Ginger Ale Soda.	*Jewett City:*	James Glorvacki.
17778	Strawberry Soda.		James Glorvacki.
17777	Ginger Ale Soda.		Peter Romanek.
17776	Strawberry Soda.		Peter Romanek.
17227	Cream Soda.	*Meriden:*	T. F. Lyons.
17205	Lemon Soda.	*Naugatuck:*	John Greene.
15596	Cream Soda.	*New Britain:*	S. F. Avery.
15593	Strawberry.		Eureka Bottling Co.
16152	Lemon Soda.	*New Haven:*	Atlantic Bottling Works.
16956	Ginger Ale Soda.		Clancy Bottling Works.
16952	Sarsparilla Soda.		Golden Eagle Bottling Works
16960	Ginger Ale Soda.		Hamilton Bottling Works.
16964	Lemon Soda.		Virginia Linauro Bottling Works.
16963	Soda.		Frank Mosca Bottling Works
16961	Lemon Soda.		New Haven Bottling Works.
15121	Lemon Soda.		Harry Owen.
16954	Cream Soda.		Shanbron Bottling Works.
17312	Ginger Ale Soda.		Smile Bottling Works.
17313	Cream Soda.		Smile Bottling Works.
16955	Orange Soda.		Yale Bottling Works.
18435	Ginger Ale Soda.	*Norwalk:*	Morris Slopshin.
18436	Strawberry Soda.		Morris Slopshin.
17244	Cream Soda.	*Norwich:*	D. A. Sullivan.
18438	Strawberry Soda.	*South Norwalk:*	Adolf Dreifuss.
17211	Lemon Soda.	*Stamford:*	Silver Springs Water Co.
17214	Strawberry Soda.		National Spring Water Co.
17329	Strawberry Soda.	*Stratford:*	George Bovodach & Steve Tomasco.
17330	Cherry Soda.		George Bovodach & Steve Tomasco.
18246	Strawberry Soda.	*Taftville:*	Albert LaBarre.
16191	Cream Soda.	*Thomaston:*	August Koegel.
15588	Strawberry Soda.	*Waterbury:*	Brass City Bottling Works.
15590	Strawberry Soda.		Brooklyn Bottling Works.
16200	Strawberry Soda.		J. A. Silver.
15390	Strawberry Soda.	*Willimantic:*	John Latusek.
16985	Lemon Soda.		John Latusek.
17201	Lemon Soda.		Mosca & Salvatore.
17203	Strawberry Soda.		Mosca & Salvatore.

Beginning January 1st, 1921, the presence of capsicum in ginger ale must be stated upon the label[1].

By official definition "ginger ale is the carbonated or artificially carbonated beverage prepared with potable water, acidulated sugar (sucrose) syrup, and ginger ale flavor," ginger ale flavor being the water-soluble product obtained from ginger, with or without flavoring substances which do not simulate the flavor or pungent effect of ginger.

"Ginger ale with capsicum is the carbonated or artificially carbonated beverage prepared with potable water, acidulated sugar (sucrose) syrup, and ginger ale with capsicum flavor," ginger ale with capsicum flavor being the water-soluble product obtained from ginger and capsicum, with or without other flavoring substances.

[1] F. I. D. No. 177.

The predominating flavor in both ginger ale and ginger ale with capsicum is that of ginger.

The beverage called ginger ale is said to have originated in England and the presence of capsicum in the formula appears to have been established by general use, its purpose being to add pungency to the product. Why the beverage should have been called ale is not apparent. It bears no resemblance to the product of that name prepared from malt and hops and is not fermented.

The method we have used for the detection of capsicum indicates the presence of capsicum or other pungent substances foreign to ginger[1]. By this method capsicum was indicated in the following samples:

D. C. No.	Brand.		Manufacturer or Dealer.
17222	Ginger Ale	*Bridgeport:*	American Bottling Works.
17215	Ginger Ale		Gottlieb Luippold.
17220	Ginger Ale.		Greater New York Bottling Co.
17232	First Prize		Grey & Light.
17230	Ginger Ale.		Hallett Mineral Water Co.
17217	Ginger Ale.		Standard Bottling Co.
17234	Ginger Ale.		West End Bottling Co.
17237	Ginger Ale.		Whistle Bottling Co.
16180	Ginger Ale.	*Bristol:*	Bristol Bottling Works.
16189	Ginger Ale		The Elco Beverage Co.
16186	Cascade		C. E. Perkins Bottling Works.
17252	Ginger Ale	*Central Village:*	U. LaFrance.
17250	Ginger Ale.	*Danielson:*	H. B. Hargraves.
16172	Ginger Ale.	*Hartford:*	Hartford Bottling Works.
17224	Hydrox.	*Meriden*	Charles N. Carroll.
17226	Sun Ray.		T. F. Lyons Co.
17204	Ginger Ale.	*Naugatuck:*	John Greene.
15597	Ginger Ale.	*New Britain:*	S. F. Avery.
15594	Ginger Ale.		Eureka Bottling Works.
15595	Ginger Ale.		William Naughton.
17242	Pequot Brand.	*New London:*	Bagdanowsky Bros.
16199	Ginger Ale.		Rich & Rubin.
17238	Ginger Ale.		Steam Bottling Works.
17247	Ginger Ale.		Chester Wright.
17243	Ginger Ale	*Norwich:*	Crystal Spring Co.
16183	Ginger Ale	*Portland:*	Portland Bottling Works.
17249	Ginger Ale.	*Putnam:*	Putnam Bottling Works.
17115	Ginger Ale.	*South Manchester:*	Manchester Bottling Works.
17213	Ginger Ale.	*Stamford:*	National Spring Water Co.
17210	Ginger Ale.		Silver Spring Water Co.
16190	Ginger Ale.	*Thomaston:*	August Koegel.
17228	Ginger Ale.	*Wallingford:*	R. S. Botsford.
16181	Ginger Ale.	*Middletown:*	Duchess Bottling Works.
15599	Arauna.		M. T. Fitzgibbons.
15587	Ginger Ale.	*Waterbury:*	Brass City Bottling Works.
15589	Ginger Ale.		Brooklyn Bottling Works.
16192	Ginger Ale.		Eagle Brewing Co.
16193	Ginger Ale.		Hamilton Bottling Works.

[1]A. O. A. C. Methods of Analysis, p. 206. 1919.

D. C. No.	Brand.		Manufacturer or Dealer.
16197	Ginger Ale.	*Waterbury:*	Mascola Bottling Works.
17209	Elco Ginger Paste.		Emil Moscola.
16198	Ginger Ale.		Reiner Bottling Works.
16196	Ginger Ale.		Yale Brewing Co.
16986	Ginger Ale.	*Willimantic:*	Willimantic Bottling Co.

Eight miscellaneous beverages, sodas, cordials, etc., were submitted for determinations of alcohol. All were found to contain alcohol in excess of 0.5 per cent., but as only one sample was submitted in the original unopened bottle the alcohol content as sold by the dealer cannot be stated. The one unopened sample was Cider soda, **16185,** which contained 1.19 per cent. of alcohol by volume. It was sold by the Bristol Bottling Works, Bristol.

Six cereal beverages were submitted, all in original unopened bottles. Palpha **17206,** Brooklyn Bottling Works, Waterbury, and Fingo **15383,** Worcester Brewing Corp., Worcester, Mass., contained 0.61 and 0.84 per cent. alcohol by volume respectively.

Beverages and Fruit Syrups Examined for Saponins.

The presence of foam producers in various soft drinks and in malt liquors has been reported or suggested in the literature. Preparations from soap bark and commercial saponin are used for this purpose but they are objectionable on account of the toxic principles they contain. Glycerrizin, the active principle of licorice, also serves to produce the desired foam.

Tests for saponins are summarized in Leach[1] and we have found them to work satisfactorily upon known saponin solutions. An old commercial preparation labeled "Soda Foam," which we had among our laboratory specimens and a water extract of soap bark responded positively to the tests there described. If glycerrizin is present or suspected the haemolysis test should be used. While it is generally best to extract the saponins and purify them before applying qualitative tests, suspicious samples may be sorted out by inducing foam directly in the solution by passing a current of air through it, collecting the froth and applying tests directly on the liquid formed when the foam subsides.

Six fruit syrups and three cereal beverages were examined for foam producers but negative results were obtained in all cases.

CEREAL PRODUCTS.

Breakfast Foods.

Two fruited cereal preparations have been analyzed. Fruited Wheat, **13973** and Fruited Oats, **13974,** a combination of figs, dates and raisins with wheat and oats respectively. Manufactured for the Fruited Cereal Co., Quincy, Ill.

[1]Food Inspection and Analysis, p. 1016.

Analyses of these products are as follows:

Station No.	13973	13974
	%	%
Moisture	9.89	9.74
Ash	3.60	3.34
Protein	15.63	13.13
Fiber	2.42	1.30
Nitrogen-free extract	66.21	68.10
Fat	2.25	4.09

Health Foods.

Three products of this class have been examined.

Ry-Krisp, **14200**, made by the Original Ry-Krisp Co., Minneapolis, Minn. This preparation is stated in the advertising literature to be made from whole rye "without soda, baking powder, yeast, or any ferment, without sweetening, shortning, or flavoring except a little salt." It is also stated to contain "nine out of the eleven mineral elements (vitamines) necessary for the proper nourishment of the human body". So far as we know it has not been demonstrated that vitamines are mineral elements. A proximate analysis of the preparation is given which is substantially correct. It is not recommended as a diabetic food but its laxative properties are emphasized.

The product was submitted for examination with reference to its usefulness in a diabetic dietary. The analysis shows a normal amount of carbohydrate nearly one-half of which is starch. Its utility in a diabetic diet will depend entirely upon the tolerance of the patient.

Swedish Health Bread, **13628**, made by O. G. Petterson, Cambridge, Mass. Submitted for analysis by a diabetic patient.

Basy Bread, **14405**, made by Doctor's Essential Food Co., Orange, N. J. This is used as an anti obesity remedy. It is stated not to be a medicine or drug but a wholesome and delicious food scientifically prepared. Three slices per day are said to accomplish weight reduction.

The proximate analysis of this preparation is given below. It furnishes no clue of course to the alleged efficacy of the bread as a weight reducer. Having been advised that symptoms resembling those which follow the administration of thyroid had been observed after eating this bread, tests were made for iodine but none was detected. The method of Seidell[1] was employed and amounts up to 20 grams of bread were used. A commercial sample of desiccated thyroid gland[2] was tested by the same procedure and 0.2 per cent. of iodine found. When 10 milligrams of this thyroid preparation were added to 0.99 gm. of bread a positive test for iodine was obtained.

[1]Jour. Biol. Chem., **3**, 391 (1917).
[2]Parke, Davis & Co.

We have since seen a discussion[1] of this product from which we quote.

"According to the manufacturers Basy Bread is made from coarse ground, hard whole wheat, preserved and sweetened with ground figs and containing vinegar, salt and water".

After giving analyses showing the composition of this bread as compared with average graham bread the discussion continues.

"The purchaser of Basy Bread finds that, in addition to eating the preparation for which he is paying $1.00 a loaf, it is also necessary to follow the 'Basy Bread' Diet. This diet is typical of those recommended in the reduction of fat".

By a simple experiment the user of this bread can test its efficacy for himself by adhering rigidly to the prescribed diet omitting the Basy Bread entirely and comparing the results with those obtained when it is included. We suspect that the diet has more to do with weight reduction than has the bread.

The analyses of these three preparations are as follows:

Station No.	14200	13628	14405
	%	%	%
Moisture	5.80	8.55	36.91
Ash	2.78	2.71	2.40
Protein	14.00	10.44	9.59
Fiber	1.34	1.82	1.85
Nitrogen-free extract:			
Starch	34.79	47.73	48.12
Other nitrogen-free extract	39.63	27.68	
Fat	1.66	1.07	1.13

Flour.

Four samples of flour were submitted by the Dairy and Food Commissioner and four samples were sent by individuals. Of the latter, Nos. **15167** and **15173** were represented to be largely gluten. Analyses showed them to contain 2.08 per cent. of nitrogen each which is about the nitrogen content of ordinary flour and much too low for gluten flour of standard quality which should contain not less than 7.1 per cent. of nitrogen on a water free basis or about 6.25 per cent. with the amount of moisture generally present in the market product.

The other samples require no comment.

CIDER.

Six samples were examined. Two, Nos. **18405** and **18424**, were sent by the Dairy and Food Commissioner and four, Nos. **15284, 14172, 14338** and **14339** were submitted by individuals. They were examined chiefly for alcoholic content, but a more complete analysis of **18405** was made as follows:

[1]Jour. Am. Med. Assoc., **70** 6, 407 (1918).

Alcohol by volume	2.87%
Solids	5.92
Ash	0.27
Sugar, as invert	4.01
Acidity, as acetic	0.48
Alkalinity of ash cc. N/10 alkali per 100 gms.	32.1

COCOA.

Four samples have been examined.

Liberty Milk Cocoa, **18408**, labeled pure milk cocoa, submitted by the Dairy and Food Commissioner was analyzed as follows:

Moisture		2.00%
Ash		2.06
Alkalinity of ash, cc. N/10 acid/1 gm.	0.75	
Nitrogen:		
Total	1.60	
From casein	0.42	
Protein:		
Casein		2.68
Other protein		7.38
Fiber		1.48
Nitrogen-free extract:		
Sucrose		65.09
Lactose		4.83
Other N-free extract		4.48
Fat		10.00

The sample appears to be as labeled.

Three samples of unsweetened cocoa submitted by a consumer were of normal composition and quality.

COFFEE, MODIFIED COFFEE, ETC.

Fourteen samples of ground coffee, two of soluble coffee, one of Kaffee Hag and one coffee substitute have been examined.

Two of these were submitted by the Dairy and Food Commissioner. **16393** contained chicory and much starchy matter and was labeled coffee, cereal and chicory. **16721** appeared to be genuine and was passed.

Sample **15158** sent by a purchaser to be tested for adulterants also appeared to be genuine.

Kaffee Hag, **13980**, is coffee from which the caffein has been largely removed. It was found to contain 0.12 per cent. caffein by weight and 0.10 per cent. of caffein calculated from nitrogen in the caffein residue. Previous results[1] were 0.04 and 0.03 per cent. respectively.

Minute Brew, **13981**, a substitute for coffee made from cereal grains contained 11.25 per cent. of protein (N x 6.25), 1.55 per cent. of material insoluble in hot water and was free from caffein.

Partial analyses of eleven samples of ground coffee and two of soluble coffee are given in Table I.

TABLE I. PARTIAL ANALYSES OF COFFEE.

Sta. No.	Brand.	Manufacturer.	Water. %	Ash. %	Fat. %	Caffein, by Wt. %	Caffein, from N. %	Evidence of Chicory, Cereals, etc.,
		Soluble Coffee.						
13938	Barrington Hall	Baker Importing Co., New York and Minneapolis.	4.12	15.51	1.32	5.66	5.50	.....
13202	Faust Instant	C. F. Blanke Tea and Coffee, Co., St. Louis.	5.37	14.88	1.11	4.47	4.36	.....
		Ground Coffee.						
13203	Autocrat	Brownell Field Co., Providence, R. I.	5.56	4.05	15.48	.....	.....	none
13183	Benefit	Direct Importing Co., Boston.	7.28	4.03	15.24	.....	.....	none
13966	Boardman's Gold Star	Wm. Boardman Sons Co., Hartford.	6.05	4.23	15.09	.....	.....	none
13940	Boardman's Putnam	Wm. Boardman Sons Co., Hartford.	3.97	4.09	16.21	.....	.....	none
13953	Garden of Allah	Clark & MacKasick Co., Boston.	6.43	4.12	16.40	.....	.....	none
13964	Golden Star	F. C. Bushnell Co., New Haven.	4.57	4.05	14.83	.....	.....	none
13174	Hermitage	Stoddard, Gilbert & Co., Inc., New Haven.	7.09	4.02	15.34	.....	.....	none
13952	Hodbro	Hodes Bros., New Haven.	4.79	4.11	15.44	.....	.....	none
13965	Sunbeam	Austin, Nichols & Co., New York and Chicago.	2.14	4.24	14.63	.....	.....	none
13941	Union Club	Chas. G. Lincoln & Co., Hartford.	4.69	4.08	15.66	.....	.....	none
13939	White House	Dwinell-Wright Co., Boston and Chicago.	4.49	4.16	15.86	.....	.....	none

The soluble coffees are evaporated and pulverized water extracts of coffee. Another preparation of this type, viz., G. Washington Prepared Coffee has been analyzed previously[1] in this laboratory.

DESICCATED FOODS.

A number of evaporated or dried food products made by the Keystone Instant Food Co., Inc., Danbury, Conn., have been analyzed. The products include Clam Broth, **15460;** Vegetable Soup, **15461;** Chicken Gumbo, **15462;** Rice Pudding, **15463;** Roast Beef Hash, **15464,** and Corned Beef Hash, **15465.**

Another product of this type is Cheshire Rabbit, **15184, 15185,** made by Cheshire Kitchens, Inc., 15 Park Row, N. Y. This is an evaporated prepared Welsh rabbit ready to serve after adding milk or water and heating.

Our analyses of these products are as follows:

TABLE II.—ANALYSES OF DESICCATED FOODS.

No.	15460	15461	15462	15463	15464	15465	15184	15185
	%	%	%	%	%	%	%	%
Moisture	8.38	10.58	10.06	6.67	10.81	8.29	9.18	16.88
Ash	34.51	13.67	8.22	3.09	7.15	8.39	7.43	7.88
Protein	36.38	14.06	12.50	12.06	32.25	31.38	30.69*	28.10*
Fiber	.....	3.38	1.26	0.36	0.97	0.80		
Nitrogen-free Extract	19.00	56.56	66.23	77.74	42.31	41.81	13.40	15.74
Fat	1.73	1.75	1.73	0.08	6.51	9.33	39.30	31.40
Salt	29.20	.....	.....	.....	.....	.....	2.84	4.45
Acidity, as lactic acid	.....	.....	.....	.....	.....	.....	1.80	1.87
Color	.....	.....	.....	.....	.....	.....	natural	Orange I

*Nitrogen x 6.38.

DIABETIC FOODS.

A number of diabetic preparations have been examined since our Bulletin 220 on this subject was published. Among them is an interesting product called Cellu Flour.

Cellu Flour, **14555,** is prepared by the Dietetic Cellulose Co., Chicago. It is a carbohydrate substitute made from purified and bleached wood pulp, straw pulp or cotton fiber; it is white, tasteless and non-nutritive, containing no starch, sugar, fat or protein; and is used for filling out reduced diets such as indicated in the Allen Treatment of diabetes. While it furnishes no nourishment it is said to satisfy hunger and reduces the tendency to over-eat. It might be called a psychological food.

The analysis of this flour is as follows:

[1]Conn. Exp. Sta. Report 1916, pp. 186–7.

Moisture	5.52%
Ash	0.30
Protein	none
Fiber	57.25
Nitrogen-free extract:	
Starch	none
Reducing sugars:	
before hydrolysis	none
after hydrolysis	none
Other nitrogen-free extract (modified cellusoses)	36.93
Ether extract	trace

By the conventional method of proximate analysis this material showed 57.25 per cent. of crude fiber and a nitrogen-free extract of 36.93 per cent. It was found, however, that neither the acid nor alkali digestates as obtained in the determination of crude fiber produced copper reducing substances and that therefor presumably, little of the material thus removed is available in digestion but consists rather of soluble cellulose complexes or modifications. This emphasizes the inaccuracy that, in some cases, may attach to the interpretation of nitrogen-free extract as available carbohydrate in calculating calorie yields.

Our attention was called by William G. Beale, of Chicago, and Bar Harbor, Me., to certain bakery products prepared from Cellu flour by the Woman's Baking Co., of Boston. This Company has submitted, at our request, a number of their products which are of particular interest. Samples were also submitted by Mr. Beale.

The products examined are as follows:

Cellu Muffins, **15256;** Bran Muffins, **15257;** Cellu Caraway Cookies, **15258;** Cellu Lemon Cookies, **15259;** Cellu Kisses, **15260;** Cellu Nuts, **15314;** Cocoa Nib Cookies, **15315;** Spice Bran Cookies, **15316;** Cellu Vanilla Cookies, **15317;** Cellu Soup Wafers, **15318;** Cellu Biscuit **15319;** Caraway Bran Cookies, **15320.**

TABLE III.—ANALYSES OF CELLU FLOUR PRODUCTS, ETC.

Sta. No.	Moisture.	Ash.	Nitrogen.	Protein Nx 6.25.	Fiber.	Nitrogen-free Extract.			Fat.	Calories per 100 gms.
						Starch.	Sugar as dextrose.	Other N-free extract.		
	%	%	%	%	%	%	%	%	%	
15256	29.08	5.37	0.59	3.66	18.23	1.61	2.10	27.02	12.93	254
15257	41.51	6.50	1.00	6.26	6.72	1.54	4.83	27.03	5.61	209
15258	14.16	5.48	0.89	5.58	16.53	1.51	2.33	31.95	22.46	368
15259	12.94	5.22	0.69	4.32	17.43	trace	4.62	34.10	21.37	364
15260	17.85	4.09	3.68	23.00	27.12	1.29	1.20	25.22	0.23	205
15314	15.91	5.71	0.86	5.38	16.80	1.07	2.57	23.82	28.74	390
15315	14.87	6.30	1.33	8.33	6.05	6.19	5.05	29.17	24.04	411
15316	16.31	6.43	1.12	6.99	6.90	4.44	7.77	32.48	18.68	375
15317	17.16	5.69	0.71	4.45	16.98	1.58	2.22	32.61	19.31	337
15318	14.22	6.66	0.64	4.01	14.97	1.69	2.43	31.39	24.63	380
15319	32.81	6.33	0.53	3.34	14.26	1.60	1.41	25.65	14.60	259
15320	12.24	6.90	1.30	8.13	2.62	3.15	3.34	38.61	25.01	438

These Cellu products are conspicious for their low nitrogen (except **15260**), low available carbohydrate (starch and soluble reducing sugars), high fiber and high nitrogen-free extract other than starch and sugar. The low or doubtful availability of the last named group should be borne in mind when interpreting the calorie yield which has been calculated in the conventional way including all of the nitrogen-free extract. The bran and part-bran products have distinctly less fiber.

Seven samples of liquors were examined with reference to their fitness for use in a diabetic dietary. Four of the samples were practically free from sugars, one contained a small amount, 3.09 per cent., and two showed larger amounts viz. 14.2 per cent. and 33.52 per cent. The last named amount is too high to be used with safety, and a stimulant with 14 per cent. of sugar should be used with caution.

EGGS AND EGG PRODUCTS.

Twenty-six samples of eggs were examined with reference to the composition of the shells. This work was done in collaboration with Prof. Dunn, of the Storrs Station. The figures given are on the basis of the air-dry shells with the inner membranous lining of the shell removed.

TABLE IV.—ANALYSES OF EGG SHELLS.

Sta. No.	Wt. of shell, grams.	Moisture.	Lime (CaO).	Magnesia (MgO).	Loss on ignition.
		%	%	%	%
15223	5.7745	0.55	52.20	1.54	45.42
15224	5.7643	0.39	52.24	....	46.07
15225	5.4725	0.29	52.16	2.48	45.78
15226	5.0275	0.35	52.08	1.04	46.25
15227	6.2050	0.29	52.01	1.20	46.15
15228	5.1178	0.40	51.56	1.35	46.39
15229	4.4340	0.29	51.82	....	46.15
15230	5.8283	0.22	51.91	....	45.70
15231	4.8030	0.21	51.99	1.43	45.92
15232	5.0580	0.23	53.28	....	45.54
15233	5.3550	0.34	53.28	....	45.41
15234	5.5155	0.50	51.85	1.61	45.69
15235	5.0840	0.50	52.69	....	45.77
15236	5.4008	0.63	52.18	....	45.67
15237	5.0183	0.64	52.36	....	45.70
15264	4.8412	....	49.40	....	.....
15265	4.8932	....	52.12	....	.....
15266	5.4114	....	51.04	....	.....
15267	5.2107	....	51.16	....	.....
15268	5.5765	....	51.12	....	.....
15269	5.6312	....	49.16	....	.....
15270	5.3247	....	51.56	....	.....
15271	4.9495	....	50.68	....	.....
15272	5.7060	....	50.88	....	.....
15273	4.9926	....	49.52	....	.....
15274	5.4776	....	50.32	....	.....

EGG POWDER.

One sample, No. **14680,** was submitted for examination. It was labeled Aigo Baking and Cooking Compound, The Egg-O Co., Baltimore, Md., and stated to consist of sprayed egg yolk, albumen, salt, powdered skimmed milk, starch, gelatin, bicarbonate of soda and to be free from coloring matter.

The presence of egg was indicated by a considerable amount of lecithin phosphoric acid and no artificial color was found.

The anaylsis is as follows:

No.	**14680**
	%
Moisture	6.83
Ash	9.47
Protein (N x 6.25)	20.48
Starch	26.40
Fat	13.85
Lecithin P_2O_5	0.46
Color	natural.

EGG NOODLES.

Eight samples of noodles were examined and the partial analyses are given in the following tabulation.

TABLE V.—PARTIAL ANALYSES OF EGG NOODLES.

Sta. No.	Brand.	Manufacturer or Dealer.	Ash.	Protein.	Lecithin P_2O_5.	Color.
			%	%	%	
13204	Mohican.	Mohican Co., Bridgeport	0.88	16.25	0.044	natural
13205	Mueller's.	C. F. Mueller Co., Jersey City	1.15	13.88	0.037	natural
13208	Warner's.	Warner Macaroni Co., Inc., Syracuse, N. Y.	0.68	14.88	0.028	natural
13209	Freihofer's.	Freihofer Baking Co., Philadelphia, Pa	0.51	12.94	0.034	natural
13935	Climax.	The Pfaffmann Egg Noodle Co., Cleveland, Ohio	1.66	13.44	0.045	natural
13937	Egg Soup Pastels.	Freihofer Baking Co., Philadelphia, Pa	0.78	13.19	0.029	natural
13962	Quaker.	Quaker Oats Co., Chicago	0.75	15.00	0.066	natural
13976	Brown Hen.	American Macaroni Co., Camden, N. J.	1.04	16.56	0.043	natural

The lecithin phosphoric acid content is taken as an index to the amount of egg material present. Accepting Juckenack's standard[1], 0.0225 per cent. of lecithin phosphoric acid may be found in noodles prepared without eggs and this amount is more than doubled by the addition of egg or egg yolk in the proportion of one to a pound of flour. Figures less than 0.035 or 0.040 per cent. do not indicate appreciable amounts of eggs.

[1]Conn. Exp. Sta. Report 1904, p. 138: Leach, Food Inspection and Analysis p. 364.

Dehydrated Eggs.

Two samples of dehydrated fresh eggs were examined. These were Atlas Brand, **13173**, Atlas Specialty Co., New York and Community Brand, **13169**, The Sweet Nut Butter Co., Boston.

Analyses are as follows:

No.	13173	13169
	%	%
Moisture	6.25	6.62
Ash	3.42	3.50
Protein	40.44	43.00
Fat	45.12	42.29
Lecithin P_2O_5	1.37	1.33

These analyses agree with those of similar products previously examined[1] and show the substance of whole egg material.

FATS AND OILS.

Olive Oil.

Five samples of olive oil have been examined and all were passed as genuine. Two of these were sent by the Dairy and Food Commissioner and three were submitted by individuals.

Cooking Fats.

Two samples of Snowdrift Pure Vegetable Shortening **13972** and **18404** and one of Peerless Paste **16158** were examined. Snowdrift is a vegetable product consisting of, or containing cottonseed oil. Peerless Paste contains cottonseed oil but not butter fat although other fat of animal origin may be present. It is interesting to note that this sample responds to tests for carrotin although the material is not sensibly colored.

Butter.

Twenty-three samples of butter have been examined of which twenty-two were submitted by the Dairy and Food Commissioner. Eighteen were passed and five contained excess of water and were deficient in fat. Butter and renovated butter must not contain less than 82.5 per cent. of milk fat and renovated butter must not contain more than 16 per cent. of water.[2] There is no standard for moisture in the definition of butter but obviously it cannot contain much over 16 per cent.

The five samples which did not meet the above requirements are tabulated as follows:

[1]Conn. Exp. Sta. Bull. 210, p. 212, (1918).
[2]State Regulation 48.

Butter Below Standard.

D.C. No.	Sold for	Dealer (New Haven).	Water.	Curd, Salt, etc.	Fat.	Refraction, 25°C.
			%	%	%	
18105	"Undergrade" butter	J. L. Gold	28.44	1.28	70.28	53.1
16898	Sweet Butter	Morris Gold	22.08	77.92		50.6
18476	Renovated Butter	Morris Gold	29.77	0.93	69.30	52.3
16900	Sweet Butter	Liebmann & Gold	27.03	72.97		51.2
18302	Sweet Butter	Liebmann & Gold	28.71	1.18	70.11	53.0

The adulteration in the above cases consists of excess water and consequent deficiency of milk fat. Sample **18105** was sold for about one half the market price of butter and was marked undergrade so that its substance and quality were not misrepresented. Samples **16898, 18476, 16900** and **18302** were renovated.

Oleomargarine.

Five samples, all submitted by the Dairy and Food Commissioner, were examined for coloring matter, but no evidence of added dyestuffs was obtained. In no case was the product sold for butter.

Nut Margarine.

Two new brands of this product have been examined, **13963,** Delicia and **13971,** Palmine, both sold by Van Dyke's Tea Store, New Haven. The analyses of these brands and of eight brands previously reported[1] are given in Table VI.

GELATIN, ETC.

Seven unofficial samples of gelatin were submitted by the Dairy and Food Department for examination. Three of these were distinctly inferior products indicated by bad odor, high fat or high keratin, or both, and in one case by excessive arsenic content.

The data on these products are as follows:

Designation of sample	A 15	A 16	A 21
Total nitrogen	15.69%	15.23%	14.92%
Ash	1.90	2.95	2.84
Fat	0.17	0.30	0.45
Keratin	0.09	0.18	0.11
Arsenic	1:500,000	1:50,000	trace
Copper	none	none	....
Odor	disagreeable	slight	disagreeable
Water solution, cold	cloudy	very cloudy	cloudy
hot	clear	cloudy	....

The ash should not exceed 2 per cent., the fat and keratin should not be much in excess of 0.08 per cent. each, arsenic does not

[1]Conn. Exp. Sta., Bull. 210 p. 203, (1918).

TABLE VI.—ANALYSES OF

Number.	Brand, Manufacturer or Dealer.	Moisture.
		%
8186	A 1. Downey Farrell Co., Chicago	10.84
8169	Cocoanut. Nucoa Butter Co., Soho Park, N. J.	6.53
8170	Providence Churning Co., Providence, R. I.	11.28
9883	Nut-ola. Armour Co.	9.44
9898	Gem. Swift & Co.	12.64
9911	Benefit. Sweet Nut Butter Co., Boston, Mass.	12.35
9937	Kingnut. Kellogg Products, Inc., Buffalo	10.12
9938	Nut Marigold. Marigold Margarine Fact. 5th Dist., N.J.	14.71
13963	Delicia. Van Dyke, New Haven	10.67
13971	Palmine. Van Dyke, New Haven	13.08

ordinarily exceed 1:700,000, a good product should be without odor, and the water solution should be clear.[1]

A product used as a substitute for gelatin in ice cream manufacture was also submitted, No. **16396.** This was found to consist chiefly of starch and Indian gum. Tests for gelatin and tragacanth were negative. The sample contained 2.48 per cent. of ash, 1.60 per cent. of nitrogen and 37.17 per cent. of starch.

ICE CREAM.

Chapter 260 of the Public Acts of 1919 regulates the manufacture and sale of ice cream in this State. It provides that the milk fat content of ice cream (plain) shall be not less than 8 per cent. and that of fruit and nut ice cream not less than 6 per cent. The presence of boric acid, salicylic acid, formaldehyde, saccharin, salts of copper, iron oxide, ochres and injurious colors or flavors in any ice cream is prohibited. Harmless permitted colors and harmless imitation flavors are allowed if their presence is declared. The use of harmless vegetable gums and gelatin is permitted; and ice cream containing less fat than that required by the standards may be manufactured and sold provided the true fat content is made know to the purchaser by suitable signs or labels.

The Dairy and Food Commissioner made a preliminary inspection last year and several hundred samples were taken. These were used as a basis for hearings to advise manufacturers and others

[1]Conn. Exp. Sta. Bull 219 p. 221, (1919).

NUT MARGARINES.

Protein (N x 6.25).	Ash.	Fat.	Free Fatty Acids as Oleic.	Refractometer Reading at 40°C.	Reichert-Meissel No.	Halphen Test.	Nitric Acid Test.
%	%	%	%				
1.25	4.51	83.40	0.45	40.0	7.00	deep pink	brown
0.69	1.58	91.20	0.39	37.2	7.50	yellow	brown
0.75	1.14	86.83	0.47	39.0	6.15	yellow	yellow
2.71	6.06	81.75	0.25	39.0	6.37	yellow	.....
1.36	2.91	83.09	0.95	40.0	6.69	pink	.....
1.29	2.08	84.27	1.11	37.0	6.22	yellow	.....
1.87	3.00	85.01	0.19	38.5	6.50	yellow	.....
1.19	1.51	82.58	1.03	38.0	6.62	yellow	.....
1.66	1.93	85.74	....	35.5	6.40	yellow	yellow
0.83	4.33	81.76	....	36.5	7.90	yellow	yellow

of the provisions of the law. Subsequently 82 official samples were taken of which only three were found to be below standard.

During the past year 47 cities and towns were visited and 400 samples collected. The distribution of the samples and results of analyses are given in the following summary.

Kind of Ice Cream.	No. of Samples collected,	No. of Samples below standard.	Per cent. below standard.
Plain ice cream	331	45	13.6
Fruit ice cream	66	2	3.0
Nut ice cream	3	0	0.0
Total	400	47	11.8

A comparison with the results obtained last year based upon the percentages of milk fat in the sample is as follows:

Range of Fat.	1919 Samples.	1919 Per cent.	1920 Samples.	1920 Per cent.
8 to 8.9	15	18.3	79	19.7
9 to 9.9	10	12.2	55	13.8
10 to 11.9	26	31.7	83	20.8
12 to 13.9	15	18.3	67	16.7
14 to 19.9	13	15.8	56	14.0
20 and above	0	....	2	0.5
Below 8.0	3	3.7	58*	14.5
Total	82	100.0	400	100.0

*Includes 11 fruit creams of legal standard.

The results of the inspection during the past year are given in detail in Table VII. Figures below 8 per cent. in the case of plain ice cream and below 6 per cent. in the case of fruit and nut creams appear in full face type.

TABLE VII.—ANALYSES OF ICE CREAM.

D. C. No.	Dealer.	Manufacturer.	Flavor.	Fat. %
	BRIDGEPORT.			
17346	J. E. Broderick	Stratford Candy Kitchen	Chocolate	12.2
17349	D. J. Broderick	Harris Hart	Chocolate	8.4
17340	Frank Cuneo	Own make	Chocolate	8.0
17345	Eagle Confectionery Co	Own make	Chocolate	9.2
18228	Sigmund Gerstl	Own make	Chocolate	8.0
18446	E. L. Graves	Own make	Chocolate	10.4
17347	Ideal Ice Cream Co	Stratford Ice Cream Co	Chocolate	8.0
17334	Lane Confectionery Co	Own make	Chocolate	13.2
17342	Andrew Musante	Own make	Chocolate	9.6
18440	New England Ice Cream Co	Own make	Chocolate	8.0
18443	George Nicholas	Own make	Chocolate	12.4
17337	Regas & Pappas	Own make	Chocolate	9.2
18225	Royal Candy Kitchen	Own make	Chocolate	11.2
18449	Strand Confectionery Co	Own make	Chocolate	8.4
18223	George Casrientes	Own make	Strawberry	**3.6**
18226	Crystal Palace Conf. Co	Own make	Strawberry	11.4
18447	E. L. Graves	Own make	Strawberry	10.4
17335	Lane Confectionery Co	Own make	Strawberry	10.8
17343	Andrew Musante	Own make	Strawberry	6.8
18441	New England Ice Cream Co	Own make	Strawberry	9.6
18444	George Nicholas	Own make	Strawberry	12.0
17338	Regas & Pappas	Own make	Strawberry	11.2
18222	Crystal Palace Conf. Co	Own make	Vanilla	10.8
17339	Frank Cuneo	Own make	Vanilla	8.8
17334	Eagle Confectionery Co	Own make	Vanilla	8.0
18227	Sigmund Gerstl	Own make	Vanilla	10.0
18445	E. L. Graves	Own make	Vanilla	11.2
17331	Horsoof Kachbourian	Huber Ice Cream Co	Vanilla	10.4
17333	Lane Confectionery Co	Own make	Vanilla	12.4
17341	Andrew Musante	Own make	Vanilla	8.8
18439	New England Ice Cream Co	Own make	Vanilla	10.0
18442	George Nicholas	Own make	Vanilla	11.6
18229	Frank Ostrofsky	Own make	Vanilla	**5.4**
17332	The Park Spa	Huber Ice Cream Co	Vanilla	10.4
17336	Regas & Pappas	Own make	Vanilla	10.0
18224	Royal Candy Kitchen	Own make	Vanilla	9.4
17325	Louis Slavin	New England Ice Cream Co	Vanilla	8.8
18448	Strand Confectionery Co	Own make	Vanilla	11.6
	Average			9.7
	BRISTOL.			
17929	Bristol Candy Kitchen	Own make	Chocolate	12.0
17919	J. A. Kennedy	New Haven Dairy	Chocolate	8.0
17925	Palace of Sweets	Own make	Chocolate	15.6
17923	St. Clair Confectionery Co	Own make	Chocolate	14.2
17928	Bristol Candy Kitchen	Own make	Strawberry	11.6
17926	Bristol Candy Kitchen	Own make	Vanilla	12.8

TABLE VII.—ANALYSES OF ICE CREAM.—*Continued.*

D. C. No.	Dealer.	Manufacturer.	Flavor.	Fat. %
	BRISTOL—(*concluded*).			
17920	J. A. Kennedy	New Haven Dairy Co	Vanilla	9.0
17924	Palace of Sweets	Own make	Vanilla	15.0
17922	St. Clair Confectionery Co	Own make	Vanilla	14.4
	Average			12.5
	COS COB.			
18205	M. Taylor	Horton Ice Cream Co	Strawberry	8.0
18204	M. Taylor	Horton Ice Cream Co	Vanilla	8.0
	Average			8.0
	DANBURY.			
17319	Danbury Candy Co	Own make	Chocolate	9.0
18257	H. E. Northrop	Own make	Chocolate	12.4
17320	D. F. Stevens	Own make	Chocolate	**7.0**
18252	Athan & Nicholson	Own make	Strawberry	8.0
18254	Charles Ryder Ice Cream Co	Own make	Strawberry	10.0
18255	Charles Ryder Ice Cream Co	Own make	Strawberry	11.2
17318	Danbury Candy Co	Own make	Vanilla	10.0
18251	Athan & Nicholson	Own make	Vanilla	8.0
18253	Charles Ryder Ice Cream Co	Own make	Vanilla	10.4
17321	D. F. Stevens	Own make	Vanilla	8.0
	Average			9.4
	DANIELSON.			
18084	Mary Salotti	Own make	Chocolate	9.4
17763	Ephrem Auger	J. H. Bouthillier	Coffee	**6.4**
16848	Cola Bros	Own make	Coffee	8.4
17762	Ephrem Auger	J. H. Bouthillier	Strawberry	6.8
18083	Mary Salotti	Own make	Strawberry	8.4
17761	Ephrem Auger	J. H. Bouthillier	Vanilla	11.4
18206	George Berris	New Haven Dairy	Vanilla	9.6
16847	Cola Bros	Own make	Vanilla	8.0
18100	Mary Salotti	Own make	Vanilla	9.0
17764	A. P. Woodward	Own make	Vanilla	**7.4**
	Average			8.5
	EAST PORT CHESTER			
18273	J. Tuchim	Neilsons	Chocolate	8.0
18274	J. Tuchim	Neilsons	Strawberry	8.0
18300	J. Tuchim	Neilsons	Vanilla	9.0
	Average			8.3
	FAIRFIELD.			
18260	Henderson Bros	Huber Ice Cream Co	Chocolate	9.4
17350	Henderson Bros	Huber Ice Cream Co	Vanilla	10.8
	Average			10.1

TABLE VII.—ANALYSES OF ICE CREAM.—*Continued.*

D. C. No.	Dealer.	Manufacturer.	Flavor.	Fat. %
	FARMINGTON.			
17501	Frederick Swanston	Hackney	Chocolate	8.4
17502	Frederick Swanston	Hackney	Vanilla	**6.3**
	Average			7.3
	FORESTVILLE.			
17917	Purity Ice Cream Co	Own make	Chocolate	**6.1**
17913	White Rock Ice Cream Co	Own make	Chocolate	9.8
17915	White Rock Ice Cream Co	Own make	Maple	9.2
17918	Purity Ice Cream Co	Own make	Strawberry	8.0
17914	White Rock Ice Cream Co	Own make	Strawberry	9.4
17911	James Holden	White Rock Ice Cream Co	Vanilla	10.0
17916	Purity Ice Cream Co	Own make	Vanilla	9.6
17912	White Rock Ice Cream Co	Own make	Vanilla	10.5
	Average			9.1
	GREENWICH.			
18291	Greenwich Drug Store	Horton Ice Cream Co	Chocolate	**6.6**
18289	Finch's Pharmacy	Horton Ice Cream Co	Chocolate	8.3
18282	J. H. Hall	Own make	Chocolate	8.8
18280	Kataris & Joseph	Own make	Chocolate	8.2
18287	A. B. Libano	Own make	Chocolate	8.2
18202	Pickwick Shop	Own make	Chocolate	15.0
18203	Pickwick Shop	Own make	Coffee	13.2
18283	J. H. Hall	Own make	Strawberry	8.0
18278	L. Kataris	Own make	Strawberry	8.4
18286	W. B. Libano	Own make	Strawberry	8.0
18276	Frank Zamfino	Own make	Strawberry	7.2
16168	Boswell Drug Co	Horton Ice Cream Co	Vanilla	8.6
18292	Boswell Drug Co	Horton Ice Cream Co	Vanilla	**5.8**
18288	W. E. Fitch's Pharmacy	Horton Ice Cream Co	Vanilla	8.0
18290	Greenwich Drug Store	Horton Ice Cream Co	Vanilla	8.0
18281	J. H. Hall	Own make	Vanilla	10.0
18277	L. Kataris	Own make	Vanilla	10.8
18279	Kataris & Joseph	Own make	Vanilla	8.0
18289	A. B. Libano	Own make	Vanilla	13.2
18201	Pickwick Shop	Own make	Vanilla	14.4
18275	Frank Zamfino	Own make	Vanilla	**7.9**
	Average			9.7
	GROTON.			
18689	Scuris Bros	Own make	Chocolate	**7.2**
18688	Scuris Bros	Own make	Vanilla	8.4
	Average			7.8

TABLE VII.—ANALYSES OF ICE CREAM.—*Continued.*

D. C. No.	Dealer.	Manufacturer.	Flavor.	Fat. %
	HARTFORD.			
18092	Thomas Appell	Own make	Chocolate	9.0
17904	Atlas Confectionery Co	Own make	Chocolate	8.8
17852	Besse	Own make	Chocolate	10.4
18096	Crown Confectionery Co	Own make	Chocolate	11.6
17902	Eagle Confectionery Co	Own make	Chocolate	14.4
17854	Goodwin Drug Co	Own make	Chocolate	11.2
17905	Goodwin Drug Co	Own make	Chocolate	9.2
17909	A. P. Leonard	Own make	Chocolate	14.0
18097	Liberty Confectionery Co	Own make	Chocolate	10.8
17859	Palace of Sweets	Own make	Chocolate	14.4
18089	Royal Candy Kitchen	Own make	Chocolate	9.6
17908	J. P. Treautafelacos	Own make	Chocolate	13.0
18093	Thomas Appell	Own make	Strawberry	9.0
18098	Crown Confectionery Co	Own make	Strawberry	12.8
17855	Goodwin Drug Co	Own make	Strawbe ry	11.2
18099	Liberty Confectionery Co	Own make	Strawberry	11.4
18090	Royal Candy Co	Own make	Strawberry	11.2
18091	Thomas Appell	Own make	Vanilla	11.2
17903	Atlas Confectionery Co	Own make	Vanilla	12.6
17851	Besse	Own make	Vanilla	12.0
18094	Crown Confectionery Co	Own make	Vanilla	13.2
17901	Eagle Confectionery Co	Own make	Vanilla	16.0
17853	Goodwin Drug Co	Own make	Vanilla	11.6
17906	Goodwin Drug Co	Own make	Vanilla	11.2
17910	A. P. Leonard	Own make	Vanilla	15.4
18095	Liberty Confectionery Co	Own make	Vanilla	8.4
17857	Newton Robinson & Co	Own make	Vanilla	8.2
17858	Palace of Sweets	Own make	Vanilla	15.2
18088	Royal Candy Co	Own make	Vanilla	10.0
17907	J. P. Treautafelacos	Own make	Vanilla	11.2
17856	Wise, Smith & Co	Hartford Ice Cream Co	French Vanilla	12.4
	Average			11.6
	JEWETT CITY.			
17773	Fred Maynard	Own make	Chocolate	**7.6**
18284	Alleandro Pieraccini	Own make	Chocolate	**5.6**
17775	Dennis J. Sullivan	Own make	Chocolate	9.0
17774	Dennis J. Sullivan	Own make	Lemon	8.8
18230	Alleandro Pieraccini	Own make	Vanilla	**6.7**
17772	Fred Maynard	Own make	Vanilla	11.8
	Average			8.3
	KILLINGLY.			
17899	Fred Espinosa	Own make	Coffee	**4.8**
17900	Fred Espinosa	Own make	Vanilla	**6.0**
	Average			5.4
	MANCHESTER.			
17843	Manchester Dairy Ice Cream Co.	Own make	Chocolate	9.4
17845	Manchester Dairy Ice Cream Co.	Own make	Coffee	11.6
17844	Manchester Dairy Ice Cream Co.	Own make	Strawberry	12.0
17842	Manchester Dairy Ice Cream Co.	Own make	Vanilla	12.0
	Average			11.2

TABLE VII.—ANALYSES OF ICE CREAM.—*Continued.*

D. C. No.	Dealer.	Manufacturer.	Flavor.	Fat. %
	MERIDEN.			
17279	Allis Bros	Own make	Caramel	14.6
17281	Albert Eichorn	Own make	Cherry Bisque	9.6
17278	Allis Bros	Own make	Chocolate	13.6
17284	Clarence Katt	Own make	Chocolate	11.8
17288	New Haven Dairy Plant	Own make	Chocolate	10.6
17282	Albert Eichorn	Own make	Maple Nut	13.6
17286	J. F. Furman	Own make	Strawberry	7.2
17285	Clarence Katt	Own make	Strawberry	10.8
17289	New Haven Dairy Plant	Own make	Strawberry	9.2
17290	New Haven Dairy Plant	Own make	Tutti Fruitti	9.0
17277	Allis Bros	Own make	Vanilla	15.4
17280	Albert Eichorn	Own make	Vanilla	14.8
17292	Mrs. Sarah Furman	J. F. Furman	Vanilla	**6.0**
17283	Clarence Katt	Own make	Vanilla	11.0
17287	New Haven Dairy Plant	Own make	Vanilla	9.6
	Average			11.1
	MILFORD.			
17348	Ideal Ice Cream Co	Stratford Ice Cream Co	Vanilla	11.6
	MOOSUP.			
17768	Habbib Abbood	Own make	Chocolate	**1.2**
17771	F. W. Daggett	Own make	Coffee	15.6
17767	Habbib Abbodd	Own make	Vanilla	**5.4**
17769	Devisso & Co	Connie McGaughery	Vanilla	8.2
	Average			7.6
	MYSTIC.			
18691	Peter Hammecher	Own make	Chocolate	12.0
18695	E. W. Haskell	Own make	Coffee	12.4
18693	John Wheeler	Own make	Coffee	18.0
18694	E. W. Haskell	Own make	Vanilla	13.6
18690	Peter Hammecher	Own make	Vanilla	15.2
18692	John Wheeler	Own make	Vanilla	20.0
	Average			15.2
	NEW BRITAIN.			
17880	Louis Gourson	Hartford Ice Cream Co	Chocolate	8.8
17308	C. E. McEnroe	Own make	Chocolate	13.6
17883	John Contaris	Own make	Chocolate	11.6
17305	St. Clair Confectionery Co	Own make	Chocolate	11.6
17302	Star Confectionery Co	Own make	Chocolate	12.8
17306	St. Clair Confectionery Co	Own make	Strawberry	12.0
17303	Star Confectionery Co	Own make	Vanilla	17.0
17882	John Contaris	Own make	Vanilla	12.4
17881	Edith Kopel	New Haven Dairy	Vanilla	9.2
17307	C. E. McEnroe	Own make	Vanilla	13.6
17304	St. Clair Confectionery Co	Own make	Vanilla	11.6
17301	Star Confectionery Co	Own make	Vanilla	13.6
	Average			12.3

TABLE VII.—ANALYSES OF ICE CREAM.—*Continued.*

D. C. No.	Dealer.	Manufacturer.	Flavor.	Fat. %
	NEW HAVEN.			
17315	John Basel	Own make	Chocolate	**7.4**
17255	Davis Drug Co	New Haven Dairy	Chocolate	9.2
17258	Huylers	Own make	Chocolate	14.4
17257	Liggett Drug Co	Semon Ice Cream Co	Chocolate	8.4
18460	New Haven Dairy Co	Own make	Chocolate	**7.6**
17262	Petersons	New Haven Dairy	Chocolate	10.2
17310	Theodore Tramis	Own make	Chocolate	8.4
17310	Peter Vallani	Own make	Chocolate	8.5
17311	Peter Vallani	Own make	Peach	6.4
17316	John Basel	Own make	Strawberry	7.0
17261	Huylers	Own make	Strawberry	12.0
18461	New Haven Dairy	Own make	Strawberry	8.0
17314	John Basel	Own make	Vanilla	**7.3**
17354	Davis Drug Co	New Haven Dairy	Vanilla	9.9
17259	Huylers	Own make	Vanilla	11.8
17256	Liggett Drug Co	Semon Ice Cream Co	Vanilla	9.4
18462	New Haven Dairy	Own make	Vanilla	8.4
17260	Petersons	New Haven Dairy	Vanilla	11.0
17296	Theodore Tramis	Own make	Vanilla	8.0
17309	Peter Vallani	Own make	Vanilla	9.6
	Average			9.1
	NEW LONDON.			
18687	Dimon Ballassi	Own make	Chocolate	16.4
18671	Conti Bros	Own make	Chocolate	8.4
18665	George Kozinos	Own make	Chocolate	13.6
18673	Johns & Manabas	Own make	Chocolate	14.0
18669	Peter Lalaty	Own make	Chocolate	11.8
18685	Basil D. Nichols	Own make	Chocolate	12.8
18623	Emanual Nichols	Own make	Chocolate	15.2
18675	S. F. Peterson	Own make	Chocolate	15.2
18677	Socrates Peterson	Own make	Chocolate	12.8
18675	E. E. Stratas	Own make	Chocolate	13.0
18681	Mohican Hotel	Own make	Coffee	13.2
18667	Abraham J. Maloof	Own make	Lemon	11.2
18686	Dimon Ballassi	Own make	Vanilla	17.0
18670	Conti Bros	Own make	Vanilla	11.2
18664	George Kozinos	Own make	Vanilla	15.6
18672	Johns & Manabas	Own make	Vanilla	14.0
18668	Peter Lalaty	Own make	Vanilla	13.6
18666	Abraham J. Maloof	Own make	Vanilla	11.2
18680	Mohican Hotel	Own make	Vanilla	22.0
18684	Basil D. Nichols	Own make	Vanilla	14.0
18682	Emanual Nichols	Own make	Vanilla	15.6
18676	Socrates Peterson	Own make	Vanilla	13.6
18674	S. F. Peterson	Own make	Vanilla	17.2
18678	E. E. Stratas	Own make	Vanilla	13.8
	Average			14.4

TABLE VII.—ANALYSES OF ICE CREAM.—*Continued.*

D. C. No.	Dealer.	Manufacturer.	Flavor.	Fat. %
	NORWALK.			
18298	Combis Candy Kitchen	DeKlym	Chocolate	8.0
18265	M. Cowas	Own make	Chocolate	8.0
18271	Cochinos & Notis	Own make	Chocolate	13.2
16170	Solomon Hatten	Horton Ice Cream Co	Chocolate	8.4
18293	C. DeKlym	Own make	Chocolate	8.0
18268	Zapperson & Pappas	Own make	Chocolate	12.4
18272	Cochinos & Notis	Own make	Coffee	13.2
18299	Combis Candy Kitchen	Own make	Strawberry	8.0
18266	M. Cowas	Own make	Strawberry	8.0
16171	Solomon Hatten	Horton Ice Cream Co	Strawberry	7.9
18296	C. DeKlym	Own make	Strawberry	7.2
18269	Zapperson & Pappas	Own make	Strawberry	9.6
18270	Cochinos & Notis	Own make	Vanilla	13.2
18297	Combis Candy Kitchen	DeKlym	Vanilla	8.4
18264	M. Cowas	Own make	Vanilla	9.2
18395	C. DeKlym	Own make	Vanilla	8.0
18267	Zapperson & Pappas	Own make	Vanilla	11.6
	Average			9.5
	NORWICH.			
18245	Tilly D. Becker	Own make	Chocolate	12.4
17792	Christ. Bell	Own make	Chocolate	17.0
17787	John A. Johnson	Own make	Chocolate	**7.6**
17790	Lagos Bros	Own make	Chocolate	8.2
17794	Stavros Peterson	Own make	Chocolate	13.0
17783	Peter Sellis	Own make	Chocolate	**6.4**
17785	Crystal Confectionery Co	Own make	Coffee	9.0
18244	Tilly D. Becker	Own make	Strawberry	16.8
17798	George Conlopoulus	Own make	Strawberry	9.6
17781	Peter Constandi	Own make	Strawberry	10.2
17796	James Ganosel	Own make	Strawberry	15.4
17791	Christ. Bell	Own make	Vanilla	18.0
17784	Crystal Confectionery Co	Own make	Vanilla	8.8
17780	Peter Constandi	Own make	Vanilla	8.2
17797	George Conlopoulus	Own make	Vanilla	9.0
17795	James Ganosel	Own make	Vanilla	15.4
17786	John Johnson	Own make	Vanilla	8.6
17789	Lagos Bros	Own make	Vanilla	12.8
17788	Prekaris Bros	Own make	Vanilla	**5.7**
17793	Stravros Peterson	Own make	Vanilla	16.0
17782	Peter Sellis	Own make	Vanilla	9.8
	Average			11.3
	NORTH GROSVENORDALE.			
17751	W. B. Chandler	Nectar Products Co	Chocolate	12.4
16850	Theophelus Donville	Own make	Strawberry	8.8
17752	W. B. Chandler	Nectar Products Co	Vanilla	9.2
16849	Theophelus Donville	Own make	Vanilla	8.4
	Average			9.7

TABLE VII.—ANALYSES OF ICE CREAM.—*Continued.*

D. C. No.	Dealer.	Manufacturer.	Flavor.	Fat. %
	PAWCATUCK.			
18242	John D. Traggis	Own make	Chocolate	12.8
18243	John Traggis	Own make	Coffee	15.2
18241	Charles Vardilos	Own make	Coffee	15.6
18240	Charles Vardilos	Own make	Vanilla	15.2
	Average			14.7
	PUTNAM.			
17756	Strombelis Bros	Progress Mfg Co	Chocolate	9.0
17760	J. E. Talbot	Own make	Chocolate	**5.0**
17758	Ernest Whittemore	Smith Bros	Chocolate	10.8
17754	James Ryan	Anderson & Patterson	Strawberry	10.4
17753	James Ryan	Anderson & Patterson	Vanilla	12.8
17755	Strombelis Bros	Progress Mfg. Co.	Vanilla	9.6
17749	J. E. Talbot	Own make	Vanilla	**5.3**
17757	Ernest Whittemore	Smith Bros	Vanilla	11.8
	Average			9.3
	ROCKVILLE.			
18002	John E. Gawtrey	Own make	Chocolate	**4.7**
17847	Palace of Sweets	Own make	Chocolate	13.8
17850	Mary Cuneo	Tait Bros	Coffee	9.2
18004	John Gawtrey	Own make	Coffee	**4.2**
18005	Mary Cuneo	Tait Bros	Pineapple	8.4
18748	Palace of Sweets	Own make	Strawberry	14.8
18003	John E. Gawtrey	Own make	Strawberry	**2.8**
17849	Mary Cuneo	Tait Bros	Vanilla	11.2
17846	Palace of Sweets	Own make	Vanilla	14.4
18001	John Gawtrey	Own make	Vanilla	**3.9**
	Average			8.7
	SOMERS.			
18007	Grace Holmes	Own make	Strawberry	10.0
18006	Grace Holmes	Own make	Vanilla	13.2
	Average			11.6
	SOMERSVILLE.			
18009	Homer Ice Cream Co	Own make	Chocolate	10.4
18008	Homer Ice Cream Co	Own make	Vanilla	13.2
	Average			11.8
	SOUTH MANCHESTER.			
17839	Mamacos & Ambulos	Own make	Chocolate	13.6
17841	Mamacos & Ambulos	Own make	Coffee	14.0
17840	Mamacos & Ambulos	Own make	Strawberry	13.6
17838	Mamacos & Ambulos	Own make	Vanilla	14.8
		Average		14.0
	SOUTH NORWALK.			
18428	New England Candy Co	Own make	Chocolate	12.0
18426	Charles Thomas	Own make	Chocolate	12.0

TABLE VII.—ANALYSES OF ICE CREAM.—*Continued.*

D. C. No.	Dealer.	Manufacturer.	Flavor.	Fat. %
	SOUTH NORWALK—(*concluded*).			
18431	Henry Wilkins	Own make	Chocolate	**1.2**
18434	Henry Wilkins	Own make	Chocolate	**4.5**
18427	Charles Thomas	Own make	Peach	10.0
18429	Plainsted Drug Store	DeKlym	Vanilla	10.0
18425	Charles Thomas	Own make	Vanilla	11.0
18430	Henry Wilkins	Own make	Vanilla	**3.6**
18432	Henry Wilkins	Own make	Vanilla	**3.4**
18433	Henry Wilkins	Own make	Vanilla	**2.5**
	Average			7.0
	SOUTHPORT.			
18262	M. R. Perry	Semon Ice Cream Co	Chocolate	10.0
18261	M. R. Perry	Semon Ice Cream Co	Vanilla	10.4
18263	M. Switzer	Horton Ice Cream Co	Vanilla	8.6
	Average			9.7
	STAMFORD.			
18213	G. K. Lawrence	Own make	Chocolate	11.0
16169	Xanthos Candy Co	Own make	Chocolate	13.2
18209	United Candy Co	Own make	Chocolate	8.6
18215	Eagle Candy Co	Own make	Chocolate	14.0
18217	Mazza & Co	Own make	Chocolate	**4.9**
18219	Olympia Confect. Co	Own make	Strawberry	11.2
18211	Xanthos Candy Co	Own make	Strawberry	12.4
18214	Eagle Candy Co	Own make	Vanilla	15.2
18216	Mazza & Co	Own make	Vanilla	**5.2**
18212	G. K. Lawrence	Own make	Vanilla	14.0
18221	G. K. Lawrence	Own make	Vanilla	13.4
18220	G. Scannalle	Own make	Vanilla	**6.2**
18207	Paul Sabini	Star Confectionery Co	Vanilla	8.0
18218	Olympia Confect. Co	Own make	Vanilla	11.2
18208	United Candy Co	Own make	Vanilla	9.2
18210	Xanthos Candy Co	Own make	Vanilla	12.8
	Average			10.6
	STONINGTON.			
18698	Victor Danesi	Maine Creamery Co	Chocolate	**7.8**
18239	Francis D. Burtch	Own make	Chocolate	15.6
18699	Victor Danesi	Maine Creamery Co	Coffee	8.4
18697	Paul Schepis	Dolby Ice Cream Co	Coffee	11.0
18238	Francis Burtch	Own make	Vanilla	13.6
18696	Paul Schepis	Dolby Ice Cream Co	Vanilla	10.2
	Average			11.1

TABLE VII.—ANALYSES OF ICE CREAM.—*Continued.*

D. C. No.	Dealer.	Manufacturer.	Flavor.	Fat. %
	STRATFORD.			
17327	Stratford Candy Kitchen	Own make	Chocolate	8.8
17328	Stratford Candy Kitchen	Own make	Strawberry	11.6
17326	Stratford Candy Kitchen	Own make	Vanilla	12.8
	Average			11.1
	SUFFIELD.			
17867	George Martinez	New Haven Dairy	Chocolate	8.4
17870	F. H. Reid	Own make	Chocolate	8.0
17869	F. H. Reid	Own make	Strawberry	6.4
17866	George Martinez	New Haven Dairy	Vanilla	9.6
17868	F. H. Reid	Own make	Vanilla	10.8
17871	Peter Janik	Tait Bros	Vanilla	10.0
	Average			8.9
	THOMPSONVILLE.			
18010	Harry Zirolli	Tait Bros	Chocolate	9.2
18013	Rice Bros	Own make	Chocolate	12.4
18014	Rice Bros	Own make	Strawberry	10.0
18011	Harry Zirolli	Tait Bros	Strawberry	9.2
18015	F. Athen & J. Devine	New Haven Dairy	Vanilla	8.6
18016	M. J. Dineen	Own make	Vanilla	15.2
18012	Rice Bros	Own make	Vanilla	13.2
	Average			11.1
	TORRINGTON.			
16645	Torrington Creamery	Own make		9.2
16646	Torrington Creamery	Own make		9.0
	Average			9.1
	UNCASVILLE.			
17799	Pappas Bros	Own make	Vanilla	8.8
	UNIONVILLE.			
17504	Hackney Ice Cream Co	Own make	Chocolate	**7.1**
17865	Hackney Ice Cream Co	Own make	Chocolate	8.0
17861	Heiman Ice Cream Co	Own make	Chocolate	9.0
17863	Heiman Ice Cream Co	Own make	Maple Nut	9.6
17505	Hackney Ice Cream Co	Own make	Strawberry	6.8
17862	Heiman Ice Cream Co	Own make	Strawberry	11.2
17864	Heiman Ice Cream Co	Own make	Vanilla	10.6
17503	Hackney Ice Cream Co	Own make	Vanilla	9.6
17860	Heiman Ice Cream Co	Own make	Vanilla	10.6
	Average			9.2
	WALLINGFORD.			
17294	Ally & David	Own make	Chocolate	11.2
17295	Ally & David	Own make	Strawberry	11.8
17293	Ally & David	Own make	Vanilla	13.2
	Average			12.1

TABLE VII.—ANALYSES OF ICE CREAM.—*Concluded.*

D. C. No.	Dealer.	Manufacturer.	Flavor.	Fat. %
	WAUREGAN.			
18658	John Albro	Own make	Chocolate	**6.8**
17765	Harmidos Wilmot	Own make	Coffee	**6.4**
18657	John Albro	Own make	Vanilla	8.0
17766	Harmidos Wilmot	Own make	Vanilla	**7.2**
	Average			7.1
	WEST HAVEN.			
17929	J. D. Illions	Semon Ice Cream Co	Chocolate	8.6
17931	Fred LeVere	Harris Hart Ice Co	Chocolate	8.4
17934	Nicholas Parela	Semon Ice Cream Co	Chocolate	9.2
17933	Harry Pite	New Haven Dairy Co	Chocolate	9.6
17932	Fred LeVere	Harris Hart Ice Cream Co	Strawberry	9.2
17930	Fred LeVere	Harris Hart Ice Cream Co	Vanilla	9.6
	Average			9.1
	WESTPORT.			
18294	J. J. O'Connor	DeKlym	Chocolate	8.4
	WILLIAMANTIC.			
16839	Hallock & Holbrook	Own make	Chocolate	16.0
16846	Patrick McDermott	Horton Ice Cream Co	Chocolate	**5.0**
16845	Peter Yanclas	Own make	Chocolate	13.4
16840	Hallock & Holbrook	Own make	Coffee	16.4
16806	William Morris	Own make	Coffee	15.2
16841	Styles Sisters	Own make	Peach	11.6
16837	William Morris	Own make	Strawberry	15.6
16838	Hallock & Holbrook	Own make	Vanilla	16.0
16835	William Morris	Own make	Vanilla	15.6
16842	Styles Sisters	Own make	Vanilla	15.8
16844	Peter Yanclas	Own make	Vanilla	14.4
	Average			14.1
	WINDSOR LOCKS.			
17877	Charles Colli	Homer Ice Cream Co	Chocolate	12.4
17872	Louis Molinari	Peter Fossa	Chocolate	8.8
17875	Vito Colapietro	Own make	Chocolate	**7.5**
17876	Vito Colapietro	Own make	Maple Nut	6.8
17874	Vito Colapietro	Own make	Vanilla	8.8
17879	Vito Colapietro	Own make	Vanilla	**3.2**
17873	Louis Molinari	Peter Fossa	Vanilla	9.6
17878	Charles Colli	Homer Ice Cream Co	Vanilla	13.2
	Average			8.8
	Average of State			10.1

The averages given for each city or town do not of course adequately represent the true conditions in the several localities. Data as to the gross sales of the various grades is necessary to show the true average quality available. For the same reason the average for the total number of samples does not properly represent the average market condition in the State; and the double standard further complicates the calculation. The larger manufacturers have naturally standardized their products at a figure close to the legal standard and their combined output constitutes the greater part of the gross supply. Of the smaller producers many, no doubt, are unwittingly furnishing rich cream through lack of careful factory control while others may be intentionally supplying an extra quality product to a limited or special class of trade. At any rate the figures show many samples testing well in excess of 8 per cent. and the average of all samples collected is 10.1 per cent.

Forty-seven samples, or 11.8 per cent. of the total number were below standard.

Of 4 samples submitted by individuals 1 was below standard.

MILK AND MILK PRODUCTS.

MARKET MILK.

Ten hundred and fifty-four samples of market milk have been examined for the Dairy and Food Commissioner, classified as follows:

Not found adulterated	752	71.4%
Adulterated by dilution with water	58	5.5
Adulterated by skimming	18	1.8
Adulterated by reason of being:		
below standard in solids and solids-not-fat	100	9.4
below standard in solids and fat	19	1.8
below standard in solids, fat and solids-not-fat	107	10.1
Total	1054	100.0

The number of samples found diluted with water is conspicuously less than in preceding years. Our data with respect to the quality of milk by official inspection summarized for the periods 1913 to 1917 inclusive and 1918 to 1920 inclusive are as follows:

	Period 1913-1917.		Period 1918-1920.	
Not found adulterated	815	43.0%	2246	60.9%
Adulterated by dilution with water	276	14.5	367	9.9
Adulterated by skimming	37	1.9	131	3.6
Otherwise adulterated or below standard	770	40.6	946	25.6
Total	1,898	100.0	3,690	100.0

This summarizes the history of the inspection of market milk for the past eight years and indicates a substantial improvement in the quality of this important product. This summary does not adequately represent the general quality of the milk in the State for the reason that, as we have stated previously, official samples, in perhaps the majority of cases, are taken upon suspicion of inferiority or adulteration and in response to complaints of local milk inspectors, health officers or dairy technicians. It is reasonable to presume therefor, that the average quality of milk sold in the State as a whole is better than the above figures indicate.

Samples found adulterated during the past year, other than those below standard are given in Table VIII.

Milk Submitted by Individuals.

One hundred and two samples of milk were examined for consumers, producers and others of which seventy-five were passed and twenty-seven were adulterated or below standard. None of these require particular comment.

Cream.

Two samples were submitted by the Dairy and Food Commissioner and four by individuals.

Tester's License.

Four samples of cream and two samples of milk have been examined to check candidates for certificates as provided in Sec. 2, Chapter 221, Public Acts of 1917.

Imitation Milk, etc.

13975. *Super-Cream.* Walter Jahn's "Super-Cream" made by the Rico Milk Products Co., East Troy, Wisconsin. Stated to contain at least 24 per cent. butter fat, and 31 per cent. total solids. Price 27 cents per can containing 7.5 ozs.

Analysis showed the following composition:

	As Sold.	Diluted with 5 parts water (calc.).
Solids	31.56%	5.26%
Ash	0.67	0.11
Protein	3.06	0.51
Sugar	3.83	0.64
Fat	24.00	4.00
Net weight	7.5 ozs.	....

The composition as stated on the label is substantiated by the analysis. However, the statement, which appears on the label, that "Super-Cream can be used wherever a rich milk is desired by the addition of five parts of water" is misleading. Such dilution would yield a product which approaches rich milk only as regards

Table VIII.—Adulterated Milk.

No.	Dealer.	Solids.	Fat.
	Containing Added Water		
	Andover.		
17455	Frank Swartz	9.93	3.4
	Branford.		
16338	E. W. Caldwell	10.19	3.2
16345	E. M. Yale	10.35	3.4
16346	E. M. Yale	10.59	3.2
16347	E. M. Yale	10.83	3.4
	Bristol.		
14989	A. H. LaLane	11.27	3.4
	Durham.		
16306	David Bros.	10.54	3.1
16307	David Bros	10.66	3.2
16308	David Bros.	11.52	3.8
16309	David Bros.	10.77	3.2
16310	David Bros.	9.77	3.2
	Elmwood.		
17999	Elmwood Catholic Ch.	9.55	3.0
	Milford.		
18504	Cecil Clark	10.12	3.1
18505	Cecil Clark	9.86	2.8
18507	Antonio Negosmeki	10.68	3.4
	Newington.		
18472	Wm. Bishop	10.52	3.4
18473	Wm. Bishop	11.06	3.6
18474	Wm. Bishop	10.68	3.3
	Newtown.		
16320	Frank Valalik	10.71	3.2
16321	Frank Valalik	10.44	3.2
16322	Frank Valalik	9.87	2.6
	Norwich.		
18783	Herbert Gardner	6.97	2.5
18784	Herbert Gardner	11.90	4.4
16786	John McLean	9.35	3.0
	Orange.		
16348	Benj. Hempstead	9.20	3.4
16126	M. DeCaprio	10.61	3.2
16342	Modestino DeCaprio	10.59	3.2
	Southbury.		
15344	H. M. Cassidy	10.18	2.8
16118	Thos. Lovedale	11.27	3.6
	Containing Added Water. —continued.		
	Southington.		
18479	Mrs. Neils Johnson	10.17	3.6
	South Norwalk.		
18526	Fred Frillow	10.49	3.2
	Torrington.		
15629	Fred Lehman	11.64	4.0
16617	F. B. Woodward	11.57	3.7
16618	F. B. Woodward	10.98	3.4
16612	Chas. Zangg	11.64	3.8
	Trumbull.		
16333	Andrew Persztai	9.63	2.9
	Wallingford.		
17638	Wilbur C. Fenn	10.53	3.2
17355	W. J. Self	9.61	3.2
17356	W. J. Self	9.47	3.0
17357	W. J. Self	10.30	3.6
17358	W. J. Self	10.07	3.6
17359	W. J. Self	10.47	3.6
	Waterbury.		
17380	D. M. Rogers	10.83	3.3
	Watertown.		
17484	John Popow	7.63	2.5
17485	John Popow	8.60	3.1
17486	John Popow	8.34	2.8
17487	John Popow	8.86	3.0
	West Hartford.		
18450	W. F. Brewer	9.81	2.4
15540	Ralph Gerth	11.15	3.5
18452	A. M. Morrell	6.93	1.4
	Westport.		
14986	Leonard Gault	10.19	3.2
16397	Leonard Gault	9.34	3.2
16398	Lenoard Gault	10.07	3.2
16399	Leonard Gault	8.54	2.6
16400	Leonard Gault	9.95	3.0
	Willimantic.		
18981	John W. Gilman	10.33	3.3
18978	L. P. Oehrig	9.61	2.7
18979	L. P. Oehrig	9.61	2.9

TABLE VIII.—ADULTERATED MILK.—*Concluded.*

No.	Dealer.	Solids.	Fat.	No.	Dealer.	Solids.	Fat.
	Skimmed Milk				*Skimmed Milk—Concluded.*		
	ANSONIA.				NORWICH.		
16468	Presto Lunch	11.25	2.3	18761	Boston Cafe	11.07	1.8
	EAST CANAAN.			18763	Wauregan Hotel	11.96	3.1
16545	S. Serlin	10.71	2.2		PLANTSVILLE.		
	DANIELSON.			16244	Stanley Tycz	9.96	1.8
18965	W. S. Brown	10.22	1.7		PUTNAM.		
	MOOSUP.			18968	H. Callas & G. Anas	11.72	2.9
18961	Joseph Cournoier	11.02	2.5	18966	Delvina Thereault	9.75	1.1
	NAUGATUCK.				TORRINGTON.		
15692	J. Daily	10.79	2.3	15220	F. J. Barton	12.81	3.3
	NEW LONDON.				WILLIMANTIC.		
18708	Far East Lunch	9.47	1.1	18984	H. Israel & Son	11.28	2.5
18709	New China Co.	9.82	1.5	18982	J. T. Nichols	11.17	2.7
18704	N. Y., N. H. & H. R.R. Co.'s Restaurant	9.62	1.2	18980	T. F. Shea	10.66	1.7
18718	Sea Food Lunch	8.90	0.9				

fat content as shown by the calculated analysis. The diluted product would be watered cream, not rich milk.

13175. *En-Zo.* "Imitation Milk. A compound of evaporated skimmed milk and refined cocoanut fat". Stated to contain 6.1 per cent. vegetable fat and 24 per cent. total solids. Made by the Enzo Company, Denmark, Wisconsin.

13970. *Carolene.* "A compound of refined nut oils and evaporated skimmed milk." The label also states that the product is composed of "fresh cow's milk, butter fat removed and highly refined cocoanut oil substituted", and that it contains 24 per cent. solids and 6 per cent. refined nut oils. Made by The Carolene Co., Inc., 130 No. Wells St., Chicago.

These products are of the same type as Hebe, a sample of which has already been examined in this laboratory.[1]

The composition of these products is shown by the following analyses:

[1]Conn. Exp. Sta., Bulletin 210, p. 224 (1918).

Number	13175	13970
Solids	23.19%	24.86%
Ash	1.50	1.59
Protein	6.76	6.89
Sugar	8.79	10.48
Fat	6.14	5.90
Constants of fat:		
Butyro-refractometer at 40°C.	36.8	36.00
Reichert-Meissel No.	9.2	.....

MILK POWDER.

Four samples of milk powders have been examined.

Klim brand, Powdered Whole Milk, **14412**; Klim brand, Powdered Skimmed Milk, **14413**; and Powdered Modified Milk, **15037**, for infant feeding, all made by the Merrell-Soule Co., Syracuse, N. Y.

Powdered Skimmed Milk, **14809,** made by the National Dry Milk Co., Dacoming, Wisconsin.

Products of this class examined by us in previous years have been summarized in an earlier Bulletin[1] from this laboratory.

Analyses of the products examined this year are as follows:

TABLE IX.—ANALYSES OF MILK POWDERS.

	14412 %	14413 %	15037 %	14809 %
Moisture	3.23	4.00	2.76	5.03
Ash	5.98	8.23	7.15	7.88
Protein (N x 6.38)	24.88	33.55	17.23	33.36
Lactose (by difference)	37.75	53.08	53.52	53.03
Fat	23.16	1.14	19.34	0.70
Acidity (as lactic acid)	....	....	0.85	1.72

In case of the whole milk powder it is directed to take eight special measures to one quart of water to make one quart of whole milk. Provided the powder is so measured as to obtain four and one-half ounces a milk of good quality will be secured. To do this however, the special measure which accompanies the package must be rather closely packed.

The analysis of the modified milk powder is substantially as stated on the label of this product.

MALTED MILK, ETC.

Six samples of products of this class have been examined. The brands include Borden's **13967**; Horlick's **13969**; and two products made by Thompson's Malted Food Co., Waukesha, Wisconsin, viz., Thompson's Malted Milk, **13579, 13968** and Thompson's Hemo, **13580, 14260.** Hemo is stated to consist of the combined extractives of barley and selected wheat, pastuerized milk, beef peptones and hemoglobin.

Analyses of these products are as follows:

[1]Conn. Exp. Sta., Bulletin 213, p. 406 (1919).

TABLE X.—ANALYSES OF MALTED MILK, ETC.

Number	13967	13969	13968	13579	13580	14260
Moisture	2.55%	3.05%	4.04%	3.72%	2.74%	...
Ash	2.93	3.80	3.80	4.32	4.65	...
Protein	14.38	15.06	10.00	12.75	13.50	...
Fiber	0.45	0.40	0.26	0.12	0.09	...
Nitrogen-free extract	70.71	69.59	74.69	73.59	73.62	...
Fat	8.98	8.10	7.12	5.50	5.40	...
Starch	none	none	none	trace	none	...
Iron (Fe.)	0.0013	0.0020	0.0002	....	0.0013	0.0050

Hemo contained 1.86 per cent. of water-soluble nitrogen distributed as follows: coaguable 0.87, precipitable by tannin-salt 0.83, residual 0.16. Malted milk, **13968**, contained 1.47 per cent. of water-soluble nitrogen distributed as follows: coaguable 0.83, precipitable by tannin-salt 0.49, residual 0.14. In the case of Hemo about 45 per cent. of the water-soluble nitrogen was precipitated by tannin-salt while in malted milk about 33 per cent. was precipitated by the same reagent indicating a larger proportion of nitrogenous substances of the peptone group in Hemo. It is understood, however, that tannin-salt is not a specific reagent for peptones, but precipitates other intermediate digestion products of protein such as proteoses, polypeptides, etc. The comparative figures given above are interesting, but the data is insufficient as a basis for any general conclusion.

Hemoglobin is the coloring matter of blood-corpuscles and is conspicuous for its iron content. The comparative figures for iron in the analyses given above show in one sample of Hemo no more iron than was found in Borden's malted milk; the second sample, **14260**, shows substantially more. Again the figures are suggestive rather than conclusive on account of limited data. According to analyses available in the literature the iron content of milk itself shows wide variations due in part no doubt to analytical differences.

The method we have employed for the determination of iron is as follows:[1]

Standard solution: Dissolve 0.7 gram of crystallized ferrous ammonium sulphate in 50 cc. of distilled water, acidify with 20 cc. of dilute sulphuric acid, heat slightly, add N/10 potassium permanganate until a faint pink color is obtained and dilute to a volume of 1000 cc. One cc. of this solution is equivalent to 0.0001 gm. of Fe. Prepare a series of standards using 1, 2, 3, etc., cc. of this solution to which is added 5 cc. of a solution of potassium thiocyanate (1:50) and dilute to a volume of 50 cc.

Determination: Burn 10 grams of sample in a platinum dish avoiding excessive heat. Add 5 cc. of conc. hydrochloric acid to dissolve the ash, transfer to a 100 cc. flask, add sufficient N/10 potassium permanganate to produce a faint pink color and dilute to volume. Filter if necessary. Take an aliquot of 40 cc. (= 4 gms. original material) add 5 cc. of potassium thiocyanate and dilute to 50 cc. Mix and compare with standards.

[1]Standard Methods of Water Analysis. Am. Public Health Asssoc., 1917, p. 44.

HUMAN MILK.

Fourteen samples of breast milk have been examined chiefly at the request of physicians and of the Visiting Nurse Association of New Haven. The value of these analyses is entirely dependent upon whether or not the samples are representative. All of the milk available at the time of feeding should be drawn and thoroughly mixed before sampling. The variations in composition between so-called 'foremilk', 'middlemilk', and 'strippings' from cows is well known. Söldner[1] has shown what these variations may be in the case of milk drawn from the human milk gland. In the following tabulation, Table XI, the first, second and third portions correspond to the fractions just indicated.

TABLE XI.—COMPOSITION OF DIFFERENT PORTIONS OF HUMAN MILK.

Sample.	Portion.	Weight of portion gms.	Solids. %	Protein (Nx6.38). %	Fat. %	Sugar. %	Ash. %
17	1st	33.1	8.82	1.15	1.71	5.50	0.46
	2nd	33.3	9.75	0.96	2.77	5.70	0.32
	3rd	57.3	10.72	0.83	4.54	5.07	0.28
67	1st	48.3	9.87	0.89	1.94	6.82	0.22
	2nd	30.3	14.11	0.89	3.07	9.92	0.23
	3rd	40.1	11.74	1.08	4.58	5.87	0.21
93	1st	39.6	8.44	1.08	1.23	5.97	0.16
	2nd	37.9	9.66	0.89	2.50	6.03	0.24
	3rd	41.9	12.17	0.89	4.61	6.43	0.24
118	1st	30.0	9.02	1.08	2.54	5.17	0.23
	2nd	22.5	10.42	1.02	3.98	5.17	0.25
	3rd	31.8	13.70	1.08	7.20	5.17	0.25

It is at once evident from these figures that the variations are chiefly due to fluctuations in fat content; and that no adequate idea of the substance and quality of the milk supply can be obtained unless the entire secretion of the gland is drawn and mixed before sampling. Thus the fat content of the entire yield in case of sample 17 is 3.22 per cent.

Analyses of the samples submitted during the past year are given in Table XII.

TABLE XII.—ANALYSES OF HUMAN MILK.

Station No.	Solids %	Protein (N x 6.38). %	Fat. %	Sugar. %	Ash. %
13634	14.10	1.37	5.8	6.73	0.20
14295	10.39	1.24	1.6	7.32	0.23
14296	...	2.23	2.64	....	....
14353	...	...	2.50	....	0.31
14398	12.95	1.72	4.0	7.00	0.23
14632	10.80	1.28	2.0	7.29	0.23
14942	15.59	...	6.9	..	0.19

[1]Lane-Claypon, Milk and Its Hygienic Relations, p. 23.

TABLE XII.—ANALYSIS OF HUMAN MILK—*Continued.*

Station No.	Solids	Protein (N x 6.38).	Fat.	Sugar.	Ash.
	%	%	%	%	%
14969	13.14	1.28	4.5	7.11	0.25
15105	14.77	1.50	5.3	7.75	0.22
15016	13.34	1.46	3.7	7.94	0.24
15172	...	...	4.0	...	...
15180	...	1.21	6.8	...	...
15221	12.17	1.02	3.8	7.17	0.18
15295	12.20	1.08	3.6	7.31	0.21

SYRUPS.

Two samples of bakers' syrups were examined.

14202. *Syromal.* It was found to contain 50 per cent. of cane sugar and 16.6 per cent. of invert sugar as determined by copper reduction methods. Polarizations at 20°C. were direct +36.3°, invert—10.4°.

14203. *Syrup,* claimed to be made of cane syrup, honey and acetic acid. It contained 42.8 per cent. of cane sugar and 30.2 per cent. of invert sugar. Polarizations at 20°C. were direct ±0°, invert —20.0°.

TEA.

No samples of tea were examined during the past year for inspection purposes, but methods for the determination of caffein were further studied and the results included in the report of the writer as Referee on tea to the Association of Official Agricultural Chemists at their annual meeting in November 1920.

The Power and Chestnut method[1] was studied and recommended to the Association as an official method. The Stahlschmidt method[2] which is now tentative, was further modified[3] so that caffein residues of a high degree of purity can be obtained. A new proceedure was also evolved[4], based upon the two methods just mentioned and the Deker[5] method, which has thus far been found to give satisfactory results and which is rapid and simple to manipulate. The two last named methods are being submitted for collaborative study with a view to the adoption of one or the other as an optional official method.

The proposed new method is as follows:

Preparation of sample: Grind the tea to pass a 1/25 inch sieve.

Assay: To 5 grams of material in a 500 cc graduated flask add 10 grams of heavy magnesium oxide and 200 cc. of distilled water. Boil gently over a low flame for two hours using a small bore glass tube 30 inches long as a condenser. Cool, dilute to volume and filter through a dry paper. Take an aliquot of 300 cc., equivalent to 3 grams of original material in

[1]Jour. Am. Chem. Soc., **41,** 1300.
[2]Jour. A. O. A. C. **2,** 3, 332.
[3]By C E. Shepard and the writer.
[4]By R. E. Andrew and the writer.
[5]Chem. Zentr **1,** 1, 62, 1903.

an erlenmeyer flask of 1,000 cc. capacity, add 10 cc. of a 10 per cent. solution of sulphuric acid and evaporate by gentle boiling until the volume is reduced to about 100 cc. Filter into a separatory funnel washing the flask with small portions of 1 per cent. sulphuric acid, and shake out six times with chloroform using 25, 20, 15, 10, 10, 10 cc. portions. Treat the combined extracts with 5cc. of a 1 per cent. solution of potassium hydroxide. When the liquids have completely separated draw off the chloroform layer into a suitable flask or beaker. Wash the alkaline solution in the separatory with two portions of chloroform of 10 cc. each and unite the washings with the main bulk of extract. Evaporate or distill off the chloroform to small bulk, transfer to a tared flask, evaporate to dryness, and further dry in a water oven at 100°C. to constant weight.

If desired, transfer the residue thus obtained to a digestion flask with successive small portions of sulphuric acid and determine nitrogen by the Kjeldahl method, calculating caffein from nitrogen by the factor 3.464.

The results obtained by the several methods are given in Table XIII.

TABLE XIII.—CAFFEIN IN TEA.

	Stahlschmidt Method. By weight.	Stahlschmidt Method. From N.	Power and Chestnut Method. By weight.	Power and Chestnut Method. From N.	Proposed Method. By weight.	Proposed Method. From N.
	%	%	%	%	%	%
Black tea, 4...	2.83	2.81	3.06	2.99	2.98	2.86
	2.89	2.87	3.05	3.03	2.94	2.87
	2.86	2.84	3.05	2.95	2.92	2.82
	....	....	....	....	2.80[1]	2.80[1]
	....	....	....	....	2.84[1]	2.80[1]
Green tea, 5...	1.64	1.63	1.61	1.55	1.70	1.61
	1.65	1.59	1.69	1.60	1.66	1.58
	....	....	....	....	1.77	1.66
	....	....	....	....	1.57[1]	1.52[1]
	....	....	....	....	1.62[1]	1.57[1]
Green tea, 9...	2.09[2]	1.94	2.12	2.01	2.14	2.08
Black tea, 10..	2.71[2]	2.63	2.69	2.67	2.62	2.62
Black tea, 12..	3.10[2]	2.96	3.20	3.12	3.00	2.93
	....	....	....	....	3.15	3.03
	....	....	....	....	3.12	2.99

Satisfactory methods[3] have been worked out for caffein in coffee but we have been interested to try the proposed method on that substance. In two samples tried we have obtained the following results:

Sample No.	Power and Chestnut Method. By weight.	Power and Chestnut Method. From N.	Proposed Method. By weight.	Proposed Method. From N.
	%	%	%	%
15409	1.51	1.47	....	....
	1.49	1.45	1.61	1.49
15410	0.21	0.17	....	....
	0.21	0.18	0.28	0.24

[1]Results by H. A. Lepper.
[2]Not purified by treatment with potassium hydroxide.
[3]H. A. Lepper, A. O. A. C. Referee on Coffee, Report of 1920.

Sample **15410** was a decaffeinated product. The results suggest that the method is probably applicable also to coffee.

VINEGAR.

One sample of vinegar submitted by the Dairy and Food Commissioner and nine by individuals have been examined for total solids and acidity. Three were found deficient in one or both particulars and seven were passed. The alcohol content of one of the samples was asked for. No alcohol was found as, of course, should be the case in the well made product.

MISCELLANEOUS MATERIALS.

Foods, Etc.

Five samples of miscellaneous food products collected by the Station agent and 8 submitted by individuals have been examined.

13954. *Ice cream cones,* made by the Repeater Cone Co., Cheshire, Conn., were found to be free from saccharin and preservatives. They contained: moisture 8.14 per cent., ash 1.05 per cent., protein 7.00 per cent., fat 1.02 per cent., nitrogen-free extract and fiber 82.79 per cent.

13977. *Orangeade Paste,* prepared by Emma Curtis, Melrose, Mass., The preparation is stated to contain fruit flavor and artificial color. It was found to contain 79.43 per cent. of solids, 68.70 per cent. of sugar (expressed as invert sugar), natural fruit flavor and a permitted color, Orange I. No preservative was found. This product has been examined once before[1] in this laboratory with substantially the same results.

13942. *Vanilla Paste,* made by Gra-Rock Products Co., Canton, Conn. Contents of one tube stated to be equivalent to 1 pint of liquid extract. No weight was given but the contents (squeezed out) weighed 36.7 grams. When mixed with a pint (473cc.) of water the solution or emulsion contained 0.01 gram of vanillin per 100 cc. equivalent to 0.13 per cent. in the original paste. The paste consists essentially of gum, glycerine and sugar with a small amount of vanillin. Vanilla extract of standard quality contains in 100 cc. the soluble matter from not less than 10 grams of vanilla bean[2]. The amount of vanillin obtained from 10 grams of vanilla bean will depend upon the quality of the bean and may vary from 0.07 to 0.24 gram[3]. However, this paste contained 0.047 gram of vanillin while the least amount that a pint of vanilla extract may be expected to contain is about 0.33 gram. We are advised that the manufacture of this product has been discontinued.

[1]Conn. Exp Sta. Bull. 219, p. 240 (1919).
[2]Standards of Purity for Food Products, U. S. D. A. Cir. 136, (1919).
[3]Conn. Exp. Sta. Report, 1901, p. 150.

13979. *Cherry Fam-ly-ade,* and **13978,** *Raspberry Fam-ly-ade,* made by the Fruit Valley Corporation, Rochester, N. Y. Each of these preparations was contained in a two-compartment glass vial; one solution consisted of, or contained, the color and sugar and the other (smaller) contained the flavor. The flavoring solution of **13979** contained 1.67 grams of benzaldehyde per 100 cc. while the flavor of **13978** appeared to be citric acid with some natural raspberry.

14391. *Baking Powder,* was found to be of standard quality as regards available carbondioxide, of which it contained 12.89 per cent.

15072 and **15165.** *Cheese,* two samples, contained 36.35 per cent. and 32.38 per cent. of moisture respectively.

15385 and **16168.** *Honey.* The samples were suspected of containing added glucose but no evidence of adulteration was found.

14170. *Orange Marmalade,* was suspected of containing artificial sweetener. No saccharin or glucose was found.

14402. *Pepper* (white), thought to contain a large amount of foreign material, conformed to the standards for white pepper. The sample contained moisture 9.03 per cent., ash 1.24 per cent., nitrogen 2.15 per cent., crude fiber 4.23 per cent., ether extract 7. 75 per cent. and ash insoluble in acid 0.10 per cent.

15170. *Surface Water,* was submitted for examination for an explanation of a scum thought to be oil. Examination showed, in parts per million, solids 320, loss on ignition (organic) 143, and mineral matter 177. Qualitative tests for iron were strong and there was no indication of oil. The fluorescent scum was due probably to organic iron compounds.

Wines, Liquors, Etc.

Ninety-one samples of alcoholic beverages have been examined for alcoholic content, or the presence of methyl (wood) alcohol, or both. The samples have been submitted chiefly by physicians, health and police officials and Prohibition Enforcement agents; and a considerable number of them have been examined by the writer as State Chemist.

Among these samples were eight taken from stock seized by Police and Detectives of Hartford in connection with the sale and consumption of "poison whiskey" which resulted in numerous deaths in that city and neighboring cities during the Christmas Holidays of 1919. On the day of the seizures samples were turned over to this laboratory where the nature of the deadly mixture was discovered and reported to the prosecutor. Of the eight samples six contained from 31.7 to 47.7 per cent. of pure methyl (wood) alcohol, one was fusel oil, used to imitate the whiskey flavor and one was genuine whiskey. Prosecutions which resulted developed the following history: A consignment of 1,000 gallons of

methyl alcohol shipped from a distillery in Michigan to a firm in London, England to be used for technical purposes and plainly marked, was stolen in Brooklyn, N. Y., while in transit, and distributed by a gang of bootleggers for beverages purposes. Three barrels found their way into this State with the results already stated, and had it not been for the prompt action of the Hartford authorities much greater disaster would have resulted.

This unfortunate affair naturally threw suspicion for a time upon all alcoholic liquors which accounts in part for the unusual number of samples submitted.

Other Materials Examined for Poisons, Etc.

Fourty-five samples of miscellaneous materials have been submitted by individuals or public officials to be examined for poisons or suspicious substances. In nine of these, examinations revealed or suggested the probable cause of the symptons or results noted.

14503. *Cake* with cocoanut frosting. The cake was suspicious because the cocoanut turned intensely pink after 24 hours. The pink color was extracted from the cocoanut and shown to be a dye, but not identified. A similar color was extracted from the cake itself. The reaction of the cocoanut on the bottom layer which was overlaid with the alkaline cake did not turn pink. It appeared that the cocoanut absorbed from the cake a color which developed a pink shade in presence of an acid.

14851. *Cider Vinegar.* This was reported to have made several persons ill. A large or considerable amount of arsenic was found.

14292. *Viscera of two geese and a duck.* The birds had died suddenly. Qualitative tests indicated considerable amounts of yellow phosphorus.

14394. *Milk and cereal* mixture prepared for feeding an infant. The sample submitted weighed 180 grams and contained 36 grains of carbolic acid. This amount would no doubt have proved fatal if it had been fed. It is recorded that 22 grains proved fatal to an adult.

14900. *Intestinal contents of a pig.* Large quantities of antimony were found.

15241. *Crystalline substance* found in bottle of milk. It proved to be potassium alum.

14452. *Old Fashioned Brown Sugar.* Complaint was made that an insoluble substance formed when milk was used with it in making candy. It was found that the sugar had an acidity requiring 14 cc. of N/10 alkali to neutralize it. When milk containing this sugar was boiled a coagulum formed. Milk containing the neutralized sugar formed no coagulum on heating. Directions were given for neutralizing the sugar with sodium bicarbonate to obviate the difficulty.

D. C. No. **18409.** *Domino Old Fashioned Brown Sugar.* Complaint was made similar to that in case of **14452.** A sample of the "insoluble substance" was submitted which was found to contain a considerable amount (2 per cent.) of nitrogen. Acidity was not determined but the explanation is doubtless the same as that already stated for the previous sample.

14201. D. C. Nos. **16501** and **18402.** *Rainbow Sugars.* The colors found were amaranth, indigo, carmine and tartrazine, all permitted colors.

15020. *Well Water.* A sediment in the water was shown to be iron rust or scale.

The remainder of the samples require no comment.

II. DRUGS, ETC.

PROPRIETARY REMEDIES.

Five preparations of this class have been examined.

13167. *Bliss Native Herbs*[1]. The Alonzo O. Bliss Medical Company, Washington, D. C. The remedy is stated to be free from opiates, narcotic drugs and mineral poisons. Forty-five cents was paid for a box of 67 tablets.

Examination and analysis show the following composition:

Average weight of tablets 0.34 gram; reaction faintly aicd; taste bitter. Analysis, parts per hundred: moisture 4.16 ash 6.43 (sulphates, trace, calcium, magnesium and phosphates, considerable); nitrogen 1.00; aloes and licorice present; ginger and cassia indicated; capsicum?; alkaloids none.

13171. *Kalpho,* prepared by the Parker Biochemic Company, New York. Nature's nerve tonic for the treatment of nervousness, sleeplessness, brain fag, etc.; a natural nerve food; contains no harmful nor habit-forming drug. Such are statements taken from the advertising literature.

Examination and analysis show the following composition:

Average weight of tablets 0.074 gram. Analysis parts per 100: moisture 0.08; ash 0.05 (calcium, sulphates and phosphates none or trace); iodides and bromides none; lactose, hydrated 97.7; extractives with ether from acid and from alkaline solutions, 0.12 and 0.03 respectively; extractives with chloroform from acid and from alkaline solutions 0.10 and 0.05 respectively; tests for alkaloids negative.

The tablets consist of milk sugar probably treated with some medicament in homeopathic dilution. We find no harmful drugs, or anything else of apparent potency.

13168. *Caldwell's Syrup Pepsin and Herb Laxative Compound.* The Pepsin Syrup Co., Monticello, Ill. Five fluid ounces cost 55 cents.

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[1]See also Street, Patent and Proprietary Medicines, p. 36.

Examination and analysis show the following composition:

Specific gravity at 15.6 °C. 1.200; alcohol by volume 5.30 per cent. The following constituents are in grams per 100 cc. Solids 52.81; ash 0.46 (calcium and magnesium present, phosphates and sulphates trace); invert sugar 1.54; sucrose 50.03; emodin-like substances present, senna indicated; salicylic acid (or salicylates) present; ether extractives from acid solution 0.216; chloroform extractives from alkaline solution, 0.026. Cloves and cinnamon flavor.

13172. *Cinot,* made by the Cinot Syndicate, Chicago, and extensively advertised as the Wonder Medicine of the Age. $1.20 was paid for a bottle of 8 fluid ounces.

Examination and analysis show the following composition:

Specific gravity at 15.6°C. 1.0553; alcohol by volume 0.20 per cent. Other constituents are in grams per 100 cc. Solids 13.79; ash 1.22 (phosphoric acid 0.04, sulphur trioxide, 0.10 calcium oxide 0.21, magnesium oxide 0.07); invert sugar 3.29; sucrose 4.22; vegetable material other than sugar 5.06; ether extractives from acid solution 0.67; emodin-like substances present, rhubarb indicated; salicylic acid (or salicylates) present; chloroform extractives from alkaline solution 0.024; alkaloids trace? not indentified.

The preparation is an aqueous solution containing about 14 per cent. of solids one-half of which is sugar and the remainder mineral and vegetable matter consisting of, or containing cathartic drugs including rhubarb. Aside from any efficacy the salicylate may have as a rheumatism remedy it also serves the more useful purpose (to the manufacturers) of preserving the liquid in the enforced absence of an appreciable amount of alcohol.

Possibly the secret of the wonderful remedial effects which are said to follow the use of this medicine is to be found in the literature contained in the package where we read in the directions "Drink plenty of water."

13170. *Allenrhu.* Made by the Alle-Rhume Remedy Co., Rochester, N. Y. Indicated for all conditions of rheumatism, etc. Price $1.50 for 16 fluid ounces.

Examination and analysis show the following composition:

Specific gravity at 15.6°C. 1.0848; alcohol none; the following constituents are in grams per 100 cc.: solids 13.93; ash 6.64 (phosphoric acid 1.72, sulphur trioxide 1.84, calcium and magnesium present); ether extractives from acid solution 0.82 (salicylic acid 0.76); chloroform extractives from alkaline solution 0.01; alkaloids trace?; invert sugar 1.90 sucrose 1.00; organic material (non-sugars) 4.39; emodin-like substances none.

The preparation is an aqueous solution of mineral salts, salicylic acid (or salicylates) with sugar and other organic material. The usual laxative vegetable drugs are not indicated.

SOAP.

Fats and oils are essentially combinations of fatty acids and glycerol. When treated with caustic alkali they undergo a definite chemical process (saponification) whereby the acidic portion of the fat or oil combines with alkali, glycerol is liberated and a soap is formed. In broad terms any metallic salt of a fatty acid is a soap; thus lead, zinc, calcium or magnesium soaps are made and have special uses. But the soaps of household use are the alkali-metallic (sodium or potassium) salts of fatty acids, and it is to this class that the term soap is generally restricted.

Taking as an example a common fat, 890 parts of stearin treated with 120 parts of caustic soda yield 918 parts of sodium soap and 92 parts of glycerol. Incidentally this shows an important reason for the war time economy in the use of fats since about one-tenth of the weight thereof is glycerol which is an essential in the manufacture of munitions.

The art of soap making is of ancient origin, but its chemistry is comparatively modern. Pliny describes a product made from goat's tallow and wood ash lye, and the treatment of fats in this manner is not entirely forgotten in the present day.

Both the character of the fat or oil used and the kind of alkali employed will determine the nature and quality of the resulting soap. The solid vegetable or animal fats, or fatty acids therefrom, with sodium produce hard soaps, while fish and vegetable oils with potassium yield soaps of softer variety. But with the same oil or fat the soap formed by the use of sodium is harder than that formed when potassium is the saponifying agent.

The soaps of sodium and potassium are soluble in water, in which particular they differ from the soaps of other metals and to which they owe their practical importance. The soaps of calcium and magnesium are insoluble and advantage is taken of this fact to distinguish hard waters. If a soluble soap becomes insoluble in water from a particular source it indicates the presence of lime or magnesia to which the hardness of water is due.

So-called marine or salt water soaps are sodium soaps of palm nut or cocoanut oils. They are not rendered insoluble by dilute brine solutions and hence a lather can be produced with them in sea water.

The most important property of soap is its detergent or cleansing action to explain which several theories, none entirely conclusive, are offered. Considerable emphasis has been given to the action of free alkali resulting from hydrolysis of the soap in solution. Mechanical affect has been advanced as an explanation based on the readiness with which soap removes mineral oils from metal surfaces. Since mineral oils do not saponify the chemical factor is eliminated in this instance. Probably the complete explanation includes also a consideration of the Brownian movement or pedisis of the lather, the formation of adsorption

compounds and the peculiar properties of colloidal solutions, of which soap in a water "solvent" represents a type.

Judgment of the quality of soap depends upon the purpose for which it is intended. Free alkali should be absent in toilet soap but it is permissible, and in limited amount, advantageous in soaps for scouring and manufacturing purposes. As a rule the less extraneous matter a soap contains the better its quality but there are exceptions such, for example, as the addition of starch to soap for use on woolen or silk fabrics. Insoluble earthy matters, unless for abrasive purposes, are regarded as adulterants; but alkali carbonates, silicates and borates are permissible on account of their detergent properties.

The detailed analysis of soap presents numerous difficulties, some of which are pointed out by Low[1] in a discussion of proposed standard methods of soap analysis. The complex nature of even the common types of laundry soap makes it impossible to show their exact chemical composition by the ordinary uniform methods of systematic analysis. We have attempted, however, to gain a general idea of the substance and quality of the soaps examined by determining the more conspicuous constituent groups by methods generally employed. The samples herein reported have been examined in two different years and the methods used in case of the older samples differ in some respects from those used in later examinations. The methods used in 1919 were based upon those outlined in Allen[2], Sadtler[3], Lewkowitsch[4] and the Bureau of Standards[5]. More recent tentative standard methods[6] have been followed in part in case of samples examined in 1920.

Methods of Analysis.

Preparation of sample: Reduce one transverse half of the solid cake to thin shavings or, if possible, run the entire cake through a food chopper, mix well and place in a tightly stoppered container.

Water (and volatile): Dissolve 2 grams of the sample in the smallest possible amount of hot 95 per cent. alcohol. Completely absorb the alcoholic solution of soap with recently ignited asbestos contained in a flat bottom dish, the dish and asbestos being first accurately tared, evaporate on a steam bath and finally dry to constant weight at 100°C.

It was found that practically constant weights were obtained after 5 hours drying except in case of soaps containing large or considerable amounts of glycerin. Since many soaps contain appreciable quantities of glycerin and soaps generally, particularly laundry soaps, contain it to some extent, a method of drying in a vacuum over sulphuric acid at room temperature was tried. This alternate proceedure is as follows:

[1]Jour. Ind. Eng. Chem, **11**, 12, 1169. (1919).
[2]Commercial Organic Analysis, 4th Ed., **2**, 422 et seq.
[3]Industrial Organic Chemistry, p. 85.
[4]Chem. Technol. and Analysis of Oils, Fats and Waxes.
[5]U. S. Dept. Commerce, Bureau of Standards, Circ. 62.
[6]Jour. Ind. Eng. Chem. **11**, 8, 785.

Weigh 2 grams of the sample into a shallow dish, provided with a tight fitting cover to prevent absorption of moisture while weighing the dried sample, place in a desiccator over sulphuric acid, exhaust, and allow to stand for 24-hour periods agitating the surface of the acid occasionally by gentle shaking.

The weight was found to be constant at 96 hours and a shorter period was generally sufficient. Comparative losses by these two methods of drying are given in the following tabulation.

Sample No.	Loss on Drying. Water oven at 100°C. %	In vacuum at room temp. %	Remarks.
13182	4.63	4.63	.....
13185	9.92	8.23	Glycerin claimed.
13186	5.02	4.76	.....
13187	10.16	7.37	Glycerin claimed.
13188	4.55	4.25	.....
13189	13.31	8.29	Glycerin claimed.
13190	5.11	3.87	Glycerin?.
13191	11.21	6.70	Glycerin claimed.

The results by the two methods are seen to agree reasonably well unless glycerin is present. Sample **13190** may have contained this constituent. Neither method represents the true water content of the soaps as considerable volatile matter other than water is lost at the higher temperature while water itself in combinations with certain alkali salts (carbonates and silicates) probably remains in either case.

Unsaponified and unsaponifiable matter: Transfer the dry residue, obtained in the determination of water, to an extraction tube and extract with petroleum ether for sixteen hours in a continuous extraction apparatus. Evaporate the solvent and dry the residue at 100°C. This will give *free fatty acids*, if present, *neutral fat*, and *unsaponifiable matter*. Deduct from this figure the per cent. of free fatty acids as determined subsequently by titration.

Free alkali and free acid: Dissolve 2 grams of the sample in hot neutral 95 per cent. alcohol, filter through a Gooch crucible, wash with the solvent and add a few drops of phenolphthalein to the filtrate. If the reaction is alkaline titrate with N/10 acid and express the result as per cent. of sodium hydroxide. If the reaction is acid titrate with N/10 alkali and express as per cent. of oleic acid (1 cc. of N/10 alkali is equivalent to 0.0282 gram oleic acid).

Alkalinity due to corbonates, silicates and borates: Exhaust the residue in the crucible (obtained in the previous determination of free alkali or free acid), by repeated additions of boiling water, transfer to a 100 cc. volumetric flask, cool and make up to volume. Titrate an aliquot with N/10 acid, using methyl orange as an indicator. The result is the alkalinity due to carbonates, silicates, etc., and is expressed in terms of per cent. of sodium oxide, Na_2O.

Material insoluble in alcohol and in water: Wash the residue still remaining in the crucible (from the previous determination), with a little alcohol and ether, dry at 100°C. and weigh.

Fatty (and resin) anhydrides: In our first analyses Method A was used. Since then Method B has been published[1] and this proceedure was followed in case of samples examined in 1920.

(A) Dissolve 2 grams of sample in 50 cc. of hot water in an Erlenmeyer flask, add 20 cc. of N/2 sulphuric acid and heat on the steam bath until the fatty acids form a clear layer on the surface of the solution. Bring the fatty acids up into the neck of the flask with hot water, and allow to cool. Loosen the hardened fatty acids and, without removing them, filter off the acid solution, saving the same for subsequent titration to determine total alkali. Add 50 cc. of hot water to the fatty acids in the flask and heat again until they form a clear layer, finally bring them into the neck of the flask and allow to harden. Mechanically remove the plug of hardened fatty acids to a small tared beaker. Pass the aqueous solution through the same filter previously employed and combine the filtrate with the previous one saved for the determination of total alkali. To the main portion of fatty acids in the tared beaker add any particles which have accumulated on the filter. If any traces adhere to the sides of the original flask, rinse out the dry flask with small portions of petroleum ether and add the washings to the tared beaker. Evaporate off the solvent, dry at 100°C and weigh. Deduct from this weight the total petroleum ether extract (which included free fatty acids, unsaponified fat, and unsaponifiable matter), and obtain the weight of fatty and resin acids combined as soap. The factor 0.97 has been used to convert figures for fatty and resin acids to their anhydrides although for certain oils this may be inaccurate.

Note. In some cases the fatty acids are liquid or semi-liquid at room temperature. In such instances weigh out 2 grams of dry beeswax and add it to the soap solution. The separated fatty acids will become incorporated with the wax and form a cake. Correct the final weight for the weight of the wax added.

(B). Dissolve 5 grams of soap in 100 cc. of water in a weighed 400 cc. Erlenmeyer flask. When completely dissolved add dilute sulphuric acid in slight excess, place a funnel in the neck of the flask and heat on a steam bath at a temperature not above 80°C until the fatty acids form a clear oily layer. Cool and transfer both fatty acids and acid water to a separatory funnel washing out adhering fat from the flask with petroleum ether (B. P. not over 65°C) using about 50 cc. of solvent. Shake out the fatty acids, avoiding too vigorous agitation, and allow the liquids to separate. Draw off the acid solution. Wash the petroleum ether layer in the separatory with three 25 cc. portions of water adding the washings to the acid solution first separated. Extract the acid solution with petroleum ether in 50, 25, and 25 cc. portions, unite the three extracts and wash with water as in case of the original petroleum ether solution. Filter the original petroleum ether solution and the petroleum ether extracts of the acid washings, both of which are now free from water-soluble impurities, through a paper wet with petroleum ether into a tared flask of suitable capacity provided with a stirring rod. Wash the filter free from fatty acids. Add 100 cc. of freshly boiled neutral 95 per cent. alcohol to the filtrate and titrate with N/10 sodium hydroxide to neutrality using phenolphthalein as an indicator. Calculate Na_2O as soap after deducting for free fatty acids in the original soap. Evaporate the neutral petroleum ether-alcohol solution to dryness breaking up any lumps of soap that may form by means of the stirring rod provided for the purpose. Dry to constant weight at a temperature not over 105°C and express the result as *soda soap* (unsaponified and unsaponifiable matters are included

[1]Tentative Standard Methods for the Sampling and Analysis of Commercial Soaps and Soap Products. Jour. Ind. Eng. Chem., 11, 8, 785-88, (1919).

and should be deducted if separately determined). Deduct the weight of sodium oxide (Na_2O), already calculated, from the weight of soda soap to obtain the weight of *fatty anhydride.*

The data on thirty-eight samples of laundry and toilet soaps are summarized in Table XIV.

There are no official specification or standards for soap in this State. Standards formulated by various Government Departments and by private enterprises differ considerably in their requirements but the following specifications relating to laundry and toilet soaps may be quoted from a set of Government regulations:[1]

Laundry Soap, (for use with soft water). Moisture must not exceed 20 per cent.; volatile matter at 105°C. not more than 34 per cent.; free alkali (as NaOH) not more than 0.2 per cent.; alakline salts, as Na_2CO_3, not more than 1.0 per cent.; insoluble in water not more than 0.1 per cent.; rosin not more than 15 per cent.

Laundry Soap (for use with moderately hard water). Moisture must not exceed 20 per cent.; volatile at 105°C., not more than 34 per cent.; free alkali, as NaOH, not more than 0.5 per cent.; alkaline salts, as Na_2CO_3, not more than 6 per cent., nor less than 2.0 per cent.; insoluble in water not more than 0.5 per cent.; rosin not more than 25 per cent.

Milled (Toilet) Soaps. Volatile matter at 105°C. must not exceed 15 per cent.; free alkali, as NaOH, not more than 0.1 per cent.; alkaline salts, as Na_2CO_3, not more than 0.3 per cent.; insoluble in water nor more than 0.1 per cent.

White Floating Soap. Volatile matter at 105°C. must not exceed 34 per cent.; alkaline salts not more than 0.5 per cent.; otherwise the same as for milled soap.

Elsewhere[2] it is stated that a good grade of laundry soap will contain not less than 60 per cent. of fatty acids and not more than 0.5 per cent. free (caustic) alkali. Toilet soap should be free from caustic alkali, should not contain excess of water and should be free from loading material or filler.

The following *upper limits* for the several constituents of different types of toilet soaps may also be quoted.[3]

	Free alkali NaOH.	Alkali as Na_2CO_3.	Free fatty acids as oleic acid.	Insoluble matter.	Water.	Actual soap.
	%	%	%	%	%	%
Floating Soap	0.25	0.40	0.50	1.0	20.0	80.0
Transparent Soap.	0.10	0.10	0.25	0.3	15.0	75.0
Castile Soap	0.25	0.25	0.50	1.0	10.0	85.0
Milled Soap	0.10	0.30	0.25	1.0	10.0	85.0

It would appear from the foregoing and other data that above 20 per cent. of water in any hard soap is rather excessive; that free alkali should be present in but very small amounts if present at all; that free fatty acids should not greatly exceed 0.5 per cent. although

[1]Dept. of Commerce, Bureau of Standards, Circ. 62, (1916).
[2]Canada Inland Revenue Dept., Bull. 408, 1918.
[3]No. Dakota Food Dept., Special Bull., IV, 2, (1916).

TABLE XIV.—ANALYSES OF SOAP.

Station No.	Brand.	Manufacturer.	Weight of Cake.	Cost of Cake.
	Laundry Soaps.		ozs.	cts.
11959	Best	B. T. Babbitt	8.2	7
12552	Bee	Colgate and Co	9.1	8
11971	Sunny Monday	N. K. Fairbanks Co	7.4	6
11960	Ozone	Fairchild & Sheldon Co	7.9	6
11963	Naptha	Fels & Co	8.6	7
11968	Borax	Kendall	8.8	5
11961	Borax	Kirkham	10.7	6
12551	Lenox	Proctor and Gamble Co	8.6	8
12550	Star	Proctor and Gamble Co	9.1	8
11972	White Naptha	Proctor and Gamble Co	9.1	8
11962	Arrow Borax	Swift & Co	9.2	7
12554	Pride	Swift & Co	8.6	7
11970	U. S. Mail	Globe Soap Co	8.2	6
12548	Welcome Borax		8.9	8
	Toilet Soaps.			
13178	Miona Witch Hazel	Armour and Co	2.4	5
13177	Venetian Verbena	Armour and Co	4.6	10
13194	Castile	Cincinnati Soap Co	2.2	5
13193	Monarch Oatmeal	Cincinnati Soap Co	2.5	5
13192	Sternes Buttermilk	Cincinnati Soap Co	2.3	5
13191	Sternes 47 Transparent Glycerine	Cincinnati Soap Co	2.0	5
13188	Coleo	Colgate and Co	2.9	10
13182	Palm	Colgate and Co	3.4	10
13176	Lucerne Rose	Crystal Soap Co	3.4	10
12555	Pearl	Globe Soap Co	4.7	6
11969	White Rose	Globe Soap Co	3.5	5
13206	Oatmeal	Holman Soap Co	4.6	10
13207	Pure	Holman Soap Co	6.4	10
13185	Violet Glycerine	Jergen	2.6	10
13180	Glycerine	J. S. Kirk and Co	3.8	10
13187	Jap Rose, Glycerine	J. S. Kirk and Co	3.8	10
13189	Harmony Rose, Glycerine	Liggetts & Co	4.2	15
13181	Rose Bath	Palmolive Co	2.7	5
15263	Ivory	Proctor and Gamble Co	4.6	10
13179	Oatmeal	John T. Stanley	1.9	5
13184	Violet Spray Glycerine	Mm. Waltke & Co	4.3	10
13190	Jersey Cream	J. B. Williams Co	3.6	15
13186	Florentine Carnation	A. B. Wrisley Co	2.8	10
12553	Lifebuoy	Lever Bros. Co	3.9	10

SOAPS.

Station No.	Actual Soap in Cake.	Actual Soap Cost per Ounce.	Loss on Drying.		Fat and Unsaponifiable.	Free Fatty Acids as Oleic Acid.	Alkali, as Na_2O combined as		Fatty and Resin Anhydrides.	Actual Soap.	Insoluble in Alcohol and Water.
			at 100°C.	in vacuum at 20°C.			Carbonate, Silicate, etc.	Soap.			
	ozs.	cts.	%	%	%	%	%	%	%	%	%
11959	5.1	1.4	25.56	....	4.27	0.42	2.30	7.70	54.71	62.41	2.26
12552	5.6	1.4	27.94	....	1.89	none[1]	1.42	8.96	52.56	61.52	0.50
11971	4.5	1.3	14.03	....	1.16	0.28	4.79	6.51	54.96	61.47	3.65
11960	5.7	1.1	20.17	....	2.92	0.28	0.50	8.79	62.87	71.66	0.33
11963	4.8	1.5	22.96	....	3.36	0.23	1.18	8.35	47.31	55.66	9.59
11968	6.1	1.2	22.90	....	1.69	0.23	1.15	8.77	60.30	69.07	1.63
11961	7.1	1.2	25.33	....	2.34	0.57	0.56	8.51	57.80	66.31	0.05
12551	5.2	1.5	23.04	....	6.45	0.14	1.73	8.62	52.26	60.88	2.68
12550	6.5	1.2	19.54	....	2.23	0.71	1.26	9.14	62.61	71.75	1.12
11972	4.7	1.7	17.92	....	0.42	0.28	6.97	5.18	46.97	52.15	0.80
11962	6.9	1.0	19.64	....	3.35	0.28	0.71	9.29	65.51	74.80	1.18
12554	5.6	1.3	20.74	....	4.72	3.63	0.22	9.94	56.63	66.57	5.38
11970	5.1	1.2	18.88	....	1.28	0.28	3.13	8.88	53.77	62.65	4.50
12548	6.3	1.3	16.53	....	1.73	0.85	2.30	7.65	63.10	70.75	1.40
13178	2.2	2.3	....	4.27	....	1.01	0.11	9.98	80.97	90.95	0.80
13177	4.2	2.4	....	4.95	....	0.42	0.06	10.02	81.81	91.83	0.56
13194	1.8	2.8	....	3.76	....	none[2]	0.20	9.45	72.97	82.42	10.80
13193	1.9	2.6	....	5.66	....	none[2]	0.18	9.00	67.80	76.80	14.53
13192	1.9	2.6	....	4.37	....	none[2]	0.17	9.32	74.48	83.80	8.28
13191	1.3	3.9	11.21	6.70	....	0.67	0.06	7.87	56.29	64.16	0.12
13188	2.7	3.7	4.55	4.25	....	0.56	0.10	10.52	83.42	93.94	0.48
13182	3.2	3.1	4.63	4.63	....	none[2]	0.13	10.46	83.43	93.89	0.10
13176	2.1	4.8	....	7.52	....	none[2]	0.72	7.15	54.29	61.44	0.20
12555	3.9	1.5	8.39	....	0.46	0.42	0.47	10.71	72.44	83.15	1.45
11969	3.0	1.7	6.60	....	0.65	0.23	0.16	10.92	73.42	84.34	1.20
13206	4.1	2.4	....	5.51	....	0.45	0.30	10.08	79.70	89.78	1.44
13207	5.5	1.8	....	3.58	....	none[2]	0.07	9.70	77.48	87.18	6.26
13185	1.7	5.9	9.92	8.23	....	2.14	none	7.81	58.62	66.43	0.12
13180	3.5	2.9	....	6.42	....	none[2]	0.10	10.30	80.94	91.24	0.80
13187	2.5	4.0	10.16	7.37	....	none[2]	0.41	7.68	57.68	65.36	0.02
13189	2.7	5.6	13.31	8.29	....	none[2]	0.26	7.68	57.62	65.30	0.08
13181	2.4	2.1	....	5.65	....	none[2]	0.30	10.27	79.27	89.54	0.70
15263	4.1	2.4	....	9.25	....	0.67	0.08	10.58	78.46	89.04	0.50
13179	1.7	2.9	....	5.96	....	none[2]	0.11	10.11	80.19	90.30	4.72
13184	2.6	3.8	....	8.09	....	none[2]	0.44	7.05	52.90	59.95	0.06
13190	3.4	4.4	5.11	3.87	....	none[2]	0.24	10.39	83.07	93.46	0.18
13186	2.6	3.8	5.02	4.76	....	0.45	0.10	10.27	81.43	91.70	1.18
12553	3.3	3.0	10.25	....	1.18	0.56	0.12	8.38	76.63	85.01	0.05

[1]Free alkali trace.
[2]Free alkali none.

many specifications omit any reference to this item from which we might infer that it was not of serious consequence; that alkali combined in forms other than soap and free alkali, i.e., as carbonate, etc., is not undesirable and that the limits vary depending upon the purpose for which the soap is intended; that matter insoluble in water should not exceed about 1 per cent. (much less in toilet soap according to some specifications); and that resin is permissible[1] as a fatty substitute and its soap equally considerable with fatty soap as a detergent.

In interpreting the results summarized in Table XIV, several points should be kept in mind. As already explained loss on drying at 100°C. includes matter which is volatile at that temperature. Drying in vacuum at room temperature approaches more nearly the true water content although alkaline carbonates and silicates will still retain some moisture. Although unsaponified fat and unsaponifiable material have not been determined in all of the toilet soaps the amounts present will be small, generally not exceeding 1.0 per cent. Free alkali is regarded as free caustic alkali, a trace being found in only one sample. Alkali combined as carbonate, silicate, etc., is expressed, in some analyses, as sodium carbonate. We have expressed alkali in these forms as sodium oxide, but the figures can be interpreted as hydrated sodium carbonate by multiplying the figures as given in the table by two. In the case of toilet soaps the fatty and resin anhydrides include fat and unsaponifiable matter which were not separately determined, but the small amount of such material usually present will not substantially alter the figures given. The estimates of cost per ounce of actual soap are based upon the prices actually paid for samples at the time of purchase, but all of the laundry soaps and some of the toilet soaps were purchased in 1919 when the price of soap was abnormally high and somewhat higher than at present, although pre-war prices do not yet prevail.

The analyses indicate that free caustic alkali is not so generally present in soaps as many suppose. The liberation of free alkali by hydrolysis in solution is automatically corrected, to some extent at least, by the presence of free fatty acids which tend to neutralize it as formed. We understand that it is for this purpose that the practice of introducing an excess of fatty material ("superfatting") is adopted.

The losses sustained by the laundry soaps at 100°C. although above 20 per cent. in a number of samples cannot be said to be excessive since the loss is not entirely due to water. The toilet soaps have shown uniformly less than 10 per cent. of moisture.

The limits for free fatty acids judged by the specifications and standards cited are not conspicuously exceeded except in sample **12554.**

[1]Lewkowitsch, II, p. 1073.

The actual soap, taken as the sum of fatty and resin anhydrides and alkali combined as soap, has been found to be between 60 and 70 per cent. as a rule in the case of laundry soap and generally above 80 per cent. in toilet soaps. Marked deficiencies in this respect in soaps of the latter type are due in part to glycerine and ingredients such as alcohol and sugar which enter into the composition of transparent soaps.

Insoluble matter in the laundry soaps is in most cases much higher than the specifications we have cited. This consists largely, or in part, of insoluble silica. Several of the toilet soaps show high percentages of insoluble matter due perhaps to siliceous matter added to increase detersive properties, or inert material such as starch, talc, etc. The cost of actual soap in products for laundry purposes is seen to vary between one cent and one and one-half cents per ounce, this upper limit being exceeded in only one case. The range is greater in the toilet soaps, the cost varying from one and one-half to about six cents per ounce. It will be noticed that no high-priced fancy soaps are included in the list.

Six miscellaneous samples of soaps have also been examined.

13943. *Cucumber Cream Soap*, made by U. S. Soap Co., New York, was found to contain 16.8 per cent. of water, 22.2 per cent. of fatty anhydrides and 3.4 per cent. of alkali (as Na_2O) combined as soap. It contained 25.6 per cent. of actual soap. Judging from the size of the wrapper the cake, as examined, was only about two-thirds of the original size indicating a large amount of water in the fresh soap.

15137, 15138, 15144. These soaps were examined for the Department of Entomology. They contained in the order named approximately 2.5 per cent., 4.19 per cent. and 35.6 per cent. actual soap.

14221, 14222. *Toilet Soaps.* Samples sent by the Department of Health, Bridgeport. They contained respectively 47.3 per cent. and 46.4 per cent. mineral matter insoluble in water.

TOILET PREPARATIONS.

The following samples were submitted by the Dairy and Food Commissioner.

16863. *Bay Rum.* Made by Wm. H. Loveland Co., Binghampton, N. Y., was declared to contain 20 per cent. of alcohol but was found to contain only 10.48 per cent. No. **16765** was passed. Neither contained wood alcohol.

17130. *Empress Instantaneous Hair Color Restorer*, Dark Brown shade and **17019**, the same name but a black shade. The Empress Manufacturing Co., Inc., New York.

Examination was as follows:

17130, bottle 1, contained paraphenylene diamine; bottle 2 contained 2.28 grams hydrogen dioxide per 100 cc. of solution.

17019, bottle 1, contained paraphenylene diamine and bottle 2 contained 1.16 grams hydrogen dioxide per 100 cc. of solution.

Paraphenylene diamine is a dangerous compound on account of its poisonous properties. Hair dyes, under other names, consisting of the same components as found in this one have been noted before[1].

The manufacturer claims that the danger attending the use of paraphenylene diamine is removed by the use therewith of an oxidizing agent such as hydrogen peroxide. However this may be, the evidence based upon reported injuries following the use of such preparations is that the combination does not work out satisfactorily in practice.

16939. *Liquid Silmerine.* Made by Parker, Belmont & Co., Chicago.

The sample was examined as follows:

Constituents are in grams per 100 cc. Solids 1.91; ash 1.26 (sodium carbonate and borate present); precipitable by alcohol 1.07 (uncorrected for ash).

16938. *Pepsodent.* Made by the Pepsodent Co., Chicago. Only alcohol was determined. It contained 1.52 per cent. alcohol by weight, no methyl alcohol present.

Note.

A request for a re-examination of our records in case of samples No. **14842,** Quinol Hair Tonic and No. **14872,** Lily of the Valley Toilet Water was received from the Colgate Company of New York. Examination of these preparations, Bulletin 219 of this Station, pp. 250 and 251, showed them to contain respectively 29.16 per cent. and 67.65 per cent. of alcohol by volume. The manufacturers claimed that careful control of these products was maintained and regularly showed 35 per cent. and 70 per cent. respectively. Our records show that duplicate determinations were made in case of **14842**, because of the variation, and that these were in close agreement; and no error was found in the record of sample **14872.** However, new samples of the preparations named were procured in the market by our Station agent and alcohol determined. Quinol Tonic was found to contain 34.85 per cent., and Lily of the Valley Toilet Water 68.56 per cent. of alcohol.

The Colgate Company was advised of our new results; but we are unable to find our original figures in error.

[1]Conn. Exp. Sta. Report 1914, p. 289; Report of Chem. Laby., Am. Med. Assoc., 1910, p. 111.

UNITED STATES PHARMACOPOEIA DRUGS.

Tincture of Cinchona and Tincture of Cinchona Compound.

The United State Pharmacopoeia prescribes that Tincture of Cinchona shall contain in 100 mils of solution not less than 0.8 gram nor more than 1.0 gram of alkaloids of Cinchona; and that Tincture of Cinchona Compound shall contain in a similar volume not less than 0.4 gram nor more than 0.5 gram of such alkaloids.

Seven samples of straight tincture and twenty-four of compound have been examined for the Dairy and Food Commissioner. The results are as follows:

Table XV.—Assays of Tincture of Cinchona and Tincture of Cinchona Compound.

D. C. No.	Manufacturer or Dealer.	Alkaloids, gram. per 100 cc.
	Tincture of Cinchona.	
16950	*Bristol:* The Madden Drug Store	0.92
16752	*Danielson:* W. E. LaBelle	0.42
16923	*Hartford:* The Goodwin Drug Store	0.83
16598	*Norwich:* John A. Dunn	0.83
16582	*Putnam:* James F. Donahue	0.95
16862	*Waterbury:* Apothecaries Hall	0.78
16574	*Willimantic:* G. O. Cartier	0.61
	Tincture of Cinchona Compound.	
16851	*Bristol:* The Madden Drug Store	0.41
16703	*East Hartford:* W. B. Noble	0.54
16719	*Glastonbury:* The Peoples Pharmacy	0.36
16922	*Hartford:* The Goodwin Drug Co	0.49
16885	*Meriden:* N. P. Forcier	0.59
16758	*Mystic:* Edw. W. Gaskell	0.29
16771	*New London:* Dr. A. Crocicchia	0.35
16769	L. P. Desmarais	0.28
16762	James Drug Store	0.82
16600	*Norwich:* John A. Dunn	0.67
16593	Pitcher & Service	0.80
16586	*Putnam:* Ed. H. Burt	0.38
16583	James F. Donahue	0.46
15887	*Rockville:* Metcalfs'	0.51
15895	Thomas Pharmacy	0.57
16728	*South Manchester:* J. H. Quinn & Co	0.37
16723	T. Weldon & Co	0.45
16737	*Stafford Springs:* D. H. McCormick	0.37
15879	*Thompsonville:* Wm. J. O'Brien	0.33
16860	*Waterbury:* Apothecaries Hall	0.31
16868	H. W. Lake Drug Co	0.50
16575	*Willimantic:* G. O. Cartier	0.43
16886	*Winsted:* F. B. Bannon	0.42
16891	G. L. Fancher	0.48

In 12 cases the preparations are within the United States Pharmacopoeia limits.

In 7 cases the variations are less than 10 per cent. of the standards; in 12 cases they exceed 10 per cent. Several preparations

would be satisfactory if correctly labeled. For example, No. **16752** is low for a straight tincture, but is within the limits for a compound, while Nos. **16593** and **16762** are too high for compounds, but would pass for straight tinctures. As they stand however, they must be classed as adulterated.

Solution of Hydrogen Dioxide.

The United States Pharmacopoeia requires that this preparation shall contain not less than 3 per cent. by weight of hydrogen dioxide (H_2O_2).

Among other specifications are the following:

Not more than 0.03 gram of solid residue remains on evaporating 20 mils of solution to dryness; and not more than 2 mils of N/10 potassium hydroxide are required to neutralize 25 mils of the solution.

Results of our analyses of twenty-three samples are as follows:

Table XVI.—Assays of Hydrogen Dioxide.

D. C. No.	Brand.	Hydrogen dioxide. %	Solids, gm. per 20 cc.	Acidity, cc N/10 KOH per 25 cc. solution.
16595	A. D. S.	3.62	0.021	1.80
16877	Albany Chemical Co.	3.07	0.024	2.50
16705	Brewer & Co.	3.29	0.015	1.88
16754	Brewer & Co.	3.04	0.015	2.25
16883	Brewer & Co.	3.03	0.057	5.00
16772	Butler Bros.	3.02	0.022	1.38
16893	Earle & Co.	3.07	0.016	1.65
15885	Eastern Drug Co.	3.07	0.026	1.25
16770	Eimer and Amend.	3.18	0.024	1.88
16920	Goodwin's Drug Store.	3.08	0.018	2.88
16590	Mallinckrodt Chemical Works.	2.88	0.037	1.38
15897	Mallinckrodt Chemical Works.	3.05	0.024	0.63
16711	Mallinckrodt Chemical Works.	3.00	0.033	1.38
16724	Mallinckrodt Chemical Works.	3.05	0.023	0.75
16596	Merck & Co.	2.95	0.030	1.38
16866	National Peroxide Co.	3.15	0.024	1.63
16579	Oakland Chemical Co.	3.74	0.008	0.65
16571	Parke, Davis Co.	3.08	0.017	1.85
16716	Parke, Davis Co.	3.16	0.024	2.13
16735	Parke, Davis Co.	3.11	0.025	2.25
16852	Parke, Davis Co.	3.20	0.025	1.63
15869	Powers-Wightman-Rosengarten Co.	3.09	0.023	1.38
16751	Powers-Wightman-Rosengarten Co.	3.01	0.029	2.38

All of the samples meet the requirement as to actual hydrogen dioxide or come within reasonable limits thereof, or of the declared strength; but several show excess of solids or of acidity or both. Since it has been found that the exact manipulation of the Pharmacopoeia method for acidity gives uncertain results in some

cases, a modified proceedure[1] has been followed in case of samples showing high acidity.

Samples **16920, 16877, 16751, 16735,** and **16754** are in excess of the Pharmacopoeia specifications for acidity by more than 10 per cent.; **16590** is in excess in solids; and **16883** is greatly in excess both as regards acidity and solids.

Lime Water.

The United State Pharmacopoeia requires that this solution shall contain not less than 0.14 per cent. of calcium hydroxide when prepared at 25°C.

The percentage of calcium hydroxide varies somewhat with the temperature at which the solution is prepared being about 0.17 per cent. at 15°C. and diminishing as the temperature rises.

Thirty-two samples were examined for the Dairy and Food Commissioner of which twenty-five met the requirements and seven were deficient. The deficient samples ranged from 31.4 per cent. to 81.0 per cent. of standard strength.

The results are as follows:

Table XVII.—Assays of Lime Water.

D. C. No.	Manufacturer or Dealer.	Calcium hydroxide, per cent.
16942	*Bristol:* Perry N. Holley	0.173
16949	The Madden Drug Store.	0.150
16753	*Danielson:* W. E. LaBelle.	0.146
16704	*East Hartford:* W. B. Noble.	0.101
16712	O'Connell Drug Co.	0.159
16717	*Glastonbury:* The People's Pharmacy.	0.145
16919	*Hartford:* The Goodwin Drug Co.	0.106
16756	*Jewett City:* Charles R. Carey.	0.179
16876	*Meriden:* W. W. Mosher.	0.178
16881	Charles H. Pinks.	0.167
16884	N. P. Forcier.	0.054
16937	*Middletown:* John J. Cronin.	0.178
16760	*Mystic:* Edward Gaskell.	0.190
16853	*New Britain:* Crowell's Drug Store.	0.176
16767	*New London:* J. Burro.	0.185
16592	*Norwich:* P. F. Bray.	0.114
16597	George M. Rathborn.	0.179
16585	*Putnam:* James F. Donahue.	0.142
16589	E. H. Burt.	0.179
15886	*Rockville:* Metcalf's.	0.077
15896	Thomas Pharmacy.	0.044
16730	*South Manchester:* J. H. Quinn & Co.	0.155
16738	*Stafford Springs:* D. H. McCormick.	0.169
16743	Ethel H. Wickes.	0.170
15872	*Thompsonville:* George R. Steele, Est.	0.179
15878	William J. O'Brien.	0.165
16858	*Waterbury:* Apothecaries Hall.	0.058
16870	H. W. Lake Drug Co.	0.169
16572	*Willimantic:* G. O. Cartier.	0.163
16577	Charles DeVilliers.	0.161
16890	*Winsted:* G. L. Fancher.	0.174
16894	John A. Williams.	0.165

[1]Conn. Exp. Sta. Report, 1909, p. 266.

Solution of Magnesium Citrate.

One hundred mils of this solution contains magnesium citrate corresponding to not less than 1.5 grams of magnesium oxide.

There is no direct numerical standard for citric acid, but according to the formula as given by the Pharmacopoeia one hundred mils should contain 9.4 grams of this ingredient.

Of the twelve samples examined for the Dairy and Food Commissioner only one failed to meet the required or declared strength as regards magnesium oxide. The following summary shows the results of assays compared with the requirements of the standard or special declarations.

Sample No. **16924** was assumed to be of standard strength, there being no declaration to the contrary, but it was found to be only 60 per cent. of standard. In cases where special declarations of quality or strength were made they were found to be substantially correct. The deficiencies in total citric acid may possibly arise from a part of the magnesium being derived from magnesium sulphate.

Table XVIII.—Assays of Solution of Magnesium Citrate.

D. C. No.	Manufacturer or Dealer.	Magnesium oxide, gms. per 100 cc. Required.	Magnesium oxide, gms. per 100 cc. Found.	Free acid, as citric, gms. per 100 cc.	Total citric acid, gms. per 100 cc. Required.	Total citric acid, gms. per 100 cc. Found.
16710	*East Hartford:* O'Connell Drug Co	1.5	2.11	3.85	9.4	10.40
16924	*Hartford:* The Goodwin Drug Co.	1.5	0.90	1.87	9.4	5.78
16761	*Mystic:* Edward W. Gaskell	1.5	1.71	3.29	9.4	9.94
16857	*New Britain:* Crowell's Drug Store	1.5	1.69	2.91	9.4	9.39
16773	*New London:* Dr. A. Crocicchia	1.5	2.06	1.21	9.4	8.79
16594	*Norwich:* Pitcher & Service	0.9	0.94	1.70	5.6	5.45
16588	*Putnam:* E. H. Burt	1.3	1.26	0.62	5.4	5.37
15888	*Rockville:* Metcalf's	1.5	1.42	2.55	9.4	7.46
16736	*Stafford Springs:* D. H. McCormick	1.5	1.62	2.32	9.4	8.07
15871	*Thompsonville:* George R. Steele, Est	1.5	1.52	4.03	9.4	7.98
16859	*Waterbury:* Apothecaries Hall	0.8	0.87	2.48	...	6.09
16576	*Willimantic:* Charles DeVilliers	0.8	0.77	1.28	...	3.99

Tincture of Nux Vomica.

The United States Pharmacopoeia requires this preparation to contain not less than 0.237 gm. nor more than 0.263 gm. of the alkaloids of nux vomica.

Twenty-five samples were submitted by the Dairy and Food Commissioner for examination. Only three were found to be within the prescribed limits of 0.237 to 0.263. Ten others, however, varied from these limits by less than 10 per cent. while six more were but slightly in excess of 10 per cent. variation. Of the

remaining six samples four were deficient, ranging from 0.160 gm. to 0.182 gm. per 100 cc., one was considerably over strength and one was not reported as there was not sufficient material to check the original assay which showed a deficiency.

The results are as follows:

Table XIX.—Assays of Tincture of Nux Vomica.

D. C. No.	Manufacturer or Dealer.	Alkaloids of Nux Vomica gm. per 100 cc.
16948	*Bristol:* The Madden Drug Store	0.160
16702	*East Hartford:* W. B. Noble	0.200
16713	O'Connell Drug Co	0.232
16718	*Glastonbury:* The Peoples Pharmacy	0.226
16918	*Hartford:* The Goodwin Drug Co	0.262
16755	*Jewett City:* Charles R. Carey	0.226
16759	*Mystic:* Edward W. Gaskell	0.211
16763	*New London:* J. H. James	0.440
16766	J. Burros	0.298
16768	E. Callahan	0.269
16591	*Norwich:* P. F. Bray	0.182
16599	John A. Dunn	0.204
16581	*Putnam:* J. J. Dupre	0.255
16584	James F. Donahue	0.160
16587	E. H. Burt	0.182
15889	*Rockville:* F. E. Metcalf	0.218
15894	Thomas Pharmacy	0.306
16729	*South Manchester:* J. H. Quinn & Co	0.226
15870	*Thompsonville:* George R. Steele, Est	0.226
16861	*Waterbury:* Apothecaries Hall	0.204
16869	H. W. Lake Drug Co	0.255
16573	*Willimantic:* G. O. Cartier	0.218
16578	Charles DeVilliers	0.226
16895	*Winsted:* John A. Williams	
16887	F. B. Bannon	0.264

Saturated Solution of Potassium Iodide.

A prescription calling for a saturated solution of potassium iodide was presented by an Inspector of the Dairy and Food Commissioner's office at five different drug stores in four different cities in this state. Solutions ranging from 63.5 per cent. to 99.5 per cent. of saturation were obtained, judging saturation by the solubility of the salt at 20°C. The amount of salt in a saturated solution varies with the temperature at which the solution is made. Thus a solution saturated at 25°C. should contain 59.7 per cent. of the salt; if saturated at 0°C. only 56.0 per cent. would be present. The usual range in temperature of "cold water" used in official formulas is taken to be 15° to 25°[1] and we therefore chose the mean of these, or ordinary room temperature, saturated at which a solution should contain 59.0 per cent. of potassium iodide[2].

The results of the assays are given in Table XX.

[1]U. S. P. IX, p. XLIX.
[2]Seidell, (1907) p. 252.

TABLE XX.—ASSAYS OF "SATURATED" SOLUTION OF POTASSIUM IODIDE.

D. C. No.	Druggist.	Potassium iodide in solution, per cent.	Degree of saturation, per cent.
15787	*Bridgeport:* Julius Ginsbert	58.74	99.5
18401	*Hartford:* Kaufman's Pharmacy	42.42	71.9
15786	*New Haven:* A. Harowitch	37.45	63.5
15850	*Norwich:* D. T. Salesser	50.91	86.3
15851	Smith Pharmacy	54.93	93.1

These results are surprising when one considers that a saturated solution of the salt is very easy to prepare, and that specific information as to its solubility is given in the Pharmacopoeia. Yet three of the solutions show varying degrees of carelessness in preparation.

HAMAMELIS (WITCH HAZEL) WATER.

Among other specifications in the United States Pharmacopoeia this preparation contains not less than 14 per cent. of alcohol, by volume and should not respond to tests for methyl alcohol.

Eleven samples have been examined for the Dairy and Food Commissioner and determinations of alcohol and tests for methyl (wood) alcohol made. No wood alcohol was found in any case and in only one, No. **15863,** was substantially less than the required or declared amount of alcohol found.

The results are as follows:

TABLE XXI.—INSPECTION OF HAMAMELIS (WITCH HAZEL) WATER.

D. C. No.	Manufacturer or Dealer.	Alcohol by volume per cent.	Methyl alcohol.
16757	J. R. Carey, Jewett City	14.04	none.
15863	Childs, New York	7.88	none.
16580	Charles DeVilliers, Willimantic	14.20	none.
15875	E. E. Dickenson, Essex	14.00	none.
15893	E. E. Dickenson, Essex	14.60	none.
16706	E. E. Dickenson, Essex	14.28	none.
16725	E. E. Dickenson, Essex	14.40	none.
16943	E. E. Dickenson, Essex	14.20	none.
16915	Goodwin's Drug Store, Hartford	14.04	none.
16865	Salem Chemical and Supply Co., Salem, Mass	14.36	none.
16739	The Sisson Drug Co., Hartford	14.48	none.

MISCELLANEOUS DRUGS, ETC.

Twenty-four samples of miscellaneous materials have been submitted chiefly by health officials and physicians. Two of these were unofficial samples from the Dairy and Food Commissioner's office.

D. C. No. **17042.** *Furniture Polish.* The preparation was found to be a mixture of cottonseed oil and denatured alcohol in the approximate proportions of 90 parts of oil and 10 parts of alcohol.

D. C. No. **15788.** *Essence of Peppermint.* It contained 82.20 per cent. of alcohol, by volume. No methyl alcohol was detected.

14442 and **14395.** *Turpentine.* Neither sample was found adulterated.

14442. Specific gravity at 15.6°C. 0.8851; color white, yellowish; polymerization residue 0.7 per cent.

14395. Specific gravity at 15.6°C. 0.8774; color white; polymerization residue 0.7 per cent.

14406. *Tablets* submitted by a physician for identification were found to contain morphine.

14457. *Pills* submitted by a physician were found to contain codeine.

14622. *Pills* submitted by a physician were found to contain 46.2 per cent. of sodium bicarbonate and 46.1 per cent. of milk sugar. No other medicament was found.

14631. *Tablets* submitted by a physician. These were hypodermic tablets of morphine sulphate, 1/4 grain, and atropine sulphate 1/150 grain. We were requested to determine the variation in gross weights and in weights of medicament.

Twenty-five tablets examined. Minimum weight 0.0244, maximum 0.0274, average 0.0257 gram.

Two groups of three tablets each assayed. Total alkaloid found (1) 0.0160 and (2) 0.0150 gram as morphine sulphate per tablet or 0.246 and 0.230 grain per tablet as compared with 0.256 grain total alkaloid declared.

The tablets were satisfactory both as regards variation in weight and medicament.

14805. *White tablets* submitted for identification. They were found to be morphine hydrochloride.

15336 and **15337.** *Liniment.* Samples submitted by New Haven County Health Officer.

Examinations: **15336.** Reaction alkaline; solids 13.40 grams per 100 cc.; ash 5.58; arsenic (As.) 2.53; vegetable extractives present, unidentified; alcohol none.

15337. Reaction acid; solids 1.98 grams per 100 cc.; ash 0.45; gallic or gallotannic acids indicated.

The first preparation is a water solution containing a relatively large amount of arsenic as the most conspicuous ingredient. The second sample was also a water solution consisting of, or containing, gallic or gallotannic acids or both.

14697, 14698, 14699. *Unknown Drugs,* submitted by the City Health Department, Bridgeport. Two samples were boric acid and the third was potassium permanganate.

15066. *Medicine,* submitted by the County Health Officer, Bridgeport. The sample was greyish white in color, with a salty taste but not bitter. It was found to consist of 98.3 per cent.

bicarbonate of soda and 1.7 per cent. of material insoluble in dilute acid largely or entirely vegetable material, unidentified, but resembling cardamon.

15104. *Medicine,* with prescription submitted by the County Health Officer of Bridgeport. The prescription proved to be too complicated to detect or determine all of the eight ingredients. So far as we could discover, however, there was no evidence that the preparation was not of the substance and quality demanded.

14287. *Saccharin tablets,* were found to consist of saccharin and milk sugar.

15338. *Hair Dye* said to be Canute Water but not submitted in original container.

The amount of material was only 10cc. but it was found to be an alkaline solution of silver nitrate.

14049, 14681. *Arsenate of Lead.* The first was submitted by Dr. Britton, State and Station Entomologist, the second by Mr. Fay, County Agent for Middlesex County.

Analyses:	14049	14681
	%	%
Moisture	0.40	.....
Lead (PbO)	65.72	64.13
Arsenic (As_2O_5)	29.18	32.66

15182. *Hexpo,* Smith's, Insecticide and Fungicide.
Analysis in parts per 100:

Moisture 5.65; silica 0.80; sulphuric acid (SO_3) 20.84; copper (metallic) 16.62; lead (PbO) 17.70; arsenic (As_2O_5) 8.10.

The mixture consists of about two-thirds copper sulphate and one-fourth lead arsenate.

15090. *Lime Sulphur Solution.* The specific gravity at 20°C. of the solution was 1.3073 equivalent to 34.1 Baumé. This is somewhat above the average density (24° to 25°).

13647. *Linseed Oil.* The sample was found to contain lead and mineral oils.

15038. *A Veterinary Preparation* said to be Stark's Reducine was found to consist essentially of a fatty base with iodides and tar.

MOTOR GASOLINE.

Gasoline generally signifies a product of crude petroleum produced by the process of distillation. This is called straight refinery gasoline. Newer types are the so-called casing-head gasoline, produced from natural gas by compression or other processes, and "cracked" or synthetic gasoline produced from heavy oils of the kerosene type by the "cracking" process. Both of these products are important factors in the present motor fuel supply but neither is generally sold as such but in the form of blends.

Gasoline is not a definite chemical substance like water or alcohol but a mixture of hydrocarbon compounds in varying proportions. The most essential characteristic of gasoline is its property of rapid vaporization which is shown and measured by determining the distillation range of the fluid. It should not contain too large a proportion of low boiling constituents, a condition which results in undue loss and danger in handling and in storage. These light fractions are the most expensive constituents in gasoline and it is therefor desirable from the standpoint of economy to include as large a proportion of the heavier and higher boiling constituents as the vaporizing power of the engine will permit. The motor derives its power from the heat of combustion of fuel. This is measured in terms of British thermal units (so-called B.T.U's.) and varies within rather narrow limits for the different varieties of gasoline. For this reason the calorific power is not generally determined in routine tests. Specific gravity alone, expressed in Baumé degrees, and generally referred to as the "test," has no significance, as an index to the substance and quality of gasoline.

Chapter 166 of the Public Acts of 1919 relates to the sale of adulterated or inferior products as gasoline. The term "gasoline" as used in the Act is construed to mean "only gasoline which has not been adulterated and with which there has been made no addition, combination or mixture of any other article after it has passed from the ownership of the manufacturer." No standards or specifications are defined in the Act.

Arrangement was made with the Commissioner of Motor Vehicles to test samples of gasoline in this laboratory, but no official samples have been received. Anticipating such work, a few preliminary tests were made of the common market brands. The apparatus and methods used were as described and recommended in Technical Paper 214, Bureau of Mines; and the specifications for distillation range those adopted by the Committee on Standardization of Petroleum Specifications effective November 25th, 1919.[1]

These specifications are as follows:

(a) Initial boiling point not higher than 60°C. (140°F.); (b) 20 per cent. of sample must distill below 105°C. (221°F.); (c) 50 per cent. must distill below 140°C. (284°F.); (d) 90 per cent. must distill below 190°C. (374°F.); (e) end or dry point must not exceed 225°C. (437°F.); (f) not less than 95 per cent. will be recovered in the receiver from the distillation.

The actual *distillation loss* is the difference between the original volume taken (100cc.) and the sum of the volumes of the distillate and of the residue left in the distillation flask.

Data obtained on 15 samples examined are summarized in Table XXII.

[1]. Oil and Gas Jour. **18,** 26, 62 1919. Chem. Absts., **14,** 3, 342 1920.

TABLE XXII.—EXAMINATION OF MOTOR GASOLINE.

No.	Date 1920.	Brand.	Color.	Sp. Grav. degrees Baumé 15.6°C.	Acidity, cc N/10 alkali per 100 cc gasoline.	Distillation range, degrees, Centigrade.					
						Initial b.p., first drop.	20% distilled at or below.	50% distilled at or below.	90% distilled at or below.	End point.	Distillation loss, per cent.
Standards or Limits.			**Water white**	....	**none**	**60**	**105**	**140**	**190**	**225**	...
13200	3/17	Atlantic	white	61.0	none	35	89	130	187	223	1.0
13948	8/25	Atlantic	white-yel'sh	60.5	none	41	86	127	184	218	0.3
13195	3/17	.....	white	58.4	none	45	96	116	160	192	0.3
13949	8/25	.....	white-yel'sh	57.2	none	47	100	135	189	220	0.8
13197	3/17	Goodrich	white	60.7	none	40	91	125	185	220	0.5
13946	8/25	Goodrich	white	59.2	none	47	96	137	189	230	1.0
13199	3/17	Gulf	white	60.0	none	40	87	116	182	223	0.5
13951	8/26	Gulf	white	61.8	none	42	92	122	177	212	0.5
13945	8/25	Gulf	white	60.5	none	44	90	119	181	218	0.4
13950	8/25	Socony	white	57.3	none	39	96	135	189	220	0.1
13198	3/17	Standard	white	59.7	none	42	100	128	180	215	0.5
13196	3/17	Texas	white	57.9	0.1	48	99	130	188	223	0.5
13947	8/25	Texas	white	57.9	none	44	95	131	187	225	0.2
13201	3/17	Tydol	white	59.2	none	44	98	128	177	214	0.5
13959	8/25	Tydol	white	62.3	none	51	93	123	183	211	0.6

We are not prepared to discuss these results in terms of the relative desirability or efficiency of the several brands of gasoline represented. Efficiency of fuel utilization depends upon several or many factors other than the quality of the fuel itself. Practically all the samples meet the specifications and standards we have selected in all respects. No. **13946** is seen to exceed the end temperature by 5 degrees and the distillation residue in case of **13196** was slightly acid. It would appear, however, that of two gasolines with the differences shown between **13200** and **13959**, for example, one might be better adopted to a particular condition or purpose than the other. The first shows a larger proportion of the lighter and low boiling fractions together with about the limit of heavy constituents, while the second contains neither extreme. It would also appear that each product sampled at two different seasons of the year shows a reasonably satisfactory degree of uniformity of composition.

SUMMARY.

Materials.	Sampled by, or at request of			Total.	Adulterated, below standard or otherwise illegal.
	Station Agent.	Dairy and Food Commissioner.	Individuals.		
Foods.					
Carbonated Soft Drinks	9	189	0	198	63
Cereal Products:					
Breakfast foods	2	0	0	2	0
Health foods	0	0	3	3	0
Flour	0	4	4	8	2
Cider	0	2	4	6	0
Cocoa	0	1	3	4	0
Coffee	15	2	1	18	0
Desiccated Foods	8	0	0	8	0
Diabetic Foods	120*	0	7	127	....
Egg and Egg Products	10	0	27	37	0
Fats and Oils:					
Olive oil	0	2	3	5	0
Cooking fats	1	2	0	3	0
Butter	0	22	1	23	4
Oleomargarine	0	5	0	5	0
Nut margarine	2	0	0	2	0
Gelatin, etc	0	8	0	8	3
Ice Cream	0	400	4	404	48
Milk and Milk Products:					
Market milk	0	1,056	102	1,158	329
Cream	0	6	4	10	0
Imitation milk	3	0	0	3	0
Milk powder	4	0	0	4	0
Malted milk	4	0	2	6	0
Human milk	0	0	14	14	0
Syrup	0	0	2	2	0
Tea	7	0	0	7	....
Vinegar	0	1	9	10	3
Miscellaneous Materials:					
Foods, etc	5	0	8	13	....
Liquors	0	10	81	91	6
Other materials	0	7	38	45	....
Total	**190**	**1,717**	**317**	**2,224**	**395**
Drugs.					
Proprietary Remedies	5	0	0	5	....
Soap	38	0	6	44	2
Toilet Preparations	2	6	0	8	3
U. S. P. Drugs:					
Cinchona, Tincture of	0	7	0	7	2
Cinchona Compound, Tincture of	0	24	0	24	10
Hydrogen Dioxide	0	23	0	23	7
Lime Water	0	32	0	32	7
Magnesium Citrate, Solution of	0	12	0	12	1
Nux Vomica, Tincture of	0	25	0	25	11
Potassium Iodide, Saturated Solution	0	5	0	5	3
Witch Hazel Water	0	11	0	11	1
Miscellaneous Drugs, etc	0	2	22	24	....
Gasoline	15	0	0	15	....
Total	**60**	**147**	**28**	**235**	**47**
Total for Foods and Drugs	**250**	**1,864**	**345**	**2,459**	**442**

*Including 107 analyses in Bull. 220 and not included in Summary for 1919, (See Bull. 219, p. 259).

CONNECTICUT

Agricultural Experiment Station

NEW HAVEN, CONN.

BULLETIN 228 MARCH, 1921

Connecticut Round Tip Tobacco

A New Type of Wrapper Leaf

By D. F. JONES

Press of The Wilson H. Lee Company.

Connecticut Round Tip Tobacco.

A New Type of Wrapper Leaf for Priming; Recommended for Trial Where Havana is Grown.

By D. F. Jones.

Both Havana and Broadleaf tobaccos grown in New England have rather narrow-pointed leaves so that the yield of wrappers from a pound of leaf is relatively small. In an endeavor to obtain a type having a more nearly round leaf which would equal or prove better than the two well-known varieties in quality and surpass them in yield, a new variety of tobacco has been developed by ten years of selection and testing. This variety is called Connecticut Round Tip on account of the broad, full tips of the leaves and is offered to tobacco growers in the belief that it has certain distinct advantages which make it worthy of serious consideration.

In recommending a new type of tobacco for trial it is fully realized that there are many reasons why any variety differing from those commonly grown may be undesirable for the grower, no matter how meritorious it is, because the trade is unfamiliar with it and there is therefore a tendency to discriminate against it. At the same time no one can maintain that the kinds of tobacco now used will always be grown or that it is impossible to obtain new varieties which will be more profitable than those now employed.

Connecticut Round Tip should not be confused with other new varieties offered from time to time, most of which were variable hybrids which had not been fixed and stabilized nor had they been selected so extensively or carefully as this tobacco has been for certain definite qualities. No plants of Connecticut Round Tip were grown outside of our trial grounds previous to 1918. But in the last three years it has been tested in the field of comparison with types now grown and has been shown to have certain valuable qualities which merit attention.

Origin of the Round Tip Tobacco.

The problem was to combine in one variety or type the higher number and the better shape of leaves of Sumatra with the larger size and other desirable qualities of Broadleaf.

The method of doing this had been developed by previous study of inheritance in tobacco.

An artificial cross was first made between Sumatra and Broadleaf. The seed was planted the next year and from the resulting plants seed was saved for the third year's planting, when the selections were begun.

Each plant was carefully studied and noted as to all important characters which could be observed in the fields. From the plants which represented the desired size and shape, seed was saved under bags for the next year's test while all the less desirable plants were dropped out. This process was repeated year after year for ten successive years till finally three selections remained which seemed equally promising. Then these were tested on a larger scale.

In 1916 about one-third of an acre of each was grown, and separately harvested, cured and sorted and the weights and proportions of the different grades were used in making the final choice.

Throughout the work selection has been based largely on the weights and appearances of the cured and sorted leaves.

It is not a "hybrid" as the term is usually understood. A hybrid is a natural or artificial cross of two fairly settled varieties and the individual hybrid plants the second and immediately following years are very variable. Years of very careful selection are required to secure a variety or type with fixed characters.

The Round Tip here described comes from a "hybrid" which has been carefully protected from natural crossing and selected for ten years so that its uniformity to type is fully equal to that of either of the varieties commonly grown in the state.

This new tobacco is largely the result of the work of E. M. East, formerly with this station and now at the Bussey Institute of Harvard University. H. K. Hayes, also formerly connected with this station, and E. G. Beinhart of the U. S. Department of Agriculture, have had a large part in producing Connecticut Round Tip. The writer has continued and completed the work. B. G. Southwick of the Hartford County Farm Bureau has rendered valuable help in securing the co-operation of growers in carrying out field tests of the variety and in interesting dealers in the merits of the leaf. During the first years of development the tobacco selections were grown for the Connecticut Experiment Station by the Windsor Tobacco Corporation at Bloomfield. Later they were grown at the Shaker Farms at Somers. Much credit is due J. B. Stewart and M. M. Smith for their co-operation in this enterprise.

Characteristic Features of Round Tip Tobacco.

The plant is a tall, vigorous grower which flowers and sets seed abundantly in the field. It has a strong root system which enables the plants to stand up in the field better than Havana. The leaves are not as large as Broadleaf but they are more com-

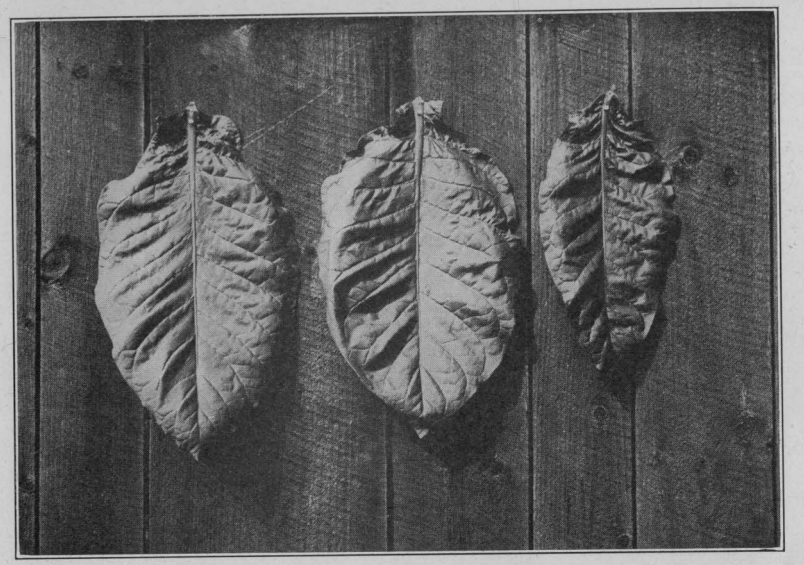

Figure 1. Round Tip leaves from the bottom, middle and top of one plant at the time of first priming.

Figure 2. A field of Round Tip grown by Morgan & Dickinson, Windsor, Conn., in 1920, who say: "It showed wonderful growth, averaging 24 leaves to the stalk, and we were particularly impressed with the round shape of the leaves and the plant's root system."

PLATE XVII.

Figure 3. Round Tip plants grown by T. J. Kearney, Poquonock, Conn., in 1920, who was pleased with their vigorous growth and production of numerous and well shaped leaves.

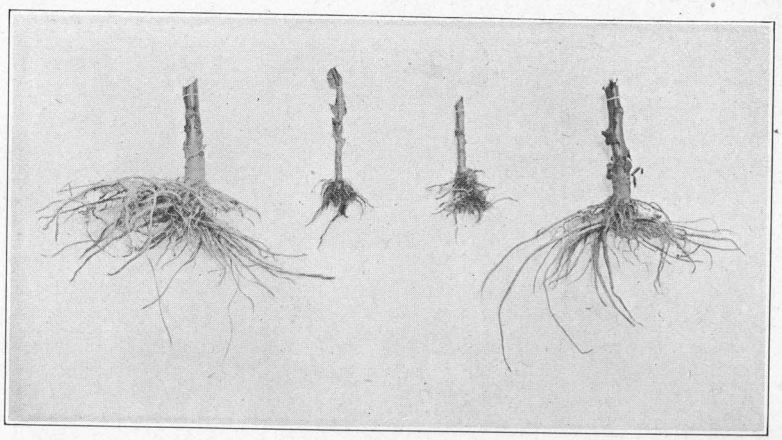

Figure 4. Roots of two plants of Round Tip, at the sides, compared with two roots of Havana, in the center, arranged in the order and comparative distance in which they grew in a field badly infested with root rot.

pact, having a broad rounding shape without the long drooping tip usually shown by that variety. The plants develop from twenty to twenty-four good sized leaves per plant. These are spaced somewhat farther apart on the stalk than those of either Broadleaf or Havana, making the plants more suitable for priming than for stalk cutting. By topping lower with from sixteen to eighteen leaves the cut tobacco can be handled satisfactorily in the sheds.

In one field in 1919 a few plants were accidently set among Havana in the field which was badly infected with root rot. The Havana plants made a very small growth while the Round Tip plants showed no sign of injury to the roots. They were vigorous and fully twice as tall as the Havana plants growing beside them. The differences in root growth are shown in the accompanying illustration. If this resistance to unfavorable soil conditions proves to be characteristic of this variety under all conditions it will be a most valuable feature and one which alone makes the variety very promising.

At their best the leaves are nearly as wide as they are long and are noticeably full at the tip. They are also held upright and close to the stalks, thus avoiding considerable damage in the field. The lengths of the leaves run from sixteen to twenty-six inches but on account of their shape a twenty inch leaf is equivalent to a much longer leaf of either Havana or Broadleaf and pound for pound yields a greater number of wrappers.

In color and quality of cured leaves the tobacco is more nearly like Havana and is recommended for the uses to which Havana is put. Many have said that it resembles shade grown Cuban somewhat. However, in color and general wrapper qualities it is usually distinct from any of the varieties now grown and in time should win a place for itself on its own merits.

Field Tests.

In testing the productiveness and quality of this tobacco it has been difficult to get a satisfactory trial for the reason that it has not been grown in sufficient amount. It has not been posible to devote much seed bed space to the growing plants and consequently there have never been enough plants to set the field all at one time. As a result, plants differing in maturity were harvested at the same time as it was necessary to pick the whole field at each priming. Moreover, the plants were handled as Havana was treated and it has since been learned that the Round Tip requires somewhat different treatment in certain particulars.

It is generally agreed that the leaves should be picked earlier than the Havana leaves of the same stage of development. They should not be left until they show yellow. The plants being large

yielders are heavy feeders and must be fertilized accordingly. Producing more leaves than Havana it should be fed proportionately more. This extra expense is fully justified since on a given area and with the same labor, except for handling, a greater quantity of tobacco is produced. The leaves being wider than Havana they should be spaced farther apart in the sheds in order to cure properly.

In 1915 at Bloomfield 1400 pounds per acre were secured and the year following 1800 pounds in three primings not counting tops. In 1918 at the Shaker Farms the rate of 2800 pounds per acre was obtained from a field of about one-third of an acre. In 1919 it was tested in seven different places in the valley by growers of Havana in amounts ranging from one-fourth to five acres. Three of them grew it as a stalk tobacco and the others primed it. The weights ran from 1400 to 1600 pounds per acre. The tobacco was set rather late and on account of uneven planting the conditions were not favorable to this variety.

In 1920 Round Tip was grown in thirteen different places in amounts from a few plants to eight acres. The tobacco made a good growth in spite of a late start in many cases, until damaged by the hail storm. In spite of much injury to the last pickings weights of from 1600 to 2000 pounds per acre were secured. The percentage of light wrappers was also high in nearly every case.

When properly cured the "burn" is satisfactory. The only serious objection to this tobacco is that it may have a bitter taste. Some think that this can be obviated by proper curing and ageing.

Its remarkable ability to stand up on soils in which other tobacco fails to thrive was also shown very clearly in 1920 in those places where a direct comparison could be made.

Opinions of Tobacco Growers.

From M. M. Smith, The Shaker Farms, Somers, Conn.

The young plants of the new variety of tobacco started more quickly, grew a large round tip leaf, required very little suckering, and stood up against a storm better than the ordinary type. As the yield of leaves and weight was more than the type usually grown, believe it should be fed accordingly. Also found that owing to wide spreading of roots, there is danger of too deep cultivation after plant is half matured.

From Morgan & Dickinson, Windsor, Conn.

We set out 9,000 plants of Round Tip on June 27th, 1920, and finished harvesting our tops on Sept. 14th. The 9,000 plants produced 1,778 pounds with some loss in weight by hail, as the last ten leaves were cut in the storm. This tobacco produced 828 pounds of No. 1 Wrappers and 571 pounds of No. 2 Wrappers. It showed wonderful growth, averaging 24 leaves to the stalk, and we were particularly impressed with the round shape of the leaves and the plant's wonderful root system. After assorting and handling this tobacco we bulked same and turned the bulks six times allowing the temperature to reach 116 degrees. After turning the sixth time we baled and placed in a warm room. We have no fault to find with our experiment but on the other hand are very much pleased with it as far as we have gone. We had a local manufacturer use a little of it and the yield is good. He said he could wrap 1,200 cigars with two pounds.

From A. H. Brown, Windsor Tobacco Growers, Inc., Windsor, Conn.

My experience with the Round Tip Tobacco the season of 1919 and 1920, while in the nature of an experiment only so far as the growing and curing is concerned, has convinced me that it possesses many desirable qualities from the grower's standpoint. It seems to produce good results on what is called "sick land" owing perhaps to its stronger root growth, and is less affected by wind storms. The name Round Tip well describes the shape of the leaves and the lower fifteen vary but little in length. In 1919 I harvested from twenty-two to twenty-six leaves per stalk but in 1920 a hail storm destroyed the leaves on the upper part of the stalk after harvesting fifteen but the number was the same as in the previous season. From my experience would advise priming a little earlier than we do the Havana variety at least the lower part of the plant. In regard to the "appearance of the assorted and fermented leaves" the failure of a number of expert tobacco men to select a Sumatra wrapped cigar placed in a box with cigars wrapped with Round Tip is pretty good evidence that it possesses the qualities that the trade demands. While its taste has been adversely criticised many smokers have grave doubts as to their ability to detect it in any way.

From Benjamin L. Haas, L. B. Haas & Co., Hartford, Conn.

Our experience has been that this new type of tobacco requires a greater length of time to cure properly. There are features of this tobacco which necessitate the tobacco being in bulk a greater length of time, and it should lay in the bale, at least, two or three months before being manufactured. There are qualities in the Connecticut Round Tip which must eventually prove to be very profitable to the cigar manufacturers. We are of the opinion that this type of tobacco will become very popular after we understand how to handle it. It requires more time in curing process than any other type of tobacco we are now growing.

From W. A. Haviland, The Haviland Tobacco Co., East Windsor Hill, Conn.

We grew one-half acre of Round Tip on land that had ceased to give us a satisfactory growth of "shade." On one side of this we grew Conn. Havana and on the other a Wisconsin resistant Havana No. 2901. This No. 2901 did very well, in fact much better than the Conn. Havana but the Round Tip throughout the entire season was larger and thriftier than either. Our experience leads us to believe that the Round Tip will yield well, even on "sick soils"; the shape of the leaf is good, the third priming is comparatively better than that of primed Havana and if a certain bitterness can be overcome in sweating Round Tip should be a very valuable tobacco.

From The Farnham Tobacco Corp., Hartford, Conn.

The seed of Round Tip tobacco which I used was rather poor and the general impression I had of the plants was that they were much slower in growing than either the Havana Seed or the Broadleaf. They seemed to be harder to push to the size necessary for planting. I planted the tobacco closely, about eleven thousand plants to the acre, and found the same tendency in regard to growth applied to the early-set plants as well as those which were in the beds, but when the tobacco became eight or ten inches high it grew rapidly and from that time on until maturity it grew faster than any other variety I had. The time for harvesting the

first leaves, in my judgment, is when the tobacco reaches the height of a man's shoulder, as I found when picking was delayed it became thick and of very poor color. Just before the tobacco buds out I found it ready to harvest up as high as the fourteenth leaf, and have decided next year to have all the good tobacco off, up to the eighteenth leaf by the time the plants break into flower. I found this tobacco more or less difficult to cure, the leaves having a tendency to stick together, due to the gum which the tobacco carries to a marked degree. The shape of the leaf is all that can be desired both as to length and width. Probably it would suit a larger number of customers if it did not grow as long as it does, but am perfectly satisfied in that regard. The only criticism I have to make is regarding the taste, which of course is a very important one, but I firmly believe that as time goes on it will be taken care of without trouble. The tobacco has a bitter taste, and although extreme temperatures have been tried in the fermentation, it has not been eliminated as yet. I believe that if the tobacco was taken down in very high case and put directly into the bulk and allowed to reach a very high temperature this trouble would be remedied. If this one factor can be taken care of and the tobacco made one which will appeal to the taste of the average smoker, I believe that it is by far the best thing that the Valley has ever had and should really make a new era in tobacco growing.

Conclusion.

It has not been our policy to say much about this tobacco as we expect it to win its own way. If it has real merit, as the preliminary trials show, it will be grown in so far as it proves profitable. In order to be appreciated it must be seen growing in the field and after sorting. Before the manufacturers will buy this tobacco they must appreciate what it is and know that it can be secured in quantity. The fact that a large number of cigars can be wrapped per pound of leaves is one forceful reason why they should give this new tobacco a careful trial.

This brief history and description is written to introduce the Connecticut Round Tip to the tobacco growers of this district in the belief that when it is tested on an adequate scale and becomes familiar to the buyer that it will be profitable for growers and manufacturers alike.

Connecticut Agricultural Experiment Station

NEW HAVEN, CONN.

BULLETIN 229 MARCH, 1921

BEING THE

Report on Commercial Feeding Stuffs

1920

By E. M. BAILEY

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March, 1921.

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Commercial Feeding Stuffs.

By E. M. Bailey.*

PROVISIONS OF THE STATUTES RELATING TO FEEDING STUFFS.

Under the Connecticut statutes the term "concentrated commercial feeding stuffs" covers practically all feeds excepting hay and straw, whole seed, unmixed meal made directly from any of the cereals or from buckwheat, and feed ground from whole grain and sold directly from manufacturer to consumer.

Under the new fertilizer law cottonseed meal is classed as a commercial fertilizer and, as such, is subject to analysis fees and tonnage tax. Provision is made, however, to exempt meal sold exclusively for feeding purposes.[1]

Section 4775 requires that every lot or parcel of concentrated commercial feeding stuff shall bear a statement giving the name and address of the manufacturer or importer, the number of net pounds in the package, the name of the article, and the percentage of protein and fat contained in it. The law forbids the use of any metal in affixing tags.

No registration of feed or payment of analysis or license fees is required.

The penalty for violation of the statute is not more than $100 fine for the first offense and not more than $200 for each subsequent offense.

The law authorizes this Station to take samples from any manufacturer or dealer, in a prescribed manner, and requires the Station to analyze annually at least one sample of each brand which it has collected, and to publish these analyses "together with such additional information in relation to the character, composition and use thereof as may be of importance."

CLASSIFICATION OF SAMPLES.

The classification and summary of commercial feeding stuffs and other materials requiring fodder analysis which have been examined during the past year is as follows:

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*Analyses are by Messrs. Shepard, Nolan and Merwin.
[1]Chap. 204, Public Acts, 1919.

Official samples taken by the Station Agent	141
Submitted by the Dairy Commissioner and by individuals	56
Examined in connection with field experiments at Storrs	362
Examined in connection with field experiments of this Station	44
Total	603

This report is concerned only with the results of the official inspection and with samples submitted by the Dairy Commissioner and by individuals.

Official samples taken by the Station Agent are classified as follows:

Cottonseed Meal	16	Maize Products	19
Cottonseed Feed	2	Distillers' Grains	1
Linseed Meal	2	Dried Beet Pulp	3
Wheat Bran	10	Cocoanut Meal	1
Wheat Mixed Feed	5	Peanut Oil Cake	1
Wheat Middlings	16	Proprietary Stock Feeds	53
Rye Products	2	Poultry Feeds	9
Oat Feed	1		
		Total	141

ETHER EXTRACT IN MOLASSES FEEDS.

In 1913 Street[1] called attention to the fact that in case of feeds containing molasses, the regular ether extraction method generally failed to remove all of the ether-soluble substances. By first washing out saccharine materials with water, drying and then extracting with ether higher results for "fat" were usually obtained. Since that time this modified proceedure for the determination of fat has been followed in such samples as were known, or declared, to contain molasses.

A summary of the results for the period 1913 to 1919 inclusive is as follows:

Year	Ether Extract by Modified Method. Higher than regular.	Lower than regular.	Total number of samples.
1913	17	5	22
1914	7	12	19
1915	18	3	21
1916	11	20	31
1917	6	2	8
1918	0	6	6
1919	11	3	14
Totals	70	51	121

It appears that out of 121 cases, 51, or about 42 per cent., gave lower figures for ether extract by the modified method than by the regular proceedure. Nevertheless it would appear to be a more rational practice to wash out sugars before proceeding to extract

[1]Conn. Exp Sta. Report 1913, Part V p. 313 et seq.

with ether and the results, even when lower, are probably nearer the truth so far as true fat is concerned. But since the term fat in a guaranty means crude fat (i. e. ether extract) it has been customary to report the higher figure for this ingredient by whichever method obtained.

Of the nine samples of molasses feeds examined this year eight equaled their guaranties for fat by the regular method and they were not subjected to the modified treatment. The one sample falling below guaranty and which was checked by the modified method gave a higher result by that proceedure.

COEFFICIENTS OF DIGESTIBILITY AND NET ENERGY VALUES.

The significance of digestion coefficients and net energy values of feeding stuffs has been briefly discussed in previous bulletins.[1] These factors for most of the types of feeds reported herein are given in the following table:

TABLE I.—COEFFICIENTS OF DIGESTIBILITY AND NET ENERGY VALUES OF FEEDING STUFFS.[2]

Feed	Average dry matter, lbs. per hundred.	Coefficient of digestibility. Protein	Fiber.	Carbohydrates.	Fat.	Net energy value, Therms per hundred lbs.
Cottonseed Meal	92.2	84	37	75	95	90.0
Cottonseed Feed	....	58	45	61	90	....
Linseed Meal (old process)	90.0	89	57	78	89	88.9
Linseed Meal (new process)	90.4	86	73	87	95	85.1
Wheat Bran	89.9	76	43	74	62	53.0
Wheat Feed	....	77	36	76	87	...
Wheat Middlings	89.6	77	30	78	88	59.1
Red Dog Flour	....	88	36	88	86	....
Rye Flour	....	80	..	88	90	...
Barley, ground	90.7	88	70	93	86	89.9
Barley Bran	....	85	20	86	87	....
Corn Gluten Meal	90.9	85	55	90	93	84.2
Corn Gluten Feed	91.3	85	76	88	85	80.7
Hominy Feed	89.9	66	76	90	91	81.3
Brewers' Grains	92.5	81	49	57	89	53.4
Malt Sprouts	92.4	77	87	80	85	72.7
Distillers' Grains, Corn	93.4	73	95	81	95	85.1
Distillers' Grains, Rye	92.8	59	..	67	84	56.0
Beet Pulp, dried	91.8	52	83	83	..	75.9
Peanut Cake, without shells	89.3	90	9	84	90	93.6
Soybean Meal, fat extracted	88.2	92	99	100	68	99.7
Cocoanut Cake	90.4	90	23	87	100	83.5

[1]Conn. Exp. Sta. Bull. 212 p. 357, 1918; Bull. 221 pp. 347-351, 1919.
[2]Henry and Morrison, 15th ed., pp. 118-119; Armsby and Putney, Penn. Exp. Sta., Bull. 142, 1916.

INSPECTION OF 1920.

Remarks on Analyses.

(*Analyses on pages* 306-323)

The definitions of the various feeding stuffs here given are those adopted by the Association of Feed Control Officials of the United States and revised to 1920.

Definitions of the several grades of cottonseed meal are as follows:

Cottonseed Meal is a product of the cottonseed only, composed principally of the kernel with such portion of the hull as is necessary in the manufacture of oil, provided that nothing shall be recognized as cottonseed meal that does not conform to the foregoing definition and that does not contain at least 36 per cent. of protein.

Choice Cottonseed Meal must be finely ground, not necessarily bolted, perfectly sound and sweet in odor, yellow, free from excess of lint, and must contain at least 41 per cent. of protein.

Prime Cottonseed Meal must be finely ground, not necessarily bolted, of sweet odor, reasonably bright in color, yellow, not brown or reddish, free from excess of lint, and must contain at least 38.6 per cent. of protein.

Good Cottonseed Meal must be finely ground, not necessarily bolted, of sweet odor, reasonably bright in color, and must contain at least 36 per cent. of protein.

Revision of these definitions is contemplated and tentative definitions[1] are as follows:

41.12 *Per cent. Protein Cottonseed Meal, Choice Quality,* must be finely ground, not necessarily bolted, perfectly sound and sweet in odor, yellow, free from excess of lint, and by analysis must contain at least 41.12 per cent. crude protein, equivalent to 8 per cent. of ammonia.

Cotton seed meal not fulfilling the above requirements as to color, odor, or texture, shall be branded Off Quality.

38.56 *Per cent. Protein Cottonseed Meal, Prime Quality,* must be finely ground, not necessarily bolted, of sweet odor, reasonably bright in color, yellow, not brown or reddish, free from excess of lint, and by analysis must contain at least 38.56 per cent. crude protein, equivalent to 7.5 per cent. of ammonia.

Cottonseed meal not fulfilling the above requirements as to color odor or texture, shall be branded Off Quality.

36 *Per cent. Protein Cottonseed Meal, Good Quality,* must be finely ground, not necessarily bolted, of sweet odor, reasonably bright in color, and by analysis must contain at least 36 per cent. crude protein equivalent to 7 per cent. of ammonia.

Cottonseed meal not fulfilling the above requirements as to color, odor or texture shall be branded Off Quality.

Readjustment of prices is particularly conspicious in this product. The prices given in Table IV were those which prevailed at the time these samples were taken (November and December 1920); the prevailing price at this time (March 1st, 1921) is less than $50 per ton.

[1]Adopted at the annual meeting of the A. F. C. O., November, 1920.

Of the sixteen samples examined three showed a deficiency in protein of more than 1 per cent. None were deficient in fat. Fiber content is not required to be stated under the law in this State but, if given, it should be correct; three samples exceeded the maximum limit for this ingredient by more than 1 per cent. in each case. The average protein content, 39.4 per cent., is substantially higher than the average found for several years past.

Cottonseed Feed is a mixture of cottonseed meal and cottonseed hulls, containing less than 36 per cent. of protein.

Two samples were analyzed one of which was slightly below guaranty in both protein and fat.

Linseed Meal is the ground product obtained after extraction of part of the oil from ground flaxseed and cleaned of weed seeds and other foreign materials by the most improved commercial processes, provided that the final product shall not contain over six per cent. of weed seeds and other foreign materials and provided further that no portion of the stated six per cent. of weed seeds and other foreign materials shall be deliberately added.

The two samples examined conformed to their guaranties.

Wheat Bran is the coarse outer coating of the wheat kernel as separated from cleaned and scoured wheat in the usual process of commercial milling.

All of the samples examined conformed to their guaranties with respect to protein and fat. One sample, **15652,** showed an excess of fiber.

Wheat Mixed Feed consists of pure wheat bran and the gray or total shorts or flour middlings combined in the proportions obtained in the usual process of commercial millings.

All of the samples examined conformed to their guaranties.

Standard Middlings (*Red Shorts or Brown Shorts*) consists mostly of the fine particles of bran, germ and very little of the fibrous offal obtained from the "tail of the mill." This product must be obtained in the usual commercial process of milling.

Gray Shorts (*Gray Middlings or Total Shorts*) consists of the fine particles of the outer bran, the inner or "bee-wing"bran, the germ, and the offal or fibrous material contained from the "tail of the mill." This product must be obtained in the usual process of commercial milling.

White Shorts or White Middlings consists of a small portion of the fine bran particles and the germ and a large portion of the fibrous offal obtained from the "tail of the mill". This product must be obtained in the usual process of flour milling.

All of the samples examined conformed to their guaranties with the exception of **15640** which was deficient in both protein and fat.

Rye Middlings or Rye Feed consists of the products other than the flour obtained in the manufacture of the ordinary "100 per cent." rye flour from the rye grain which has been cleaned and scoured.

The two samples examined conformed to their guaranties for both protein and fat.

Oat Products. Only one sample of oat feed was analyzed and this satisfied the requirements of the guaranty.

Corn Gluten Feed is that portion of commercial shelled corn after the separation of the larger part of the starch and the germ by the processes employed in the manufacture of cornstarch and glucose. It may or may not contain corn solubles.

All of the samples examined were found to meet their guaranties. In one case, however, no guaranty was given.

Corn Meal. Only one sample was analyzed for which there was no statement of guaranty.

Hominy Feed is the kiln dried mixture of the mill run bran coating, the mill run germ, with or without a partial extraction of the oil and a part of the starchy portion of the white corn kernel obtained in the manufacture of hominy, hominy grits and corn meal by the degerminating process.

The only deficiency found was in **15608** which was 0.95 per cent. below guaranty in fat.

Distillers' Products. Only one sample of distillers' dried grains was examined. It was of normal composition and quality.

Dried Beet Pulp is the material obtained by drying the residue from sugar beets which have been cleaned and freed from crowns, leaves and sand and which have been extracted in the process of manufacturing sugar.

The three samples examined conformed to their guaranties for protein and fat and no excess of fiber greater than 1 per cent. was found.

Cocoanut Oil Meal (*"Copra Oil Meal"*) is the ground residue from the extraction of part of the oil from the dried meat of the cocoanut.

The single sample examined contained 0.94 per cent. less than the guaranteed amount of protein.

Peanut Oil Meal is the ground residue after the extraction of part of the oil from peanut kernels.

The single sample examined was deficient in protein by 2.06 per cent.

Proprietary Mixed Feeds. When compounded with materials of good quality these feeds possess undoubted merit. The variety of sources from which they derive their nutrients makes possible a supplementing of nutritive elements which modern ideas of efficient feeding endorse as a rational practice. They should not be made an outlet, however, for refuse or low-grade materials of little worth.

The law in this State does not require a statement of the ingredients of which such feeds are composed but information is valuable to the feeder and it is furnished in case of the following brands:

Acorn Dairy Feed. Cottonseed meal, linseed meal, wheat bran with mill run screenings, corn gluten feed, ivory nut meal, cocoanut meal, corn feed meal, starch mill corn solubles with calcium salts, salt, kafir meal.

Algrane Milk Feed. Cotton seed meal, linseed oil meal, corn gluten feed, ground corn, wheat midds (with mill run screenings) ground barley, molasses, salt ½ of 1 per cent., oat hulls, oat shorts, oat clippings not over 600 lbs. per ton.

Biles Ready Dairy Ration. Corn distillers' dried grains, choice cottonseed meal, old process linseed meal, white wheat middlings, winter wheat bran, hominy meal, cocoanut oil meal, corn gluten feed, brewers' dried grains, barley malt sprouts, one-half per cent. fine table salt, and nothing else.

Bull Brand Stock Feed. Hominy feed, corn feed meal, barley feed, linseed oil meal, wheat bran, wheat middlings, second clear flour clipped oat by-product and three-fourths of one per cent. salt (wheat bran and wheat middlings may contain ground screenings not exceeding mill run).

Crosby's Stock Food. Ground barley, ground hominy feed, ground oats, oat feed (oat hulls, oat shorts, oat middlings).

Fourex Dairy Ration. Cottonseed meal, old process linseed meal, hominy meal, wheat bran and middlings, gluten feed, reground oat feed (oat hulls, oat shorts, oat middlings). Rye middlings, malt sprouts and salt.

Hamlin's Quality Feed. Corn, oats, alfalfa and cane syrup.

National Dairy Feed. Ground corn, ground oats, wheat bran, screenings from bran, oats, wheat and barley, cottonseed meal, copra meal, alfalfa meal, molasses, one per cent. salt.

Portage Stock Feed. Either white or yellow shelled corn, barley, oat shorts, oat hulls, oat middlings, wheat middlings, and ½ of one per cent. salt.

Purina Cow Chow. Linseed oil meal (old process), gluten feed from corn, hominy feed, cottonseed meal, ground alfalfa, molasses and one per cent. salt.

Purina Pig Chow. Hominy feed, cane molasses, gluten feed from corn, corn meal, digester tankage, linseed oil meal (old process), alfalfa, charcoal (made from humus) and one per cent. salt.

Red Star Dairy Feed. Gluten feed, wheat bran, wheat middlings, old process oil meal, ground barley, cottonseed meal, corn distillers' grains, hominy and 1% salt.

Syragold Milk Ration. Dried brewers' grains, malt sprouts, corn gluten feed, linseed meal, wheat bran with mill run screenings, cottonseed meal, ground cottonseed hulls and salt.

Ti-O-Ga Dairy Feed. Cottonseed meal, old process linseed meal, wheat bran, cane molasses, wheat middlings, cocoanut oil meal, dried brewers' grains, corn gluten meal, corn gluten feed, barley, salt.

H-O Company's Laying Mash. Linseed oil meal, corn gluten feed, bone meal, ground corn, oat middlings, wheat middlings and wheat bran (with mill run screenings), hominy feed, rolled oats, ground peas.

Summary of Deficiencies.

Variations from guaranty greater than 1 per cent. in protein and crude fiber and 0.25 per cent. in fat together with other remarks or criticisms are summarized in Table II.

TABLE II.—FEEDS NOT CONFORMING TO GUARANTIES OR OTHERWISE ILLEGAL.

Station No.	Brand and Manufacturer.	Protein deficiency.	Fat deficiency.	Fiber excess.	Remarks.
	Cottonseed Meal.	%	%	%	
15601	Crown. Ashcraft-Wilkinson Co., Atlanta, Ga.	1.37	....	1.21	
15606	Paramount. Ashcraft-Wilkinson Co., Atlanta, Ga.	....	....	....	Wire tags, illegal.
15635	Jay. F. W. Brode & Co., Memphis, Tenn.	....	....	....	Wire tags, illegal.
15628	Prime. Cotton Seed Products Co., Louisville, Ky.	....	....	....	Wire tags, illegal.
15564	Good. W. D. Hall Co., Atlanta, Ga.	....	....	....	Wire tags, illegal.
15548	Memphis. L. B. Lovitt & Co., Memphis, Tenn.	....	....	1.12	Wire tags, illegal.
15540	Danish. Humphreys-Godwin Co., Memphis, Tenn.	1.44	....	....	
15631	Thirty Six. L. B. Lovitt & Co., Memphis, Tenn.	....	....	....	Wire tags, illegal.
15532	Holstein. Steele-Kolb By-Products Co., Inc., Birmingham, Ala.	2.50	....	3.20	
	Cottonseed Feed.				
15523	77. Humphreys-Godwin Co., Memphis, Tenn.	....	0.37	....	Wire tags, illegal.
	Wheat Bran.				
15620	The Anthony Mills, Anthony, Kansas.	....	....	....	Wire tags, illegal.
15652	The Hunter Milling Co., Wellington, Kansas.	....	....	....	Wire tags, illegal.
15522	Maple Leaf Milling Co., Limited, Toronto, Canada	....	....	....	Wire tags, illegal.
	Wheat Middlings.				
15640	Shorts. James Goldie Co., Guelph, Ont.	1.25	1.38	....	
	Corn Gluten Feed.				
15561	Hubinger Bros. Co., Keokuk, Iowa‡	....	....	....	No guaranty.
	Corn Meal.				
15664	Unknown	....	....	....	No guaranty.
	Hominy Feed.				
15559	Aunt Jemima Mills Co., St. Joseph, Mo.	....	....	....	Wire tags, illegal.
15570	The Patent Cereal Co., Geneva, N. Y.	....	....	....	Wire tags, illegal.
15608	Plymouth's Pure. Plymouth Milling Co., Lemars, Iowa	0.95	....	....	
	Peanut Oil Meal.				
15657	Beta. Oil Seeds Co., Bayonne, N. J.	2.06	....	....	
	Proprietary Feeds.				
15653	Stock Feed. Hales & Edwards, Chicago‡	....	0.83	....	
15531	Vitality Stock Feed. Rosenbaum Bros., Chicago	1.69	....	....	

‡Statement of dealer.

TABLE II.—FEEDS NOT CONFORMING TO GUARANTIES OR OTHERWISE ILLEGAL—*Concluded.*

Station No.	Brand and Manufacturer.	Protein deficiency.	Fat deficiency.	Fiber excess.	Remarks.
		%	%	%	
15553	Acorn Dairy Feed. Chapin & Co., Hammond, Ind.	....	....	....	Wire tags, illegal.
15629	Crosby's Quality Feed Dairy Ration. E. Crosby & Co., Brattleboro, Vt.	1.12	....	....	
15599	Eshelman's 20 Dairy Feed. John W. Eshelman & Sons, Lancaster, Pa.	2.44	....	....	
15546	Syragold Milk Ration. Syracuse Milling Co., Syracuse, N. Y.	....	....	2.74	
15667	Unknown	....	....	....	No guaranty.
15656	Pioneer Hog Feed. Hales & Edwards, Chicago	....	0.68	....	

MISCELLANEOUS SAMPLES, ETC.

CAROB BEANS.

Three analyses of carob beans, otherwise known as locust beans and St. John's bread are here given. Sample **15974** was obtained through the courtesy of Meech & Stoddard, Inc., Middletown, who also submitted a sample of bean and pod meal, No. **15833.** The third analysis is taken from the literature[1]. Analyses are of the bean and pod.

ANALYSES OF CAROB BEANS.

Sample No.	15974	15833	Quoted analysis.
	%	%	%
Moisture	13.29	6.09	15.00
Ash	2.57	16.97	2.50
Protein	4.67	5.19	5.90
Fiber	5.91	6.67	75.30
Nitrogen-free Extract	73.12	62.76	
Fat	0.44	2.32	1.30

The high ash content in **15833** is due to a large amount (12.72 per cent.) of sand from dirt adhering to the beans.

CRUDE FIBER.

A sample of feed sent out by Mr. G. L. Bidwell, of the Bureau of Chemistry, Washington, Referee on methods for crude fiber determination, was examined in this laboratory by Mr. Shepard. His result, by the method proposed, was 13.35 per cent. By the proceedure employed here he obtained 13.07 per cent.

[1]Farmer's Bulletin 121, p. 17, 1900.

Samples Submitted by the Dairy Commissioner.

Three samples have been examined.

18528. *Chick feed,* was found to consist largely of cracked corn, oats, rye, millet and screenings. No decomposed or injurious material was detected.

17501 R and **11376 J.** *Interstate samples of Cottonseed meal* by Inspector W. J. Warner to check a sample, **13864,** drawn by our Station Agent. They contained respectively, 5.77 per cent. and 5.82 per cent. of nitrogen. Our original sample, **13864,** contained about 1 per cent. less nitrogen, five determinations on two separate sub-samples giving results of 4.92, 4.84, 4.91, 4.78 and 4.78 per cent. The various samples were taken from what was said to be the same shipment but there were evidently two different grades of meal in the lot. The goods were sold under a guarty of 5.76 per cent. nitrogen, equivalent to 36 per cent. protein.

Samples Submitted by Individuals.

Corn Products. **14404.** Sweet corn, sent by F. C. Hubbard, Middletown, contained 10.4 per cent. of moisture.

14472. Farmers' Gluten, sent by The Coles Co., Middletown, contained 30.63 per cent. of protein.

15813. Gluten Feed, sent by A. S. Tanner, New Preston, contained 24.88 per cent. of protein.

14426. Gluten Feed, sent by H. R. Stone, Southbury, was analyzed as follows:

Moisture 6.30; ash 2.79; protein 25.19; fiber 6.52; nitrogen free extract 55.84; fat 3.36. per cent.

14889. Hominy, sent by Middlefield Grain and Coal Co., Middlefield, contained 11.13 per cent. of protein.

14430. Hominy, sent by Powder Hill Dairy Farm, Wallingford, contained 11.75 per cent. of protein.

14428. Hominy, sent by A. Gerosia, Plainfield, contained 8.85 per cent. of crude fat.

16194. Hominy Feed, sent by the Yantic Grain and Products Co., Norwich, contained 10.50 per cent. of protein and 4.15 per cent. of fiber.

Wheat Products. **15840.** Flour Middlings, sent by M. Asher, Andover, contained 17 per cent. of protein.

14755. Treated Bran, sent by Meech & Stoddard, Inc., Middletown. It consisted of coarse bran, probably wheat, with a small proportion of charred material, evidently the result of toasting or scorching.

15354. Shredded Wheat Waste for poultry, sent by Z. N. Beach, Wallingford, contained 12 per cent. of protein.

Proprietary Mixed Feeds. Fifteen samples have been submitted.

16077. Horse Feed, sent by L. A. Bevan, County Agent, Danbury.

15459. Cow Feed, sent by Miss A. P. Bingham, Rockfall.

15972. Dairy Feed; and **15973.** Dry Mash, both sent by L. B. Merriman, Torrington.

15978 and **15979.** Special Mixtures, sent by L. H. Healey, North Woodstock.

16115. Horse Feed, sent by American Summatra Tobacco Co., East Hartford.

15329. College Stock Feed, sent by H. R. Stone, Southbury. Guaranty, protein 10 per cent.; fiber 11 per cent.; fat 2.5 per cent.; carbohydrates 60 per cent.

15447. Rabbit Mule Feed; **15448.** Green Cross Mule Feed; and **15932.** Monogram Feed, all sent by the Griffin Tobacco Co., Bloomfield.

15411. Big Repeater Dairy Ration, sent by E. H. Rollins, Granby.

15255. Farmer Jones Dairy Feed, sent by Washington Supply Co., Inc., Washington Depot.

14414. Eshelman's 24, sent by L. W. Smith, New Preston.

16054. Dairy Feed, sent by Charles T. Mason, Washington Depot.

The analyses of these feeds are given in the following Table:

Table III.—Analyses of Proprietary Feeds Submitted by Individuals.

Station No.	Moisture. %	Ash. %	Protein. %	Fiber. %	Nitrogen-free Extract. %	Fat. %
16077	6.16	8.79	20.38	6.16	52.97	5.54
15459	10.22	5.85	25.00	8.03	45.69	5.21
15972	7.87	4.21	19.19	9.55	53.61	5.57
15973	7.77	9.10	20.88	7.09	47.98	7.18
15978	7.17	3.86	20.44	8.50	55.05	4.98
15979	7.19	3.95	20.94	7.84	55.99	4.09
16115	7.29	6.97	11.25	13.82	58.59	2.08
15329	10.59	....	13.19	6.99	.....	5.75
15447	8.60	7.32	10.63	14.84	56.83	1.78
15448	8.78	5.05	11.06	11.14	60.82	3.15
15932	6.77	7.21	12.94	10.76	59.88	2.44
15411	10.19	....	24.50	9.96	.....	5.44
15255	.....	....	22.44	.....	.....	....
14414	.....	....	24.88	.....	.....	....
16054	8.28	....	25.44	.....	.....	9.21

Unclassified. **15880.** Alfalfa Feed, damaged, sent by Arthur Mather, Hartford, was found to contain a normal amount (10.13 per cent.) of protein and otherwise not obviously inferior.

15812. Cottonseed Feed, sent by A. S. Tanner, New Preston, contained 35.13 per cent. of protein.

16124. Sample sent by C. E. Slauson Co., Stamford, for identification. The material had the composition and general appearance of dried beet pulp.

14352 and **14336.** Yeast Grains, sent by T. C. Dyer, Collinsville, contained respectively 23.52 per cent. and 21.06 per cent. of nitrogen.

TABLE IV.—ANALYSES OF COMMERCIAL FEEDS,

Station No.	Manufacturer and Brand.	Retail Dealer.
	OIL SEED PRODUCTS.	
	Cottonseed Meal.	
15601	Crown. Ashcraft-Wilkinson Co., Atlanta, Ga.	*Torrington:* D. L. Talcott..
		Guaranty.....
15584	Helmet. Ashcraft-Wilkinson Co., Atlanta, Ga.	*New Milford:* Geo. E. Ackley
		Guaranty .....
15606†	Paramount. Ashcraft-Wilkinson Co., Atlanta, Ga.....	*Winsted:* E. Manchester & Sons.....
		Guaranty.....
15635†	Jay. F. W. Brode & Co., Memphis, Tenn....	*South Coventry:* W. C. Latimer.....
		Guaranty.....
15628†	Prime. The Cotton Seed Products Co., Louisville, Ky.....	*Granby:* E. H. Rollins.....
		Guaranty.....
15580	Ordinary. Ennis Cotton Oil & Manufacturing Co., Ennis, Tex.....	*New Milford:* Geo. T. Soule
		Guaranty.....
15581	Choice. Fidelity Products Co., Houston, Texas.....	*New Milford:* Geo. T. Soule
		Guaranty.....
15564†	Good. W. D. Hall Company, Atlanta, Ga....	*Wallingford:* A. E. Hall....
		Guaranty.....
15586	Bull. Humphreys-Godwin Co., Memphis, Tenn.....	*Danbury:* H. E. Meeker....
		Guaranty.....
15540	Danish. Humphreys-Godwin Co., Memphis, Tenn.....	*West Chesire:* G. W. Thorpe.
		Guaranty.....
15666	Danish. Humphreys-Godwin Co., Memphis, Tenn.....	*New Haven:* R. G. Davis & Sons.....
		Guaranty.....
15548†	Memphis. L. B. Lovitt & Co., Memphis, Tenn.....	*Plainville:* Eaton Bros.....
		Guaranty.....
15631†	Thirty Six. L. B. Lovitt & Co., Memphis, Tenn.....	*Hartford:* Meech Grain Co.
		Guaranty.....
15532	Holstein. Steele-Kolb By-Products Co., Inc., Birmingham, Ala.....	*Hamden:* I. W. Beers.....
		Guaranty.....
15654	Planet. A. C. Westervelt & Co., Memphis, Tenn.....	*Middletown:* Meech & Stoddard, Inc.....
		Guaranty.....
15598	Winder Oil Mill Co., Winder, Ga.....	*Waterbury:* Spencer Grain Co.....
		Guaranty.....
		Average guaranty.....
		Average of analyses.....
		Average digestible.....
	Cottonseed Feed.	
15555	Danish. Humphreys-Godwin Co., Memphis, Tenn.....	*Branford:* S. V. Osborn....
		Guaranty.....
15523†	77. Humphreys-Godwin Co., Memphis, Tenn.....	*East Haven:* F. A. Forbes..
		Guaranty.....
		Average guaranty.....
		Average of analyses.....
		Average digestible.....

†Wire tags.

INSPECTION OF 1920.

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N.x6.25)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat)	
15601	6.66	6.50	37.25	11.21	31.51	6.87	$70.00
.....	.....	.....	38.62	10.00	23.00	6.00	.....
15584	6.54	7.53	40.38	7.35	29.24	8.96	60.00
.....	.....	.....	41.00	10.00	23.00	6.00	.....
15606	6.82	6.07	36.19	11.62	32.28	7.02	65.00
.....	.....	.....	36.00	14.00	27.00	5.50	....
15635	7.71	5.03	35.44	13.86	31.57	6.39	58.00
.....	.....	.....	36.00	14.00	30.00	5.00	....
15628	8.98	6.02	39.69	10.36	28.21	6.74	52.00
.....	.....	.....	38.62	10.00	.. ..	6.00	.....
15580	6.80	6.63	46.88	4.77	24.39	10.53	60.00
.....	.....	.....	43.00	12.00	25.00	6.00	.....
15581	6.74	6.73	46.50	4.35	24.62	11.06	60.00
.....	.....	.....	43.00	12.00	.....	6.00	.....
15564	8.11	6.36	36.00	11.83	31.84	5.86	47.00
.....	.....	.....	36.00	14.00	27.00	5.50	.....
15586	6.97	5.83	44.13	7.17	28.16	7.74	62.00
.....	.....	.....	43.00	10.00	26.00	5.00	. ..
15540	7.92	5.92	34.56	12.88	31.95	6.77	58.00
.....	.....	.....	36.00	15.00	25.00	5.00	.....
15666	8.42	6.26	36.50	11.78	29.98	7.06	.....
.....	.....	.....	36.00	15.00	25.00	5.00	.....
15548	8.65	6.45	38.06	13.12	27.21	6.51	70.00
.....	.....	.....	38.50	12.00	27.50	5.50	.....
15631	7.26	6.69	39.38	10.92	27.56	8.19	67.00
.....	.....	.....	36.00	14.00	28.50	5.00	.....
15532	7.62	5.88	33.50	17.20	29.01	6.79	64.00
.....	.....	.....	36.00	14.00	27.00	5.00	.....
15654	11.21	7.32	44.31	6.64	22.24	8.28	62.00
.....	.....	....	43.00	10.00	26.00	6.00	.....
15598	6.27	6.99	41.75	6.81	28.28	9.90	58.00
.....	.....	.....	38.50	7.10	30.75	7.50	.....
.....	.....	.....	**38.70**	**12.07**	**26.48**	**5.62**	.....
.....	**7.67**	**6.39**	**39.41**	**10.12**	**28.62**	**7.70**	**60.86**
.....	.....	.....	**33.10**	**3.74**	**21.47**	**7.40**	.....
15555	8.28	6.35	36.06	11.24	30.56	7.51	64.00
.....	.....	.....	36.00	15.00	25.00	5.00	.....
15523	8.58	3.79	19.63	26.53	37.84	3.63	55.00
.....	.....	.....	20.00	28.00	35.00	4.00	.....
.....	.....	.....	**28.00**	**21.50**	**32.50**	**4.50**	.....
... .	**8.43**	**5.07**	**27.85**	**18.88**	**34.20**	**5.57**	**59.50**
.....	.....	.....	**16.15**	**8.50**	**20.86**	**5.01**	.....

TABLE IV.—ANALYSES OF COMMERCIAL FEEDS,

Station No.	Manufacturer and Brand.	Retail Dealer.
	OIL SEED PRODUCTS—*Concluded.*	
	Linseed Meal, Old Process.	
15524	Kellogg's Oil Meal. Spencer Kellogg & Sons, Undercliff, N. J.	*East Haven:* F. A. Forbes.
		Guaranty
15575	Ground Linseed Cake. Midland Linseed Products Co., Minneapolis, Minn.	*New Britain:* C. W. Lines Co.
		Guaranty
		Average guaranty
		Average of analyses
		Average digestible
	WHEAT PRODUCTS.	
	Wheat Bran.	
15620*†	The Anthony Mills, Anthony, Kansas.	*New Haven:* Crittenden Benham Co.
		Guaranty
15557	Commander. Commander Mill Co., Minneapolis, Minn.	*Guilford:* Fred. C. Morse.
		Guaranty
15602*	Choice. Hecker-Jones-Jewell Milling Co., New York, N. Y.	*Torrington:* D. L. Talcott.
		Guaranty
15652†	The Hunter Milling Co., Wellington, Kansas.	*New London:* P. Swartz & Co.
		Guaranty
15522†	Maple Leaf Milling Co., Limited, Toronto Canada	*East Haven:* F. A. Forbes.
		Guaranty
15634	Maple Leaf Milling Co., Toronto, Canada.	*Rockville:* Rockville Milling Co.
		Guaranty
15647	Choice. Niagara Falls Milling Co., Niagara Falls, N. Y.	*Norwich:* Chas. Slosberg & Son.
		Guaranty
15645	Omar. Omaha Flour Mills Co., Omaha, Neb.	*Yantic:* Yantic Grain & Products Co.
		Guaranty
15545	Thompson Milling Co., Lockport, N. Y.	*Plantsville:* W. H. Cowles.
		Guaranty
15665*	Washburn-Crosby Co., Minneapolis, Minn.	*New Haven:* R. G. Davis & Sons.
		Guaranty
		Average guaranty
		Average of analyses
		Average digestible
	Wheat Feed (Mixed Feed).	
15605	Snowflake. Lawrenceburg Roller Mill Co., Lawrenceburg, Ind.	*Winsted:* E. Manchester & & Sons.
		Guaranty
15549*	Pillsbury's. Pillsbury Mills, Minneapolis, Minn.	*Plainville:* Eaton Bros.
		Guaranty

*With screenings. † Wire tags.

INSPECTION OF 1920—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein (N.x625)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat)	
15524	8.54	5.80	31.06	8.39	39.16	7.05	$70.00
.....	.....	.....	31.00	.....	.....	5.00	.....
15575	9.94	6.21	30.19	8.25	37.73	7.68	72.00
.....	.....	.....	31.00	.....	.....	5.00	.....
.....	.....	.....	**31.00**	.....	.....	**5.00**	.....
.....	**9.24**	**6.01**	**30.63**	**8.32**	**38.43**	**7.37**	**71.00**
.....	.....	.....	**27.26**	**4.74**	**29.98**	**6.56**	.....
15620	11.19	6.22	17.81	8.81	51.69	4.28	51.00
.....	.....	.....	14.50	10.00	.....	3.50	.....
15557	9.50	6.61	14.69	11.10	52.82	5.28	49.00
.....	.....	.....	13.00	.....	.....	3.50	.....
15602	9.97	5.56	16.94	9.32	52.62	5.59	48.00
.....	.....	.....	14.50	12.50	51.55	3.75	.....
15652	13.51	6.80	17.25	9.68	48.65	4.11	50.00
.....	.....	.....	14.50	11.00	52.00	3.50	.....
15522	9.10	5.49	17.63	10.37	51.38	6.03	31.00
.....	.....	.....	14.00	10.00	48.00	4.50	.....
15634	9.15	5.13	18.00	9.31	52.99	5.42	50.00
.....	.....	.....	15.50	.....	.....	4.50	.....
15647	12.57	5.60	18.31	12.40	45.25	5.87	48.00
.....	.....	.....	12.00	.....	.....	3.00	.....
15645	9.23	7.18	14.94	9.59	54.44	4.62	48.00
.....	.....	.....	14.50	11.00	50.00	3.50	.....
15545	9.81	6.76	16.13	9.88	52.54	4.88	47.00
.....	.....	.....	11.00	15.00	.....	3.00	.....
15665	10.92	5.06	17.44	10.62	50.15	5.81	.....
.....	.....	.....	13.00	....	....	4.50	.....
.....	.....	.....	**13.65**	**11.59**	**50.39**	**3.73**	.....
.....	**10.50**	**6.04**	**16.91**	**10.11**	**51.25**	**5.19**	**46.89**
.....	.....	.....	**12.85**	**4.35**	**37.93**	**3.22**	.....
15605	9.14	5.94	16.69	8.90	54.86	4.47	$55.00
.....	....	.....	14.00	.....	.....	3.00	.....
15549	9.89	4.62	16.38	7.64	56.41	5.06	65.00
.....	.....	.....	14.00	.....	.....	4.00	.....

TABLE IV.—ANALYSES OF COMMERCIAL FEEDS,

Station No.	Manufacturer and Brand.	Retail Dealer.
	WHEAT PRODUCTS—*Concluded.*	
	Wheat Feed (Mixed Feed)—Concluded.	
15556	Occident. Russell Miller Milling Co., Minneapolis, Minn	*Guilford:* Fred C. Morse Guaranty
15534	Gold Mine. Sheffield King Milling Co., Minneapolis, Minn	*Ansonia:* Ansonia Flour & Grain Co Guaranty
15627	Kent. Williams Bros., Co., Kent, Ohio	*Granby:* E. H. Rollins Guaranty Average guaranty Average of analyses Average digestible
	Wheat Middlings.	
15533*	Bay State. Bay State Milling Co., Winona, Wis	*Ansonia:* Ansonia Flour & Grain Co Guaranty
15596*	Big Diamond. Big Diamond Mills Co., Minneapolis, Minn	*Waterbury:* Spencer Grain Co Guaranty
15554*	Madelia. C. S. Christenson Co., Madelia, Minn	*Branford:* S. V. Osborn Guaranty
15611	Duluth Universal Milling Co., Duluth, Minn.	*Hazardville:* A. D. Bridges Sons Guaranty
15640	Shorts. Jas. Goldie Co., Guelph, Ont	*Willimantic:* Boston Grain Store Guaranty
15600*	Hecker-Jones-Jewell Milling Co., New York	*Torrington:* D. L. Talcott Guaranty
15529	Black Hawk. International Milling Co., Minneapolis, Minn	*Hamden:* I. W. Beers Guaranty
15526	Rex. Maple Leaf Milling Co., Toronto, Canada	*East Haven:* F. A. Forbes Guaranty
15616	Alta. Russell Miller Milling Co., Minneapolis, Minn	*Suffield:* Spencer Bros. Guaranty
15539	XXX Comet. Northwestern Consolidated Milling Co., Minneapolis, Minn	*Southport:* C. Buckingham & Co., Inc Guaranty
15619*	Ogilvie Flour Mills Co., Winnipeg, Canada	*New Haven:* Crittenden-Benham Co Guaranty
15563*	Pillsbury's B. Pillsbury Mills, Minneapolis, Minn	*Wallingford:* A. E. Hall Guaranty
15621	Quaker City. Quaker City Mills Co., Philadelphia, Pa	*New Haven:* R. G. Davis & Sons Guaranty

*With screenings.

INSPECTION OF 1920—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N.x6.25)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat)	
15556	10.35	5.44	18.31	7.89	52.36	5.65	$50.00
.....	.....	.....	15.00	....	.....	4.50	.....
15534	8.54	5.24	16.31	9.08	55.59	5.24	60.00
.....	.....	.....	15.00	.....	.....	4.50	.....
15627	10.67	5.43	16.31	7.50	55.82	4.27	56.00
.....	.....	.....	14.00	.....	.....	3.00	.....
.....	.....	.....	**14.40**	.....	.....	**3.80**	.....
.....	**9.70**	**5.33**	**16.80**	**8.20**	**55.01**	**4.94**	**57.20**
.....	.....	.....	**12.94**	**2.95**	**41.81**	**4.30**	.....
15533	9.27	3.91	16.38	6.78	57.95	5.71	56.00
.....	.....	.....	15.00	.....	.....	4.00	.....
15596	9.28	4.92	16.88	8.45	55.49	4.98	50.00
.....	.....	.....	15.00	.....	.....	4.50	.....
15554	10.97	4.86	16.00	7.88	56.23	4.06	60.00
.....	.....	.....	14.00	.....	.....	3.00	.....
15611	8.62	3.44	17.00	4.92	60.54	5.48	60.00
.....	.....	.....	15.00	.....	.....	5.00	.....
15640	9.89	4.04	15.75	5.75	59.95	4.62	50.00
.....	.....	.....	17.00	.....	.....	6.00	.....
15600	9.18	5.08	17.06	7.56	55.88	5.24	50.00
.....	.....	.....	15.50	10.00	54.24	4.50	.....
15529	8.92	4.98	15.38	8.37	56.72	5.63	43.00
.....	.....	.....	14.00	.....	.....	3.50	.....
15526	9.06	4.25	16.75	7.84	55.84	6.26	53.00
.....	.....	.....	16.00	.....	.....	5.50	.....
15616	10.31	4.11	17.00	6.89	55.98	5.71	70.00
.....	.....	.....	15.00	.....	.....	4.50	.....
15539	10.53	2.59	16.69	1.95	63.52	4.72	77.00
.....	.....	.....	16.00	.....	.....	4.00	.....
15619	11.03	4.00	17.50	7.20	54.47	5.77	51.00
.....	.....	.....	13.00	.....	.....	4.00	.....
15563	10.47	5.04	16.06	8.92	54.02	5.49	45.00
.....	.....	.....	14.00	... .	.....	4.00	.....
15621	11.00	4.31	17.50	5.08	56.91	5.20	71.00
.....	.....	.....	14.00	.....	.....	4.00	.....

TABLE IV.—ANALYSES OF COMMERCIAL FEEDS,

Station No.	Manufacturer and Brand.	Retail Dealer.
	WHEAT PRODUCTS—*Concluded.*	
	Wheat Middlings—Concluded.	
15603*	Pennant. David Stott Flour Mills, Detroit, Mich.	*Torrington:* F. L. Wadhams & Son
		Guaranty
15558*	Angelus. Thompson Milling Co., Lockport, N. Y.	*Guilford:* Fred C. Morse
		Guaranty
15573*	Standard. Washburn Crosby Co., Minneapolis, Minn.	*New Britain:* C. W. Lines Co.
		Guaranty
		Average guaranty
		Average of analyses
		Average digestible
	RYE PRODUCTS.	
15562	Feed. Boutwell Mill & Grain Co., Troy, N. Y.	*Wallingford:* A. E. Hall
		Guaranty
15630*	Middlings. Shane Bros. & Wilson Co., Minneapolis, Minn.	*Hartford:* Meech Grain Co.
		Guaranty
	OAT PRODUCTS.	
15544	Purity Oat Feed. Purity Oat Co., Keokuk, Iowa	*Plantsville:* W. H. Cowles
		Guaranty
	MAIZE PRODUCTS.	
	Corn Gluten Feed.	
15527	Cream of Corn. American Maize Products Co., New York	*East Haven:* F. A. Forbes
		Guaranty
15612	Cream of Corn. American Maize Products Co., Roby, Ind.	*Hazardville:* A. D. Bridges Sons
		Guaranty
15528	Buffalo.‡ Corn Products Refining Co., New York	*Hamden:* I. W. Beers
		Guaranty
15551	Buffalo. Corn Products Refining Co., New York	*Branford:* S. V. Osborn
		Guaranty
15625	Globe. Corn Products Refining Co., New York	*Bristol:* Goodsell Bros.
		Guaranty
15561	Hubinger Bros. Co.,‡ Keokuk, Iowa	*North Haven:* W. L. Thorpe
		Guaranty
15537	Staley's. A. E. Staley Mfg. Co., Decatur, Ill.	*Southport:* C. Buckingham & Co., Inc.
		Guaranty
15579	Farmer Jones. U. S. Food Products Co., Peoria, Ill.	*New Milford:* Geo. T. Soule
		Guaranty
		Average guaranty
		Average of analyses
		Average digestible

*With screenings. ‡Statement of dealer.

INSPECTION OF 1920—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N.x6.25)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat)	
15603	9.68	4.53	16.13	6.58	58.28	4.80	$32.00
.....	.....	.....	15.00	.....	.....	4.00	.....
15558	11.77	3.85	17.75	6.14	55.38	5.11	60.00
.....	.....	.....	11.00	15.00	.....	3.00	.....
15573	12.20	4.06	19.06	6.86	52.02	5.80	65.00
.....	.....	.....	14.00	.....	.....	4.00	.....
.....	.....	.....	**14.60**	.....	.....	**4.22**	.....
.....	**10.13**	**4.25**	**16.81**	**6.70**	**56.82**	**5.29**	**55.81**
.....	.....	.....	**12.94**	**2.01**	**44.32**	**4.66**	.....
15562	11.51	3.74	15.06	4.03	62.59	3.07	45.00
.....	.....	.....	13.50	.....	.....	3.00	.....
15630	9.81	3.79	17.19	5.04	60.87	3.30	74.00
.....	.....	.....	15.50	9.00	55.00	3.50	.....
15544	6.48	7.63	6.06	26.62	51.15	2.06	35.00
.....	.....	.....	5.00	.....	.....	1.75	.....
15527	7.11	2.41	24.50	7.38	53.73	4.87	60.00
.....	.....	.....	23.00	.....	.....	1.50	.....
15612	7.05	2.47	23.56	6.05	57.32	3.55	65.00
.....	.....	.....	23.00	8.50	.....	1.50	.....
15528	8.37	4.76	26.38	5.69	50.09	4.71	60.00
.....	.....	.....	23.00	.....	.....	1.00	.....
15551	8.69	5.18	26.44	7.05	50.17	2.47	60.00
.....	.....	.....	23.00	.....	.....	1.00	.....
15625	8.83	2.89	26.56	6.04	54.52	1.16	60.00
.....	.....	.....	23.00	.....	.....	1.00	.....
15561	9.34	2.05	22.88	5.93	56.41	3.39	62.00
.....	.....	.....	.....	.....	.....	.....	.....
15537	7.65	4.60	26.06	7.71	51.73	2.25	63.00
.....	.....	.....	23.00	.....	.....	1.00	.....
15579	7.99	2.06	25.94	7.12	49.86	7.03	60.00
.....	.....	.....	23.00	9.50	.....	2.00	.....
.....	.....	.....	**23.00**	.....	.....	**1.28**	.....
.....	**8.14**	**3.30**	**25.30**	**6.62**	**52.98**	**3.68**	**61.25**
.....	.....	.....	**21.41**	**4.93**	**46.62**	**3.10**	.....

TABLE IV.—ANALYSES OF COMMERCIAL FEEDS,

Station No.	Manufacturer and Brand.	Retail Dealer.
	MAIZE PRODUCTS—*Concluded.*	
	Corn Meal.	
15664	.....	*New Haven:* R. G. Davis & Sons.....
		Guaranty.....
	Hominy Feed.	
15642	Homco. American Hominy Co., Indianpolis, Ind.....	*Willimantic:* Boston Grain Store.....
		Guaranty.....
15559†	Aunt Jemima Mills Co., St. Joseph, Mo.....	*Guilford:* Fred. C. Morse...
		Guaranty.....
15636	Spring Garden. The Baltimore Pearl Hominy Co., Baltimore, Md.....	*Willimantic:* Willimantic Grain Co.....
		Guaranty.....
15560	Emco. Evans Milling Co., Indianapolis, Ind.	*North Haven:* W. L. Thorpe
		Guaranty.....
15626	White. Kellogg Toasted Corn Flake Co., Battle Creek, Mich.....	*Bristol:* Goodsell Bros.....
		Guaranty.....
15604	True Value. Ladish Milling Co., Milwaukee, Wis.....	*Torrington:* F. L. Wadams & Son.....
		Guaranty.....
15643	Miller Cereal Mills, Omaha, Neb.....	*Yantic:* Yantic Grain and Products Co.....
		Guaranty.....
15538	Choice Steam Cooked. Miner-Hillard Milling Co., Wilkes-Barre, Pa.....	*West Cheshire:* G. W. Thorpe
		Guaranty.....
15570†	The Patent Cereal Co., Geneva, N. Y.....	*Meriden:* August Grulich, Est.....
		Guaranty.....
15608	Plymouth's Pure. Plymouth Milling Co., Lemars, Iowa.....	*Winsted:* E. Manchester & Sons.....
		Guaranty.....
		Average guaranty.....
		Average of analyses.....
		Average digestible.....
	DISTILLERS' PRODUCTS.	
15609	Eagle. Distillers' Dried Grains, The Dewey Bros., Blanchester, Ohio.....	*Winsted:* E. Manchester & Sons.....
		Guaranty.....
	MISCELLANEOUS FEEDS.	
15649	Dried Beet Pulp. Kasco Mills, Inc., Toledo, Ohio.....	*New London:* Conn. Grain Corp.....
		Guaranty.....
15651	Dried Beet Pulp. Max Hottelet, Milwaukee, Wis.....	*New London:* P. Schwartz & Co.....
		Guaranty.....

†Wire tags.

INSPECTION OF 1920—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N.x6.25)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat)	
15664	16.00	1.23	8.44	2.06	68.99	3.28	$.....
.....	.....	.....	.....	.....	.....	.....	.....
15642	7.92	2.62	11.25	4.51	65.44	8.26	45.00
.....	.....	.....	10.00	6.00	.....	6.00	.....
15559	9.99	3.44	12.19	5.82	63.38	5.18	50.00
.....	.....	.....	10.00	8.00	65.00	5.00	.....
15636	8.82	2.46	10.94	4.58	67.21	5.99	50.00
.....	.....	.....	10.00	6.00	60.00	5.00	.....
15560	9.74	2.98	11.75	5.02	60.45	10.06	49.00
.....	.....	.....	10.00	7.00	.....	7.50	.....
15626	9.68	2.73	11.44	4.16	63.22	8.77	56.00
.....	.....	.....	10.00	5.00	55.00	6.00	.....
15604	7.35	2.30	10.94	3.48	69.20	6.73	33.00
.....	.....	.....	10.50	5.00	.....	5.00	.....
15643	9.17	2.91	11.44	4.69	63.47	8.32	50.00
.....	.....	.....	10.00	4.00	65.00	7.00	.....
15538	10.19	2.44	11.19	5.13	65.69	5.36	49.00
.....	.....	.....	10.00	5.00	.....	4.00	.....
15570	10.23	2.44	11.13	5.55	64.03	6.62	50.00
.....	.....	.....	10.00	.....	.....	5.00	.....
15608	7.98	2.20	10.75	4.20	67.32	7.55	52.00
.....	.....	.....	10.00	.....	.....	8.50	.....
.....	.....	.....	**10.05**	**6.00**	.....	**5.90**	.....
.....	**9.11**	**2.65**	**11.30**	**4.71**	**64.94**	**7.29**	**48.40**
.....	.....	.....	**8.78**	**3.58**	**58.45**	**6.63**	.....
15609	5.23	1.71	32.69	11.02	35.95	13.40	72.00
.....	.....	.....	30.00	13.00	30.00	10.00	.....
15649	10.73	3.38	9.00	18.84	56.18	1.87	60.00
.....	.....	.....	9.00	18.00	.....	0.50	.....
15651	9.40	3.26	9.00	20.24	56.63	1.47	60.00
.....	.....	.....	8.00	20.00	60.00	0.50	.....

TABLE IV.—ANALYSES OF COMMERCIAL FEEDS,

Station No.	Manufacturer and Brand.	Retail Dealer.
	MISCELLANEOUS FEEDS—*Concluded.*	
15565	Dried Beet Pulp. Larrowe Milling Co., Detroit, Mich.	*Wallingford:* A. E. Hall
		Guaranty
		Average guaranty
		Average of analyses
		Average digestible
15658	Cocoanut Oil Meal. Oil Seeds Co., Bayonne, N. J.	*Middletown:* Meech & Stoddard, Inc.
		Guaranty
15657	Beta Brand Peanut Oil Meal. Oil Seeds Co., Bayonne, N. J	*Middletown:* Meech & Stoddard, Inc
		Guaranty
	PROPRIETARY MIXED FEEDS. *Horse, Dairy and Stock Feeds.*	
15655	Blatchford's Calf Meal. Blatchford Calf Meal Co., Wauregan, Ill.	*Middletown:* Meech & Stoddard, Inc
		Guaranty
15525	Schumacher's Calf Meal. Quaker Oats Co., Chicago, Ill	*East Haven:* F. A. Forbes
		Guaranty
15639	Ryde's Cream Calf Meal. Ryde & Co., Chicago, Ill.	*Willimantic:* Willimantic Grain Co
		Guaranty
15632	Hamlin Quality Horse Feed. Dwight Hamlin, Pittsburgh, Pa	*Hartford:* Meech Grain Co.
		Guaranty
15577	Peter's King Corn Horse and Mule Feed. M. C. Peters Mills Co., Omaha, Neb.	*Shelton:* Ansonia Flour & Grain Co
		Guaranty
15572	Purina O-Molene Feed. Purina Mills, St. Louis	*Meriden:* August Grulich, Est
		Guaranty
15622	Farmer Jones Horse Feed. U. S. Food Products Co., Peoria, Ill.	*New Haven:* R. G. Davis & Sons
		Guaranty
15656	Pioneer Hog Feed. Hales & Edwards Chicago, Ill.	*Middletown:* Meech & Stoddard, Inc
		Guaranty
15566	Barford's Ready Ration for Growing Pigs. Meech & Stoddard, Inc., Middletown	*Meriden:* Meriden Grain & Coal Co
		Guaranty
15594	Go-Tu-It Hog Ration. Park & Pollard Co., Boston	*Norwalk:* C. E. Slauson Co.
		Guaranty
15576	Peters Hog Profit. M. C. Peters Mill Co., Omaha, Neb.	*Shelton:* Ansonia Flour and Grain Co
		Guaranty
15571	Purina Pig Chow. Purina Mills, Buffalo, N. Y.	*Meriden:* August Grulich, Est
		Guaranty

INSPECTION OF 1920—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N.x6.25)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat)	
15565	6.95	3.28	8.56	19.30	61.20	0.71	$58.00
.....	.....	.....	8.00	20.00	58.00	0.50	.....
.....	.....	.....	**8.33**	**19.33**	**59.00**	**0.50**	.....
.....	**9.03**	**3.31**	**8.85**	**19.46**	**58.00**	**1.35**	**59.33**
.....	.....	.....	**4.60**	**16.15**	**48.14**	.....	.....
15658	12.96	8.44	19.06	12.28	35.17	12.09	.....
.....	.....	.....	20.00	.....	.....	7.00	.....
15657	14.51	6.20	27.94	10.81	27.84	12.70	.....
.....	.....	.....	30.00	10.00	.....	7.00	.....
15655	13.96	6.00	23.19	8.31	43.76	4.78	130.00
.....	.....	.....	24.00	.....	.....	5.00	.....
15525	7.74	5.21	19.50	2.06	57.51	7.98	115.00
.....	.....	.....	18.00	.....	.....	8.00	.....
15639	8.17	5.39	25.19	6.53	49.79	4.93	140.00
.....	.....	.....	25.00	.....	.....	5.00	.....
15632	7.57	7.89	9.00	13.65	59.86	2.03	62.00
.....	.....	.....	9.00	14.00	.....	1.50	.....
15577	7.96	6.44	11.06	16.06	56.25	2.23	65.00
.....	.....	.....	10.00	.....	.....	1.50	.....
15572	9.72	3.87	10.56	6.37	65.38	4.10	58.00
.....	.....	.....	9.75	.....	.....	3.00	.....
15622	9.54	3.85	10.94	7.18	64.66	3.83	60.00
.....	.....	.....	10.00	.....	.....	2.50	....
15656	12.30	5.48	16.88	9.03	52.99	3.32	58.00
.....	.....	.....	15.00	.....	.....	4.00	.....
15566	9.64	4.43	18.75	6.90	53.68	6.60	61.00
.....	.....	.....	18.00	.....	.....	5.00	.....
15594	8.43	9.74	18.25	6.95	50.71	5.92	75.00
.....	.....	.....	15.00	.....	.....	6.00	.....
15576	10.88	6.28	19.25	5.63	52.95	5.01	88.00
.....	.....	.....	17.00	.....	.....	4.00	.....
15571	11.63	8.78	17.06	5.47	52.71	4.35	65.00
.....	.....	.....	15.00	9.00	59.00	2.50	.....

TABLE IV.—ANALYSES OF COMMERCIAL FEEDS,

Station No.	Manufacturer and Brand.	Retail Dealer.
	PROPRIETARY MIXED FEEDS—*Continued.*	
	Horse, Dairy and Stock Feeds—Continued.	
15615	Portage Stock Feed. Akron Feed & Milling Co., Akron, Ohio	*Thompsonville:* Geo.S.Phelps & Co
		Guaranty
15536	Armour's Stock Feed. Armour Grain Co., Chicago, Ill	*Southport:* C. Buckingham & Co., Inc
		Guaranty
15617	Wirthmore Stock Feed. Chas. M. Cox Co., Boston, Mass	*Suffield:* Spencer Bros
		Guaranty
15641	Crosby's Stock Feed. E. Crosby & Co., Brattleboro, Vt	*Willimantic:* Boston Grain Store
		Guaranty
15637	Grandin's Stock Feed. D. H. Grandin Milling Co., Jamestown, N. Y	*Willimantic:* Willimantic Grain Co
		Guaranty
15653	Stock Feed. Hales & Edwards,‡ Chicago, Ill	*New London:* P. Swartz & Co
		Guaranty
15614	Krause Stock Feed. Charles A. Krause, Milwaukee, Wis	*Thompsonville:* George S. Phelps & Co
		Guaranty
15583	Bull Brand Stock Feed. Maritime Trading Corp., Buffalo, N. Y	*New Milford:* George E. Ackley
		Guaranty
15587	M. & S. Stock Feed. Meech & Stoddard, Inc., Middletown, Conn	*Danbury:* H. E. Meeker
		Guaranty
15650	Old Honesty Stock Feed. Oswego Milling Co., Oswego, N. Y	*New London:* P. Schwartz & Co
		Guaranty
15610	Schumacher Feed. Quaker Oats Co., Chicago, Ill	*Hazardville:* A. D. Bridges Sons
		Guaranty
15531	Vitality Stock Feed. Rosenbaum Bros., Chicago, Ill	*Hamden:* I. W. Beers
		Guaranty
15646	Haskell's Stock Feed. Sheets Elevator Co., Haskell Mills, Toledo, Ohio	*Norwich:* Charles Slosberg Sons
		Guaranty
15530	Armour's Dairy Feed. Armour Grain Co., Chicago	*Hamden:* I. W. Beers
		Guaranty
15553†	Acorn Dairy Feed. Chapin & Co., Hammond, Ind	*Branford:* S. V. Osborn
		Guaranty
15589	Unicorn Dairy Ration. Chapin & Co., Hammond, Ind	*Danbury:* F. C. Benjamin
		Guaranty
15541	Wirthmore Balanced Ration for Milch Cows. Chas. M. Cox Co., Boston, Mass	*West Cheshire:* G. W.Thorpe,
		Guaranty
15629	Crosby's Quality Feed Dairy Ration. E. Crosby & Co., Brattleboro, Vt	*Hartford:* Meech Grain Co.
		Guaranty

†Wire tags. ‡Statement of dealer.

INSPECTION OF 1920—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N.x6.25)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat)	
15615	8.35	4.27	10.13	10.96	61.54	4.75	$55.00
			8.50	10.00		4.00	
15536	6.99	4.78	12.63	12.47	58.20	4.93	50.00
			12.00			4.00	
15617	8.03	3.68	10.50	8.73	63.76	5.30	60.00
			9.00			4.00	
15641	9.16	2.94	10.44	7.03	65.25	5.18	48.00
			9.00	10.00	60.00	4.00	
15637	8.55	3.73	9.13	10.50	62.36	5.73	50.00
			10.00			4.00	
15653	10.80	5.43	12.56	10.46	57.58	3.17	50.00
			10.00			4.00	
15614	8.76	2.88	10.31	7.87	66.90	3.28	55.00
			9.00			3.00	
15583	8.70	4.72	13.81	8.77	58.71	5.29	60.00
			11.00	12.00	60.00	4.00	
15587	8.53	3.85	10.63	9.85	61.74	5.40	60.00
			9.00			3.00	
15650	10.16	4.64	11.25	11.46	58.60	3.89	50.00
			10.00			3.00	
15610	9.29	5.50	11.00	9.26	61.80	3.15	55.00
			10.00			3.25	
15531	7.86	7.04	10.31	12.24	58.80	3.75	55.00
			12.00			3.00	
15646	7.39	3.27	9.63	9.75	63.75	6.21	50.00
			9.00			6.00	
15530	7.09	7.25	27.69	13.55	38.48	5.94	72.00
			22.00			5.00	
15553	9.12	6.23	20.00	8.17	51.93	4.55	70.00
			20.00	10.00		3.00	
15589	8.41	6.96	24.88	7.49	46.36	5.90	72.00
			24.00			4.50	
15541	8.99	5.32	24.19	10.60	45.85	5.05	65.00
			24.00			5.00	
15629	8.85	4.93	23.88	10.47	46.23	5.64	73.00
			25.00			5.00	

TABLE IV.—ANALYSES OF COMMERCIAL FEEDS.

Station No.	Manufacturer and Brand.	Retail Dealer.
	PROPRIETARY MIXED FEEDS—*Continued.*	
	Horse, Dairy and Stock Feeds—Continued.	
15599	Eshelman's 20 Dairy Feed. John W. Eshelman & Sons, Lancaster, Pa	*Torrington:* D. L. Talcott.. Guaranty
15588	Eshelman's 24 Dairy Feed. John W. Eshelman & Sons, Lancaster, Pa	*Danbury:* F. C. Benjamin Guaranty
15638	Grandin's Twin-Six Dairy Feed. D. H. Grandin Milling Co., Jamestown, N. Y	*Willimantic:* Williamantic Grain Co Guaranty
15623	Al Grane Milk Feed. H-O Co.'s Mills, Buffalo, N. Y	*Bristol:* Goodsell Bros Guaranty
15547	National Dairy Feed. Ladish Milling Co., Milwaukee, Wis	*Plantsville:* W. H. Cowles... Guaranty
15613	Larro Feed for Dairy Cows. Larrowe Milling Co, Detroit, Mich	*Thompsonville:* George S. Phelps & Co Guaranty
15607	Red Star Dairy Feed. E. Manchester & Sons, Winsted, Conn	*Winsted:* E. Manchester & Sons Guaranty
15567	Barford's Balanced Dairy Ration. Meech & Stoddard, Middletown, Conn	*Meriden:* Meriden Grain & Coal Co Guaranty
15633	Barford's Balanced Dairy Ration. Meech & Stoddard, Inc., Middletown, Conn	*Hartford:* Meech Grain Co. Guaranty
15597	Steven's 44 Dairy Ration. Park & Pollard Co., Boston, Mass	*Waterbury:* Spencer Grain Co Guaranty
15574	Pillsbury's Dairy Ration. Pillsbury Flour Mill Co., Minneapolis, Minn	*New Britain:* C. W. Lines Co Guaranty
15592	Purina Cow Chow. Purina Mills, Buffalo, N. Y	*Norwalk:* C. E. Slauson Co. Guaranty
15591	Protena More Milk Dairy Feed. Purina Mills, St. Louis	*Norwalk:* C. E. Slauson Co. Guaranty
15535	Big Q Dairy Ration. Quaker Oats Co., Chicago, Ill	*Ansonia:* Ansonia Flour & Grain Co Guaranty
15590	Quaker Dairy Feed Without Molasses. Quaker Oats Co., Chicago	*Danbury:* F. C. Benjamin.. Guaranty
15546	Syragold Milk Ration. Syracuse Milling Co., Syracuse, N. Y	*Plantsville:* W. H. Cowles.. Guaranty
15578	Ti-O-Ga Dairy Feed. Tioga Mill & Elevator Co., Waverly, N. Y	*New Milford:* Geo. T. Soule Guaranty
15644	Biles Ready Dairy Ration. The Ubiko Milling Co., Cincinnati, Ohio	*Yantic:* Yantic Grain and Products Co Guaranty
15550	Fourex Dairy Ration. The Ubiko Milling Co., Cincinnati, Ohio	*Plainville:* Eaton Bros. Guaranty

INSPECTION OF 1920—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein (N.x6.25)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat)	
15599	9.81	7.34	17.56	12.03	48.34	4.92	$68.00
.....	.....	.....	20.00	.....	.....	4.00	.....
15588	7.83	6.44	25.50	11.85	42.50	5.88	70.00
.....	.....	.....	24.00	.....	.....	5.00	.....
15638	7.53	6.09	22.31	12.03	46.67	5.37	60.00
.....	.....	.....	22.00	.....	.....	5.00	.....
15623	9.47	6.21	15.38	11.28	53.55	4.11	60.00
.....	.....	.....	14.00	15.00	.....	4.00	.....
15547	9.59	6.18	25.13	8.76	44.14	6.20	70.00
.....	.....	.....	20.00	12.00	55.00	4.00	.....
15613	7.82	5.72	22.31	10.23	49.40	4.52	75.00
.....	.....	.....	20.00	.....	.....	3.00	.....
15607	8.42	5.11	24.50	8.79	46.50	6.68	67.00
.....	.....	.....	23.00	10.00	.....	4.00	.....
15567	9.24	4.90	21.50	8.40	47.98	7.98	60.00
.....	.....	.....	19.00	.....	.....	5.50	.....
15633	7.92	5.38	19.13	9.03	51.41	7.13	78.00
.....	.....	.....	19.00	.....	.....	5.50	.....
15597	6.94	8.37	26.88	10.86	38.47	7.48	75.00
.....	.....	.....	24.00	.....	.....	5.00	.....
15574	8.61	6.82	19.38	10.14	50.23	4.82	72.00
.....	.....	.....	19.00	.....	.....	4.00	.....
15592	8.58	6.43	26.56	10.74	43.17	4.52	75.00
.....	.....	.....	24.00	12.00	53.00	4.30	.....
15591	8.20	7.12	18.75	10.13	51.30	4.50	60.00
.....	.....	.....	16.50	.....	.....	3.50	.....
15535	7.46	5.22	22.06	10.78	48.97	5.51	73.00
.....	.....	.....	22.00	.....	.....	5.00	.....
15590	7.68	9.08	16.69	13.57	48.25	4.73	65.00
.....	.....	.....	16.00	.....	.....	4.50	.....
15546	9.50	5.76	20.56	17.74	42.11	4.33	70.00
.....	.....	.....	20.00	15.00	43.00	4.50	.....
15578	9.32	6.88	29.06	8.06	41.60	5.08	68.00
.....	.....	.....	23.00	11.00	.....	3.50	.....
15644	7.83	5.28	24.13	8.29	47.71	6.76	70.00
.....	.....	.....	24.00	10.00	50.00	5.00	.....
15550	8.89	6.74	20.81	10.55	48.56	4.45	65.00
.....	.....	.....	20.00	12.00	52.00	4.00	.....

TABLE IV.—ANALYSES OF COMMERCIAL FEEDS,

Station No.	Manufacturer and Brand.	Retail Dealer.
	PROPRIETARY MIXED FEEDS—*Concluded.*	
	Horse, Dairy and Stock Feeds—Concluded.	
15552	Big Repeater Dairy Ration. U. S. Feed Association, Toledo, Ohio	*Branford:* S. V. Osborn Guaranty
15542	Farmer Jones Dairy Feed. U. S. Food Products Co., Peoria, Ill	*West Cheshire:* G. W. Thorpe Guaranty
15543	Success Dairy Feed. U. S. Food Products Co., Peoria, Ill	*West Cheshire:* G. W. Thorpe Guaranty
15667	Dairy Feed	*New Haven:* R. G. Davis & Sons Guaranty
	POULTRY FEEDS.	
15585	Blatchford's Fill the Basket Egg Mash. Blatchford Calf Meal Co., Wauregan, Ill.	*New Milford:* Geo. E. Ackley Guaranty
15569	Iroquois Poultry Mash. Buffalo Cereal Co., Buffalo, N. Y	*Meriden:* Meriden Grain & Coal Co Guaranty
15582	Wirthmore Mash Feed. Chas. M. Cox, Boston, Mass	*New Milford:* Geo. T. Soule Guaranty
15624	H. O. Co.'s Laying Mash. H. O. Co.'s Mills, Buffalo, N. Y	*Bristol:* Goodsell Bros. Guaranty
15568	M. & S. Dry Mash. Meech & Stoddard, Middletown, Conn	*Meriden:* Meriden Grain & Coal Co Guaranty
15648	Mystic Laying Mash. Mystic Milling & Feed Co., Rochester, N. Y	*Norwich:* Chas. Slosberg & Son Guaranty
15593	Lay or Bust. Park and Pollard Co., Boston, Mass	*Norwalk:* C. E. Slauson Co. Guaranty
15618	Purina Chicken Chowder. Purina Mills, St. Louis	*New Haven:* Crittenden-Benham Co Guaranty
15595	Full-O-Pep Growing Mash. Quaker Oats Co., Ill	*Norwalk:* C. E. Slauson Co. Guaranty

15334. Beef Scrap, sent by H. H. Johnson, County Agent, Norwich, contained 55.88 per cent. of protein.

14350. Cane Molar, molasses used in the preparation of stock feeds was found to contain only a trace of sulphur dioxide.

Condimental Foods, Tonics, etc. **14468.** Sample sent by Mrs. George Middleton, North Windham, consisted of mixed ground grains, mainly corn, oats and wheat. No evidence of medicaments was found.

15441. Stock Feed Tonic, sent by B. S. Dibble, East Canaan, consisted of, or contained, salt, charcoal, partially digested starchy material, bicarbonate of soda, sulphur, quassia, chaff, and weed seeds. Epsom salt and limestone or shells were indicated.

INSPECTION OF 1920—*Concluded.*

Station No.	Pounds per Hundred.						Price per ton.
	Water	Ash.	Protein (N.x6.25).	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat)	
15552	8.84	5.36	22.88	9.21	48.55	5.16	$70.00
.....	.....	.....	22.00	.....	.....	5.00	.....
15542	8.85	7.28	24.50	7.54	47.01	4.82[1]	65.00
.....	.....	.....	20.00	.....	.....	5.00	.....
15543	9.39	7.80	22.81	7.20	48.38	4.42	60.00
.....	.....	.....	16.00	.....	.....	4.00	.....
15667	11.67	3.44	19.44	7.01	53.26	5.18	.....
.....	.....	.....	.....	.....	.....	.....	.....
15585	8.18	14.43	21.31	8.72	42.05	5.31	100.00
.....	.....	.....	19.00	.....	.....	4.00	.....
15569	8.86	5.08	16.25	8.04	55.80	5.97	63.00
.....	.....	.....	15.00	.....	.....	4.00	.....
15582	9.77	9.43	23.13	5.69	46.64	5.34	78.00
.....	.....	.....	20.00	.....	.....	4.00	.....
15624	9.20	10.88	20.00	5.23	49.23	5.46	75.00
.....	.....	.....	17.00	6.00	.....	4.50	.....
15568	9.62	8.68	19.81	6.63	49.01	6.25	60.00
.....	.....	.....	12.00	.....	.....	3.00	.....
15648	11.85	8.60	23.75	9.60	41.93	4.27	78.00
.....	.....	.....	23.00	.....	.....	4.00	.....
15593	8.52	12.04	18.19	7.62	49.76	3.87	75.00
.....	.....	.....	18.00	.....	.....	1.50	.....
15618	9.50	7.46	20.06	8.51	49.71	4.76	81.00
.....	.....	.....	18.00	.....	.....	4.00	.....
15595	8.24	9.60	19.63	4.88	52.58	5.07	90.00
.....	.....	.....	17.00	.....	.....	5.25	.....

[1] By modified method; 4.52 by regular method.

FEEDS SUSPECTED OF CONTAINING FOREIGN OR INJURIOUS MATERIALS.

15252. Oats suspected of having been sulphured, sent by R. E. Macey, West Haven. No evidence of bleaching was obtained.

15305. Shelled corn and peanut feed, sent by Mrs. William Lord, Noroton Heights, was referred to the Department of Entomology. Dr. Britton reported the sample to be moderately infested with the rice weevil and slightly infested with the Indian meal moth.

14982. Scratch Feed and **14983.** Chick Feed, sent by E. Johnson, Thomaston. There was nothing suspicious about the substance of the feeds but **14982,** in our opinion, was entirely too coarse for young chicks.

CONNECTICUT
Agricultural Experiment Station
NEW HAVEN, CONN.

BULLETIN 230 **JUNE, 1921**

ENTOMOLOGICAL SERIES, No. 29

THE GRASS-FEEDING FROG-HOPPER OR SPITTLE-BUG

By Philip Garman

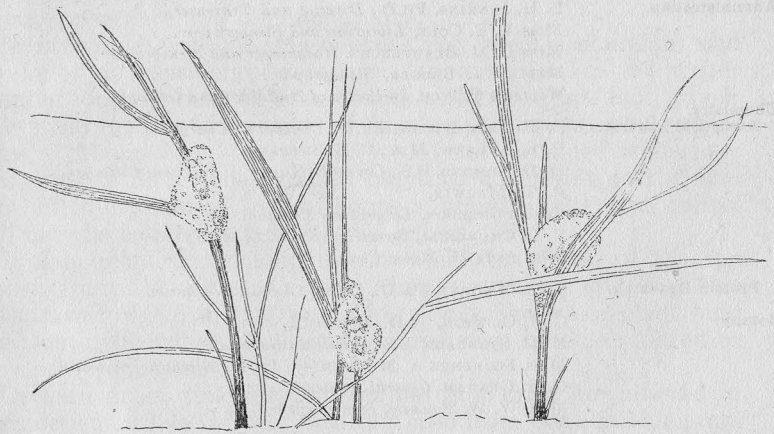


Figure 17. Spittle balls containing nymphs on grass stems

CONTENTS

Press of The Wilson H. Lee Company.

The Grass-Feeding Frog-Hopper or Spittle-Bug

(*Philaenus lineatus* Linnaeus)

Order *Hemiptera* — Family *Cercopidae*

By Philip Garman, Ph.D.

Frog-hopper or spittle-bug balls are often observed on shrubbery or herbaceous plants, in waste or uncultivated fields. Those of the grass-feeding species are especially noticeable in meadows and may cause persons not acquainted with them to speculate—often blindly—concerning their probable nature. Such speculations are mainly confined to the belief in "frog-spit" and "snake-spit," though occasionally we find people who think them the young of grasshoppers. The term "frog-hopper," which has grown out of the unfounded belief that spittle balls are voided by tree-frogs, is not inappropriate when applied to the adult bug because of its squat appearance and hopping ability.

In favorable locations frog-hoppers may become abundant and no doubt do considerable damage. In one instance the writer counted fourteen balls on grass plants within a square foot, which shows the relative abundance of frog-hoppers under some conditions. About New Haven they do not become sufficiently numerous to do serious damage, but they contribute to the sum total of injury caused by leaf-hoppers, grasshoppers and thrips, and may be counted a pest for this reason.

Frog-hoppers are sucking insects which make use of the sap drawn from the plant, to form their protective spittle. Any withdrawal of sap in this way naturally weakens the plant, and the stem upon which the insect has fed may become stunted or may not produce seed.

Orchard grass, timothy, red top and blue grass are infested in Connecticut, while Osborn[5] reports it also from Canada blue grass in Maine. The adults likewise feed on grass shoots but apparently do not do as much damage as the nymphs.

Those who have studied the life histories of American Cercopidae have not reported direct field observation of the egg stage of any of them; nor have they followed these insects through their complete cycle from egg to egg or adult to adult.

Some of the missing links in our chain of information have been observed for the grass-feeding spittle-bug and an effort has been made to follow it through its life cycle by observations in the field, insectary and laboratory. These facts are herein recorded.

History

Osborn[5] studied the species of Maine Cercopidae and his observations are of especial value. He says of the grass-feeding species

that it lives through the winter in the egg stage. The eggs hatch late in May or early in June, and the nymph passes through several stages (3-4) before the adult emerges. Adults were obtained in Maine the first part of July and probably mate there in August. Egg laying is extended over "some weeks in autumn." Ball in his summary of the life history of Cercopidae[1] says that all species except one pass the winter in the egg stage.

The Egg

Confined in small wire cages placed over grass planted in flower pots, the adult bugs were induced to mate and lay eggs. The eggs are laid between the leaf and the main stem (Fig. 18, e), are usually placed diagonally to the stem, and within two or three inches of the ground. They are firmly attached to the plant, either to leaf or stem. As many as eleven have been found in one group but they are sometimes laid singly. Cage records indicate that four or five are usually deposited together.

In 1920 eggs were obtained on the following dates from adult females brought from the field and mated in the insectary:— July 12, 16, 25, 29; August 2, 3, 5, 7, 8, 10, 11, 14, 15, 19, 21, 31; September 9, 12 and 20. In 1921 the first eggs were obtained July 7, but could probably have been obtained earlier judging from the time of adult emergence. In 1920 adults were mated July 1, but no eggs were obtained. Of the eggs obtained in 1920, those laid on July 19, 25, 29; August 5, 6, 7, 12, 14, 26; September 7, 9 and 17, hatched the following spring, the period of incubation varying from 228 to 281 days.

Table Giving Data on the Length of the Egg Stage.

Eggs Laid	Eggs Hatched	Length of Period (Days)
July 19, 1920	April 26, 1921	281
July 25, 1920	May 6, 1921	275
July 29, 1920	April 27, 1921	272
August 5, 1920	April 30, 1921	268
August 5, 1920	April 27, 1921	265
August 5, 1920	April 27, 1921	265
August 8, 1920	April 25, 1921	260
August 7, 1920	April 30, 1921	266
August 8, 1920	April 26, 1921	261
August 9, 1920	April 30, 1921	264
August 10, 1920	April 20–26, 1921	253–259
August 14, 1920	April 26, 1921	255
August 14, 1920	April 25, 1921	254
August 15, 1920	April 26, 1921	254
August 14, 1920	April 26, 1921	255
August 14, 1920	April 25, 1921	254
August 31, 1920	April 26, 1921	239
September 9, 1920	April 25, 1921	228
September 12, 1920	April 28, 1921	228
September 17, 1920	May 8, 1921	233

It is interesting to note in addition to the fact that the incubation period varied from 228-281 days in 1920-'21, that the eggs laid between July 19-September 17 hatched within a short time of one another. These eggs were all placed out of doors as soon as laid and brought to the insectary after frost. Furthermore, it was noted in field cages that all hatched about the same time in 1920; viz., April 20, and that young were first seen in the field about this time both in shaded and exposed situations.

The Nymph

The nymph passes through four instars, and the nymphal stage lasts about forty-five days, according to field observations. In 1920 spittle balls were observed from June 1 to August 13, though most of them disappeared about July 4. In 1921 nymphs were present in field cages from April 20 to June 14. The average sum of the different stages obtained in the insectary totals twenty-eight days, and it seems probable that the usual period lies between twenty-eight and forty-five days in this latitude, though possibly more, or less.

The first stage nymphs lived in 1921 from—

April 27 to May 10 ..... 13 days
April 20 to May 3 ..... 13 days
April 26 to May 11 ..... 15 days
April 26 to May 10 ..... 15 days
April 26 to May 11 ..... 15 days
April 28 to May 11 ..... 13 days
April 26 to May 11 ..... 15 days

The mean hourly temperature in the insectary during the period from April 26 to May 11 was 56° F; maximum 76°; minimum 45° F. During 19 hours of this period the temperature registered below 50° F.

The second stage collected from the field in 1920 lived from:—

June 8 to June 12 ..... 4 days
June 8 to June 9 ..... 1 day.

Data on this stage are very unsatisfactory. Two specimens in the third instar collected from the field in 1920 lived from June 8 to June 12, four days, but these also are unsatisfactory data.

The fourth instar in 1920 lived from:—

June 12 to June 20 ..... 8 days
June 9 to June 20 ..... 11 days
June 12 to June 18 ..... 6 days
June 8 to June 18 ..... 10 days
June 8 to June 15 ..... 7 days

Osborn reared this stage in Maine in 2-6 days.

In field cages, nymphs hatched about April 20, and the first adults were seen June 14. Insectary temperature during this period varied from 45° - 82° F. The mean hourly temperature during April (April 26 to May 1) was 60.1° F., during May, 57.1° F; and during June (1-14) 60.3° F. For about 60 hours of this period the temperature was below 50° F.

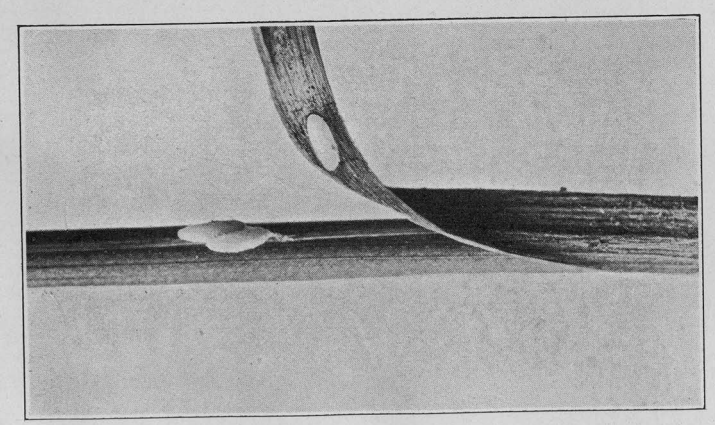
Habits of the Nymph

The newly emerged nymph has a yellow spot on each side of the abdomen. These spots probably mark the location of the spittle glands, the openings of which are on the seventh and eighth segments. While some of the material for the spittle comes from the anal opening, a great part must come from these abdominal glands, the substance flowing beneath the abdomen where it is filled with air bubbles. The apparatus for filling the mass with air bubbles is curious and is connected with a special adaptation for supplying air to the insect itself. In young nymphs the ventral surface of the abdomen is covered with a film of gelatinous material, allowing a space beneath it which connects with the space between the flap-like plates of the terminal segments. Air is drawn beneath this film, the insect keeping the tip of the abdomen above the surface when quiet. Spiracles connecting with air tubes are located on the ventral surface, between pleura and sterna and are covered by the film, in young specimens, and by a series of overlapping plates—extensions of the pleura—in older ones. The insect is enabled in this way to obtain a continual supply of air and at the same time remain submerged in the spittle. When the insect desires to expand the froth it sticks the abdomen above the spittle, encloses an air bubble within the two terminal flaps, brings it beneath the surface and forces it out. Some species, however, are able to work faster. Placing the tip of the abdomen near the surface of the spittle they roll the terminal flaps together rapidly, taking air in and expelling it beneath the surface of the spittle, at the same time moving the tip of the abdomen but little.

Expansion of the froth with air serves to hide the nymph and makes excessive secretion unnecessary. During nymphal life the bug may construct several balls but there is usually little migration after the first mass is formed. Moults take place within the froth and in the case of the grass-feeding frog-hopper, the adult also develops within where it hardens sufficiently to enable it to fly. Thus during nymphal life at least, the grass-feeding spittle-bug is protected from predaceous and parasitic enemies and partly from adverse climatic conditions. Lack of moisture seems to prevent development of the younger stages which depend largely on tender rapidly growing shoots as a food supply. The result is seen in their more frequent occurrence in low damp places than in higher well drained pastures.

a. Spittle balls on grass About natural size Photo by Walden.

b. Adult bug. Six times natural size.



c. Eggs on grass. Eight times natural size. Photo by Walden.

PLATE XIX

a. Field with spittle-masses. Photo by Walden.

b. Grass infested with frog-hoppers, showing spittle-masses. Photo by Walden.

Composition of the Froth

Osborn[5] says that the froth mass is only partly soluble in water. This is true since the balls often remain on the stems after showers. The substance is more readily soluble in sodium hydroxide, but is not easily soluble in 80% alcohol. It probably contains some starch or converted sugar, though there is no reaction to iodine. The "albuminous" substance is not coagulated with heat. The material of spittle balls offers an ideal medium for molds and bacteria which may sometimes be found in large numbers.

The Adult

Adults were collected from grass plots near the Station from June 15 to November 9, 1920, and specimens were taken on May 29, 1921, by Mr. Walden. None could be found in the spring of 1921, prior to May 29, in the field where spittle balls and adults were numerous in 1920. None of the adults survived in field cages, although some laid eggs which hatched the following spring. About two dozen adults in a field cage disappeared completely during the summer but laid eggs which hatched about April 20. Another field cage contained two dozen nymphs; all were adult July 4, and they lived in this state until about August 16, when no live individuals could be found. Eggs were laid by these bugs, and recently hatched nymphs were found April 20, 1921.

The adults apparently lay but few eggs. In breeding cages not over one dozen eggs could be obtained from a single female, though it is probable that they may lay more under suitable conditions. Most individuals laid one or two lots of eggs consisting of four or five each, and then died, in spite of efforts to keep them alive and obtain more eggs. Two gravid females collected in the field August 27, contained 4 and 12 well developed eggs respectively, while two others collected in July contained 0 and 4 eggs.

The period elapsing between emergence of the adult and egg laying is about a month. In 1920 adults were obtained in the field June 15 and the first eggs could not be secured until July 12, although attempts were made several times previous to this date. In 1921, with a much more advanced season, freshly emerged adults were taken in the field by Mr. Walden, May 29, and the first eggs were obtained July 6 from confined bugs brought to the insectary. Mating takes place from the first of July until October, at least in this locality.

The length of life of the adult in field cages was about one month and a half, but observations on unconfined specimens indicate a longer period—two to two and one-half months or more. Thus in a grass plot near the Station, no spittle balls were seen after the first of July, yet adults were collected here until November 9.

Eggs were laid in small cages, within two or three days after mating.

The adult bug is comparatively sluggish most of the time. It remains on the stems of grass plants, and is not easily disturbed. If poked with a stick it moves leisurely up or down but never rapidly. If it receives a more violent poke or blow it responds with a tremendous hop, landing a foot or more away from the original position. If followed, it will usually be found lying feet upwards on the ground or head downwards in the grass, and a second blow will fail to react on it until it has had time to regain its feet. The bugs are most active towards evening, lying almost inactive during the morning.

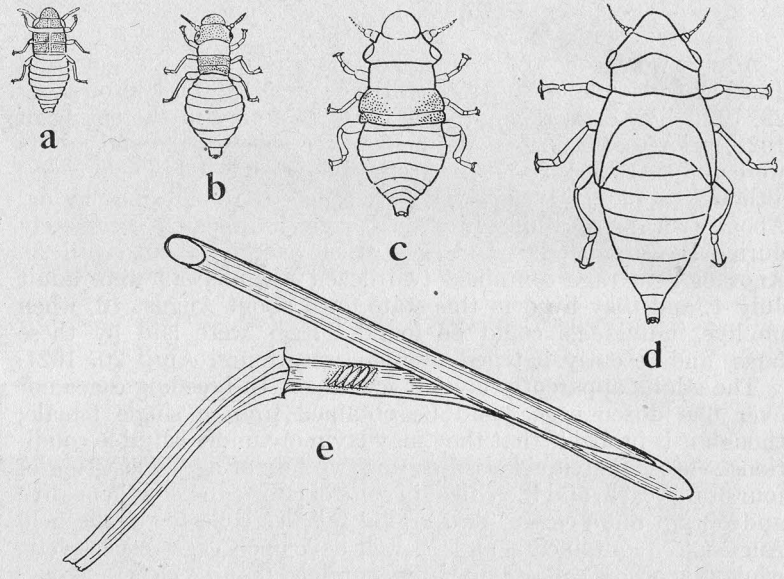


Figure 18. The egg and the nymphal instars of the grass-feeding spittle-bug. a. First instar. b. Second instar. c. Third instar. d. Fourth instar. e. Diagram showing the usual position of the egg.

Description of the Different Stages

Egg (Fig. 18; Pl. XVIII, c.)—The egg is elongate, slightly curved and flattened a little and is usually embedded in a whitish adhesive substance. The surface is smooth. When first laid it is nearly white, but turns light brown with age. There is often a yellowish tint at one end.

Total length about .75-1 mm.

First Instar (Fig. 18, a.)—This stage has the head and thorax and also the legs, dark brown. The abdomen is yellowish white with a darker yellow spot on each side below. The antennae consist of two distinct divisions, the distal division having a number of indistinct annuli. The proximal division has two indefinite segments.

Length of alcoholic specimens 1.2–1.5 mm.

Second Instar (Fig. 18, b.)—This instar is similar in nearly all respects to the first instar except that the prothorax now lacks brown pigment.

The antennae are a little more plainly divided into segments but the two main divisions are still evident. The yellow spots of the abdomen are smaller.

Length of alcoholic specimens 2-3 mm.

Third Instar (Fig. 18, c)—During this stage the abdominal yellow spots disappear, the head loses its brown color, and the wing pads are much more developed. The antennal segments may now be counted with ease.

Length of alcoholic specimens 3.5-4.5 mm.

Fourth Instar (Fig. 18, d)—This stage lacks the brown color of the thorax and head, the entire insect being pale. Antennae are well developed, distinctly segmented and not separated into two divisions as in the first and second instar. The wing pads are well developed, now extending to the caudal margin of the first abdominal segment, and the sexes are easily distinguished with the aid of a microscope.

Length (alcoholic specimens) 5 mm.

Adult, male (Pl. XVIII, b)—Color brown with a pale stripe along each side on the costal margins of the elytra. Head brown, eyes black, the front below marked with arcuate black lines; lora dark brown or black. Venter of thorax and abdomen, and also the tarsal claws black. There is usually a darker stripe on each elytron above the pale costal stripe. The hind legs in common with other spittle-bugs have the tibiae and first two tarsal segments greatly expanded at their tips and spinose.

Length 4.5-5.5 mm; width of head across the eyes 1.5–1.8 mm; greatest width across the elytra when folded 1.8–2 mm.

Female —Similar to the male but slightly larger and the elytra less definitely marked. The meso and metathorax and caudal half of the abdomen below are pale in color.

Length 5–6 mm.

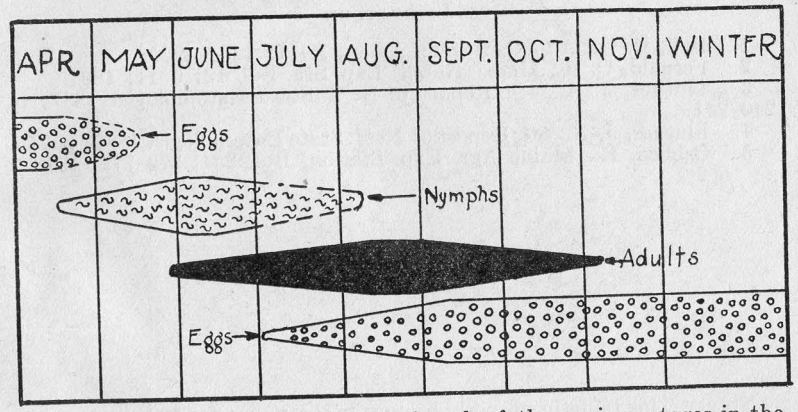


Figure 19. Diagram showing the length of the various stages in the life history.

Control Measures

Osborn suggests control measures for the grass-feeding spittle-bugs, which seem ample. Rotation of crops, or burning over grass land in the fall, winter or early spring should be effective. Hopper-dozer control would probably remove many of the adults but the latter are sluggish and it is doubtful whether the method would

capture a large per cent. Mowing in spring and fall unless very close to the ground and the grass raked off soon after, would also be ineffective because of the position of the eggs. If the grass is allowed to lie on the ground the nymphs will soon crawl from the cut grass to fresh stems.

Spraying is too costly an operation to be of much use in practical control work. Dusting might be done effectively under some conditions though it is well nigh impossible to get action from any insecticides owing to the protective spittle.

Summary

1. The grass-feeding frog-hopper may cause considerable damage to grasses in meadows.

2. The life cycle lasts a year, the greater part of which is passed as an egg laid during the summer and fall.

3. The eggs are laid between a leaf and a stem, being usually placed 4 or 5 together, and within two or three inches of the ground.

4. The adults are found in the field from June until frost, laying eggs over a considerable period (July-October).

5. The nymph passes through four stages, and lives about a month and a half. Nymphs hatched in 1921 about April 20.

6. Control measures should consist of burning over the land during fall, winter, or early spring.

Literature

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3. Lintner, J. A., 4th Report of N. Y. State Entomologist 1887; p. 240–241.
4. Lintner, J. A., 5th Report of N. Y. State Entomologist 1888; p. 245.
5. Osborn, H., Maine Agr. Exp. Station, Bul. 254; 273–277; 1916.

Note:—This bulletin properly belongs in the report for 1921, but owing to delay in issuing the report for 1920, it is here included to secure its earlier publication.

CONNECTICUT

Agricultural Experiment Station

NEW HAVEN, CONN.

BULLETIN 231 SEPTEMBER, 1921

Report of the Tree Protection Examining Board

By W. E. Britton, *Chairman*

Miscellaneous Notes

By E. H. Jenkins

CONTENTS

FIRST REPORT

OF THE

Tree Protection Examining Board

FOR THE BIENNIAL PERIOD ENDING JUNE 30, 1921.*

By W. E. BRITTON, Chairman.

For many years men have traveled about the State and in various places obtained work for the alleged improvement of orchard and shade trees, such as pruning, spraying, bracing, filling cavities, or applying fertilizers. In some cases good service was rendered and the owners were satisfied; in others no benefit resulted. Occasionally trees were positively injured by the treatment, because the so-called "tree doctors" did not understand their business. Finally this condition existed: tree work was being done by well-trained, intelligent and conscientious men; by poorly trained but reliable men; and worst of all, by unscrupulous men who were usually, though not always, poorly trained. The unsatisfactory work of the unreliable men had a tendency to bring the whole business into disrepute. Some of them were at work here one day, but the next they would be gone, perhaps forever, only to be followed by a new crop. Even though such men guaranteed their work, the owner could obtain no redress because the men could not be found.

More than thirty years ago, in the southwestern corner of the State, traveling "tree doctors" did a flourishing business by boring holes in the trunks of elm trees and inserting some chemical substance which they claimed would dissolve in the sap and be carried to the leaves and keep the trees free from the attacks of the elm leaf beetle. The price was seventy-five cents per tree. It was easy money and many property owners "fell for it." Needless to state, no benefit followed the treatment, and members of the Station staff removed some of the material seven years after it was placed in the tree, and apparently none of it had dissolved. A chemical examination showed it to be powdered sulphur and some kind of grease, two substances as nearly insoluble in the sap as could easily be found.

Now such transient work damaged the business of those men and firms who had established a reputation for intelligence and

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* This report properly belongs in the Station report for 1921 rather than in this Station report of 1920. But as there is great delay in issuing the latter it seems advisable to include in it this paper rather than to hold it for the Station report of 1921.

square dealing, and after due consideration, they thought best to apply for legislation to regulate this condition by the issuing of licenses or certificates to qualified workers.

As a result, the following act was passed by the General Assembly of 1919, and was approved May 2nd:—

AN ACT CONCERNING THE IMPROVEMENT, PROTECTION OR PRESERVATION OF FRUIT, SHADE OR ORNAMENTAL TREES.

Chapter 181. Public Acts of 1919. (In effect July 1, 1919.)

SECTION 1. No person, firm or corporation shall advertise, solicit or contract to improve the condition of fruit, shade, forest or ornamental trees, by pruning, trimming or filling cavities, or to protect such trees from damage by insects or disease, either by spraying or any other method, without having secured a certificate as specified in section two of this act; and any person, firm or corporation failing to comply with the terms of this act shall be fined not more than one hundred dollars; provided any person may improve or protect any tree on his own premises or on the property of his employer or on any property within the limits of the town of which he is a legal resident, without securing such a certificate.

SEC. 2. The botanist, entomologist and forester of the Connecticut Agricultural Experiment Station shall constitute a board which shall, upon application from any person, firm or corporation, examine the qualifications of the applicant to improve, protect or preserve fruit, shade, ornamental or forest trees, and if satisfied that the applicant is qualified, may issue a certificate so stating; which certificate shall be valid for one year from the date of its issue, unless sooner revoked as provided in section three of this act, and may be renewed by the board for succeeding years without further examination, upon payment of the fee hereinafter required, provided any person, firm or corporation receiving such certificate shall be responsible for the acts of all employees in the performance of such work.

SEC. 3. Said board shall prepare all necessary forms and prescribe all rules and regulations governing examinations, and any certificate issued under the provisions of this act may be revoked by it upon proof that improper methods have been used or for other sufficient cause.

Sec. 4. Each applicant for an examination shall pay a fee of five dollars in advance, and a fee of two dollars, for each certificate or renewal issued; which fees may be expended by the board for any expense incurred by it in making examinations or issuing certificates, and an account of all receipts and expenditures under this act shall be rendered annually to the state comptroller.

As the botanist, entomologist, and forester of this Station were named to constitute a Board, a meeting of this Board was held on June 14th, and organized by electing as Chairman, W. E. Britton, Entomologist, and as Secretary and Treasurer, W. O. Filley, Forester. The Board also drew up the following rules and regulations according to the provisions of the law:—

EXAMINATION RULES AND REGULATIONS.

I. Each person, firm or corporation required to secure a certificate under Chapter 181, Public Acts of 1919, shall be examined as follows: When a firm is under control of one person who is solely responsible for the contracts, methods and oversight of each piece of work, this person

alone may be required to pass the examination, but when more than one person is responsible for the methods of work and oversight of same, each shall be required to take the examination. When foremen or others are given complete charge of recommending and applying treatments, they shall also be required to take the examination, in so far as it relates to their work. The Examining Board shall decide who shall be required to take the examination.

II. Unless otherwise arranged, candidates for certificates shall appear for examination at the Connecticut Agricultural Experiment Station, at New Haven, at such times as shall be designated by the Board.

III. Examinations may be oral, written, or both, as shall be determined by the Examining Board, and, in general, shall cover tree species, tree life and growth; diseases and insect pests of trees, with treatment for same; pruning and tree surgery.

IV. Candidates prior to the time of examination shall furnish a typewritten statement of their qualifications as follows:—

1. General education.
2. Special training for tree protection work.
3. Experience in tree protection work. The latter shall include
   (a) Place of business, name of firm and position now held.
   (b) Previous positions held.
   (c) Total length of experience.
   (d) Contracts now under way or completed during the past 12 months.

In addition three or more recommendations as to reliability and efficiency shall be furnished; and where typed or printed forms of contracts, regulations, etc., are used, these shall also be supplied, or if not available, statements shall be made concerning the same.

V. If satisfied with the qualifications of the applicant, the Board will issue a certificate good for the succeeding twelve months (unless revoked for cause), then to be renewed upon application under such conditions as the Examining Board may require in each case.

VI. Upon evidence of unfitness in training or improper business methods, the Examining Board may refuse to issue a certificate or cancel one that has been issued. Complaints may be made to the Board on these points, and if deemed desirable by the Board, private hearings of the interested parties shall be held.

The new measure became a law on May 2nd, but it did not take effect until July 1, 1919. In order to give the tree men a chance to meet the provisions of the law, two examinations were held before the law became operative: one on June 27th and one on June 30th. Four examinations were held in July, on the 9th, 12th, 16th and 23rd, respectively.

The form of application used is as follows:—

.....19

I,.....,hereby make application to the Tree Protection Examining Board, for an examination / a renewal certificate, as provided in Chapter 181, Public Acts of 1919.

I enclose fee of $.....as required by law.

.....
Applicant

.....
Address

Fee for Examination Certificate; $5.00
" " Renewal Certificate $2.00

The law provides that the fee shall be paid in advance. In most cases a check for five dollars was received by mail, but in some cases the applicants were allowed to make payment at the time of the examination.

EXAMINATIONS

The Board expected and preferred to hold examinations rather infrequently and to have each one well attended. But though the new law and notices of the examinations were at first mentioned in the newspapers, only a few candidates were present at most of the examinations. Some of the applicants were unable to be present on any of the dates set and asked for another date in the near future. It often happened that an application would be received a few days following an examination, with a request for an examination at an early date. This explains the reason for holding so many examinations in attempting to accomodate the applicants.

During the two years covered by this report, twenty examinations were held on the dates given below:—

In 1919: June 27 and 30; July 9, 12, 16 and 23; August 1; September 17; October 29; November 19.
In 1920: January 28; March 17 and 31; May 5; June 7 and 17; September 15; December 6.
In 1921: February 28 and May 11.

The examination has consisted of written answers to certain fundamental questions, selected to show the applicants' knowledge of the subject. In addition to these answers, each applicant was asked oral questions by each member of the Board, and he was told whether his answers were right or wrong, and if wrong, wherein they were wrong. Several different sets of written questions have been used in the course of these examinations, and one of these is given below as a sample:—

TREE PROTECTION EXAMINING BOARD.

EXAMINATION QUESTIONS.

(Please indicate by number each question answered.)

A. **Injurious Insects** (Answer *both.*)

(1) Explain the purpose of an insecticide, name examples of the common types, and specify how they are used.
(2) Describe briefly the difference between sucking and chewing insects, explain how each may injure trees and give remedies for each.

(Answer *any two.*)

(3) What are the three principal types of insect injury to trees? Give an example of each with remedy.
(4) How and when would you treat elm trees as a protection against the ravages of the elm leaf beetle?
(5) What are the chief insect pests of the apple orchard, and what treatment is commonly recommended for each?
(6) Give a brief account of the maple borer and how to combat it.

B. **Tree Diseases.** (Answer *three out of the five.*)

(7) What are fungi? Give several examples. How do they reproduce? How does a parasite differ from a saprophyte?
(8) What kinds of injury to trees are caused by the following: Sun scorch? Drought? Ice storms? Late frosts? Lightning? Animals (including man)?
(9) What different fungous diseases have you tried to control and by what methods?
(10) What causes decay of wood in trees and how would you control it?
(11) What is a fungicide? Name four kinds. Give theory of spraying against fungi. How is Bordeaux mixture made? Distinguish between a fungicide and an insecticide.

C. **Tree Surgery.** (Answer *any three.*)

(12) Describe in detail the way you would remove a large limb and the treatment you would give the resulting cut surface if undecayed.
(13) Discuss the relative merits of filled cavities and open cavities, stating under what conditions you would recommend one or the other.
(14) Describe your method of filling cavities, giving the reason for each operation.
(15) What may be done to hasten the healing of wounds and the growing over of filled cavities?
(16) Discuss advantages and disadvantages of the different methods of strengthening weak trees.

D. **Tree Life and Growth.** (Answer *one.*)

(17) Discuss the growth of a tree, indicating where and when growth takes place, also the manner in which the roots and leaves perform their work.

(18) Describe the way in which water and food materials are secured by a tree, and how they are utilized by it.

E. **Tree Species.**

(19) Identify the specimens on the table, giving the common name of each as numbered.

Altogether 65 candidates took the examinations. Of this number 61 were finally granted certificates, four of them being required to take a second examination. Four applicants were refused certificates because the Board did not consider them qualified.

Certificates

The form of the regular certificate adopted by the Board is as follows:—

CERTIFICATE

FROM

Tree Protection Examining Board

STATE OF CONNECTICUT

This is to Certify that _____

of _____ has been duly examined in compliance with the provisions of Chapter 181, Public Acts of 1919, and is considered qualified to conduct the business of protecting trees.

No. _____ _____ Entomologist, *Chairman*

Date _____ _____ Forester, *Sec'y-Treas.* } Examining Board

Expires _____ _____ Botanist

CONNECTICUT AGRICULTURAL EXPERIMENT STATION
NEW HAVEN, CONNECTICUT

A small card shown below was furnished for each foreman employed by a firm receiving a regular certificate:—

State of Connecticut

TREE PROTECTION EXAMINING BOARD

THE BEARER

is working under supervision of and is responsible to

.....

of .....Conn.,

to whom this board has issued Certificate No. .....as provided by Chapter 181, Public Acts of 1919. Said Certificate expires .....

CONNECTICUT AGRICULTURAL EXPERIMENT STATION
NEW HAVEN, CONN. .....
Secretary

Up to this time no certificate has been revoked although several holders have failed to renew. The list of individuals and firms receiving certificates between July 1, 1919, and June 30, 1921, together with number and date of each certificate and date of renewal, is given below—

LIST OF FIRMS AND INDIVIDUALS RECEIVING CERTIFICATES FOR TREE WORK.

Biennial Period Ending June 30, 1921.

Name	Address	Certificate Number	Date Issued	Date of Renewal
Armstrong, Edward H.	Branford, Ct.	34	Sept. 18, 1919	Not renewed
Baldwin, Thomas J., Jr.	Guilford, Ct.	21	July 16, 1919	July 15, 1920
Bartlett Co., F. A., (F. A. Bartlett)	Stamford, Ct.	10	July 16, 1919	July 15, 1920
Beaupain & Saunders, (Harry F. Beaupain)	So. Norwalk, Ct.	27	Aug. 13, 1919	Aug. 12, 1920
Bertolf Bros., (August C. Bertolf)	Sound Beach, Ct.	24	July 30, 1919	July 29, 1920
Brown, Edgar M.	Hartford, Ct.	52	June 7, 1920	June 6, 1921
Cardarelli, B. J.	Cromwell, Ct.	57	Mar. 1, 1921	
Clark, Wyllis S.	New Canaan, Ct.	20	July 16, 1919	July 15, 1920
Clyne, G. A.	West Cheshire, Ct.	5	July 2, 1919	July 1, 1920
Condon, Maurice L.	Lake Mahopac, N. Y.	46	Feb. 3, 1920	Feb. 2, 1921
Conn. Forestry Co., (Walter S. Crosby)	West Haven, Ct.	29	Sept. 18, 1919	Sept. 17, 1920
Dept. Pomology, Conn. Agr. College, (S.P. Hollister)	Storrs, Ct.	47	Mar. 22, 1920	Mar. 21, 1921
Davey Tree Expert Co.,	Kent, Ohio			
(Charles T. Burks)	Stamford, Ct.	59	May 27, 1921	
(Geo. J. Champlain)	Kent, Ohio	13	July 16, 1919	July 15, 1920
(Felix H. Caldwell)	Kent, Ohio	15	July 16, 1919	July 15, 1920
(John C. G. DeWolf)	Kent, Ohio	14	July 16, 1919	July 15, 1920
(Peter Gammie)	Kent, Ohio	60	May 27, 1921	
(Walter O. Noyes)	Danbury, Ct.	28	Sept. 18, 1919	Not renewed
(Harold A. Horn)	Kent, Ohio	49	April 5, 1920	Not renewed

Name	Address	Certificate Number	Date Issued	Date of Renewal
Desmond, Thomas H.	Simsbury, Ct.	50	April 5, 1920	April 4, 1921
Dunlop, Daniel S.	Cromwell, Ct.	58	March 1, 1921	
Easton, Clifford H.	New York, N. Y.	53	June 17, 1920	June 16, 1921
Elm City Nursery Co., (W. E. Campbell)	New Haven, Ct.	7	July 2, 1919	July 1, 1920
Gavitt, Lester E.	Westerly, R. I.	51	May 10, 1920	May 9, 1921
Gilbert, J. E.	New Haven, Ct.	61	May 27, 1921	
Goodwin Associates, The James L. (Edward E. Pettee)	Hartford, Ct.	38	Nov. 7, 1919	Nov. 6, 1920
(James L. Goodwin)	Hartford, Ct.	39	Nov. 7, 1919	Nov. 6, 1920
Hartford Forestry Co., (Philip Hansling, Jr.)	Hartford, Ct.	16	July 16, 1919	July 15, 1920
(Philip Hansling)	Hartford, Ct.	17	July 16, 1919	July 15, 1920
Herthal, Gus, Jr.	Bridgeport, Ct.	36	Sept. 18, 1919	Sept. 17, 1920
Herthal, G. F.	Bridgeport, Ct.	25	July 30, 1919	July 29, 1920
Homewood Forestry Co., (Peter J. Belletti)	Waterbury, Ct.	41	Nov. 7, 1919	Nov. 6, 1920
Hunt Co., W. W., (W. A. Wright)	Hartford, Ct.	33	Sept. 18, 1919	Sept. 17, 1920
Jaynes, H. A., Conn. Tree Surgery Co.	Storrs, Ct.	56	Aug. 6, 1920	
Kelley, James J.	New Canaan, Ct.	19	July 16, 1919	July 15, 1920
Kellner & Son, Herman H., (Arthur H. Kellner)	Danbury, Ct.	26	Aug. 13, 1919	Aug. 12, 1920
Landscape Foresters Ltd., (C. E. Mager)	New York, N. Y.	32	Sept. 18, 1919	Sept. 17, 1920
Mallett Co., George A., (George A. Mallett)	Bridgeport, Ct.	11	July 16, 1919	July 15, 1920
Markham, W. R.	Middletown, Ct.	23	July 30, 1919	July 29, 1920
McLain & Co., J. A., (J. A. McLain)	Stamford, Ct.	37	Sept. 18, 1919	Sept. 17, 1920
McLeod, Donald	Cromwell, Ct.	54	June 17, 1920	Not renewed
Meader Co., L. H., (Lewis H. Meader, Jr.)	Providence, R. I.	31	Sept. 18, 1919	Sept. 17, 1920
Millane Tree Expert Co., (Neil A. Millane)	Middletown, Ct.	1	July 2, 1919	July 1, 1920
Morris, Harry H.	Danbury, Ct.	40	Nov. 7, 1919	Nov. 6, 1920
Munson Whitaker Co., (Robert O'Shea)	Boston, Mass.	42	Nov. 26, 1919	Nov. 25, 1920
Nichol, James (Fred B. Bartlett)	Greenwich, Ct.	12	July 16, 1919	July 15, 1920
Old Colony Forestry Co., (Thos. J. McGinnis)	West Haven, Ct.	4	July 2, 1919	July 1, 1920
O'Meara, Harry J.	Stamford, Ct.	35	Sept. 18, 1919	Sept. 17, 1920
Palmer, Arthur J.	West Haven, Ct.	2	July 2, 1919	July 1, 1920
Pauley Tree Expert Co., (George A. Pauley, Jr.)	New Canaan, Ct.	22	July 30, 1919	July 29, 1920
Quality Seed Store, (William J. Rice)	Stamford, Ct.	9	July 2, 1919	July 1, 1920
Rich, Nehemiah L.	Stamford, Ct.	3	July 2, 1919	July 1, 1920
Schoonman, W. J.	New London, Ct.	6	July 2, 1919	July 1, 1920
Shaw, Walter	Westville, Ct.	55	June 17, 1920	Not renewed
Sierman, C. H.	Hartford, Ct.	8	July 2, 1919	July 1, 1920
Smith, Joseph P.	Stamford, Ct.	44	Nov. 26, 1919	Not renewed
Van Heiningen, Jacob C.	So. Wilton, Ct.	48	April 5, 1920	Not renewed
Verkade, H.	New London, Ct.	18	July 16, 1919	July 15, 1920
Wilcox, Reginald C.	Essex, Ct.	30	Sept. 18, 1919	Sept. 17, 1920
Wright, John L.	Putnam, Ct.	43	Nov. 26, 1919	Nov. 25, 1920
Zack, Harry J.	Chester, Ct.	45	Feb. 3, 1920	Feb. 2, 1921

TREE WORKERS' INSTITUTE

The early examinations indicated that many of the applicants were not well versed in the growth and care of trees, yet some of these men had conducted a fairly successful business for a number of years. Evidently they knew what to do better than they could tell how or why it should be done. To the members of the Board it seemed unfair to refuse certificates to such men, so an effort was made to help them by giving them the proper instruction in their work; consequently an institute was held at the Station on July 22 and 23, with the following program:-

Tuesday Morning, July 22

10:00 A. M.	How a Tree Lives and Grows (Illustrated). Prof. A. H. Graves.
11:00	Best Species of Shade Trees for Street and Home Planting. Best Methods of Planting and Guarding Street Trees. G. A. Cromie, Supt. of Trees, City of New Haven.
11:45	Discussion. Led by E. F. Coe, Elm City Nursery Co., New Haven.
12:00	Methods of Fertilizing Trees. Dr. E. H. Jenkins, Director, Conn. Agricultural Experiment Station.

Tuesday Afternoon

2:00 P. M.	Fungous Diseases of Trees. (Illustrated by Stereopticon.) Dr. G. P. Clinton, Botanist.
3:00	Cavity Work and Care of Mutilations. G. A. Cromie, Supt. of Trees, City of New Haven.
3:30	The Pruning and Spraying of Shade Trees. G. H. Hollister, Supt. of Keney Park, Hartford.
4:00	Discussion. Led by F. A. Bartlett, Stamford.
4:15	Question Box.

Tuesday Evening

7:30 P. M.	The Tree Doctor and the Golden Rule. Dr. E. H. Jenkins.
8:15	Methods of Forest Planting and Management. (Illustrated by Stereopticon.) W. O. Filley, Forester.
9:00	Discussion. Led by L. F. Harvey, County Agricultural Agent, New Haven.
9:15	Question Box.

Wednesday Morning, July 23

10:00 A. M.	Some Common Insects Attacking Shade and Fruit Trees. (Illustrated by Stereopticon.) Dr. W. E. Britton, Entomologist.
11:00	The Pruning and Spraying of Fruit Trees. (Illustrated by Stereopticon.) E. M. Stoddard, Assistant Botanist.
11:30	Solid Stream Spraying as Practiced in Gipsy Moth Work. (Illustrated by Stereopticon.) I. W. Davis, Assistant Entomologist.
12:00	Discussion. Led by N. A. Millane, Middletown.
12:15	Question Box.

Notices of this institute were sent to newspapers and to all tree workers, including the tree wardens in each town and the men in charge of shade trees in each city in the State. Considering the

number of such men interested, the attendance was rather small, about forty being present. The rainy weather no doubt kept many away. The papers were full of interesting information and there was great interest shown by the questions and discussions.

At that time it was planned to hold further institutes but this has not been done, as the need for it has in part at least subsided. It was also thought best to form a State organization of tree workers and a committee was elected to prepare a plan, but so far nothing further has developed.

Financial Statement

Receipts

From 65 examination fees @ $5.00 each	$325.00
53 renewal fees @ $2.00 each	106.00
	$431.00

Expenditures

Printing	$59.70	
Postage	21.26	
Stationery	11.10	
Filing Cabinets, etc	62.50	
Office Supplies	24.18	
Traveling Expenses of Board	38.28	217.02
Balance on Hand June 30, 1921		$213.98

Dangers Which May Arise

Of course tree workers are supposed to know all about trees and to be able to diagnose troubles on sight. Most of them are unable to do so, and many of our best specialists can do so only after a careful examination. Many times, evidence is lacking. If evidence can be obtained and the tree worker is in doubt, he should submit it to his Agricultural Experiment Station, or to some other institution where competent specialists are employed. There are many cases on record where tree workers have not done this, but induced the owners to allow them to give treatment at considerable expense, which afterward proved useless. Even positive injury has resulted in some instances. It is human nature for the tree worker to dislike to say that he does not know, yet an honest man frequently must do so. It is much better to say so and try to find out, than to make a serious mistake by giving the wrong treatment. There are many injuries to trees which are non-parasitic in their nature, for which the usual remedies for parasitic troubles are worthless.

Then, too, some owners give authority for certain work to be done, but do not keep in close touch with the progress of it and are astounded at the size of the bill when finally presented. A good way of keeping check on the cost is to have the owner or his agent approve and sign the time slips each day or week, as the case may be.

The Board may revoke a certificate for improper work done, or if dishonest business methods are followed when dealing with clients. The Board has no jurisdiction, however, over legal questions, such as fixing damages in a case of violation of contract. Such matters must go to the courts if they cannot be settled to the satisfaction of both parties.

Employ Workers Who Hold Certificates

Unless the owner is acquainted with some tree worker in whom he has confidence, it is safer to employ only those men or firms who hold certificates from this Board. It is true that the law permits a tree worker to practice without a certificate in the town of which he is a legal resident, but this provision was included for the purpose of allowing farmers and orchardists to employ men to do the necessary spraying and pruning of their orchards. It is a question if city tree workers should have been allowed to do this. However, the exception is clear in the law and must stand until changed.

If a tree worker solicits work from you, ask him if he or his firm has passed the examination and holds the certificate of this Board. If not, tell him that you prefer some one who holds a state certificate. This will help to induce all workers to apply for the examination and certificate, according to the provisions of the law. The names of those who have received certificates from the Board are given on pages 345 and 346.

Complaints Will be Investigated

The Board cannot guarantee the work of any one, even though a certificate has been issued to him, but requests that written complaints of unsatisfactory work, discourteous treatment, or improper business methods be filed with the Secretary. So far as may be possible, such complaints will be investigated and the findings will be recorded and furnished to both parties concerned. If the tree worker is at fault and the circumstances warrant, his certificate may be revoked.

The Board also invites complaints regarding tree workers who are operating in violation of the law, and will follow up all such complaints wherever feasible.

A Partial List of Publications Relating to the Care of Trees

Bailey, L. H., "The Pruning Manual," The Macmillan Co., New York, 1919.

Blakeslee, A. F., and Jarvis, C. D., "Trees in Winter," The Macmillan Co., York, 1913.

Collins, J. F., "Tree Surgery," Farmers' Bulletin No. 1178, U. S. Department of Agriculture, Washington, D. C., 1920.

Fernow, B. E., "The Care of Trees," Henry Holt & Co., New York, 1910.

Houser, J. S., "Destructive Insects Affecting Shade and Forest Trees," Bulletin 332, Agricultural Experiment Station, Wooster, Ohio, 1918.

Kotinsky, Jacob, "Insects Injurious to Deciduous Shade Trees and Their Control," Farmers' Bulletin No. 1169, U. S. Department of Agriculture, Washington, D. C., 1921.
Levison, J. J., "Studies of Trees," John Wiley & Sons, New York, 1914.
Peets, Elbert, "Practical Tree Repair," McBride, Nast & Co., New York, 1913.
Rankin, W. F., "Manual of Tree Diseases," The Macmillan Co., New York, 1918.
Solotaroff, William, "Shade Trees in Towns and Cities," John Wiley & Sons, New York, 1911.
Stone, G. E., "Shade Trees, Characteristics, Adaptation, Diseases and Care," Bulletin No. 170, Massachusetts Agricultural Experiment Station, Amherst, Mass., 1916.

Also, the bulletins and reports of this Station, and of other Agricultural Experiment Stations, and of the United States Department of Agriculture, treat of special subjects relating to trees. If available, these may be obtained free on request. It is recommended that tree workers obtain these publications and use them for reference in connection with their work.

The foregoing report has been approved and adopted as the First Report of the Tree Protection Examining Board. It is intended to issue future reports biennially covering the activities of the Board under the provisions of the law.

Respectfully submitted,

W. E. BRITTON, Entomologist,
Chairman.

W. O. FILLEY, Forester,
Secretary and Treasurer.

G. P. CLINTON, Botanist.

AN EXPERIMENT IN TOP-DRESSING A RUN-OUT MEADOW

By E. H. JENKINS

The meadow was acquired in 1915. Its previous cropping was unknown but its average annual yield for the following six years was 1.01 tons per acre of poor hay much mixed with weeds. Seventeen plots were established, 14 feet wide and 155½ feet long, each one-twentieth of an acre. Four-foot strips separated the plots. The top-dressings were applied early each year. The hay from all the plots was weighed on the same day. The yields of the checks show an increased natural yield from No. 1 to No. 17, and the "gains" have been corrected as required by this difference in the check plots. For two years no potash could be applied to plot 8, and in 1920 an equivalent amount of muriate was used in place of kainit.

The arrangement of the plots, their treatment and the corrected average results of the six years cropping appear in the following table

Plot No.	FERTILIZER	Tons of Hay Per Acre	Corrected Gain in Tons	Cost of Fertilizer 1915	Cost of Fertilizer 1919
1	None	0.80	.....	.....	.....
2	2.3 tons manure	1.57	0.56	$ 8.05	$12.65
3	250 lbs. nitrate	1.98	0.97	6.88	12.50
4	175 lbs. nitrate + 150 lbs. bone	1.74	0.73	7.45	12.65
5	None	0.71	.....	.....	.....
6	250 lbs. nitrate + 200 lbs. acid phosphate	1.96	0.96	8.18	15.85
7	250 lbs. nitrate + 190 lbs. basic slag	2.05	1.04	8.49	*
8	250 lbs. nitrate + 200 lbs. acid phos. + 130 lbs. kainit	2.10	1.10	9.09	*
9	None	0.97	....	.....	.....
10	Double quantity of 2	1.69	0.68	16.10	25.30
11	" " " 3	2.09	1.08	13.76	25.00
12	" " " 4	1.47	0.46	14.90	25.30
13	None	1.01	....	.....	.....
14	Double quantity of No. 6	2.44	1.43	16.36	31.70
15	" " " " 7	2.43	1.42	16.98	*
16	" " " " 8	3.19	2.13	18.18	*
17	None	1.10	....	.....	.....

*Basic slag and kainit were not available in 1919.

CERTIFICATION OF BABCOCK TEST APPARATUS

As provided by statute the Station tests the accuracy of Babcock apparatus which is used for determining the value of milk or cream. Each piece thus tested is permanently marked with the Station initials, CT. AG. ST. if it is accurately graduated: BAD if it is inaccurate.

Since our last report 2,102 pieces have been tested of which 43, or about two percent, were bad.

SORGHUM JUICE

A single test of juice from Early Amber Sorghum grown at Mt. Carmel gave the following result:

Sucrose (Cane sugar)	7.35%
Invert sugar	3.29
Total sugars	10.64
Undetermined solids	1.87
Total solids	12.51

TEST OF PERILLA

Perilla frutescens is grown extensively in Japan for the oil in its seeds. In 1917 the Institute of Industrial Research asked the co-operation of this Station in testing its growth in this part of the country.

The seed was planted in drills 18 inches apart about 3 inches apart in the row.

The planting was made May 31st, as weather and labor conditions made earlier planting impossible.

On September 18th, the plants had a maximum height of 50 inches, average 44-46 inches, and were beginning to blossom.

They were sparsely branched mostly near the root, and had already been slightly touched by frost. A short time later they were killed by cold.

We judge that, in this region, seed could only be produced by starting the plants in the greenhouse and later setting them in the field.

EFFECTS OF BORAX ON THE GROWTH OF POTATOES, CORN AND BEANS

By E. H. Jenkins

In consequence of the lack of German potash salts during the war, various domestic sources of potash were exploited and their output eagerly sought and used.

Occasional injury or total loss of crops led to careful search for the cause, which in widely separated districts was not at first evident. It was found that the domestic potash obtained from certain sources contained notable quantities of borax, which in relatively small amounts is a plant poison, and it was proved that in some cases the injuries noted were certainly caused by borax in the fertilizer. Further study of the poisonous effect of borax and the limits of its toxicity seemed to the directors of the New England, New York and New Jersey Stations to be immediately necessary, and it was evident that such a study could be carried

out best as a single joint project, each Station bearing its proportionate part of the expense involved. This Station joined with the others in this study.

Director Hills of the Vermont Station placed a suitable greenhouse at the disposal of the co-operating Stations, Director Woods and Dr. Morse, pathologist of the Maine Station, assembled the materials and prepared detailed plans, Director Lipman of the New Jersey Station selected a trained experimenter to take charge of the greenhouse work, and the experiments were carried out during 1920. The method and results were published in Soil Science Vol. XII, No. 2, pp 79-106, 13 plates August 1921, with the title, "Effect Upon the Growth of Potatoes, Corn and Beans Resulting from the Addition of Borax to the Fertilizers Used. J. P. Neller and W. J. Morse."

The general summary is as follows:

"Plants were uninjured where fertilizer mixtures made from borax-free chemicals were applied to soil in pots in which potatoes, corn and beans were grown. These crops were injured where the pots contained the same soil and the same fertilizer mixtures in like quantity, provided sufficient amounts of borax were added with the fertilizer. The same types of injury were produced, in somewhat greater degree, when a commercial fertilizer carrying equivalent amounts of borax was applied.

"Corn and beans were more susceptible to the injurious effects of borax than were potatoes. Under the conditions of the experiment, anhydrous borax at the rate of 3 pounds per acre was the largest amount that could be applied in drills with safety to beans. The limit for corn is somewhat under 5 pounds, and for potatoes slightly above 5 pounds per acre. Borax applied with the fertilizer below the seed or seedpiece proved more toxic in all cases than where applied above in like manner. Mixing the borax and fertilizer with the soil decreased the injury and slightly raised the amount that could be applied per acre with safety.

"Evidence was obtained that applications of lime prevented some of the injury to potatoes. The tests with gypsum and manure were not conclusive with this crop. All three of these materials seemed to reduce the toxic effects on corn. Lime was beneficial with beans, but gypsum and manure did not show any appreciable influence.

"The above results were all obtained with soil at an optimum water content of 19.2 per cent. A subsequent test with beans showed that more injury occurred where the soil moisture was maintained at 15.2 per cent. than where it was 30.4 per cent.

"The only indication of possible stimulation due to the presence of small amounts of boron occurred with corn, but the evidence was inconclusive."

The Station has a few reprints of this paper which can be given to persons specially interested in the technique followed.

TIMOTHY AS A COVER CROP FOR TOBACCO LAND

By E. H. Jenkins

Various experimenters have made observations on the amount of vegetable matter and plant food left in the soil by the stubble and roots of crops. Among these may be cited:

Heiden, Düngelehre, I, p. 72, 1866, and III, p. 243, 1872, notes the work of Boussingault, John, Schubart, Hellriegel, Dietrich and others.

Hopkins, Soil Fertility and Permanent Agriculture p. 218, 1910, gives statistics on the amount of dry matter and plant food in various legumes and cites the observations of others.

Penny, Delaware Station, Bulletin 67, 1905, reports observations on the root system of crimson clover at various periods of growth.

In the report of the Connecticut Board of Agriculture, 1871, p. 95, notice is given of Weiske's observations at Proskau, on the composition of roots and stubble of a number of crops. (Versuchs-St. 14, p. 107, 1871.)

Woods, Storrs Station Report, 1888, p. 28, reports Observations on the Quantity and Composition of Roots of Clover, Timothy, Wheat and Other Plants, taken at time of harvest in Maine.

The observations here to be noted do not admit of close comparison with those referred to above, for these reasons: They were made on young, green crops to be plowed under for manure. The sowing was somewhat heavier than would be practiced if the crop were to be harvested and it was grown on tobacco land, and therefore on very heavily fertilized soil.

The observations specially concern or only concern tobacco growers.

It is matter of common knowledge and common complaint among tobacco growers in the Connecticut valley that on many fields the yield of tobacco has gradually decreased.

No appreciable loss of quality in the leaf is noted but only an unsatisfactory yield per acre.

This cannot be attributed to lack of fertilizer for increased applications and changes in the fertilizer formulas have not improved this condition.

The cause of the trouble is not known and can only be surmised, but it has been noticed in some cases that resting the land by growing other crops for a few years restored the soil, so that the yield of tobacco became satisfactory again.

But this change of crops is both inconvenient and expensive. The tobacco grower usually specializes in the one crop.

His barns, tools and help cannot conveniently be shifted to the raising of other crops at any profit.

This condition has raised the question whether the restoration of the land cannot be effected gradually, if not immediately, by growing some kind of cover crop between successive tobacco crops, sowing the seed as soon as possible after harvesting tobacco and keeping the cover crop on the land until it has to be broken up in the spring and fitted for the next crop.

Several well-known growers have followed this plan consistently for a number of years and have obtained very favorable results,

some of which are reported in the Hartford County Farm News for August, 1919.

Various cover crops have been suggested and tried. The nitrogen-gathering crops, vetches, clovers, soy beans and the like have no special value over the cereals on tobacco lands, because they do not exercise their nitrogen-gathering function where nitrogen is fairly abundant in the soil already, as is the case on highly fertilized tobacco fields.

There is the further objection to their use that certain legumes are natural hosts of the dreaded *Thielavia* or root rot disease; moreover they make no such growth through the colder season as do the cereals and other grasses.

Of these rye has been and is, quite commonly used. The tradition that it sours the land has no basis in fact, but one sound objection to it is its very rapid growth in spring. If it is not turned under at just the right time it becomes too "woody" and when turned under decays but slowly and leaves the soil too loose and open. If rye is used it should be sown at the rate of a bushel and a half to the acre.

Timothy is now being tried and so far has given good satisfaction. It makes slow growth above ground and never gets too rank or woody before the time for plowing, but it forms a thick mat of very fine roots which fill the soil to the depth of six or eight inches and takes up from it surprisingly large amounts of plant food. It can be sown thicker than is usual in seeding down for a hay crop. Half a bushel of timothy seed per acre should be enough. It should be sown as early as is possible. Where tobacco is primed the seed may be sown after the second priming. Some wait until the tobacco is harvested and the stalk disk-harrowed.

We urge tobacco growers who are concerned with diminishing yields on their fields to test timothy as a cover crop for at least three years in succession, sowing early, with a fairly heavy seeding. It is the only alternative in sight to avoid the necessity of dropping tobacco and growing other crops for a time; and the experience of some growers has shown its value in restoring production.

Apart from the use of cover crops as a corrective for failing tobacco soils, they are always needed as a protection from the drifting of the soils in high winds, from their washing in heavy rains and from the leaching of the plant food in them. Whenever the land is unfrozen, timothy and rye are always growing and gathering and holding the soluble plant food in the soil for the following crop and adding to it a store of organic material got largely from the air.

Within the last two years some observations have been made by Mr. B. G. Southwick, the Hartford County Agent, Mr. Henry Dorsey, Extension Agronomist, and the writer, to determine how much organic matter and plant food a timothy cover crop might gather from a tobacco soil and hold for the tobacco crop.

The samples, usually five in each field, were taken with a six inch iron tube, driven down six or seven inches. The cores thus obtained with the roots and top growth, were very carefully washed out by the writer, on fine sieves, and when partially dried were cleaned as far as possible of all adhering soil and foreign matters and then analyzed.

While some roots go much deeper than seven inches their total weight is relatively very small.

The averages of the five samples taken from each field are given below.

A., B. and C. were taken May 8, 1919, just before the crop was turned under. The top growth was six to eight inches high. A from land of D. E. Newberry, South Windsor, B from Windsor Tobacco Corporation, Windsor, C from S. F. Brown, Poquonock.

D. E. F. were taken in the late fall of 1919 and show what had been taken by the crop before winter. D from J. W. Alsop, Avon, E from J. E. Phelps, Suffield F from D. E. Newberry, South Windsor.

G. and H. were taken in May, 1920, just before plowing. H is a mixture of timothy and alsike clover. In 1920 timothy did not make nearly as good a growth as in the previous year on account of unfavorable weather conditions and farmers generally did not have as good cover crops as usual.

The samples were taken from different fields, probably unlike in soil, moisture conditions and fertility, so that no very close agreement in results was to be expected.

But in general they indicate that *an even, thick stand of timothy may contain, when plowed under, not far from three tons of vegetable matter, 100 pounds of nitrogen, 50 of phosphoric acid and more than 100 pounds of potash for the use of the following crop.*

To fix a valuation on this material is hardly possible.

If we calculate that forty per cent. of the nitrogen is available to the coming crop and half of the phosphoric acid and potash, we find a valuation of about $31.00.

But the value of three tons of vegetable matter, quite widely and evenly distributed in the soil it is impossible to estimate.

POUNDS PER ACRE OF ORGANIC MATTER AND PLANT FOOD CONTAINED IN A COVER CROP OF TIMOTHY GROWN ON TOBACCO SOIL

Spring, 1919	Organic Matter.	Nitrogen.	Phosphoric Acid.	Potash.
A. So. Windsor,	7860	176	70	173
B. Windsor,	6099	185	75	183
C. Poquonock,	7112	160	72	150
Average	7020	173	72	168
Fall, 1919				
D. Avon	2813	68.2	31.5	61.2
E. Suffield,	2015	60.2	28.2	49.2
F. So. Windsor,	1398	39.4	17.8	28.3
Average	2075	55.9	25.8	46.2
Spring, 1920				
G. Suffield,	5060	94.8	37.8	117.0
H. So. Windsor,	6693	90.4	57.6	131.5

ERRATA.

Page 8, Last line, for Unbleached read Unleached.
12, Eighth line, for Foul read Fowl.
20, Fourth line from bottom, for Roger read Rogers.
40, Second line in table, for M. S. Shoemaker, read M. L. Shoemaker.
42, Sample 15031, for North, read Northern.
59, Second line following table, for potato, read pot.
142, 143, Top of 3rd column, for average, read acreage.
225, Twenty-third and twenty-ninth lines from top for glycerrizin read glycyrrhizin.
231, Tenth line from top, for cellusoses read celluloses.
282, Seventh line from bottom for adopted, read adapted.

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