Where there are many brood galleries in the main trunk of a tree the effect is the same as girdling, and the tree soon dies. In this manner thousands of trees have been killed in the vicinity of New York City, and in Connecticut, particularly in Fairfield County. The trouble is not a new one as it has been frequently recorded as occurring periodically in some portion of the country at least since 1872. For instance in 1901, 110 hickory trees died on the Hillhouse place in New Haven. The pest then subsided leaving a few trees which remain to this day, uninjured. On the Station grounds three trees died in 1912, and though we suspected the hickory bark borer to be the cause of their death, on cutting the trees, few of these bark borers could be found in them. Some other borers were present and sections of the wood were placed in breeding cages. Later we obtained a large number of specimens of a weevil or snout beetle, *Magdalis olyra* Hbst. Dr. Hopkins writes that these are rarely found in the same trees with the hickory bark borer.

It is apparent, therefore, that while most of the trees are killed by the hickory bark borer, some trees die from other causes, probably drought being an important factor. Usually those trees standing on dry knolls or ledges are the first to go.

Badly infested trees cannot recover and should be removed. Dr. Hopkins recommends that all infested trees be disposed of between October 1st and May 1st, so as to kill the over-wintering beetles. This can be done by peeling, or by using the wood as fuel. If the outer portion is allowed to remain upon the logs during the following summer, the beetles will escape and may attack other trees. All dead trees should therefore be cut at the end of the season, and dead branches and tops of living trees should be removed and destroyed.

If a tree is not infested, but in danger from surrounding conditions, it may be worth while to spray the bark of choice trees on trunk and branches in early spring with lead arsenate, one pound in five gallons of water. After the growth has been formed for the season, say about July 1st, thoroughly spraying the foliage with the same mixture may prevent damage to the leaf stems. There are a number of secret preparations on the market claimed to penetrate the burrows and to kill the beetles without injuring the trees. Most of these preparations have not been tested except by their manufacturers, and it is now too early to pass judgment upon them. As a rule these materials of great penetrative power are dangerous on account of injuring the trees, and it is usually wise to "beware of all secret preparations."

THE PEAR MIDGE.

Contarinia (Diplosis) pyrivora Riley.

Infested fruit from Cannon Station, Mystic and Watertown, received about June 1st, contained the larvæ of this insect. In each case the young pears dropped freely and a remedy was requested. This insect is of peculiar interest to the fruit growers of Connecticut, because it was first described from material gathered in 1884, in the orchard of Coe Bros., Meriden, Conn., by the late Dr. John B. Smith, who as an assistant to Dr. C. V. Riley, then Government Entomologist at Washington, had been sent to investigate the trouble reported by Mr. Coe in correspondence with Dr. Riley. Dr. Smith found that the insect belonged to the order diptera (two-winged flies) and to the family Cecidomyidæ (gall midges).

Larva, pupa and adult were described by Dr. Riley in the report of the Commissioner of Agriculture for 1885, page 287, though at that time it was thought it might prove to be the European species *D. nigra* Meig., the type of which was not available, if in existence. At that time the pear midge was supposed to be an introduced insect, was not known to occur elsewhere in America, and seemed to be confined to a very small region in the vicinity of Mr. Coe's orchard. Both Dr. Smith and Dr. Riley urged that the American Pomological Society, or some other organization, make an effort to stamp it out. This urgent advice apparently was not followed, though Mr. Coe had attempted to destroy his entire crop of pears in 1883, hoping in this way to get rid of the pest. In a few years the insect appeared elsewhere. In 1891 it was discovered at Catskill, N. Y., and in three localities in New Jersey, and is now known to be distributed in the Northeastern United States and in Central Europe. Several accounts of this insect have appeared in various reports of state entomologists and in entomological journals and bulletins.

The adult is a small two-winged fly which lays its eggs in the clusters at blossoming time, or even earlier. Dr. Felt has found

the larvæ at the base of the calyx at the time the petals fall,* and they soon work their way into the young fruit. The infested pears can nearly always be detected on account of their more globular, and later lop-sided shape, while the normal-shaped fruits are free from maggots. The infested pears usually crack open after a rain and thus allow the maggots to escape before the pears drop. When fully grown the maggots are about 3 mm. (one-eighth of an inch) in length. They go into the ground and form minute oval cells in which they pupate, and from which the adults emerge the following spring. There is one brood each year.

This insect has done considerable damage locally, especially in the New England states, New York and New Jersey. Certain varieties seem to be injured more than others, particularly Bosc, Bartlett and Seckel, in the order named. Dr. Smith states† that the insect has been gradually worked out in New Jersey and maintains itself in only a few places near Newark and New Brunswick.

No remedial treatment is known other than gathering and destroying the infested pears before the maggots leave them. This is comparatively simple because the infested pears are so easily distinguished from the healthy fruit. Cultivating the soil during the month of June would doubtless destroy many of the larvæ in the cells. Young pears infested by the maggots are shown on plate VII, d and e.

THE WEST INDIAN PEACH SCALE IN CONNECTICUT.

Aulacaspis pentagona Targ.

This insect was discovered this fall in Greenwich, Conn., on Chinese privet, *Ligustrum ibota,* by Mr. Walden. It had not previously been recorded from Connecticut, though fifteen years ago Cooley reported the species from Jamaica Plain, Mass.,‡ where it had been collected on different species of *Prunus,* growing on the grounds of the Arnold Arboretum. Though it is called the West Indian Peach Scale this species does not confine its attacks to peach trees but infests a great variety of plants belonging to widely different botanical families. A full list of food plants was given by Webster* in 1898 and a partial list will be found in Mrs. Fernald's Catalogue of the Coccidæ of the World, page 235. The insect is now known to occur in China, Japan, Ceylon, Hawaiian Islands, New Zealand, Australia, Brazil, Panama, West Indies, South Africa, Italy, Switzerland and England. In the United States it has been reported from California, Florida, Georgia, Washington, D. C., Ohio, Massachusetts and now from Connecticut.

Dr. H. T. Fernald states† that this scale has been found abundantly on flowering cherry imported into Massachusetts. I now believe that it was present on weeping cherry imported from Japan three years ago into one of our Connecticut nurseries. We did not attempt to identify it at the time, but ordered the trees fumigated with hydrocyanic acid gas, to kill the scales which were present in moderate numbers on the twigs. These trees were planted out and were clean when afterward examined.

It is probable that the West Indian Peach Scale will not prove a destructive pest in this State. According to the published statements of Newell and Rosenfeld‡ it has been injurious in a few instances in Louisiana, but has not seemed to spread to new localities. Moreover, from the records of the effect of low temperatures on this insect§ it is doubtful if it will survive our severest winters. The winter of 1912-1913, was a comparatively mild one, and evidently the scale did survive it and spread over the plants in a small block of privet. Greenwich is on Long Island Sound and minimum temperatures are there much higher than in most inland towns.

This scale is circular, and larger and more strongly convex than most other armored scales found in Connecticut. It is closely related to the rose scale, *Aulacaspis rosæ* Bouche, but may be distinguished from it by the larger number of circumgenital pores in the female, when examined under a compound microscope. The rose scale is commonly found on roses and blackberry plants, and the exuviæ are light yellow. In *A. pentagona*

* Report N. Y. State Entomologist, 28, p. 97, 1912.
† Insects of New Jersey, p. 729, 1909.
‡ Canadian Entomologist, XXX, p. 232, 1898.

* Canadian Entomologist, XXX, p. 79, 1898.
† Journal of Economic Entomology, Vol. III, p. 275, 1910.
‡ Ibid, Vol. I, p. 153, 1908; Vol. III, p. 215, 1910.
§ Ibid, Vol. I, p. 258, 1908.

the exuviæ are orange-yellow and many of the scales are more or less covered by the epidermal tissues of the plant and therefore of the same color, making it much less conspicuous. When not covered by the bark of the host plant the scales are white and conspicuous like the rose scale. Where the scales have died and fallen from the twigs, the ventral scales remaining are also white and conspicuous. An infested privet twig is shown on plate VIII, a.

If the West Indian Peach Scale withstands our winters and infests and injures trees and shrubs, it is probable that a thorough spraying with a modern contact insecticide like the lime-sulphur wash or one of the oil mixtures, will serve to hold it in check.

MOSQUITO CONTROL WORK IN CONNECTICUT IN 1913.

In the report of this Station for 1912, page 283, it was stated that legislation would be sought providing for the control of mosquito breeding places and three bills were introduced.

One bill carrying an appropriation and providing for the drainage of large marsh areas under state supervision was finally passed by the house and senate, with the appropriation reduced to $10,000.00 for the biennial period. This measure was vetoed by Governor Baldwin after the adjournment of the session in June.

The amendment to Section 2526 of the General Statutes was defeated.

The following important measure was enacted, and is now a part of the statute law of the State.

An Act Concerning Public Health and the Control of Mosquito Breeding Places.

Chapter 143 of Public Acts of 1913.

Section 1. *Public nuisance.* Any accumulation of water in which mosquitoes are breeding is hereby declared to be a public nuisance.

Sec. 2. *Authority to abolish.* When it has been brought to the attention of a health officer or board of health, through the complaint of any citizen, or when discovered by any inspector or agent of said health officer or board of health, that rain water barrels, tin cans, bottles or other receptacles, or pools near human habitations are breeding mosquitoes, it shall be the duty of said health officer or board of health to investigate and to cause such breeding places to be abolished, screened, or treated in such manner as to prevent the breeding of mosquitoes. The health officer, or any inspector or agent employed by him, shall have the right to enter any premises in performance of his duties under this act.

Approved May 29, 1913.

Examinations of Suspected Breeding Areas Made on Request of Health Officers.

At the request of Dr. Edgar Adams Wilson, Town Health Officer of Meriden, on June 23, I inspected a swampy area near the Undercliff Tuberculosis Sanatorium in Meriden. Dr. Williams of the sanatorium accompanied me and I tested the water in many places, especially around the margins of the woodland area where many red maple trees and various shrubs of a semi-aquatic nature, grow in the water. The water did not appear to be more than a foot deep, and was discolored by the dead leaves.

Mosquitoes fairly swarmed over this area. A number of adults, collected from my coat, and those reared from wrigglers dipped from the stagnant pools, proved to be *Culex cantans* Meig., a species which flies only a short distance, though far enough to annoy the patients at the sanatorium, where, according to Dr. Williams, mosquitoes had been quite troublesome.

Though the water was tested at many points, only a few wrigglers were found, but I am reasonably certain that this area, of perhaps an acre in extent, is a breeding place. Probably earlier in the season and at various other times during the summer, one would find larvæ much more abundant. There were certain mosquito enemies in some portions of the pool, but in bunches of grass and in the shallow water wrigglers were present. I was informed that this pool is on land owned by the City of Meriden, and that it does not belong to the sanatorium.

Draining is a simple remedy and was promptly advised. A ditch was once cut, running in a northeasterly direction through the adjoining pasture, but had become partly filled. If this ditch could be deepened to about two feet, it would probably drain the entire area. It would not need a long ditch, as the pasture slopes away rapidly, and a depression further down the slope could be made to hold water if needed as a drinking place for the cows pastured there.

A report to this effect was sent to Dr. Wilson, and duplicate copies furnished the sanatorium and Mr. C. E. Hoadley, County Health Officer of New Haven County.

Later I was assured that an attempt would be made to carry out these recommendations.

On August 19, at the suggestion of Dr. E. C. M. Hall, Health Officer of East Haven, an examination was made of a certain area along the shore, between Momauguin and Silver Sands, just east of the area drained by the Anti-Mosquito Committee in 1912. Mr. Ripley made the examination and found that a portion of the area contained pools filled with wrigglers. A brief report containing the facts was at once sent to Dr. Hall.

Examination of Other Areas.

In coöperation with the Anti-Mosquito Committee and the City Park Department, we examined the ditches cut in 1912 in the salt marshes about New Haven, to see if they were in good condition to do active work, and also the pools in the public parks which in 1913 as in 1912, were kept oiled by the Park Department. Some of these areas were inspected several times. once in June and two or three times in July and August, and reports made to the proper authorities. In the parks the particular sections given most attention were Beaver Pond Park, Edgewood Park, and the meadows at the foot of East Rock. At Beaver Pond Park we found larvæ of the malarial mosquito late in the summer, and it will be very difficult to entirely prevent breeding here until some comprehensive system of improving this area is carried out. Oiling alone, though a benefit, will not do it.

At the base of East Rock there was little breeding except around the dump, near the corner of Willow and Mechanic Streets, where larvæ of the salt marsh mosquito and other species of *Culex* were very abundant.

The pools in Edgewood Park were kept oiled and were not found to breed mosquitoes except at a few places. This does not, however, apply to the main stream of West River, the conditions of which are described in the following chapter.

West River Responsible for a Scourge of *Culex pipiens* in New Haven.

On August 5, Mr. L. B. Ripley, who had been sent to examine the pools in Edgewood Park, reported that he found wrigglers in the margins of the main stream (West River) especially in the coves, or where choked by vegetation or rubbish the water remained quiet. Small pools under the Whalley Avenue Bridge, existing on account of low water were literally alive with *Culex* larvæ.

On August 11, Mr. Ripley examined the stream above the bridge and found wrigglers very abundant, particularly between Blake Street and Valley Street bridges, through West Rock Park. With one dip of the ladle, which holds about a gill, 200 wrigglers were taken. From a further investigation we found that the west branch of the river, as far as the Pond Lily Company's dye works, was filled with wrigglers. Little or no breeding could be detected in the other branches of West River, where the water was clear.

The west branch receives the waste from the dye works and further down the stream the refuse from the Joseph Parker and Sons paper mills and the factories of the Geometric Tool Co., and of the Greist Mfg. Co. The dye stuffs in the stream discolor the water, often making it look like ink. It was a season of extreme drought and the water was unusually low, and therefore was nearly stagnant, and completely so in many pools which would be connected with the stream in high water, but in low water entirely separate. The dye stuffs had apparently either killed or driven away the fish, and mosquitoes were breeding here intensively—literally by millions. The wrigglers clustered around stones, sticks, dead leaves or any other objects in the water and they were visible from the banks at a distance of perhaps fifteen feet. Up to this time West River had not even been suspected of breeding mosquitoes.

This discovery explained a great mystery. Annually, for at least three years, in the entire western portion of the City of New Haven there has been a scourge of rain-barrel mosquitoes, *Culex pipiens* Linn., beginning the latter part of July and ending only on the approach of cold weather. The mosquitoes were very abundant in 1912 and fairly swarmed into cellars to hibernate, but they were probably worse in 1913, or would have been,

if control measures had not been adopted. In fact the writer has never seen them so abundant anywhere as they were in the western part of New Haven about August 1, 1913.

In 1912 when the Anti-Mosquito Committee of the Civic Federation caused all known breeding places in and about New Haven to be drained or oiled for the season, salt marsh mosquitoes were scarce, yet rain-barrel mosquitoes were abundant and many citizens who had contributed toward the mosquito campaign fund complained. They had given good money but there were still just as many mosquitoes.

Much searching was therefore done for rain-water barrels, though a thousand of them could not produce as many mosquitoes as this stream furnished. They fairly swarmed in protected corners of buildings, under verandas, and in shrubbery. They were innocuous during the day but as soon as it was dark they began to sing and to bite. Many were small and readily entered houses through the meshes of the screens. Unless the windows were kept entirely closed, or mosquito bars placed over the beds it was impossible to sleep at night.

Now the origin of the mosquito outbreak was no longer a mystery. What to do was the next question. The condition of West River was reported by telephone to the offices of the Board of Health and the Superintendent of Parks on August 12, and a formal letter was sent to each on August 14. On August 21, a meeting of the Board of Health was held and the matter considered. The writer, in company with a committee of the Edgewood Civic Association, consisting of Messrs. Chas. E. Brown, Geo. W. Crane and Carleton H. Stevens, attended this meeting, explained the situation and urged prompt action.

Considerable time must necessarily elapse before the Board could notify all property owners to abate this nuisance. The Board, under the new law becoming effective August 1, given on page 242, clearly had the right to abate the nuisance, but of course must go about it in a legal manner. Immediate relief was demanded. As a remedy, flushing the stream by opening the gates above was the simplest; but there was a serious drought and water was very low and could not be wasted. Hence the oiling method was chosen.

The Executive Board of the Anti-Mosquito Committee, therefore, voted to appropriate a sum of money, not to exceed $50.00,

toward the cost, the remainder to be collected from interested persons. The writer was asked to take charge of the oiling work, which was started the next day, August 22. He was fortunate in being able to obtain the services of Mr. James E. Hitchcock, who was employed by the Anti-Mosquito Committee on the work in 1912. During the next few days the entire surface of the river, where mosquito wrigglers could be found, was sprayed with oil from a point opposite Ramsdell Street, near the Pond Lily dye works, eastward to the Whalley Avenue bridge, a distance of nearly one and one-half miles of the winding course of the stream. Also the canal near the paper mills and many detached pools that in high water are connected with the river, were treated. The winding course of the stream, with its brush-grown banks and its rough and irregular bed, partially filled with vegetation and rubbish, made the oiling work difficult and expensive.

Kerosene was used because it could be purchased immediately. Six barrels of crude oil, donated by the Geometric Tool Co., was also applied and gave excellent results. The oil was spread by means of two "double forester" pumps, one the property of the Civic Federation and the other kindly loaned for the purpose by the State Forester. See plate X.

The Park Department oiled the edges of the stream through Edgewood and West Rock Parks, but in the latter not enough oil was used and the work had to be done over by Mr. Hitchcock, the Park Department furnishing two men to help.

The entire cost of this work amounted to $125.31, and was nearly covered by local contributions of money, labor and oil.

The treatment was effective. We examined the stream and could find few live wrigglers but thousands of dead ones floated down. A day or two after the work was finished rain carried off most of the oil and later one small brood of mosquitoes developed and the adults emerged, but were not a great nuisance because of the cooler weather and many of the larvæ were washed down stream by heavy rains in September and October. The myriads of adults which had emerged before oiling gradually disappeared and on the approach of winter, hibernating adult rain-barrel mosquitoes were much less abundant than in 1912. Apparently these mosquitoes were a nuisance nearly a mile distant from West River.

Unless some remedial action is taken, the condition may and probably will exist in West River each season of scant rainfall, as long as the pollution is allowed to continue. Once the pollution stops the stream can again be stocked with fish, and there will be no more mosquitoes from it. The bed should be cleared of rubbish, and straightened. I understand that the City Board of Health has already warned the property owners abutting the stream that the nuisance must be abated.

Adults, larvæ and pupæ were sent to Dr. L. O. Howard at Washington, who kindly confirmed our identification; it was the rain-barrel mosquito, *Culex pipiens* Linn.

Other Similar Outbreaks.

Howard, Dyar and Knab record a similar outbreak near Urbana, Ill., where a creek is practically stagnant in late summer. At a certain point this creek receives the waste from a slaughter house, and for some distance below was so charged with decomposing animal matter that no fish could live in it, though it contained millions of wrigglers of rain-barrel mosquitoes. Adults covered the trees and bushes along the banks, but their presence was felt only for a short distance, and few of them reached the town perhaps a mile away. They continued to reproduce until cold weather.*

Another interesting outbreak of rain-barrel mosquitoes which occurred in 1913 in Greenwich, Conn., was described to me in a letter by Mr. Edwin M. Skinner, President of the United States Drainage and Irrigation Co., of New York City. Just north of the village of Mianus, there is a dam six or eight feet above tide level, formerly used to furnish power for the Palmer Bros., gas engine plant, but now abandoned for another site where steam is used. About 500 yards north of the Palmer dam, is another dam about six feet high, where a grist mill used to stand but of which only the sluiceway and part of the water wheel remain. These dams are not used but on account of sewage emptying into the river above and between them, they are allowed to remain rather than permit the sewage to be exposed.

* The mosquitoes of North and Central America and the West Indies, Vol. I, p. 135, 1912.

A short distance above the second dam there is a mill where lap-robes and cheap plush goods are made from cow-hair and low grade wool. A cheap grade of oil is used in spinning the raw wool and cow-hair, and the product is washed with water from the river which again flows into the stream. Probably dye stuffs are also used and emptied into the river. These waste materials, together with the sewage held back by the dams, probably destroyed the fish and furnished an ideal breeding place for rain-barrel mosquitoes. The stream flow was slight in the period of drought, and the water was stagnant and slimy and thickly filled with wrigglers. The river is about 100 feet wide by the grist mill dam and perhaps 150 feet broad at the Palmer dam and literally filled with larvæ.

Above the woolen mill is another dam, above which the water is pure and sweet. The health officer ordered the gates lifted at this upper dam and all the wrigglers were washed into Long Island Sound the same day that they were discovered.

Cutting and Maintaining Ditches in 1913.

In New Haven the Anti-Mosquito Committee collected a small amount of money in 1913, and with it kept clear the ditches cut in the salt marshes in 1912. Similar maintenance work has also been done at Shippan Point, Darien, South Norwalk and Fairfield.

Considerable draining and filling has been done in the town of Greenwich, little of it, however, applying to the salt marsh. Many fresh water pools and swamps, which have in previous years been breeding places of malarial mosquitoes and various species of *Culex,* have been eliminated throughout an area extending along the coast and about two and one-half miles inland or as far as the village of Glenville. The north line of this area is parallel with the north town line.

ENTOMOLOGICAL FEATURES OF THE SEASON.

Following the mild weather, the spring of 1913 was cool and with abundant rainfall during May. In June, July and August the rainfall was much below the normal, resulting in a severe drought in which many native trees and plants were vitally injured, and cultivated crops reduced in yield. Heavy rains came in September.

The climatic conditions cannot fail to effect insect life, though less directly than plant life. Many hickory trees have died, chiefly from the attacks of the hickory-bark borer, particularly in the southwestern corner of the State. In some localities oaks have died, but these trees, like the hickories, have evidently been injured by freezing or drought or both, and were attacked afterward by various bark beetles.

White grubs have been comparatively scarce and except in one or two cases, have not been reported as damaging crops.

The Colorado potato beetle, too, was not abundant and nearly all larvæ that we observed carried Tachinid parasite eggs.

The apple-tree tent-caterpillar was more abundant than we have ever seen it and roadsides and neglected apple trees and bushes were stripped. The damage was apparently greater inland than along the coast. Cocoons gathered at Stonington were strongly parasitized.

The forest tent-caterpillar was also more common than usual, though not very destructive.

Cutworms were not particularly abundant.

Aphids caused much damage, especially the rosy and green apple aphids, and the cabbage and pea aphids.

One of the chief features of the season is the discovery of new territory infested by the brown-tail moth. The scouting in the previous winter shows that insect to have spread much farther westward than was supposed.

The gypsy moth is now almost eradicated at both Stonington and Wallingford, the only two infestations found in the State.

The more important of these insects are treated in some detail in the separate articles and notes of this report.

MISCELLANEOUS INSECT NOTES.

The Dying Oak Trees.—On September 24, 1912, the writer was called to examine some oak trees which were dying on a large place owned by Mr. Mallory in the extreme southwest corner of Greenwich, just over the line from Port Chester, N. Y. The trees began dying in July, after having made their season's growth, and were mostly chestnut oaks; a few white oaks and a few of another kind, possibly black oaks, had also died. As

the trees all stood upon a ledgy knoll, the extreme drought seemed largely responsible for their death, though bark borers were at work in them. Another visit was made to this place August 5, 1913, in company with Dr. G. P. Clinton, botanist of this Station, Mr. H. W. Merkel of the New York Zoological Park, and Messrs. F. A. Bartlett of the Frost and Bartlett Co. of Stamford. More trees had died and one white oak had just been cut upon which the writer observed winter injury in 1912. In 1913 borers were at work under the bark where none were found the preceding year. Plate XII, b, shows the appearance of a piece of bark from a chestnut oak which had just been felled. The larger galleries were made by a common flat-headed borer, *Chrysobothris femorata* Fabr., and the smaller ones by the two-lined chestnut borer, *Agrilus bilineatus* Web. Both kinds of larvæ were present in the burrows.

From other trees examined and reported, our opinion is confirmed that the trouble is due, not primarily to insects but to winter and drought injury, followed by these borers which are well known to attack weakened and unthrifty trees.

Flight of Spruce Bud Moth, *Tortrix fumiferana* Clem.—A brief note in the report of this Station for 1912, page 291, mentions this moth as being unusually common in 1912, but it was even more abundant in 1913. Swarms appeared the last day of July and newspapers in different parts of the State commented upon it the following morning. The following appeared in the *Hartford Courant* of August 1st: "The city was infested last night by a scourge of moths which appeared suddenly and in great numbers. In some parts of the city the insects were so numerous last night that they completely covered the windows and screen doors of lighted restaurants and stores. The moths are spotted with gray and a dirty shade of brown."

On the day that this item appeared a reporter on one of the New Haven daily papers telephoned to this office for information, and stated that he observed the moths to be very abundant around the lights at the corner of Chapel and York streets. Mr. Ripley was sent to obtain adults which we at once recognized as the spruce bud moth. Hundreds of them had been at this corner, many had been crushed on the sidewalk, and some were resting upon the poles and on the walls of the adjoining buidings. In a few days, however, all had disappeared.

The larva of this insect, in a spruce twig, was received from Mr. E. Kent Hubbard, Jr., of Middletown, who had collected it in the Maine woods. Several adults were received at this office August 2, collected around lights at New London by Dr. Chas. B. Graves, and August 4, by John H. Osgood at Putnam.

Parsley Stalk Weevil, *Listronotus latiusculus* Boh.—On August 16, Dr. Clinton brought in some parsley plants from the vegetable farm of A. N. Farnham of New Haven, which had been injured by this insect. The crown of each plant had been tunneled by the larva, as shown on plate XI, b, and the plants though alive were sickly and wilted. Mr. Lowry visited the place August 18, and obtained more material. On some of the plants the tunnels showed on the outside, and two and three larvæ are sometimes found in the same plant. The infested plants usually decay just below the surface of the ground, though the root below the point of attack may remain sound for a time. The infested plants at Mr. Farnham's were all growing in cold frames. It is doubtful if there is any practicable remedy, though carbon disulphide injected into the soil might kill the larvæ. An account of this insect may be found in Bulletin 82 of the Bureau of Entomology, page 14, U. S. Department of Agriculture. The insect has not previously been reported from Connecticut.

The Cottony Maple Scale, *Pulvinaria vitis* Linn.—This insect attacks many different trees and shrubs but is chiefly a pest of soft maple shade trees. In Connecticut it has seldom been injurious and usually a few specimens only are found on a tree. At Sound Beach, Stamford, the silver maples on several streets in a certain locality are now badly infested. The underside of nearly all branches are lined with scales and the trees more or less injured. Some of these trees were sprayed last spring with the miscible oils which seem to be effective. This insect is known in literature as *Pulvinaria innumerabilis* Rathvon, but studies by Professor J. G. Sanders* showed it to be identical with the European *P. vitis,* under which name it must now be known.

* Journal of Economic Entomology, Vol. II, p. 433, 1909.

Abundance of *Omphalocera dentosa* Grote.—This insect was described and illustrated in the report of this Station for 1911, page 292, as a pest of barberry hedges. It has apparently been more abundant and has done more damage in 1913 than in any preceding year since our observations began. Hedges of Japanese barberry (*Berberis Thunbergii* D. C.) and of the common barberry (*Berberis vulgaris* Linn.) were attacked. A tall hedge of common barberry was practically defoliated at the top and the larval webs were so numerous as to render it unsightly. In inspecting nurseries, the work of this insect was noticed at New Canaan, Stratford and New Haven. Purple-leaved barberry plants in a New Haven nursery were nearly stripped of their leaves but contained a mass of old webs. The writer also noticed barberry bushes growing by the roadside in North Guilford, which had lost nearly all of their leaves from the attacks of this insect.

The Eggs of *Hemerocampa definita* Pack., **and Their Resemblance to Gypsy Moth Eggs.**—Occasionally we find the egg-clusters of this tussock moth, which is apparently not very common, and they are often mistaken for those of the gypsy moth. Though there is great variation, certain egg-clusters are about the same size, shape and color as gypsy moth egg-clusters, but the hairs are somewhat coarser, more crinkled, the whole cluster more loosely constructed, and the eggs more exposed. As a rule, also, the eggs of *Hemerocampa* are deposited on a network of silk on or near the old cocoon, which is often on a leaf which is also fastened to the twig by silk threads. Gypsy moth eggs are usually laid on a solid surface, except in case of great abundance. In two apple orchards near Gales Ferry, Mr. Caffrey found some of these egg-clusters fastened directly to the bark and greatly resembling gypsy moth eggs. There is a difference in the micropylar structure of the eggs of these two moths, which will generally serve to fix their identity, but even entomologists have been mistaken regarding them. *Hemerocampa definita* is a near relative of the White Marked Tussock Moth, described in the report of this Station for 1905, page 230; it is, however, much less common and its eggs are shown on plate XII, a, of this report. Mr. Caffrey found *H. definita* fairly common in the northern part of the State, and we have

records of its occurrence in Thompson, Putnam, Union, Stafford, Willington, Mansfield, Somers, Enfield, Coventry, Ellington, Manchester, Tolland, Bolton, Eastford, Ashford and Ledyard. The eggs have been found in Connecticut on apple, cherry, poplar, willow, rose, plum, hawthorn, alder, lilac and birch.

Cocoons of the Promethea Moth, *Callosamia promethea* Drury.—Each year the cocoons of this moth are sent in by correspondents who think that it may be some important pest. During the past year specimens have been received from Elliotts, Collinsville, Guilford, Lebanon, New Canaan, West Haven and twice from Wallingford. The cocoons hang from the lower branches of sassafras, tulip, wild cherry and occasionally peach and plum trees. Each cocoon is usually rolled in a leaf with a strong silk fastening around the petiole, as is shown on plate IX, c, so that it is difficult to tear it from the tree. The adult moth is one of our larger species of night-flying moths. The female resembles the Cecropia moth, though smaller, and the male is nearly black.

Subsidence of the San José Scale.—This insect, which for fifteen years has been a serious enemy of fruit trees, seems to be now on the wane. Many old apple trees badly injured a few years ago, and which have not been sprayed, are taking on new vigor and seem to show only a slight scale infestation. We had supposed this to be result of lady beetles, two species of which commonly feed upon the San José Scale. Specimens of scale gathered this fall by Mr. Davis show many holes from which small hymenopterous parasites have emerged. We have not reared the adult parasite but it is probably a species already known, and may be the same that has been cleaning up the orchards in Pennsylvania.

Galls on Gooseberry.—While inspecting imported nursery stock in East Haven, April 23, Mr. Walden was asked to look at some unthrifty gooseberry plants in a neighboring yard owned by Mr. Eugene Wilson. Many of these plants were dead, and some of the living and dead plants had curious galls near their tips, much resembling the illustrations of galls on currants in England, caused by the currant mite, *Eriophyes ribis* Nal., and

known as "Big Bud."* We were unable to find any statement to the effect that this mite attacks the gooseberry in England, but it does injure black and red currants. No mites or other animal life could be found in these galls, which may be those of the gooseberry gall midge *Rhopalomyia grossulariæ* Felt. described and figured by Professor J. S. Houser of the Ohio Station.† The owner was advised to cut off and burn all twigs showing these galls. See plate XI, a.

Abundance of Spittle Insects.—Everyone is more or less familiar with the small masses of "spittle" or froth on the stems of grass, caused by small immature sucking insects of the family Cercopidæ, often called "spittle insects" or "frog hoppers." These insects were unusually abundant in 1913, and nearly every stalk of grass, in some fields, carried a mass of froth. One's clothes would become soaked in walking through the grass.

These insects are supposed to cause some injury, but the matter is not well understood, and not one life history of a single American species has ever been worked out.

Interesting Pupa Cells of the Clover Weevil, *Phytonomus punctatus* Fabr.—On May 17, Mrs. Robert F. Mitchell sent to the office some of the pupa cases of this insect which were very abundant in the soil of her garden in New Haven. These were placed in a breeding cage and in a few days the adults began to emerge. The clover weevil is rarely injurious in Connecticut, though the larvæ feed upon clover leaves. The pupa cells are small lace-like oval cases, about three-sixteenths of an inch in length, pale green in color, and are shown with larva and pupa on plate VII, c.

Birch Leaf Skeletonizer, *Bucculatrix canadensisella* Chamb.—The injury by this insect, which was so conspicuous in the State in 1910 and which has somewhat subsided, is still apparent. Though present over the entire State as in 1911 and 1912, the center of attack has moved westward, and seemed to be the most serious in the northwestern portion of the State where yellow and black birches were attacked. A full account of this insect is given in the report of this Station for 1910, page 701.

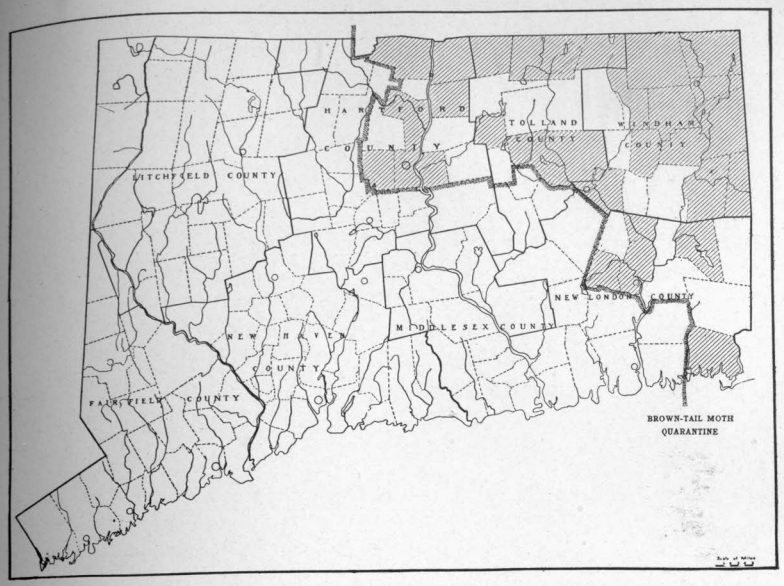
* Theobald, Insect Pests of Fruit, p. 240, 1909.
† Houser, Journal of Economic Entomology, Vol. V, p. 180, 1912.

Elm Leaf Beetle, *Galerucella luteola* Müll.—In some of the shore towns and cities, and especially where spraying has been practiced for several years, this pest was rather scarce during the past summer. On the other hand it was extremely abundant in certain inland towns, particularly in Litchfield County. The writer also observed many unsprayed elms in Woodbury which lost nearly all their leaves in July from the attacks of the larvæ, aggravated no doubt by the severe drought. Trees in the vicinity which had been sprayed remained in good condition.

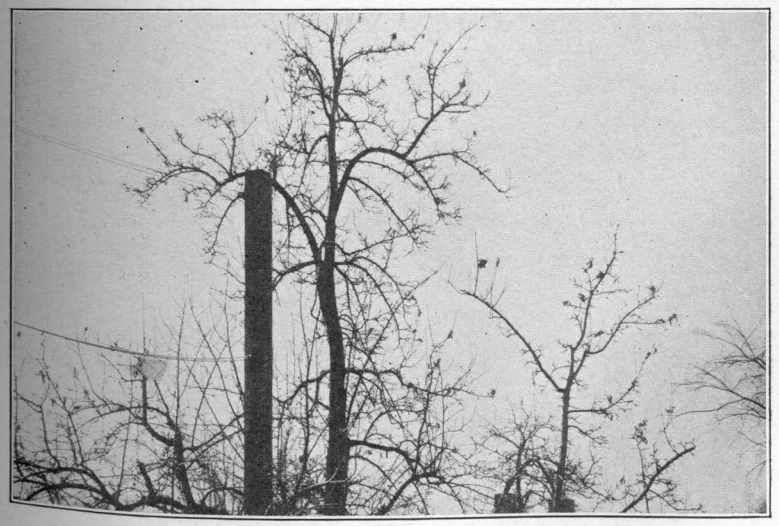
The Poplar Sawfly, *Trichiocampus viminalis* Fallen. During the past three or four years the larvæ of this sawfly have been rather common on Carolina poplars near the Station, and late in August may be seen crawling down the trunks of the trees presumably to seek a place in which to pupate. The full-grown larva is four-fifths of an inch long, orange-yellow, marked with black spots, and bearing whitish hairs. There are two broods each year, the larvæ of the first brood appearing in June. These caterpillars feed upon the leaves and may be poisoned by spraying the tree with lead arsenate in case they should become destructively abundant. The adult is a small four-winged fly.

The Linden Borer, *Saperda vestita* Say. Larvæ of this beetle were rather common in young linden trees in one nursery this year. They tunnel under the bark and in the wood at the base. Decay often starts involving the entire stem, the leaves shrivel and the tree dies and breaks off. Trees in all stages of injury were found. Mr. Lowry captured an adult beetle in Wallingford, June 23. Where this borer causes damage, the only remedy is to examine the trees in May and September and to dig out the larvæ or kill them in the burrows with a wire, or by injecting a few drops of carbon disulphide and closing the opening.

Abundance of Tarnished Plant Bug, *Lygus pratensis* Linn. The tarnished plant bug was unusually abundant in 1913, and injured many different plants by sucking the sap from the bud or leaf stem causing that part to "blast" or wilt. Several complaints were received regarding injury to Dahlia buds, and in Litchfield potatoes were damaged by this insect. It is doubtful if a satisfactory remedy exists.



a. Map showing quarantine line and present distribution in Connecticut.

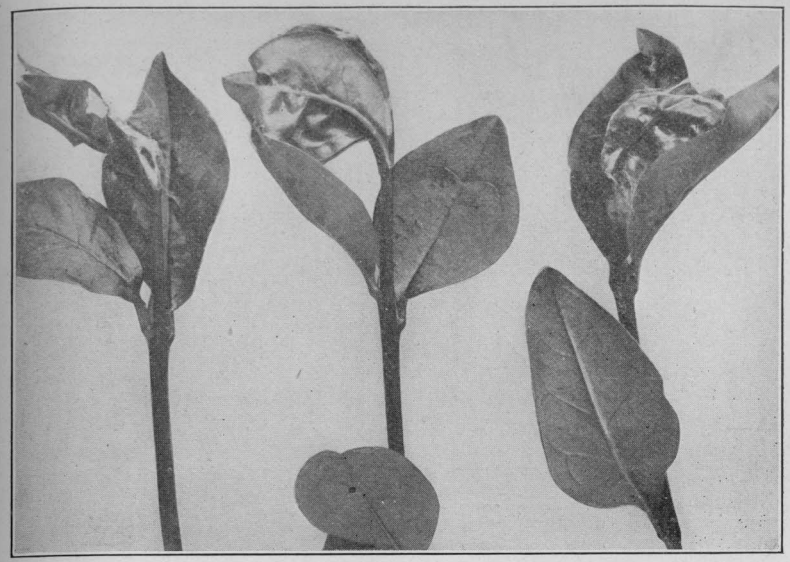


b. Winter nests on pear trees in Hartford.

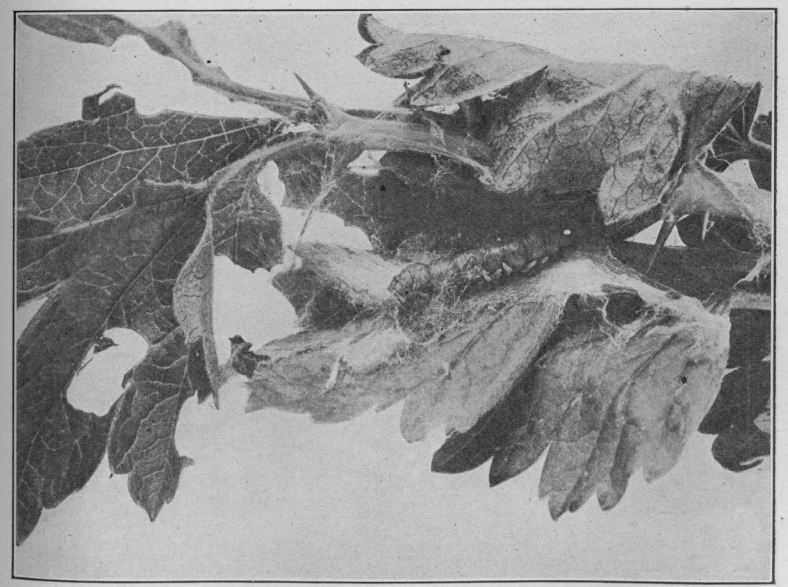
THE BROWN-TAIL MOTH.

Winter nests cut from pear tree in Hartford; center nest shows old egg-mass on leaf; natural size.

THE BROWN-TAIL MOTH.

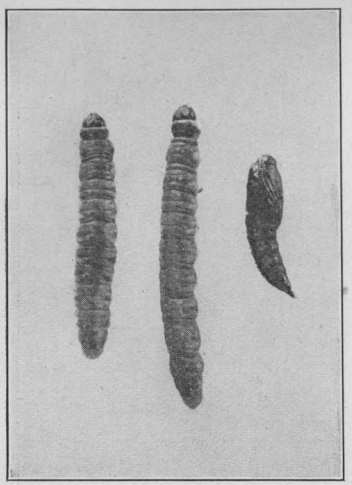


a. Leaves of California privet, drawn together.

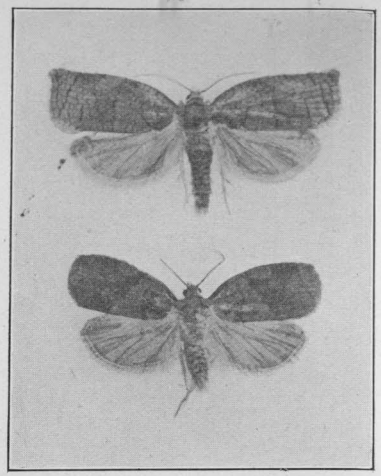


b. Larva on gooseberry.

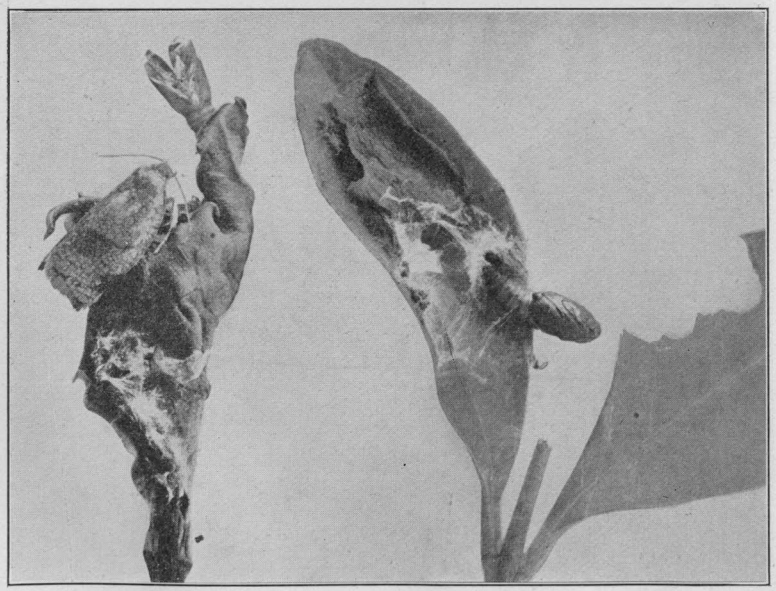
A LEAF-FOLDER *Archips rosana* Linn.



a. Larvæ and pupa.



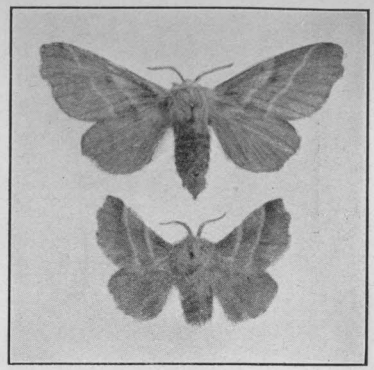
b. Adults, female above.



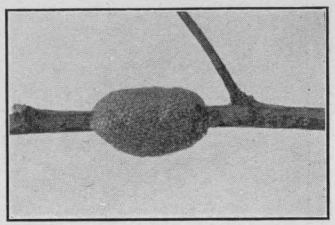
c. Pupa case and adult.

A LEAF-FOLDER *Archips rosana* Linn. All figures twice natural size.

a. Nest in apple-tree.



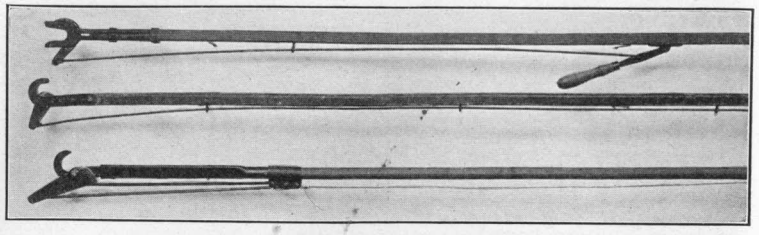
b. Adults, female above. Natural size.



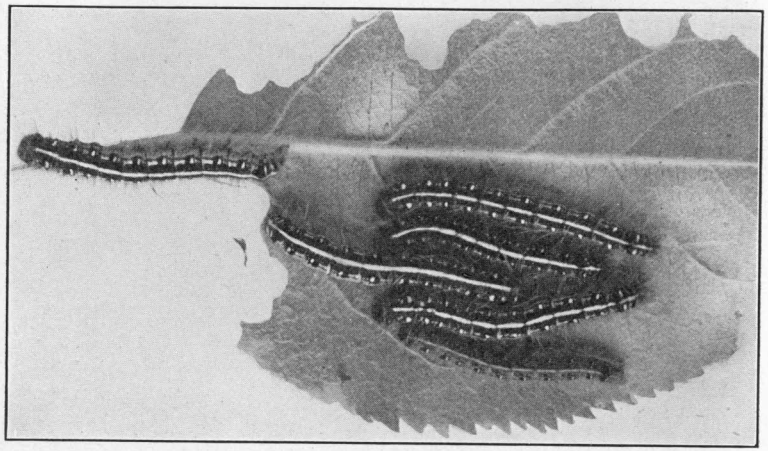
c. Egg-mass on twig. Natural size.

d. A consignment of imported stock in a Connecticut nursery.

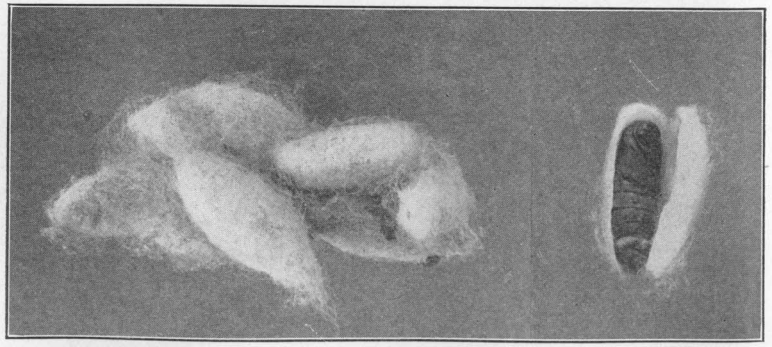
APPLE-TREE TENT-CATERPILLAR; IMPORTED NURSERY STOCK.



a. Tree pruners for clipping off egg-masses.

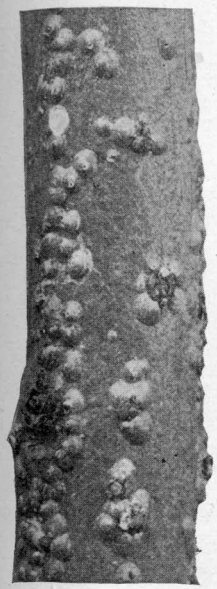


b. Caterpillars. Natural size.

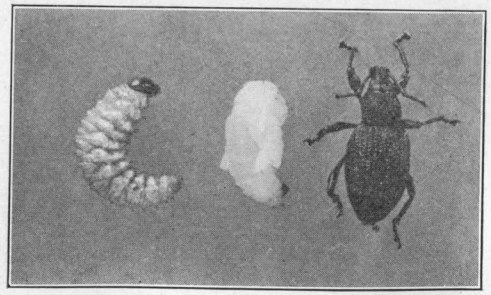


c. Cocoons. Natural size.

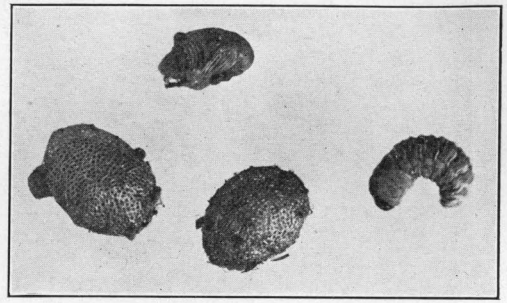
APPLE-TREE TENT-CATERPILLAR.



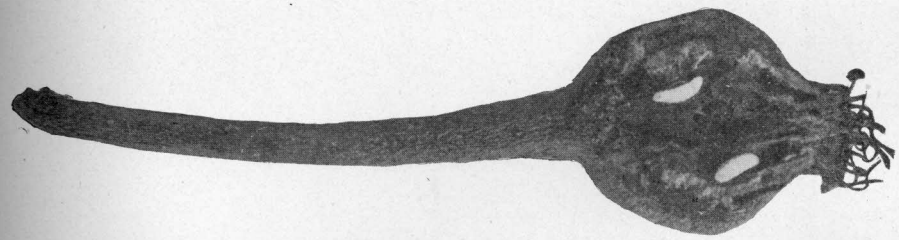
a. West Indian peach scale. Twice enlarged.



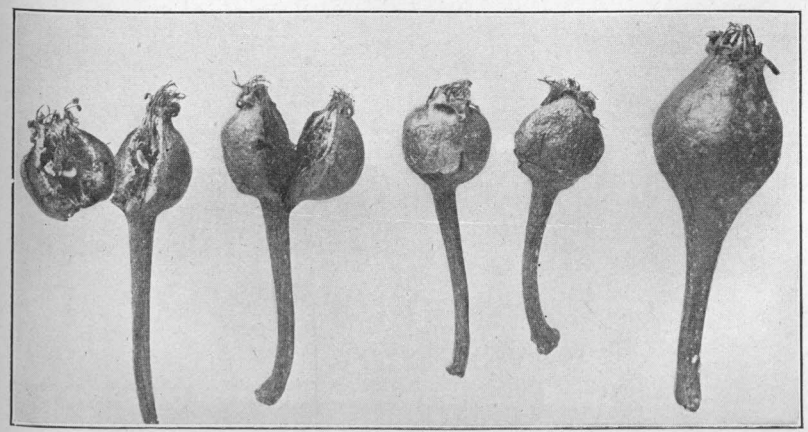
b. *Otiorhynchus sulcatus* Fabr. Larva, pupa and adult. Twice enlarged.



c. Clover weevil, larva, pupa and pupa cases Twice enlarged.



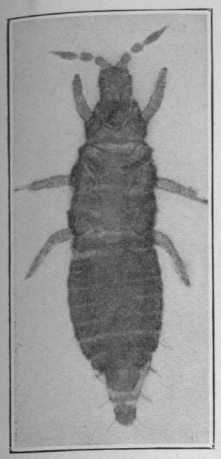
d. Pear midge. Young pear showing maggots inside. Three times enlarged.



a. View on Station grounds.

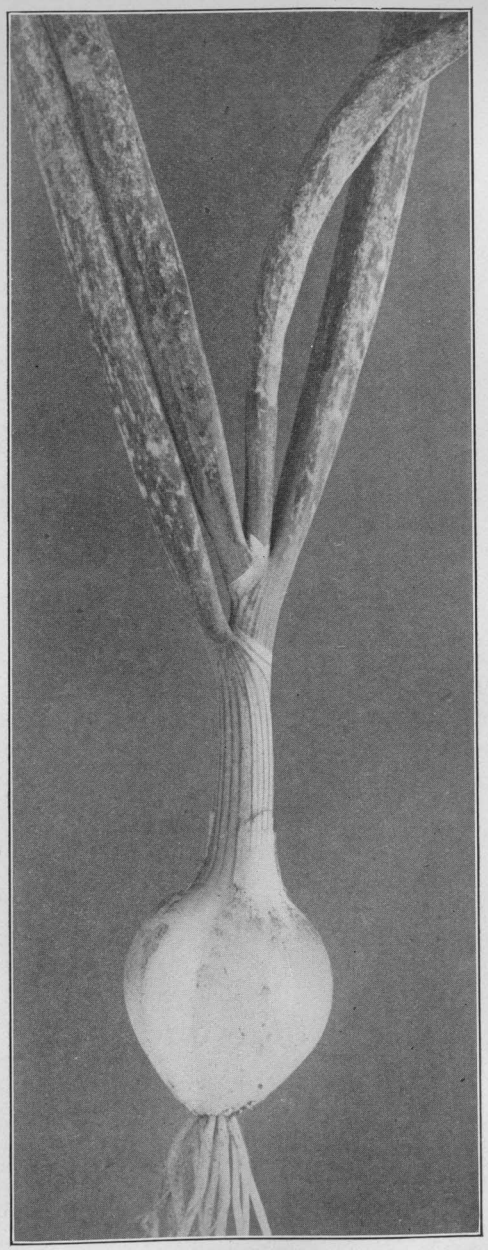
b. Spraying onions at Wethersfield.

CONTROL OF ONION THRIPS.



a. Immature thrips much enlarged.

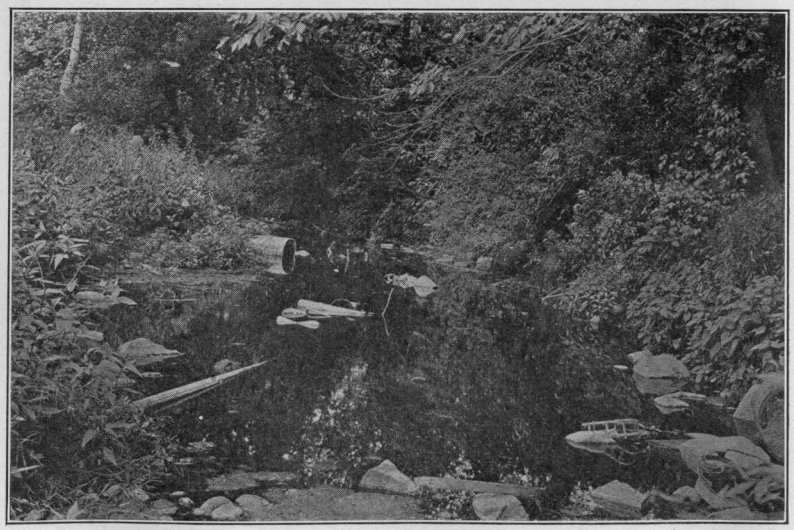
c. Cocoon of Promethea moth. Natural size.



b. Onion plant injured by thrips. Natural size.

ONION THRIPS AND COCOON OF PROMETHEA MOTH.

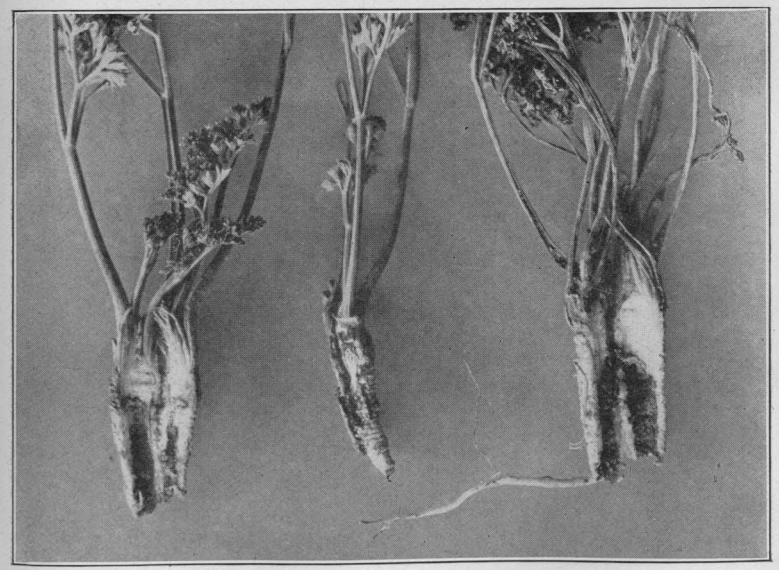
a. Oiling canal near paper mill.



b. A disconnected pool filled with wrigglers.

MOSQUITO-BREEDING PLACES.

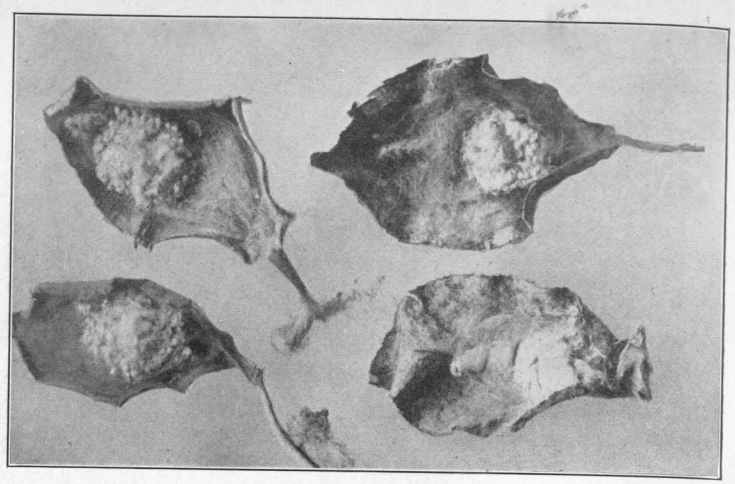
a. Galls on gooseberry.



b. Parsley plants injured by weevil.

GOOSEBERRY GALLS AND PARSLEY STALK WEEVIL.

Both natural size.



a. Egg-clusters of *Hemerocampa definita* Pack. Natural size.

b. Large galleries were made by *Chrysobothris femorata* Fabr. and small ones by *Agrilus bilineatus* Web. Natural size.

TUSSOCK MOTH EGG-CLUSTERS; WORK OF BORERS IN OAK BARK.

PART IV.

Eighteenth Report on Food Products and Sixth Report on Drug Products, 1913.

SECTION 2 OF PART 1

By John Phillips Street.*

Section 1, printed as Part I of the Annual Report, contained the analyses of 136 diabetic foods, twelve peanut butters, seventeen saccharin preparations and thirty-eight wines, 203 samples in all. The other samples of foods and drugs examined during the past year are herewith reported.

Of the 734 samples collected by the station agent, 477 were passed and twenty-six were adulterated, below standard, misbranded or short weight. The Dairy and Food Commissioner has also sent in 999 samples, chiefly milk, vinegar and turpentine. Of these 424 were adulterated, misbranded or below standard. Besides the above, 169 samples have been examined for city and health officials and other individuals, making a total of 1902 samples from all sources.

I. FOOD PRODUCTS.

BREAD.

The present examination of this important food product concerns chiefly its water-content and the variations in weight of loaves from the same baking. All the samples baked in Connecticut were bought from the bakeries producing them, and were

*The analytical work herein reported was done jointly with E. M. Bailey, C. B. Morison, C. E. Shepard and G. L. Davis.

TABLE I.—

Station No.	Bakery.	Weight of Individual Loaves. oz.	Average Weight of Loaf. oz.
948	Winslow's Bakery, Inc.	14.53, 14.07, 13.93	14.18
966	Ye Olde Time Bakerie	13.37, 14.00, 13.58	13.65
	Ave. 21 New Haven Samples	....	13.89
	New London :—		
998	C. and C. Bakery. (Matchless)	15.52, 14.50	15.01
996	Domestic Bakery	13.83, 13.62	13.73
999	Gager-Crawford Co.	14.53, 13.72	14.13
1003	A. Gordon	14.74, 14.04	14.39
1000	New England Bakery	13.58, 13.58	13.58
997	O. K. Bakery. (Peerless)	12.59, 12.35	12.47
	Ave. 6 New London Samples	....	13.89
	Norwalk :—		
1024	Deklyn's Bakery	12.91, 12.59	12.75
1029	Rundle Bakery	13.69, 13.44	13.57
	Ave. 2 Norwalk Samples	....	13.16
	Norwich :—		
993	The Mohican Co.	13.86, 13.47	13.67
994	O'Connor's Bakery. (Home-Made)	12.95, 13.26	13.11
995	Providence Bakery	14.18, 14.96	14.57
	Ave. 3 Norwich Samples	...	13.78
	South Norwalk :—		
1028	Rundle Bakery, E. Norwalk (Sold by C. A. Lane)	14.57, 13.51	14.04
1027	Owens' Bakery	13.79, 14.07	13.93
1025	John P. Raihi's Bakery	13.02, 13.72	13.37
	Ave. 3 South Norwalk Samples	....	13.78
	Stamford :—		
1005	Andrew Davey	13.02, 13.05	13.04
1010	O. K. Bakery	14.29, 13.79	14.04
1007	Marsh Baking Co. (Butter.) Sold by Samuel Price Co.	12.20, 12.38	12.29
1004	Stamford Bakery,	11.92, 12.10	12.01
1011	West Park Bakery	13.33, 13.09	13.21
	Ave. 5 Stamford Samples	....	12.92
	Waterbury :—		
1023	Bouffard's Bakery	13.26, 14.53	13.90
1013	P. Hock	13.86, 15.34	14.60
1020	Joslin's Bakery	11.71, 11.39	11.55
1015	Kelly's Bakery	16.97, 16.05	16.51
1017	The Mohican Co.	16.40, 16.12	16.26
1014	O'Brien's Bakery. (Gold-Medal)	13.97, 13.97	13.97
1019	Penner & Bohn	13.93, 13.86	13.90
1016	Raymond Bros.	14.11, 14.14	14.13
1021	Trott's Bakery	14.00, 14.36	14.18
1022	Waterbury Market Co.	13.23, 12.91	13.07
	Ave. 10 Waterbury Samples		14.21

BREAD.—*Continued.*

Per cent. of Water in Individual Loaves.	Composition of Average Loaf. In Original Material. Water.	Ether Extract.	Ash.	Protein (N x 6.25).	Carbohydrates including Fiber.	In Water-free Material. Ether Extract.	Ash.	Protein (N x 6.25).	Carbohydrates including Fiber.	Average Dry Matter per Loaf.	Cost per Pound of Bread.
35.56, 35.08, 33.78	34.81	0.72	1.53	10.01	52.93	1.10	2.35	15.36	81.19	9.24	5.6
34.19, 35.30, 32.75	34.08	1.80	1.41	9.41	53.30	2.73	2.14	14.28	80.85	9.00	5.9
....	34.75	1.52	1.41	9.52	52.80	2.33	2.16	14.59	80.92	9.06	5.8
37.68, 36.34	37.01	0.52	1.58	10.15	50.74	0.83	2.51	16.11	80.55	9.45	5.3
35.05, 35.42	35.24	4.37	1.54	9.14	49.71	6.75	2.38	14.11	76.76	8.89	5.8
36.64, 37.41	37.03	1.32	1.20	8.95	51.50	2.09	1.91	14.21	81.79	8.90	5.7
28.55, 27.70	28.13	0.90	1.66	11.76	57.55	1.25	2.31	16.36	80.08	10.34	5.6
35.75, 38.43	37.09	1.57	1.42	8.62	51.30	2.50	2.26	13.70	81.54	8.55	5.9
32.23, 31.20	31.72	0.92	1.57	10.11	55.68	1.35	2.30	14.81	81.54	8.52	6.4
....	34.37	1.60	1.50	9.79	52.74	2.44	2.29	14.92	80.35	9.11	5.8
31.83, 31.67	31.75	1.22	1.65	10.42	54.96	1.78	2.42	15.27	80.53	8.70	6.3
32.40, 33.21	32.81	0.64	1.49	10.08	54.98	0.95	2.22	15.00	81.83	9.11	5.9
....	32.28	0.93	1.57	10.25	54.97	1.36	2.32	15.14	81.18	8.91	6.1
35.68, 35.40	35.54	0.82	1.54	9.02	53.08	1.27	2.39	13.99	82.35	8.81	5.9
29.58, 29.00	29.29	1.88	1.13	9.58	58.12	2.66	1.60	13.55	82.19	9.27	6.1
33.64, 34.95	34.30	0.84	1.39	9.77	53.70	1.28	2.12	14.87	81.73	9.57	5.5
....	33.04	1.18	1.35	9.46	54.97	1.76	2.02	14.13	82.09	9.22	5.8
35.40, 34.63	35.02	0.44	1.37	9.67	53.50	0.68	2.11	14.88	82.33	9.12	5.7
34.32, 35.13	34.73	0.48	1.35	9.72	53.72	0.74	2.07	14.89	82.30	9.09	5.8
34.85, 34.92	34.89	2.13	1.44	9.49	52.05	3.27	2.21	14.59	79.93	8.71	6.0
....	34.88	1.02	1.38	9.63	53.09	1.56	2.13	14.79	81.52	8.97	5.8
33.98, 35.22	34.60	0.72	1.54	9.76	53.38	1.10	2.35	14.93	81.62	8.53	6.1
33.06, 32.61	32.84	1.05	1.51	9.92	54.68	1.56	2.25	14.78	81.41	9.43	5.7
35.86, 34.78	35.32	0.15	1.33	10.03	53.17	0.23	2.05	15.51	82.21	7.95	6.5
34.16, 33.45	33.81	0.22	1.80	8.94	55.23	0.33	2.72	13.51	83.44	7.95	6.7
33.19, 35.10	34.15	0.79	1.48	9.05	54.53	1.20	2.25	13.74	82.81	8.70	6.1
....	34.14	0.59	1.53	9.54	54.20	0.88	2.32	14.50	82.30	8.51	6.2
32.61, 33.24	32.93	0.89	1.28	9.87	55.03	1.33	1.91	14.72	82.04	9.32	5.8
37.17, 38.27	37.72	1.04	1.13	8.73	51.38	1.67	1.81	14.02	82.50	9.09	5.5
31.82, 29.61	30.72	1.33	1.53	10.28	56.14	1.92	2.21	14.84	81.03	8.00	6.9
34.35, 32.91	33.63	1.44	1.51	10.25	53.17	2.17	2.28	15.44	80.11	10.96	4.8
31.36, 32.86	32.11	0.65	1.45	9.80	55.99	0.96	2.14	14.43	82.47	11.04	4.9
32.36, 31.76	32.06	1.20	1.28	9.49	55.97	1.77	1.88	13.97	82.38	9.49	5.7
32.18, 29.75	30.97	2.36	1.25	9.76	55.66	3.42	1.81	14.14	80.63	9.60	5.8
34.86, 35.41	35.14	0.73	1.47	10.30	52.36	1.13	2.27	15.88	80.72	9.16	5.7
33.27, 34.20	33.74	1.81	1.38	9.47	53.60	2.73	2.08	14.30	80.89	9.40	5.6
32.98, 30.67	31.83	0.90	0.83	11.36	55.08	1.32	1.22	16.66	80.80	8.91	6.1
....	33.09	1.24	1.31	9.93	54.43	1.85	1.96	14.84	81.35	9.50	5.7

TABLE I.—BREAD.—*Continued.*

Station No.	Bakery.	Weight of Individual Loaves. oz.	Average Weight of Loaf. oz.	Per cent. of Water in Individual Loaves.	Composition of Average Loaf. In Original Material. Water.	Ether Extract.	Ash.	Protein (N x 6.25).	Carbohydrates including Fiber.	In Water-free Material. Ether Extract.	Ash.	Protein (N x 6.25).	Carbohydrates including Fiber.	Average Dry Matter per Loaf.	Cost per Pound of Bread.
	Loaves of Varying Prices.														
1001	(3 cts.) The Mohican Co., New London	11.85, 12.45	12.15	34.02, 31.69	32.86	0.54	1.38	9.54	55.68	0.80	2.06	14.21	82.93	8.16	3.9
968	(4 cts.) N. Jevolino, New Haven	15.13, 15.13	15.13	31.61, 36.18	33.95	0.08	1.46	11.07	53.44	0.12	2.21	16.76	80.91	10.00	4.2
967	" Wm. McLeman, New Haven	13.16, 13.62, 13.97	13.58	31.00, 34.35, 31.80	32.38	1.62	1.47	9.35	55.18	2.40	2.17	13.83	81.60	9.18	4.7
949	" F. Pfrommer, New Haven	11.75, 11.96, 11.57	11.76	32.84, 34.98, 33.31	33.71	0.76	1.44	9.64	54.45	1.15	2.17	14.54	82.14	7.80	5.4
991	(8 cts.) A. Jacobson, Norwich	24.34	24.34	31.64	31.64	0.31	1.67	9.76	56.62	0.45	2.44	14.28	82.83	16.64	5.3
990	" Chas. Stelan, Norwich	29.66	29.66	29.36	29.36	0.12	1.00	10.13	59.39	0.17	1.42	14.34	84.07	20.95	4.3
1012	" J. O'Brien, Waterbury. (Gold Medal)	19.05	19.05	32.90	32.90	1.22	1.23	9.45	55.20	1.82	1.83	14.08	82.27	12.78	6.7
	Bread not made in Connecticut.														
989	(10 cts.) Dexter's Mother's Bread, Springfield, Mass. (Cash Grocery, Hartford)	27.44	27.44	38.45	38.45	0.36	1.50	9.28	50.41	0.58	2.44	15.08	81.90	16.89	5.8
1002	(5 cts.) Dexter's Five-Cent Bread, Springfield, Mass. (L. C. Gadbois, New London)	13.47, 13.44	13.46	36.98, 37.76	37.37	0.44	1.70	9.40	51.09	0.70	2.71	15.01	81.58	8.43	5.9
1018	(5 cts.) Dexter's Five-Cent Bread, Springfield, Mass. (H. R. Hotchkiss, Waterbury)	13.97, 13.40	13.69	37.86, 37.49	37.68	0.29	1.77	9.41	50.85	0.47	2.84	15.09	81.60	8.53	5.8
973	(5 cts.) Fleischmann's Peter Pan Bread, New York. (Village Store Co., Bridgeport)	13.23, 13.40, 12.84	13.16[2]	35.08, 33.67, 33.50	34.08	0.60	1.45	10.69	53.18	0.91	2.20	16.22	80.67	8.67	5.1
1009	(5 cts.) Shults Bronx Bread, New York. (Brown Bros., Stamford)	12.03, 12.80	12.42[3]	32.97, 31.39	32.18	0.58	1.62	10.35	55.27	0.86	2.39	15.26	81.49	8.42	6.4
1008	(5 cts.) Ward's Dainty Maid Bread, New York. (Brown & Webb, Stamford)	12.45, 13.12	12.79[3]	31.15, 32.14	31.65	0.83	1.45	10.21	55.86	1.21	2.12	14.94	81.73	8.74	6.3
992	(5 cts.) Ward's Tip Top Bread, So. Providence, R. I. (R. F. Smith, Norwich)	13.47, 13.93	13.70	35.08, 35.43	35.26	0.84	1.33	9.60	52.97	1.30	2.05	14.83	81.82	8.87	5.8
1026	(5 cts.) Ward's Tip Top Bread, Bronx, N. Y. (A. F. Beckman & Co., So. Norwalk)	13.23, 13.16	13.20	33.60, 32.48	33.04	0.92	1.60	9.81	54.63	1.37	2.39	14.65	81.59	8.84	6.1
1006	(5 cts.) Ward's Tip Top Bread, New York. (W. W. Waterbury, Stamford)	13.05, 13.26	13.16[3]	27.82, 38.32	33.07	0.82	1.35	9.22	55.54	1.23	2.02	13.77	82.98	8.81	6.1
	Maximum of all samples	19.65[1]	18.84[1]		39.53	4.37	1.80	11.76	58.12	6.75	2.72	16.76	83.76	12.72[1]	6.9
	Minimum " "	11.39[1]	11.55[1]		28.13	0.08	0.83	8.39	49.15	0.12	1.32	12.59	76.76	7.95[1]	4.2
	Average " "	....	13.98[1]		33.80	1.21	1.42	9.73	53.84	1.83	2.15	14.69	81.33	9.24[1]	5.7

[1] 5 cent loaves only. [2] Guaranteed weight 13 oz. [3] Guaranteed weight 12 oz.

brought promptly to the laboratory, where they were weighed at once and a quarter-section taken for analysis, thus insuring the proper relation between crust and crumb. The quarter-section was weighed, cut into thin slices, and dried in the air over steam pipes until dry enough for grinding.

Two hundred and one loaves, representing the product of seventy-nine Connecticut, one Springfield and three New York bakers, were examined. Moisture was determined in every loaf, the other ingredients only in a single loaf unless some abnormality in this loaf was noted. The analyses, reported in Table I, are calculated to the average water-content of the loaves purchased from each particular baker. In 193 cases the loaves cost five cents, in three four cents, in three eight cents, and in one each three and ten cents.

Weight of Loaves.

The five-cent loaves ranged in weight from 11.39 to 19.65 ozs., average 13.98 ozs. Six of these weighed less than 12 ozs., twenty-five from 12 to 13 ozs., eighty-two from 13 to 14 ozs., forty-two from 14 to 15 ozs., 18 from 15 to 16 ozs., eight from 16 to 17 ozs., three from 17 to 18 ozs., one from 18 to 19 ozs., and one over 19 ozs. The two three-cent loaves weighed 11.85 and 12.45 ozs.; of the four-cent loaves three weighed from 11.6 to 12 ozs., three from 13.2 to 14 ozs., and two 15.2 ozs.; the three eight-cent loaves weighed 19.1, 24.3 and 29.7 ozs.; the ten-cent loaf, 27.4 ozs.

A similar investigation was made by the writer in New Jersey in 1895. At that time forty loaves, costing four or five cents, weighed from 12.7 to 21.8 ozs., average, 16.4 ozs. In other words, in 1895 in New Jersey 58 per cent. of the five-cent loaves weighed over 16 ozs. and 83 per cent. over 15 ozs., while in 1912 in Connecticut only 7 per cent. weighed over 16 ozs. and only 16 per cent. over 15 ozs. Assuming similar conditions in these two states, the average weight of the five-cent loaf has shrunk since 1895 from 16.4 to 14 ozs., or 15 per cent.

Variations in Weight of Loaves from Same Bakery.

In fifty-three instances two, and in twenty-seven, three, five-cent loaves were bought of the same baker at the same time, and represented the same baking. The average variation in weight of loaves from the same baker was 0.53 oz. These variations are summarized as follows:

7 from 0 to .125 oz.	9 from .76 to 1.00 oz.
15 from .13 to .25 oz.	8 from 1.01 to 1.25 ozs.
23 from .26 to .50 oz.	3 from 1.50 to 2.00 ozs.
15 from .51 to .75 oz.	

In other words, the product of 26 per cent. of the bakers varied less than 0.25 oz., 56 per cent. less than 0.50 oz., and 75 per cent. less than 0.75 oz., while with 11, or 14 per cent. of the bakers, the variation exceeded 1 oz. The analyses of the samples indicated that these variations were seldom due to differences in moisture-content, but rather to irregularities in the loaves themselves.

Chemical Composition of Bread.

The samples showed wide variations in all their ingredients. The maxima, minima and averages are given in the following tabulation:

	Max.	Min.	Ave.
Water	39.53	28.13	33.80
Ether Extract	4.37	0.08	1.21
Ash	1.80	0.83	1.42
Protein	11.76	8.39	9.73
Carbohydrates and Fiber	58.12	49.15	53.84
Dry Matter per five-cent loaf, oz.	11.73	7.95	9.24

The moisture-content of the individual loaves ranged from 27.70 to 40.07 per cent.; twenty-two contained from 27.7 to 30.9, eighty-four from 30 to 32.9, sixty-nine from 33 to 35.9, and twenty-six over 36 per cent. In some instances, at least, the bread contained excessive water. This is shown more strikingly when the actual amount of dry matter per loaf is considered. In the five-cent loaves this ranged from 7.95 to 12.72 ozs., average, 9.24 oz. Four bakers supplied less than 8 ozs. of dry matter per loaf, seventy-three from 8 to 10 ozs., twelve from 10 to 12 ozs., and one over 12 ozs.

The ether extract (fat) also showed a wide range, from 0.08 to 4.37 per cent. These differences are largely due to the methods of the bakers. In some cases only flour, yeast and salt are used, while in others milk, butter, lard and sugar, either alone or in combination, are employed. The variations in fat are also due in part to the fact, noted by several investigators, that in the process of baking a part of the fat is either destroyed or rendered non-extractable by ether. In three samples the amount of fat found is much lower than could have resulted from the use of any brand of flour.

The variations in ash, protein and carbohydrates are due in part to differences in moisture content, but even more to the materials used.

Bread of Different Cities.

Table II shows the average composition of the five-cent loaves produced in nine Connecticut cities. The average weight of the loaf ranged from 12.92 to 15.28 ozs., Stamford showing the lightest and Hartford the heaviest loaf, a difference of 2.36 ozs.

TABLE II:—AVERAGE COMPOSITION OF FIVE CENT LOAVES OF BREAD SOLD IN DIFFERENT CITIES.

City.	Bakeries represented.	Average Weight.	Composition of Average Loaf.									Average Dry Matter per Loaf.	Cost per Pound of Bread.
			In Original Material.					In Water-free Material.					
			Water.	Ether Extract.	Ash.	Protein (N x 6.25).	Carbohydrates including Fiber.	Ether Extract.	Ash.	Protein (N x 6.25).	Carbohydrates including Fiber.		
		oz.										oz.	cts.
Bridgeport	10	13.87	33.01	1.42	1.37	9.52	54.68	2.12	2.05	14.21	81.62	9.29	5.8
Hartford	12	15.28	33.25	1.39	1.46	10.01	53.89	2.08	2.19	15.00	80.73	10.20	5.3
New Haven	21	13.89	34.75	1.52	1.41	9.52	52.80	2.33	2.16	14.59	80.92	9.06	5.8
New London	6	13.89	34.37	1.60	1.50	9.79	52.74	2.44	2.29	14.92	80.35	9.11	5.8
Norwalk	2	13.16	32.28	0.93	1.57	10.25	54.97	1.36	2.32	15.14	81.18	8.91	6.1
Norwich	3	13.78	33.04	1.18	1.35	9.46	54.97	1.76	2.02	14.13	82.09	9.22	5.8
South Norwalk	3	13.78	34.88	1.02	1.38	9.63	53.09	1.56	2.13	14.79	81.52	8.97	5.8
Stamford	5	12.92	34.14	0.59	1.53	9.54	54.20	0.88	2.32	14.50	82.30	8.51	6.2
Waterbury	10	14.21	33.09	1.24	1.31	9.93	54.43	1.85	1.96	14.84	81.35	9.50	5.7
Average of all samples		13.98	33.80	1.21	1.42	9.73	53.84	1.83	2.15	14.69	81.33	9.24	5.7

per loaf, or 1.69 ozs. of dry matter. The average Hartford loaf also contained more protein and fat and almost as much carbohydrates as that sold in Stamford. Of course these averages are not necessarily conclusive for those cities in which only a few samples were taken. However, in each town all the more representative bakeries were visited, and the averages as given probably reflect quite accurately the existing conditions in the cities named.

Cost of Bread.

The bread cost from 4.2 to 6.9 cents per lb., with an average of 5.7 cents. The average cost per lb. in the three-cent loaf was 3.9 cents, in the four-cent, 4.8 cents, in the five-cent, 5.8 cents, in the eight-cent, 5.4 cents, and in the ten-cent, 5.8 cents. The cheapness of the three- and four-cent loaves indicated, therefore, a real saving, as far as quantity is concerned, because the relative decrease in price was greater than the decrease in weight. The data for the eight-cent loaves are limited to three samples, but these indicate that this sized loaf is a cheaper purchase than the five-cent loaf, about double the weight of bread being furnished for an increase in price of but 60 per cent.

The average cost per lb. in the five-cent loaves in the different cities ranged from 5.3 to 6.2 cents, Hartford showing the lowest and Stamford the highest cost. On the average, the cost per pound of bread in Hartford was 0.4 cent lower than in any of the other cities. Bridgeport, New Haven, New London, Norwich, South Norwalk and Waterbury showed very similar costs, while in Norwalk the cost was almost as high as in Stamford.

Guaranteed Weight.

Fleischmann's Peter Pan Bread, claiming a weight of 13 ozs., weighed 12.84, 13.23 and 13.40 ozs. *Shults Bronx Bread,* claiming 12 ozs., weighed 12.03 and 12.80 ozs. *Ward's Dainty Maid Bread,* claiming 12 ozs., weighed 12.45 and 13.12 ozs. *Ward's Tip Top Bread,* claiming 12 ozs., weighed 13.05 and 13.26 ozs. There appears to be no difficulty, therefore, in the bakers maintaining the weight claimed.

CANDY.

One hundred and eighty-nine samples were examined, mostly of the cheaper sorts. These included the following:

35 Mixed chocolates and chocolate creams.
14 Caramels.
25 Marshmallows.
11 Marshmallows in combination.
12 Wafers and mottoes.
8 Molasses kisses.
6 Fudge.
13 Jelly Beans.
20 Gum Drops.
11 Licorice Lozenges.
4 Coated peanuts.
30 Miscellaneous.

The examination was directed chiefly to determine added mineral matter and coal-tar dyes, and the accuracy of the weight claimed for the various candies.

Mixed Chocolates and Chocolate Creams.

Thirty-five samples were examined. The fat in the coating ranged from 28.58 to 49.64 per cent.; the ash in the coating from 0.72 to 2.26 per cent. The fat appeared in all cases to be cocoa fat and no mineral adulterant was detected.

The cost of the samples ranged from fourteen to seventy cents per pound.

TABLE III:—MIXED CHOCOLATES AND CHOCOLATE CREAMS.

Sample No.	Brand, or Dealer.	Weight.		Cost.		Analysis of Chocolate Coating.			
		Claimed.	Found.	Per Package.	Per Pound.	Fat.	Babyro-Refraction @ 40° C.	Melting Point of Fat.	Ash.
		gms.	gms.	cts.	cts.	%	°	°C.	%
1137	Russell's Chocolates (Cambridge, Mass.)	227	234	35	68	32.76	45.2	28–33	1.57
1138	H. D. Foss & Co.'s Chocolates (Boston, Mass.)	227	251	30	54	35.71	45.5	28–32	1.52
1139	Barr's Saturday Candy	454	433	29	30	34.27	45.5	30–35	1.28
1140	Lenox Necco Sweets, Chocolates (Boston, Mass.)	227	241	25	47	40.65	45.5	30–35	1.78
1141	Violet Assort, Chocolates (Touraine Conf. Co., Boston, Mass.)	454	430	29	31	35.63	45.0	29–32	1.38
1142	Assorted Bon Bons & Chocolates (Mirror Candies, N. Y.)	454	457	29	29	30.91	42.5	29–32	1.17
1370	Lowney's Cameo Assort. Chocolates (Boston, Mass.)	227	235	25	48	33.26	46.0	33–35	2.26
1371	Sparrow's Empress Chocolates (Boston Conf. Co.)	227	226	35	70	36.29	42.0	29–32	1.48
1372	*Bradley & Smith's Chocolate Creams	227	225	10	19	31.46	46.5	29–31	1.05
1381	Assorted. Olympia Candy Co., New Haven	227	215	10	21	35.78	43.0	33–35	1.60
1382	Assorted. Sold by Shartenberg & Robinson, New Haven	227	238	8	15	36.67	40.0	34–36	1.70
1407	*Kibbe Co.'s, Chocolate Creams (Springfield, Mass.)	227	218	10	21	35.65	46.0	33–36	1.78
1409	Dorothy Chocolates Assorted	227	233	25	49	33.42	45.5	29–32	1.24
1412	Chocolate Creams. Olympia Candy Co., Stamford	227	225	10	20	37.21	44.0	28–32	1.34
1419	Chocolate Creams. Wm. Matthews, Glenbrook	227	236	13	25	32.57	45.0	30–32	1.46
1423	Chocolate Creams. Eagle Candy Co., Stamford	227	210	10	22	31.48	45.0	30–33	1.38
1436	Bell's Chocolates	227	218	10	21	32.69	45.0	28–31	1.17
1441	Sold by Norwalk Candy Co. (Columbus, N. Y.	227	217	10	21	35.29	40.5	30–33	1.10
1491	Sparrow's Chocolates (Boston Conf. Co.)	...	238	10	19	49.64	46.0	28–32	2.23
1492	Chocolate Creams. Olympia Candy Co., Bridgeport	227	238	10	19	30.52	46.0	31–34	0.83
1495	Sold by Atlantic Fruit Store, Bridgeport	227	232	10	20	37.09	46.0	30–33	1.32
1496	Sold by Musanti Conf., Bridgeport (Cambridge, Mass.)	227	229	20	40	39.89	46.0	31–34	1.12
1503	Howland's Dry Goods Store, Bridgeport	227	243	20	37	37.20	46.0	26–28.5	1.62
1517	Riker's Drug Store, Bridgeport	227	235	15	29	41.84	46.0	28–30.5	1.81
1519	Lane's Confectionery, Bridgeport	227	235	20	39	34.45	46.0	27.5–28	1.46
1520	Sold by 1367 Stratford Ave., Bridgeport	227	219	15	31	33.34	45.5	31–32	1.38
1526	Sold by Store, Cor. Stratford Ave. and E. Main St., Bridgeport	227	217	10	21	28.58	46.0	27–29	0.72
1527	Star Confectionery, Bridgeport	227	229	13	25	34.66	45.0	30.5–31	1.87
1539	Sold by G. N. Jensen, Hartford	227	238	10	19	41.12	46.5	33.5–35	1.51
1545	Schraft's Chocolates	227	227	20	40	35.48	46.5	30–32	1.31
1569	Morris, Hartford	227	230	10	20	35.39	45.0	31.5–32.5	1.43
1574	Darrow & Ruden, New York	454	470	15	14	32.09	46.5	29–31	1.17
1580	Sold by Kelly's Bakery, Waterbury	227	239	10	19	31.53	47.0	31–32	1.15
1582	Sold by M. Baz, Waterbury	227	247	10	18	40.44	47.0	31.34	1.63
1590	Raspberry Chocolate Cream, Delatour (Stamped on each candy)	227	236	20	38	33.18	46.5	31.5–32.5	1.31

* Statement of dealer.

In all but nine samples a correct weight of candy was delivered. *Barr's Saturday Candy* and *Touraine Violet Assorted Chocolates* contained 0.7 and 0.8 oz. less than the pound claimed. *Kibbe's Chocolate Creams, Bell's Chocolates* and chocolates sold by the store at *1367 Stratford Avenue, Bridgeport,* were each short 0.3 oz. on a half pound purchase. Chocolates sold by the *Norwalk Candy Co.* and the store at corner of *Stratford Avenue and E. Main Street, Bridgeport,* were each short 0.4 oz. in a half pound. Those sold by the *Olympia Candy Co., Stamford,* were short 0.42 oz. and those of the *Eagle Candy Co., Stamford,* were short 0.6 oz. in a half pound. Most of these shortages were apparently due to the practice of selling cardboard for candy.

Caramels.

Fourteen samples were examined. The ash ranged from 0.63 to 1.46 per cent. No adulteration was detected. In all but two of the samples the individual caramels were wrapped in oiled paper.

The cost ranged from 8 to 60 cents per lb.

TABLE IV:—CARAMELS.

Sample No.	Brand, or Dealer.	Weight.		Cost.		Ash.
		Claimed.	Found.	Per Package.	Per Pound.	
		gms.	gms.	cts.	cts.	%
1392	* Cream. E. F. Hopton, Binghamton, N. Y.	227	291	5	8	0.48
1404	Standard. Lancaster, Pa.	227	236	12	23	1.44
1410	* Huyler's. New York. (Many with nuts)	227	228	30	60	1.13
1416	* Chocolate. Wardwell's Confectionery, Stamford	...	199	15	34	0.65
1420	* Assorted. (Columbia)	227	225	15	30	1.17
1429	* Assorted. Sold by F. W. Woolworth & Co., Stamford	227	225	5	10	0.63
1442	† Vanilla. Sold by Morelli & Carbonne, Norwalk	227	237	13	28	1.93
1500	* Vanilla. (Columbus), with nuts	227	230	13	26	1.46
1504	* Chocolate. Lane's Confectionery, Bridgeport	227	240	20	38	0.64
1506	* Chocolate. E. L. Graves, Bridgeport	227	222	15	31	1.18
1538	Chocolate. Capital Candy Co., Hartford	227	226	15	30	0.92
1542	* Assorted. Peterson's Candy Kitchen, Hartford	227	220	13	27	0.65
1570	* Chocolate. Sold by S. J. Rickman, Hartford	227	240	20	38	1.28
1572	† Vanilla. Sold by Sam Spalter, Hartford	227	211	10	22	1.67

* Wrapped in oiled paper. † Wrapped in brown oiled paper.

TABLE V:—

Sample No.	Brand, or Dealer.	Weight.		Cost.		Ash.	Nitrogen.
		Claimed.	Found.	Per Package.	Per Pound.		
		gms.	gms.	cts.	cts.	%	%
1374	Hauff's Confectionery, New Haven	227	232	25	49	0.73	0.38
1375	Extra Fine Marshmallows (Mirror Candies)	227	237	20	38	0.55	0.37
1376	Athens Candy Kitchen, New Haven	227	211	13	28	0.31	0.47
1377	Grand 5 and 10 Cent Store, New Haven. (Brownish-yellow coating.)	227	228	5	10	0.49	....
1378	Marshmallow Santa Claus (surrounded by paper)	...	99	12	55	0.19	0.56
1379	S. S. Kresge, New Haven	227	272	5	8	0.31	6.41
1406	Boston Candy Kitchen	227	235	10	19	0.32	0.48
1607	House of Hasselbach, New Haven	227	229	20	40	0.35	0.09
1417	Mason & Legenheimer, New York	227	236	10	19	0.31	0.43
1427	Sold by J. R. Evans, Stamford	227	221	5	10	0.58	0.42
1439	Henry Heide, New York	99	94	10	48	0.51	0.46
1440	Sold by Eagle Confectionery, Norwalk	...	170	10	27	0.31	0.52
1499	Sold by Peter Arillo, Bridgeport	...	101	10	45	0.22	0.47
1505	Sold by E. L. Graves, Bridgeport	227	216	20	42	0.35	0.19
1514	S. S. Kresge, Bridgeport	227	227	5	10	0.29	0.43
1523	5 and 10 Cent Store, 550 E. Main St., Bridgeport	227	206	5	11	0.34	0.44
1529	Star Confectionery, Bridgeport	227	224	10	20	0.25	0.64
1548	Palace of Sweets, Hartford	227	227	10	20	0.28	0.40
1552	Knorpp's Real German "Fairy Foam" Candies. (Babies.)	...	84	10	54	0.20	0.66
1556	Holdstock's, Hartford	227	213	15	32	0.21	0.42
1559	Hartford Candy Kitchen, Hartford	227	225	10	20	0.32	0.42
1566	Brown, Thomson & Co., Hartford	227	280	10	16	0.21	0.28
1589	H. G. Woolworth Co., Waterbury	227	229	5	10	0.25	0.37
1592	Palace Confectionery, Waterbury	227	240	10	19	0.19	0.51
1598	Angelus, Rueckheim Bros. & Eckstein, Chicago	86	111	10	41	0.29	0.47

No short weight was detected except in the vanilla caramels sold by *Sam Spalter, Hartford,* which were short 0.56 oz. in a half pound.

Marshmallows.

Twenty-five samples were examined. Many of the samples contained much adhering powder, consisting largely of corn starch. This ranged from 1 to 52 grams per pound. It was particularly large in *Mirror Extra Fine Marshmallows* and those sold by the *5 and 10 Cent Store, 550 E. Main Street, Bridgeport,* in which it amounted to nearly 2 ozs. in the pound. The ash ranged from 0.19 to 0.73 per cent., indicating no added mineral adulterant. The nitrogen found, except in *Hasselbach's* and possibly *Graves',* indicated the use of gelatin, the presence of which was confirmed by other tests as shown in the table.

MARSHMALLOWS.

Adhering Powder, per lb.	Amount of Solution on Standing 1 hr. in Cold Water.	Amount of Solution on Heating for 10 min.	Result on Cooling Heated Solution.	Precipitate with 95 per cent. Alcohol.	Precipitate with Pieric Acid.
gms.	Nearly complete.	Turbid with foam....	Cons. gelat. ppt.....	Heavy.....	Heavy.
17	Very little.....	Turbid with foam....	Cons. gelat. ppt....	Heavy.....	Heavy.
47	Much.....	Nearly clear	Slight gelat. ppt....	Medium...	Heavy.
5	.....	.....	.....	.....	....
0	Very little.....	Nearly clear.....	Very slight gelat. ppt.	Small	Heavy.
0	Much.....	Slightly turbid.....	Cons. gelat. ppt....	Medium...	Heavy.
8	Very little.....	Slightly turbid.....	Medium gelat. ppt..	Heavy.....	Heavy.
10	Much.....	Turbid	Cons. gelat. ppt....	Heavy.....	Slight.
..	Much.....	Turbid	Cons. gelat. ppt....	Heavy.....	Heavy.
8	Little.....	Turbid	Cons. gelat. ppt....	Heavy.....	Heavy.
7	Much.....	Turbid with foam....	Slight gelat. ppt....	Heavy.....	Heavy.
5	Little.....	Nearly clear.....	Very slight gelat. ppt.	Heavy.....	Heavy.
9	Very little.....	Slightly turbid.....	Slight gelat. ppt....	Very heavy.	Heavy.
4	Little.....	Turbid	Cons. gelat. ppt....	Heavy.....	Slight.
8	Much.....	Turbid	Cons. gelat. ppt....	Heavy.....	Heavy.
18	Little.....	Sl. turbid with foam.	Slight gelat. ppt....	Medium...	Heavy.
52	Little.....	Turbid	Cons. gelat. ppt....	Very heavy.	Heavy.
6	Little.....	Turbid	Cons. gelat. ppt....	Heavy,....	Heavy.
6	.....	.....	.....	.....	....
0	Very little.....	Slightly turbid.....	Very slight gelat. ppt.	Heavy.....	Slight.
1	Little.....	Clear, yellowish.....	No ppt	Heavy.....	Heavy.
6	.....	.....	.....	.....	....
11	.....	.....	.....	.....	....
2	.....	.....	.....	.....	....
5	.....	.....	.....	.....	....
4	.....	.....	.....	.....	....

The cost ranged from 8 to 55 cents per pound. This is doubtless to a large extent influenced by delicacy of flavor and fineness of texture, qualities which are not revealed by chemical analysis.

Five samples showed short weight. *Henry Heide's* were short 0.2 ozs. in 3.3 ozs., or 0.9 oz. in the pound. *Graves'* were short 0.4 oz., *Holdstock's,* 0.5 oz., *Athens Candy Kitchen, New Haven,* 0.56 oz., and *5 and 10 Cent Store, 550 E. Main Street, Bridgeport,* 0.74 oz., in the half pound. The last named firm in selling a "half pound" of marshmallows, actually delivered 6.4 ozs. of marshmallows with 0.9 oz. of adhering powdered sugar and corn starch.

Marshmallows in Combination.

Eleven samples were analyzed. The three samples coated with chocolate contained from 34.12 to 40.25 of cocoa fat in the coverings.

TABLE VI:—MARSHMALLOWS IN COMBINATION.

Sample No.	Brand, or Dealer		Weight. Claimed.	Weight. Found.	Cost. Per Package.	Cost. Per Pound.	Ash.	Analysis of chocolate coating. Fat.	Batyro Refractive Index @ 40° C.	Melting Point of Fat.
			gms.	gms.	cts.	cts.	%	%	%	°C.
1387	Marshmallow Carmels.	Olympia Candy Co., New Haven	227	226	13	26	1.41	.....	....	.....
1389	" "	Chocolate Shop, New Haven	227	235	20	39	....	.....	....	.....
1402	" "	Riker-Jaynes, New Haven	227	233	19	37	0.75	.....	....	.....
1430	" "	Xanthos Candy Co., Stamford	227	229	13	26	1.01	.....	....	.....
1555	" "	Holdstock's, Hartford	227	215	20	42	1.09	.....	....	.....
1385	Chocolate Marshmallow Sticks.	Louis' Candy Store, New Haven	....	186	10	24	....	.....	....	.....
1408	* Chocolate Marshmallows.	John Wilkinson, West Haven	227	240	20	38	1.58	36.37	46.0	31–35
1449	" "	Olympia Candy Co., Bridgeport	227	221	13	27	1.35	34.12	45.0	28–30
1510	" "	Cigars, Store, 1312 Stratford Ave. Bdg't.	....	192	10	24	....	.....	....	.....
1547	" "	George Bros., Hartford	....	252	12	22	1.31	40.25	46.5	31–32.5
1576	" "	Turkeys, Jim Tolisano, Hartford	....	180	10	25	....	.....	....	.....

* Statement of dealer.

TABLE VII:—WAFERS AND MOTTOES.

Sample No.	Brand, or Dealer.	Weight. Claimed.	Weight. Found.	Cost. Per Package.	Cost. Per Pound.	Ash.	Polarization at 21° C. Direct.	Polarization at 21° C. After Inversion.	Insoluble Matter.	Colors.
		gms	gms	cts	cts	%	°V.	°V.	%	
1135	Boston Wafers (C. A. Briggs Co.)	...	111	5	20	0.05	98.0	—25.52	1.75	*Erythrosin, *Amaranth, *Naphtol Yellow S, *Orange I, Green (unidentified).
1136	" " Wintergreen (C. A. Briggs Co.)	...	109	5	21	0.07	98.0	—26.40	2.34	Not colored.
1373	Sultan Wafers, Cinnamon (Kibbe)	...	113	5	20	0.11	98.0	—15.40	6.83	*Erythrosin, *Amaranth.
1415	Mottoes, Olympia Candy Co., Stamford	227	193	20	42	0.13	99.0	— 7.92	7.51	*Erythrosin, Yellow (unidentified).
1507	" F. W. Woolworth & Co., Bridgeport	227	238	5	10	0.10	97.6	— 9.24	9.98	*Erythrosin, *Amaranth, *Napthol Yellow S, *Orange I, Natural Color (unidentified).
1512	" A. Rovegno, Bridgeport	227	230	10	20	0.07	100.0	—19.80	1.65	*Erythrosin, *Amaranth, *Napthol Yellow S, *Orange I.
1518	" Store, 939 E. Main St., Bridgeport	227	235	10	19	0.06	100.6	—19.80	2.77	*Napthol Yellow S, *Orange I.
1546	" George Bros., Hartford	227	236	10	19	0.08	102.4	—22.66	1.60	*Erythrosin, *Napthol Yellow S, *Orange I.
1550	" F. W. Woolworth & Co., Hartford	227	228	5	10	0.11	98.0	— 7.04	10.63	*Erythrosin, *Amaranth, *Orange I.
1558	" Brown, Thomson & Co., Hartford	227	228	10	20	0.07	102.4	—20.68	0.78	*Erythrosin, *Napthol Yellow S, *Indigo Carmine.
1560	" Domenico Mainello, Hartford	227	236	10	19	0.08	102.0	—22.44	0.81	*Erythrosin, *Orange I.
1596	" Star Confectionery, Waterbury	227	232	20	39	0.08	98.0	—19.80	1.19	*Erythrosin, *Napthol Yellow S.

* Permitted coal-tar colors.

The cost per pound ranged from 22 to 42 cents.

No marked shortage in weight was found except in *Holdstock's Marshmallow Caramels,* which were short 0.42 oz. in the half pound.

Wafers and Mottoes.

Twelve samples were examined. The ash was inconsiderable in all cases, ranging from 0.05 to 0.13 per cent. The samples contained considerable quantities of insoluble matter (starch), ranging from 0.78 to 10.63 per cent. *Kibbe's Cinnamon Sultan Wafers,* mottoes of the *Olympia Candy Co., Stamford,* and two samples of *Woolworth's Mottoes,* contained large quantities, from 6.83 to 10.63 per cent.

All but one of the samples contained artificial color. Erythrosin was detected in ten cases, amaranth in five, naphthol yellow S in six, orange I in seven, and indigo-carmine in one. One sample was probably colored with naphthol yellow, and one each with an unidentified green, yellow and natural color. In all cases where the color was positively identified it was one of the seven permitted coal-tar dyes. The green in *Brigg's Boston Wafers* and the yellow in the mottoes of the *Olympia Candy Co., Stamford,* and in those of the *Star Confectionery, Waterbury,* were not permitted dyes, but we failed to identify them.

The samples cost from 10 to 42 cents per lb. Of the nine samples sold for a definite weight, one-half pound, only one showed a material shortage. This was **1415,** *Olympia Candy Co., Stamford,* which was short 1.2 ozs. in the half pound.

Molasses Kisses.

Eight samples were examined. In seven of these the ash ranged from 0.20 to 0.92 per cent. *Joslin and Allen's Ta-To,* however, contained 3.78 per cent., an excessive amount. One sample was colored with amaranth, a permitted coal-tar color.

The cost ranged from 17 to 22 cents per pound.

All but two of the samples showed short weight, ranging from 0.2 to 1.5 ozs., in the half pound. The samples from *Joslin and Allen,* the store at *1367 Stratford Avenue, Bridgeport,* the *Bradley Smith Co.,* and from the *Olympia Candy Co.,* were short 0.5, 0.6, 0.6 and 1.5 ozs., respectively, in the half pound.

Fudge.

The six samples examined showed an ash ranging from 0.35 to 0.89 per cent. They cost from 10 to 44 cents per pound. Only one sample was materially short weight, *Hasselbach's Marshmallow Fudge,* which was short 0.6 oz. in the half pound.

TABLE VIII:—MOLASSES KISSES AND FUDGE.

Sample No.	Brand or Dealer.	Weight. Claimed.	Weight. Found.	Cost. Per Package.	Cost. Per Pound.	Ash.
	Molasses Kisses.	gms.	gms.	cts.	cts.	%
1393	The Runkle Co., Kenton, O.	227	221	10	21	0.73
1414	Olympia Candy Co., Stamford	227	185	8	20	0.92
1434	The Bradley-Smith Co., New Haven (Satin Puffs).	227	210	10	22	0.73
1445	H. E. Burdick, Woonsocket, R. I., (U. O. Z. Brand)	227	218	8	17	0.86
1530	*Sold by Store, 1367 Stratford Ave., Bridgeport	227	211	10	22	0.20
1568	†The Kibbe Co. (Delicious New Kings)	227	234	10	19	0.86
1577	Silver Bros., Hartford, (Silk Kisses)	227	226	10	20	0.61
1585	Joslin & Allen, Waterbury, (Ta-To)	227	212	10	21	3.78
	Fudge.					
1386	Chocolate, Sold by F.W. Woolworth & Co., N. Haven	227	228	5	10	0.64
1388	Marshmallow, House of Hasselbach, New Haven.	227	210	20	44	0.78
1422	Nut, Eagle Candy Co., Stamford	227	220	10	21	0.56
1425	Sold by J. R. Evans, Stamford	227	231	5	10	0.79
1447	Sold by F. R. Starr, Norwalk	227	223	10	20	0.35
1594	Chocolate, sold by F. W. Woolworth & Co., Waterbury	227	227	5	10	0.89

* Contains amaranth. † Contain peanut butter.

Jelly Beans.

Thirteen samples were examined. The ash ranged from 0.12 to 0.47 per cent., giving no evidence of added make-weight.

Each sample contained bean-shaped candies of assorted colors, and to save time a composite sample of the colored beans was first examined. In this was found amaranth, erythrosin, napthol yellow S, and orange I, all permitted colors. At least one coal-tar color was found in each sample except **1400,** which contained cochineal and **1497,** probably cochineal also. In these two samples the other colors were not pronounced, and were not

identified. **1513** contained cochineal and erythrosin. **1551,** *Woolworth's,* contained magenta, an unpermitted coal-tar color. **1544** contained charcoal.

The jelly beans cost from 10 to 21 cents per pound. *Bradley, Smith & Co's* (**1400**), *Woolworth's* and the *Hartford Candy Kitchen* samples, showed shortages in weight of 0.77, 0.74 and 0.77 oz. in the pound.

TABLE IX:—JELLY BEANS.

Sample No.	Brand or Dealer.	Weight. Claimed.	Weight. Found.	Cost. Per Package.	Cost. Per Pound.	Ash.	Colors.
		gms.	gms.	cts.	cts.		
1380	Assorted. *Bradley-Smith Co., New Haven ...	227	248	10	18	0.12	Permitted coal-tar
1400	" " " "	454	432	20	21	0.16	Cochineal
1421	" Eagle Candy Co., Stamford.....	454	449	15	15	0.47	Permitted coal-tar
1438	" F. W. Woolworth & Co., S. Norwalk	454	431	10	11	0.32	" "
1497	" Store 1321 State st., Bridgeport.....	454	451	20	20	0.16	Cochineal
1513	" Store 1312 Stratford ave., Bridgeport	454	451	15	15	0.16	Magenta
1541	" H. W. Cleveland, Hartford	454	454	20	20	0.31	Permitted coal-tar
1544	Licorice Peterson Candy Kitchen, Hartford..	227	218	8	17	0.31	Charcoal
1551	Assorted. F. W. Woolworth & Co., Hartford..	454	450	10	10	0.34	Permitted coal-tar
1567	" Hartford Candy Kitchen, Hartford..	454	432	20	21	0.21	" "
1575	" Leroy Bros., Hartford	454	449	20	20	0.32	" "
1593	" Palace Confectionery, Waterbury...	454	460	15	15	0.28	" "
1595	" F. W. Woolworth & Co., Waterbury	454	453	10	10	0.20	" "

*Statement of dealer.

Gum Drops.

Twenty samples were examined. The ash ranged from 0.16 to 0.51 per cent. As with the jelly beans a composite sample of the gum drops was first tested for color. In this composite amaranth, erythrosin, naphthol yellow S and orange I, all permitted coal-tar colors, were detected. Individual dye tests to determine if any sample contained *only* natural color were not satisfactory because of the weakness of the color solution in many cases. No unpermitted coal-tar color was found in any of the samples.

The gum drops cost from 9 to 31 cents per pound.

TABLE X:—GUM DROPS.

Sample No.	Dealer, or Brand	Weight. Claimed.	Weight. Found.	Cost. Per Package.	Cost. Per Pound.	Ash.	Colors.
		gms.	gms.	cts.	cts.	%	
1383	Assorted. Fred Ross, New Haven	227	239	10	19	0.33	Permitted coal-tar
1384	" Bijou Candy Store, New Haven	227	223	15	31	0.18	See text
1395	" Grand 5 and 10 Cent Store, New Haven	227	222	10	20	0.33	" "
1396	" W. J. Wulle, New Haven	227	248	10	18	0.23	Permitted coal-tar
1397	Black. Greek-American Confectionery Co., New Haven.....	227	215	5	11	0.31	
1411	Assorted. Star Confectionery, Stamford	454	458	15	15	0.36	Permitted coal-tar
1413	" Wardwell's Confectionery, Stamford	227	224	15	30	0.17	See text
1431	" Xanthos Candy Co., Stamford	227	230	10	20	0.34	" "
1433	" L. Paganett, Stamford.....	227	226	10	20	0.45	" "
1435	" New England Candy Co., South Norwalk	227	214	10	21	0.26	Permitted coal-tar
1444	" Eagle Candy Co., Norwalk.....	227	237	8	15	0.51	"
1501	" E. L. Graves, Bridgeport.....	227	223	10	20	0.16	"
1524	" J. M. Calcatera & Son, Bridgeport.....	227	232	5	10	0.51	"
1540	" Hartford Market Co., Hartford.....	227	226	8	16	0.33	"
1562	Pink. J. R. Evans & Co., Hartford.....	227	242	5	9	0.27	"
1571	Assorted. H. Glasser, Hartford	227	238	15	29	0.30	"
1578	" Boston Grocery, Hartford.....	227	220	15	31	0.26	See text
1584	" Joslin & Allen, Waterbury.....	227	227	10	20	0.27	Permitted coal-tar
1588	" The Standard, Waterbury.....	227	239	5	9	0.33	"
1591	" N. G. Vose, Waterbury	227	238	10	19	0.51	See text

In only two samples was there a marked short-weight. The sample from the *Greek American Confectionery Co., New Haven,* was short 0.42 oz., and that from the *New England Candy Co., South Norwalk,* was short 0.46 oz. in the half pound.

Licorice Lozenges.

Eleven samples were analyzed. The ash was extremely variable, ranging from 0.43 to 2.41 per cent. All the samples, except **1418** and **1494**, contained carbon (charcoal) and in **1564** this amounted to 0.23 per cent.

TABLE XI:—LICORICE LOZENGES.

Sample No.	Brand, or Dealer.	Weight. Claimed.	Weight. Found.	Cost. Per Package.	Cost. Per Pound.	Ash.
		gms.	gms.	cts.	cts.	%
1418	Henry Heide, New York	114	121	8	30	2.24
1448	" " " "	227	235	20	39	2.19
1521	" " " "	114	134	7	24	2.00
1528	" " " "	114	111	5	20	1.92
1536	"BSC"	170	172	10	26	2.36
1563	"BSC"	114	128	5	17	2.41
1537	Passa	...	108	5	21	1.02
1494	R. W. Ensign, Bridgeport	114	88	5	26	2.00
1522	5 & 10 Cent Store, Bridgeport	114	97	3	14	0.70
1557	N. Spector, Hartford	227	215	5	11	0.56
1564	J. R. Evans & Co., Hartford	114	118	3	12	0.43

The cost per pound ranged from 11 to 39 cents, four samples of the same make ranging from twenty to thirty-nine cents.

Three samples were short-weight, that of *R. W. Ensign,* by 0.9 oz., in a quarter pound, that of the *5 and 10 Cent Store, Bridgeport,* by 0.6 oz. in a quarter pound, and that of *N. Spector,* by 0.42 oz. in a half pound.

Coated Peanuts.

The four samples examined ranged in ash from 0.95 to 1.27 per cent. No arsenic was found in the coating of any sample. The samples cost from 10 to 19 cents per pound, and no short-weight was observed.

TABLE XII:—COATED PEANUTS.

Sample No.	Brand, or Dealer.	Weight. Claimed.	Weight. Found.	Cost. Per Package.	Cost. Per Pound.	Ash.
		gms.	gms.	cts.	cts.	%
1450	J. Debarbieri, Bridgeport	227	236	10	19	0.95
1493	Musante Confectionery, Bridgeport	227	233	20	19	0.95
1509	F. W. Woolworth & Co., Bridgeport	227	237	5	10	1.07
1561	J. R. Evans & Co., Hartford	227	232	5	10	1.27

Miscellaneous Candies.

Thirty miscellaneous samples were examined.

Eight samples of candy toys and animals ranged in ash from 0.16 to 0.40 per cent. In every case a coal-tar color was detected. Of the permitted colors amaranth was found in every sample, erythrosin in one, orange I in three. The sample from the *Grand 5 and 10 Cent Store, New Haven,* certainly contained orange II, an unpermitted coal-tar color, as did also probably the sample of *Woolworth's.* Three other samples contained a yellow dye, which was not determined.

Six samples of lime drops and two of spearmint drops ranged in ash from 0.03 to 0.38 per cent. Only permitted coal-tar dyes were found in these samples, light green S. F. yellowish eight times and naphthol yellow S three times.

In the "peach stones" and "pink drops" amaranth and orange I were found; in the "red and yellow drops," amaranth, erythrosin and undetermined orange; in *Puritan Ribbon Candy,* erythrosin; in *Peterson's Green Drops,* light green S. F. yellowish and naphthol yellow S; in *Violante's Marbles,* erythrosin and an undetermined violet, in *Woolworth's Red Drops,* probably orange G.

Bradley Smith Co.'s Pink Drops were short-weight, 0.42 oz. in the half pound, *Pink Drops* sold at *1312 Stratford Avenue, Bridgeport,* were short 1.3 ozs. in the half pound, and *Puritan Ribbon Candy* was short 1 oz. in two pounds.

TABLE XIII:—MISCELLANEOUS CANDIES.

Sample No.	Brand, or Dealer	Weight. Claimed.	Weight. Found.	Cost. Per Package.	Cost. Per Pound.	Ash.	Colors.
		gms.	gms.	cts.	cts.	%	
1390	Candy Toys. Bradley Smith Co., New Haven	227	230	10	20	0.16	†Amaranth, undetermined yellow.
1391	“ “ Grand 5 & 10 Cent Store, New Haven	454	486	10	9	0.34	†Amaranth, †Orange I, Orange II.
1428	“ “ F. W. Woolworth & Co., Stamford	454	454	10	10	0.40	†Amaranth, †Erythrosin, †Or. I, Or. II (?).
1442	“ “ F. R. Starr, Norwalk	227	228	10	20	0.16	†Amaranth, undetermined yellow.
1508	“ “ F. W. Woolworth & Co., Bridgeport	227	246	5	9	0.16	†Amaranth.
1549	“ “ “ “ “ Hartford	227	235	5	10	0.27	†Amaranth.
1554	“ “ Wilkinson, Hartford	227	225	15	15	0.21	†Amaranth, †Orange I.
1581	“ “ Kelly's Bakery, Waterbury	227	254	10	18	0.17	†Amaranth, undetermined yellow.
1405	Lime Drops. Boston Candy Kitchen, New Haven	227	235	10	19	0.09	†Light green S. F. y.
1432	“ “ Franklin's American Cuts, New York	...	122	10	37	0.13	†Light green S. F. y., †Napthol yellow S.
1437	“ “ F. W. Woolworth & Co., So. Norwalk	227	231	5	10	0.14	†Light green S. F. y.
1553	“ “ Wilkinson, Hartford	227	226	15	15	0.07	†Light green S. F. y.
1565	“ “ Morris, Hartford	227	223	8	16	0.17	†Light green S. F. y., †Napthol yellow S.
1579	“ “ Boston Grocery, Hartford	227	230	20	40	0.03	†Light green S. F. y.
1426	Spearmint Drops. J. R. Evans, Stamford	227	228	5	10	0.16	†Light green S. F. y.
1587	“ “ H. G. Woolworth Co., Waterbury	227	237	5	10	0.38	†Light green S. F. y., †Napthol yellow S.
1394	Peach Stones. Bradley Smith Co., New Haven	227	228	5	10	0.18	†Amaranth, †Orange I.
1597	“ “	227	224	10	20	0.15	†Amaranth.
1401	Pink Drops. Bradley Smith Co., New Haven	227	215	10	21	0.15	†Amaranth, †Orange I (?).
1502	Red and Yellow Drops. Howland's, Bridgeport	227	253	10	18	0.05	†Amaranth, †Erythrosin, und'm'd orange.
1511	Pink Drops. Store, 1312 Stafford Ave., Bridgeport	227	190	5	12	0.07	†Amaranth.
1531	*Chocolate Cream Bars. Wm. Mayer, New Haven,	...	128	5	17	0.43	*
1532	Indian Strings. Wm. H. Luden	...	180	10	25	0.10	Not identified.
1533	Puritan Ribbon Candy. Weeks Bros. Co., Providence, R.I.	908	880	25	13	0.39	†Erythrosin.
1534	Bon Bons (Disk-like). Cummings Candy Kitchen, N.H'v'n	227	223	20	41	0.06	Not identified.
1543	Green Drops. Peterson's Candy Kitchen, Hartford	227	221	8	16	0.16	†Light green S. F. y., †Napthol yellow S.
1583	Marbles. Violante Bros., Waterbury	...	144	5	16	0.74	†Erythrosin, †undetermined violet.
1586	Red Drops. H. G. Woolworth Co., Waterbury	227	230	5	10	0.12	Orange G (?).
1758	German Chewing Candy. Push cart, Hartford	...	160	10	28	0.28	....
1719	Turkish Nugget Candy. Push cart, New Britain	...	212	10	21	0.43	....

* Coating contains 5.36% fat. Refract. Index at 40°, 39.5. Melting point, 26–27° C. Color a mixture of *yellow and red shades*, the former probably Orange I. † Permitted coal-tar colors.

Summary.

One hundred and eighty-nine samples were examined. No foreign fat was found in any of the chocolate coatings, and no added mineral matter except in one sample of molasses kisses, which contained 3.78 per cent. of ash.

All but two of the twenty-five marshmallows contained gelatine. In many of these the adhering powder, consisting of powdered sugar and starch, was excessive, in two cases amounting to 2 ozs. in the pound.

Four samples of wafers and mottoes contained from 6.83 to 10.63 per cent. starch. All but two of the twelve samples contained artificial colors, in three cases unpermitted coal-tar dyes.

All but two of the thirteen jelly beans contained coal-tar colors. One contained magenta, an unpermitted dye, and one contained charcoal.

None of the twenty samples of gum drops contained an unpermitted coal-tar color.

All but two of the eleven samples of licorice lozenges contained charcoal, in one case 0.23 per cent.

None of the four samples of coated peanuts contained arsenic in the coatings.

Of the eight samples of candy animals all contained coal-tar colors, two orange II, an unpermitted coal-tar color, and three an unpermitted yellow.

Thirty-five of the 189 samples showed short-weight, nine of the chocolates from 0.6 to 1.2 ozs. per pound, one caramels, 1.1 ozs. per pound, five marshmallows, 0.8 to 1.5 ozs. per pound, one marshmallow caramels 0.8 oz. per pound, one mottoes, 2.4 ozs. per pound, six molasses kisses from 0.4 to 3.0 ozs. per pound, one fudge, 1.2 ozs. per pound, three jelly beans, 0.74 to 0.77 oz. per pound, two gum drops, 0.8 to 0.9 oz. per pound, three licorice drops, from 0.8 to 3.6 ozs. per pound, and three miscellaneous samples, from 0.8 to 2.6 ozs. per pound.

DEHYDRO FOODS.

These foods are prepared chiefly for travelers or campers who wish to carry food in a concentrated form. A comparison of our analyses with the known composition of the specified vegetables shows that the claims of the manufacturer are essentially

true for the peas, corn and cranberries. For the *Cream of Tomatoes* and *Cream of Potatoes* the claim is made that they contain "nothing but strictly fresh vegetables, flour and pure milk." The high protein and low fat percentages, however, indicate the use of skim milk or a skim milk powder. The description and analyses of the samples follow:

1639. *Dehydro Fresh Sweet Corn.* "The equivalent of six portions." Cost 10 cents per 4.4 ozs.

1640. *Dehydro Cream of Tomatoes.* "A most delicious cream soup." Cost 15 cents per 4.0 ozs.

1641. *Dehydro Select Quality Fresh Green Peas.* "The equivalent of five portions." Cost 15 cents per 3.1 ozs.

1642. *Dehydro Cream of Potatoes.* "A most delicious cream soup." Cost 15 cents per 4.2 ozs.

1643. *Dehydro Fresh Cranberries.* "The equivalent of one quart of fresh cranberries. Contents of this can will make six to eight portions." Cost 15 cents per 1.7 ozs.

All the above are made by the American Dehydrating Co., Waukesha, Wis., and are sold by John Gilbert and Son, New Haven.

Analyses of Dehydro Foods.

	1639	1640	1641	1642	1643
Water	6.72	6.45	10.40	4.69	7.07
Ash	2.44	8.79	2.69	6.06	2.02
Protein (N × 6.25)	12.50	27.44	22.00	24.38	4.06
Fiber	2.03	3.27	6.45	0.99	45.25
Nitrogen-free extract	70.41	52.08	56.63	63.59	33.40
Fat	5.90	1.97	1.83	0.29	6.20
Calories per 100 gms.	385	336	331	354	206

DIABETIC FOODS.

Since publishing Part I. of this report, in which the analyses of a large number of diabetic foods were given, we have received 24 additional samples, the analyses of which will be found in Table XIII a. Only three of these products, *Loeb's Gluten Luft Bread, P. and L. Genuine Gluten Bread,* and *Hoyt's Gum Gluten Flour,* have been examined by us before.

Loeb's Gluten Luft Bread showed 6.2 per cent. more protein and 4 per cent. less starch than our earlier analysis, showing a commendable effort to improve this relatively cheap aerated bread.

P. and L. Genuine Gluten Bread likewise shows a marked improvement, in spite of a considerably increased water content. Calculated to the same moisture basis as the sample reported in Part I, it would show 30.7 per cent. protein and 28.4 per cent. starch, an increase of 20.3 per cent. protein and a decrease of 15.8 per cent. starch.

Hepco Dodgers and *Hepco Flour* are soy bean preparations, and are characterized by their high protein and fat content, and the almost complete absence of starch. An investigation as to the nature of the carbohydrates of these and other soy bean preparations is now being taken up in this laboratory.

The various "Sanity" preparations were sent to us by a New York dealer in diabetic foods. A few are good, but most are objectionable when judged from the standpoint of their content of starch and other carbohydrates. *Echtes Mandelgebäck für Diabetiker* and *Pokorny's Echter Diabetiker Zwieback* are practically identical in composition; and are characterized by a very high fat content and a very low percentage of starch. *Diabetiker Bisquits* and *Saccharin-Oblaten* contain 35.4 and 27.1 per cent. of starch. The other "Sanity" baked preparations, however, show no especial suitability for the use of diabetics, as they contain from 55 to 75 per cent. of nitrogen-free extract, with from 42 to 59 per cent. of starch.

The four "Sanity" chocolate preparations contain but little starch, from a trace to 6.2 per cent. They do contain, however, considerable sugar, the *Mandel-, Nuss- und Schokolade Bonbons,* 18.60 per cent. as dextrose, the *Laevulose-Schokolade,* the *Mandel- u. Nussschokolade with Laevulose,* and the *Manit-Chocolate,* 17.55, 14.31 and 21.32 per cent. sugar as invert, respectively. The theory that levulose is less objectionable for diabetics than other forms of sugar is quite prevalent. However, the following comment on this subject by von Noorden, one of the most eminent authorities on diabetes, is worthy of close attention:—

"That levulose, milk sugar and inulin are more useful than the other carbohydrates is a common opinion, but the importance of their use in practise does not correspond with the theory. In light cases the form of carbohydrate makes little difference; in severe cases the advantage from using levulose, milk sugar, etc., is only slightly greater

TABLE XIIIa.—DIABETIC FOODS.

Station No.	Manufacturer and Brand.		Water.	Ash.	Protein (N x 6.25).	Fiber.	Nitrogen-free Extract.	Fat (Ether Extract).	Starch.	Polarization at 20° C.* Direct.	Polarization at 20° C.* After Inversion.	Weight supplying same amount carbohydrates as 10 gms. wheat bread.	Calculated Calories per 100 gms.
			%	%	%	%	%	%	%			gms.	
3265	Waukesha Health Products Co., Waukesha, Wis.	Hepco Dodgers	6.9	5.4	41.6	4.1	20.7	21.3	Trace.	....	...	26	441
3200	" " " " "	Hepco Flour for Diabetics	4.6	5.1	42.9	4.2	22.4	20.8	Trace.	....	...	24	448
3309	Loeb's Diabetic Food Bakery, New York.	Gluten Luft Bread	8.5	1.1	34.1	0.2	47.4	8.7	40.1	....	...	11	404
3310	" " " " "	P. and L. Genuine Gluten Bread	42.2	1.4	25.8	0.1	27.8	2.7	23.9	....	...	19	239
3312	"Sanity," Prag.	Aleuronat-zwieback für Diabetiker	8.4	2.0	17.0	0.3	61.6	10.7	49.3	....	...	9	411
3311	" "	Bretzels	7.2	3.6	12.8	0.3	55.4	20.7	46.5	....	...	10	459
3313	" "	Conglutin Mandelzwieback für Diabetiker	7.1	2.3	15.0	0.3	54.6	20.7	42.4	....	...	10	465
3325	" "	Diabetiker-Bisquits ohne Mehl und ohne Zucker	8.4	1.9	25.8	0.4	45.3	18.2	35.4	....	...	12	448
3314	" "	Diabetiker-Cakes	7.5	1.8	14.0	0.5	60.1	16.1	52.0	....	...	9	441
3317	" "	Echte Delikatess-Salzstangen für Diabetiker	6.9	3.5	12.7	0.5	54.1	22.3	44.8	....	...	10	468
3322	" "	Echtes Mandelgebäck für Diabetiker	4.3	2.9	32.5	0.9	10.8	48.6	4.0	....	...	49	611
3315	" "	Haferzwieback (ungesüsst) für Zucker- u. Magenkranke	8.2	1.8	14.9	0.5	58.7	15.9	47.6	....	...	9	438
3306	" "	Karlsbader Curzwieback für Diabetiker, etc	9.0	1.8	10.2	0.2	74.6	4.2	58.7	....	...	7	376
3307	" "	Pokorny's Echter Diabetiker Zwieback, ohne Mehl und ohne Zucker	4.6	3.2	32.9	0.9	10.4	48.0	3.6	....	...	51	605
3308	" "	Saccharin-Oblaten ohne Zucker	5.7	2.4	16.8	1.7	41.7	31.7	27.1	....	...	13	519
3316	Brah-Ma (mfr. name not given).	Sent by Eugene Loeb, New York	8.1	2.9	11.0	1.3	68.6	8.1	55.2	....	...	8	391
3320	"Sanity," Prag.	Diabetiker Mandel-, Nuss- und Schokolade Bonbons	18.4	2.3	12.5	0.9	37.1†	28.8	Trace.	+10.2	+9.4	14	458
3324	" "	Laevulose Schokolade	4.0	3.0	11.4	2.6	35.6‡	43.4	6.2	—5.0	—5.0	15	579
3323	" "	Mandel- u. Nussschokolade mit Laevulose für Diabetiker	3.1	2.6	12.0	2.2	26.2§	53.9	4.3	—3.0	—4.0	20	638
3326	" "	Manit-Chocolate	4.2	2.5	10.0	1.7	37.9¶	43.7	4.8	—6.4	—6.6	14	585
3486	Pure Gluten Food Co., New York.	Hoyt's Gum Gluten Dainty Fluffs No. 1	7.2	0.9	86.0	0.3	5.0	0.6	5.0	....	...	106	369
3487	" " " " "	Hoyt's Gum Gluten Flour, Ground	8.5	1.0	41.4	0.3	47.4	1.4	40.4	....	...	11	368

* 6.5 gms. to 100 cc., read in 200 mm. tube. † 18.60% total sugars as dextrose. ‡ 17.55% total sugars as invert. § 14.31% total sugars as invert. ¶ 21.32% total sugars as invert.

than from using bread and flour. . . . Only in certain cases does it appear to me that the special form of carbohydrate possesses any particular significance."

Hoyt's Gum Gluten Dainty Fluffs No. 1 contains 86 per cent. protein with only 5 per cent. starch. It is an aerated product somewhat similar to *Fromm's Uni Bread* and *Health Food No. 1 Proto Puffs*, although containing considerably more protein and less starch than either. Its claim that it "contains over 80 per cent. protein and less than 10 per cent. starch" is more than satisfied.

Hoyt's Gum Gluten Flour, Ground, is a type of the gluten flour which conforms to the U. S. standard of 35 per cent. protein. It contains over 41 per cent. protein, but an almost equal amount of starch.

Huckleberry Wine for Diabetics, probably the "Sanity" brand, contains 10.33 per cent. alcohol by volume, 0.135 per cent. invert sugar; it should be a very satisfactory preparation.

Kirschen mit Stein, made by Rud. Bernhard & Co., Bregenz-Lochan, contains 153 gms. of drained cherries and 54 gms. of juice. The edible portion of the cherries contains 3.77 per cent. invert sugar, and the juice 3.84 per cent. The sample contains saccharin and an unidentified color.

GELATINE.

Five samples were examined, all of which were sold as thickeners for ice cream. The U. S. Standard for gelatine requires not less than 15 per cent. of nitrogen and not more than 2 per cent. of ash.

TABLE XIV:—ICE CREAM POWDERS.

Sample No.	Brand.	Cost per lb. (in 5-to lb. lots.)	Water.	Ash.	Organic Matter.	Nitrogen.	Lime (CaO).	Cane Sugar.	Alcohol Precipitate.	Starch.	Remarks.
		cts.									
1689	Crandallo, The Crandall-Pettee Co., New York	35	1.33	0.58	98.09	0	0.28	81.46	16.24	* Yes	Cane sugar and gum tragacanth
1690	Magic Ice Cream Powder, Royal Mfg. & Imp. Co., Kansas City, Mo.	100	15.41	6.65	77.94	0	2.72	0	72.42	0	Probably a sea weed or lichen preparation
1691	Creamthick, O. J. Weeks & Co., New York	25	12.97	3.77	83.26	0.60	1.39	0	73.59	Yes	" " " " "
1692	Snow, B. Heller & Co., Chicago	...	9.85	2.43	87.72	0.25	0.87	41.01	47.10	Yes	A reducing sugar, starch and a sea weed or lichen preparation
1694	National Cream Thickener, National Gum & Mica Co., New York	12	3.58	1.64	94.78	0	....	61.05	22.18	0	Sugar and a sea weed or lichen preparation
1695	Gum Powder, National Gum & Mica Co., New York	17	12.19	7.30	80.51	0.16	3.25	0	73.54	0	Similar to 1690 and 1691
1697	Red Seal Purity Cream Powder, Warner-Jenkinson Co., St. Louis	30	5.52	1.57	92.91	0	0.62	47.76	43.22	† Yes	Cane sugar, corn starch and gum (tragacanth ?)
1698	Golden Ice Cream Powder, J. Hungerford Smith, Rochester, N. Y.	42	5.07	2.14	92.79	0	0.90	62.85	29.30	0	Cane sugar and a sea weed or lichen preparation, flavored with vanilla
1700	Velvet Special, Blanke Mfg. & Supply Co., St. Louis	35	2.40	1.41	96.19	0	0.56	74.97	13.41	0	Cane sugar and gum tragacanth
1703	Cream-X-Celo, Edwin C. Ekert, Hanover, Pa.	28	5.03	1.53	93.44	0.28	0.52	46.52	46.90	* Yes	Cane sugar and gum tragacanth

* Probably chiefly from the gum. † Contains corn starch.

1693. Gelatine. Milligan & Higgins Glue Co., New York. Price, 35 cents per pound.

1696. Crystal Flake Gelatine. Kingery Mfg. Co., Cincinnati, Ohio. Price, (?).

1699. 5 X I C Ground Gelatine. Essex Gelatine Co., Boston, Mass. Price, 32 cents per pound.

1701. No. 1 Granulated Gelatine. Hughes Gelatine Co., Detroit, Mich. Price, 30 cents per pound.

1702. No. 2 Gelatine. Hughes Gelatine Co., Detroit, Mich. Price, 26 cents per pound.

	1693	1696	1699	1701	1702
Ash	0.95	1.72	1.44	1.75	2.37
Nitrogen	15.40	15.12	15.46	15.00	15.24
Equal to Gelatine (N x 5.55)	85.45	83.92	85.80	83.25	84.58

All of the above samples comply with the U. S. Standard, except **1702**, which shows an excess of ash.

ICE CREAM POWDERS.

Ten preparations advertised to the trade as ice cream thickeners have been examined.

Seven of the samples contained from 41 to 81 per cent. cane sugar, while three contained none. Corn starch was found in **1697**, the small amounts of starch found in four other samples probably being a constituent of the gum used. Gum tragacanth was found in four samples, and in six the gelatinous principle was due to a seaweed or lichen. The amounts of nitrogen found were small, showing that no considerable quantity of gelatine was present in any of the samples.

As these preparations are chiefly used to give an appearance of superior quality to the ice cream their use must be deprecated.

The cost per pound, in five to ten pound lots, ranged from twelve cents to one dollar.

JELLY POWDERS.

A new examination of this class of preparations was made chiefly to determine the nature of the coloring matter used. As shown in our report for 1909 these powders contain on the average about 90 per cent. of cane sugar and 8 per cent. of gelatine, in which the consumer pays about twenty-two cents per pound for the sugar. If one wishes to use this sort of material in the preparation of desserts, economy would suggest the purchase of pulverized gelatine, to which flavoring and sweetening might be added at will. There is no mystery whatever in the compounding of these powders.

Six *Jell-O* and nine *Tryphosa* preparations were examined, the former made by The Genesee Pure Food Co., LeRoy, N. Y.; the latter by E. C. Rich, New York. They were as follows: **1061**, *Jell-O Orange;* **1062**, *Jell-O Lemon;* **1064**, *Jell-O Strawberry;* **1068**, *Jell-O Raspberry;* **1102**, *Jell-O Cherry;* **1103**, *Jell-O Coffee;* **1059**, *Tryphosa Vanilla;* **1060**, *Tryphosa Pineapple;* **1063**, *Tryphosa Wild Cherry;* **1065**, *Tryphosa Raspberry;* **1066**, *Tryphosa Chocolate;* **1067**, *Tryphosa Terpeneless Orange;* **1069**, *Tryphosa Peach;* **1070**, *Tryphosa Strawberry,* and **1071**, *Tryphosa Terpeneless Lemon.*

Of the six *Jell-O* preparations, one claimed artificial color, one artificial vegetable color and three both artificial color and flavor. Of the nine *Tryphosa* preparations one claimed artificial color, five vegetable color, and two (wild cherry and peach) artificial flavor and color.

The following tabulation shows our findings in these samples:

	Cost per package. oz.	Net Weight. cts.	Flavor.	Color.
Jell-O, Orange	10	3.5	.....	†Cochineal.
" Lemon	10	3.6	.....	†Vegetable.
" Strawberry	9	3.5	*Artificial.	†Cochineal.
" Raspberry	10	3.2	*Artificial.	†Cudbear.
" Cherry	9	3.6	*Artificial.	†Cudbear.
" Coffee	9	2.4	Natural.	Natural.
Tryphosa, Vanilla	9	5.0	Natural.	*Vegetable.
" Pineapple	9	5.0	Natural.	*Vegetable.
" Wild Cherry	8	7.4	*Artificial.	†Amaranth, Orange I.
" Raspberry	9	5.1	Natural.	†Probably Cudbear.
" Chocolate	9	6.9	Natural.	Natural.
" Terpeneless Orange	10	5.2	Natural.	†Vegetable.
" Peach	10	7.3	*Artificial.	†Vegetable.
" Strawberry	10	7.2	Natural.	†Amaranth.
" Terpeneless Lemon	10	7.4	Natural.	†Vegetable.

*Claimed on label. †Artificial color claimed.

From the above it is seen that in five instances the flavor was artificial as claimed. In only two brands was the color natural, in the coffee and the chocolate. In two cases the artificial color was cochineal, in three cudbear, in six a vegetable color, and in two a coal-tar color. All the colors used were permitted colors, and in all cases the samples were properly branded.

CANNED PUMPKIN.

Twenty-three samples of canned pumpkin were examined. The following summary shows the wide range in composition:

	Original Substance. Max.	Min.	Ave.*	Water-free Basis. Max.	Min.	Ave.*
Water	94.32	78.83	92.20	....	....	....
Ash	1.51	0.40	0.58	10.55	4.00	7.44
Protein (N x 6.25)	2.72	0.65	0.99	17.06	7.50	12.69
Fiber	3.51	0.81	1.23	22.63	7.80	15.77
Nitrogen-free Extract	13.01	3.23	4.74	78.40	52.75	60.77
Ether Extract	0.62	0.10	0.26	6.41	1.61	3.33
Starch	3.04	Trace	0.12	22.57	Trace	1.54

The composition of fresh pumpkin is as follows:†

	Original Substance.	Water-free Basis.
Water	93.1	...
Ash	0.6	8.7
Protein (N x 6.25)	1.0	14.5
Fiber	1.2	17.4
Nitrogen-free Extract	4.0	58.0
Ether Extract	0.1	1.4

In preparing canned pumpkin the pulp is cooked very little if of good consistency, but if too thin it is evaporated to some extent. For this reason the composition of the canned product should not be materially different from that of the fresh vegetable, and such we find to be the case when considering average composition. Individual samples, however, showed wide variations. Nos. **1760** and **1612** contained 78.83 and 86.53 per cent. of water, respectively, the increase in dry matter being primarily due to the increased starch content, 0.89 and 3.04 per cent., respectively. No. **1637** was unusually high in protein, ash, fiber

*Omitting Nos. 1095, 1760 and 1612.

†Atwater & Bryant, Off. Expt. Stat., Bull. 28, p. 68.

and fat, *due chiefly to the presence of many seeds and some rind.*

No. **1096** claimed on its label "3% cornstarch," but the analysis showed no more than the normal amount of starch. Nos. **1095, 1760** and **1612,** however, contained excessive starch, which in the last named sample made up over 22 per cent. of the dry matter.

All but one of the samples were packed in No. 3 cans, which according to Bitting should contain at least 32 ounces; no sample contained materially less than this amount. Seven samples claimed on the label a definite weight; in four cases this claim was satisfied, while in two cases there was a deficiency of 0.6 ounces and in one a deficiency of 2.4 ounces.

The cost of the pumpkin ranged from 7 to 16 cents. The sample containing many seeds, and distinctly inferior in quality, was among the highest priced brands.

The dry matter per can ranged from 1.88 to 4.63 ounces, the cost per pound of the dry matter ranging from forty-one cents to $1.28.

No. **1054** showed a badly corroded can, as did also No. **1629.** In the latter sample the pulp near the sides of the can was darkened by this corrosion. Pumpkin and squash have the power of dissolving tin in relatively large amounts, and should always be packed in enamelled cans. The only samples packed in cans of this kind were Nos. **1613** and **1628,** which likewise were the only samples showing no corrosion of the can.

TABLE XV.—BRANDS OF CANNED PUMPKIN.

1613. Pumpkin, (packed for) Acker, Merrall and Condit Co., New York.
1712. Greenwich Brand Pumpkin, (distributed by) Austin, Nichols & Co., New York.
1109 and 1729. J. R. Brand Pumpkin, (distributed by) Austin Nichols & Co., New York.
1754. Burt Olney's Golden Pumpkin, Burt Olney Canning Co., Oneida, N. Y.
1630. Supreme Brand Pumpkin, (distributed by) Burton & Davis Co., New York.
1111. Delft Brand Pumpkin, First Quality, Cherry Creek Canning Co., Cherry Creek, N. Y.
1095. Emerald Brand Pumpkin, Standard Quality, Cherry Creek Canning Co., Cherry Creek, N. Y.

1629. Lake Shore Pumpkin, The Cummins Canning Co., Conneaut, Ohio.
1096. Golden Pumpkin, Solid Dry Packed, "3% Corn Starch," W. H. Dudley & Co., New York, Boston, Philadelphia.
1637. Flag Brand Extra Dry Golden Pumpkin, Finest Quality, Fort Stanwix Canning Co., Rome, N. Y.
1055. Grandmother's Brand Pumpkin, (distributed by) The Great Atlantic & Pacific Tea Co., Jersey City, N. J.
1752. Pearl Drop Pumpkin, "Unsurpassed in Quality," Lee Canning Co., New York.
1056. Homes Sweetest Brand Pumpkin, First Quality, The Wm. McKinley Canning Co., Lenox, N. Y.
1608. Iron Mountain Brand Pumpkin, H. S. Mill Canning Co., Springtown, Pa.
1054. Sphinx Brand Pumpkin, (packed for) Miner, Read and Garrette, New Haven.
1097. Sunrise Pumpkin, (packed for) Miner, Read and Tullock.
1760. Oneida Community Quality Stewed Pumpkin, Oneida Community, Ltd., Kenwood, N. Y.
1753. Silver Key Brand Pumpkin, First Quality, Oswego Preserving Co., Oswego, N. Y.
1110. New York State Pumpkin Monroe Brand, (packed for) Rochester Preserving Co., Rochester, N. Y. "All goods bearing this brand are guaranteed equal in quality to any so called Extra Standards."
1612. White Rose Brand Pumpkin, (distributed by) Seeman Bros., New York.
1628. Robin Hood Brand Pumpkin, R. C. Williams & Co., New York.
1713. Empire Brand Golden Pumpkin, First Quality, Winters and Prophet Canning Co., Mount Morris, N. Y.

MISCELLANEOUS FOODS.

1072. *Trix,* The New England Cereal Co., South Norwalk, Conn. "Wheat, Rice, Barley. Triple Food, Triple Seal, Substantial." Guaranteed composition, "Water, 3.78; Ash, 1.70; Fat, 0.11; Protein, 12.31; Crude Fiber, 1.07; Carbohydrates, by difference, 81.03." Cost, 15 cents per 15.6 ounces.

1822. *Post Tavern Special,* Postum Cereal Co., Battle Creek, Mich. "A Food made of Wheat, Corn, Rice and Salt, skilfully blended." Cost, 15 cents per 28.7 ounces.

1126. *Bonano,* International Banana Food Co., Chicago, Ill. "Made from Bananas." Cost, 25 cents per 11.9 ounces.

1757. *The Original Cocoanut Cream Pudding, Lemon.* The Eugene Christian Food Co., New York. "Is a combination of four of the purest and most nutritious articles known to Food

TABLE XVI:—ANALYSES OF

Station No.	Brand.	Gross weight, gms.	Net weight, gms.	Net weight, oz.	Net weight, oz., Claimed.	Cost per can, cts.	Dry Matter, per can, oz.
1613	Acker, Merrall & Condit Co.	1079	938	33.1	....	15	1.88
1712	Greenwich Brand	1072	934	32.9	32.0	8	2.65
1109	J. R. Brand	1088	947	33.4	34.0	9	2.24
1727	" "	1075	946	33.4	34.0	9	2.19
1754	Burt Olney's Golden	1029	896	31.6	34.0	15	2.91
1630	Supreme Brand	1134	994	35.1	....	15	2.30
1111	Delft Brand	1127	970	34.2	....	7	2.00
1095	Emerald Brand	1185	1027	36.2	....	10	3.12
1629	Lake Shore	1122	983	34.7	....	9	3.51
1096	Dudley's Golden	1212	1068	37.7	....	10	3.77
1637	Flag Brand, Extra Dry	1148	997	35.2	34.0	15	3.74
1055	Grandmother's Brand	1097	941	33.2	....	10	2.80
1752	Pearl Drop	1107	971	34.3	32.0	10	2.45
1056	Homes Sweetest Brand	1063	917	32.3	....	10	2.35
1608	Iron Mountain Brand	1137	980	34.6	....	12	2.47
1054	Sphinx Brand	1128	984	34.7	....	10	3.07
1097	Sunrise	1129	984	34.7	....	10	2.79
1760	Oneida Community	712	606	21.4	....	16	4.53
1753	Silver Key Brand	1076	925	32.6	....	13	2.03
1110	Monroe Brand	1086	950	33.5	....	10	2.65
1612	White Rose Brand	1116	975	34.4	....	15	4.63
1628	Robin Hood Brand	1166	1001	35.3	32.0	15	2.21
1713	Empire Brand, Golden	1136	994	35.1	....	15	3.31
	Maximum (all)	*1212*	*1068*	*37.7*	....	*16*	*4.63*
	Minimum (all)	*712*	*606*	*21.4*	....	7	*1.88*
	Average (excluding 1095, 1760 and 1612)	*1110*	*966*	*34.1*	....	*11*	*2.67*

Chemistry." Cost, 10 cents per 7 ounces. It is essentially a carbohydrate preparation, containing nearly 80 per cent. of carbohydrates, of which over half is starch.

1821. *Instant Postum,* Postum Cereal Co., Battle Creek, Mich. "This is the regular Postum in a concentrated form, nothing added. A compound made of different parts of wheat and a small portion of New Orleans molasses." Cost, 30 cents per 4.5 ounces. The "concentration" of this food lies in the ash and carbohydrates, the protein content being extremely low. 100 gms. of the material yield 332 calories, of which 307 are derived from carbohydrates.

The following tabulation shows the composition of these five products:

CANNED PUMPKIN.

Cost of Dry Matter per pound, cts.	In Original Substance. Water.	Ash.	Protein (N x 6.25)	Fiber.	Nitrogen-free Extract.	Fat (Ether Extract).	Starch.	In Dry Matter. Ash.	Protein (N x 6.25).	Fiber.	Nitrogen-free Extract.	Fat (Ether Extract).	Starch.
128	94.32	0.40	0.65	1.21	3.26	0.16	0.04	7.04	11.44	21.30	57.40	2.82	0.70
48	91.94	0.60	0.92	1.08	5.30	0.16	0.20	7.44	11.41	13.40	65.76	1.99	2.48
63	93.30	0.57	1.03	0.88	4.09	0.13	Tr.	8.51	15.37	13.13	61.04	1.94	Tr.
66	93.43	0.57	0.92	0.81	4.16	0.11	0.07	8.68	14.00	12.33	63.32	1.67	1.07
82	90.80	0.58	1.23	1.84	4.96	0.59	0.25	6.30	13.37	20.00	53.91	6.41	2.72
104	93.46	0.47	0.89	1.48	3.45	0.25	Tr.	7.19	13.61	22.63	52.75	3.82	Tr.
56	94.16	0.46	0.76	1.11	3.23	0.28	0.03	7.88	13.01	19.01	55.31	4.79	0.51
51	91.38	0.51	0.86	1.24	5.87	0.14	0.71	5.93	9.98	14.38	68.09	1.62	8.26
41	89.88	0.83	1.31	1.29	6.49	0.20	0.15	8.20	12.94	12.75	64.13	1.98	1.48
42	90.01	0.52	1.02	1.09	6.85	0.51	0.16	5.20	10.21	10.92	68.57	5.10	1.60
64	89.38	1.12	1.38	1.71	5.79	0.62	0.07	10.55	12.99	16.10	54.52	5.84	0.66
57	91.56	0.61	0.92	1.34	5.42	0.15	0.18	7.23	10.90	15.88	64.22	1.77	2.13
65	92.86	0.42	1.07	1.41	3.80	0.44	0.14	5.88	14.99	19.75	53.22	6.16	1.97
68	92.73	0.53	1.24	1.34	3.89	0.27	0.15	7.29	17.06	18.43	53.51	3.71	2.06
78	92.85	0.60	0.86	1.42	4.11	0.16	0.12	8.39	12.03	19.86	57.48	2.24	1.68
52	91.16	0.62	1.03	1.26	5.76	0.17	0.28	7.01	11.65	14.25	65.16	1.93	3.17
57	91.95	0.59	1.08	1.21	4.92	0.25	0.05	7.33	13.42	15.03	61.12	3.10	0.62
57	78.83	1.51	2.72	3.51	13.01	0.42	0.89	7.13	12.85	16.58	61.46	1.98	4.20
102	93.78	0.47	0.59	0.94	4.12	0.10	0.10	7.56	9.49	15.11	66.23	1.61	1.61
60	92.10	0.53	0.94	1.17	5.11	0.15	0.12	6.71	11.90	14.81	64.68	1.90	1.52
52	86.53	0.54	1.01	1.05	10.56	0.31	3.04	4.00	7.50	7.80	78.40	2.30	22.57
109	93.73	0.46	0.88	0.78	3.90	0.25	0.26	7.34	14.04	12.44	62.20	3.98	4.01
73	90.56	0.76	1.07	1.23	6.19	0.19	0.12	8.05	11.33	13.03	65.58	2.01	1.27
128	*94.32*	*1.51*	*2.72*	*3.51*	*13.01*	*0.62*	*3.04*	*10.55*	*17.06*	*22.63*	*78.40*	*6.41*	*22.57*
41	*78.83*	*0.40*	*0.65*	*0.81*	*3.23*	*0.10*	*Tr.*	*4.00*	*7.50*	*7.80*	*52.75*	*1.61*	*Tr.*
66	*92.20*	*0.58*	*0.99*	*1.23*	*4.74*	*0.26*	*0.12*	*7.44*	*12.69*	*15.77*	*60.77*	*3.33*	*1.54*

	1072	1822	1126	1757	1821
Water	6.20	9.88	8.94	7.31	5.56
Ash	1.54	0.86	3.12	2.69	11.38
Protein (N x 6.25)	14.50	10.94	4.08	4.75	6.13
Fiber	0.27	0.28	3.83	0.31	0.09
Nitrogen free extract	77.34	76.97	79.59	79.60	76.78
Fat	0.15	1.07	0.44	5.34	0.06
Starch	48.56	69.30	24.83	44.96	....
Calories per 100 gms.	369	361	339	385	332

1756. *Klim,* Merrell-Soule Co., Syracuse, N. Y. "For all cooking where milk is needed." Cost 25 cents per 15.8 ounces. The material is a desiccated skim milk and showed the following composition: Water, 2.56; ash, 8.10; protein (N x 6.25), 36.31; fiber, 0.26; nitrogen-free extract, 50.54, and fat, 2.23 per cent.; Calories, 367 per 100 gms.

1952. *Heintz Health Biscuits,* Heintz Food Co., Chicago, Ill. "Regulate Digestion. A safe and reliable remedy for constipation." Cost 25 cents per 6.2 ounces, or 64 cents per pound. The net weight was 2.8 ounces less than claimed. The analysis was as follows: water, 6.35; ash, 2.97; protein (N x 6.25), 5.31; fiber, 1.15; nitrogen-free extract, 77.15; fat, 7.07; starch, 27.06; Calories, 393 per 100 gms.

II. DRUG PRODUCTS.

CALOMEL.

(*Hydrargyri Chloridum Mite.*)

Twenty-two samples were tested for the presence of corrosive sublimate (mercuric chloride) with negative results.

The cost ranged from 20 to 40 cents per 2 ounces.

CHLOROFORM.

This is defined by the U. S. Pharmacopœia as "a liquid consisting of 99 to 99.4 per cent. by weight of absolute chloroform, and 0.6 to 1 per cent. of alcohol."

The twenty-one samples examined were very satisfactory, although judged by the strict requirements of the U. S. P. several showed the presence of slight impurities. In two samples the residue on evaporation was too high, and in three traces of water were found. The alcohol content ranged from 2.8 to 10.0 c c. per liter, in no case exceeding the maximum limits of the U. S. P. None of the samples contained acetone, chlorides or acidity, nor was water present in more than traces except in Nos. **1718, 1610** and **1616.**

The cost ranged from 50 to 90 cents per 8 ounces.

TINCTURE OF OPIUM.

(*Laudanum*).

The U. S. Pharmacopœia requires that this tincture when assayed by the U. S. P. method shall contain in 100 c c. "not less than 1.2 nor more than 1.25 gms. of crystallizable morphine."

Eight samples were examined by this method, all but one showing a considerable deficiency in morphine.

The cost ranged from sixty cents to one dollar for 6 ounces.

The results of the assays are given on page 297.

TABLE XVII:—CHLOROFORM.

Sample No.	Place of Sampling.	Cost per 8 oz., cts.	Specific gravity @ 15° C.	Residue on evaporation. mgms. per 100 cc.	Alchohol, cc. per liter.	Organic Impurities.‡	Chlorinated Decomposition Products.§
1113	Bridgeport	50	1.490	1.8	10.0	Much	0
1114	"	50	1.491	2.0	6.5	"	0
1736	Hartford	50	1.497	2.4	4.0	Slight	0
1737	"	65	1.496	2.6	3.5	"	0
1738	"	75	1.491	3.0	8.5	Considerable	0
1739	"	50	1.492	5.0	7.0	"	Faint
1705	Meriden	75	1.496	10.8	4.5	Much	Opalescent
1706	" (Powers-Weightmann-Rosengarten Co.)	75*	1.494	1.0	6.0	Slight	0
1717	New Britain	60	1.495	1.6	5.5	"	Faint
1718	"	75	1.492	1.2	7.5	Much	"
1040	New Haven	80	1.498	1.0	2.8	Slight	0
1041	"	50	1.497	1.0	2.8	Considerable	0
1042	"	55	1.493	3.0	6.5	Much	Faint
1725	New London	75	1.493	31.4	4.8	Considerable	"
1726	"	65	1.492	1.4	7.0	"	"
1730	Norwich	90	1.492	6.4	8.3	"	"
1610	South Norwalk	80	1.491	2.8	9.0	Very much	0
1615	Stamford	40†	1.492	5.2	6.0	Considerable	0
1616	"	50	1.491	3.2	9.0	Slight	0
1632	Waterbury	50	1.493	5.0	7.5	"	Faint
1633	"	60	1.497	0.6	3.0	"	0

* Pound. † 6 oz. ‡ Slight, considerable, much, etc., are terms used with reference to the color of 2 cc. of $\frac{N}{1000}$ iodin diluted to 15 cc. with water; slight is the color which approximately matches this. § The blank used was 2 cc. concentrated sulphuric acid+15 cc. water+5 drops silver nitrate; faint opalescence indicates a test clear when viewed *horizontally but* slightly turbid when viewed at an angle.

Station No.	Place of purchase.	Cost per 6 oz. cts.	Crystallizable Morphine per 100 cc. gms.	Per Cent. of U. S. P. Minimum.
1112	Bridgeport	60	.9706	80.9
1734	Hartford	75	.6845	57.0
1735	"	75	.9504	79.2
1038	New Haven	75	.9956	83.0
1039	" "	90	1.1922	99.4
1606	" "	90	.8842	73.7
1618	Stamford	65	.7722	64.4
1631	Waterbury	100	.8770	73.1

FOOD AND DRUG PRODUCTS EXAMINED FOR THE DAIRY AND FOOD COMMISSIONER.

Nine hundred and ninety-nine samples were examined for the Dairy and Food Commissioner. Since the details regarding them in many instances were not supplied to us, only a brief summary of the results is here given.

Of the whole number of samples examined, 559 were not found to be adulterated, 15 were legally labeled compounds, while 424 were adulterated, misbranded, or below standard.

In connection with these samples the chemists of the station have been called on for court testimony in sixteen instances.

Butter and Butter Substitutes. Of seventy-four samples examined seven were butter, twenty-five renovated butter and forty-two oleomargarine. Three of the latter were colored with annatto.

Candy. The sample tested contained no sulphites.

Abizol. This material was found in a Bridgeport candy factory, where it was claimed to be used as a hardener. It was found to consist chiefly of sulphurous acid (24.41 per cent.) together with sulphite salts.

Color. This color sold to a manufacturer of "soft drinks" proved to be Tropeolin O, an unpermitted coal-tar color.

Cheese. Twelve samples were examined in a study of the losses in weight of this material when stored in an ice box at 49° Fahr., and in an open closet at 60-66° Fahr. The samples were weighed daily for seven days and the following losses were shown:

Losses of Weight in Cheese,

	In Ice Box			In Closet		
	Original Weight.	Weight after 7 days.	Loss.	Original Weight.	Weight after 7 days.	Loss.
	gms	gms.	gms.	gms.	gms.	gms.
Fromage de Camembert	283	255	28	279	229	50
MacLaren's Nippy Cheese	105	105	0	106	105	1
Sap Sago Swiss Spalty	113	111	2	113	104	9
Isigny Type Cheese	478	408	70	507	405	102
" " "	298	247	51	264	196	68
Chiffeman's Camembert	307	293	14	313	279	34
Shefford Snappy Cheese	94	93	1	90	90	0
Star Brand Cream Cheese	92	91	1	96	92	4
International Welsh Rabbit Cheese	91	91	0	96	95	1
Liederkranz Cheese	130	127	3	124	118	6
MacLaren's Deviled Cheese	109	109	0	110	109	1
Cow Brand Neufchatel Cheese ..	74	74	0	74	72	2

It will be noted that in eight of the brands the losses were trifling both in the ice box and the closet. The *Fromage de Camembert,* covered simply with thin paper and packed in a wooden box, lost 9.9 per cent. in the ice box and 17.9 per cent. in the closet. The other brand of *Camembert,* wrapped in tin foil, showed losses of only 4.6 and 10.9 per cent., respectively. The samples of *Isigny* cheese were simply wrapped in thin paper. The larger one showed losses of 14.6 and 20.1 per cent., and the smaller, losses of 17.1 and 25.8 per cent. in the ice box and closet, respectively. These results on a limited number of brands for a relatively short time indicate that if a cheese is properly packed the losses in weight will be relatively small under the usual methods of sale, especially when the cheese is kept under refrigeration.

Incidentally a partial analysis was made of these samples as follows:

	Water.	Protein.	Fat.	*Undetermined.
Fromage de Camembert (Casino) ...	48.80	19.69	25.68	5.83
MacLaren's Nippy Cheese	29.32	26.88	38.63	5.17
†Sap Sago Swiss Spalty	32.28	52.79	2.80	12.13
‡Isigny Type Cheese	62.97	21.92	9.86	5.25
‡ " " "	61.68	22.39	11.19	4.74
Le Delicieux Camembert	50.77	18.38	26.47	4.38
Shefford Snappy Cheese	30.90	26.31	39.38	3.41
Cream Cheese Star Brand	38.06	12.71	47.25	1.98
International Welsh Rabbit Cheese ...	34.61	25.00	35.25	5.14
Liederkranz Cheese (Monroe)	54.13	16.32	26.38	3.17
MacLaren's Deviled Cheese	35.71	25.58	33.75	4.96
Cow Brand Neufchatel Cheese (N. Y.)	46.73	19.11	31.88	2.28

*Chiefly ash. †Made from skim milk. ‡Made from partly skimmed milk. None of the cheeses contained boric acid.

Cream. Of fourteen samples of cream, eleven were of standard quality, one contained only 12.5 per cent. fat, and two samples from Waterbury contained sucrate of lime.

Honey. The two samples examined showed no adulteration.

Ice Cream. Nineteen samples from Stamford were tested for fat and artificial color. The fat ranged from 6 to 12.75 per cent., seven samples showing less than 8 per cent. Two samples were colored with acid magenta, an unpermitted coal-tar color.

Milk. Four hundred and twelve samples were examined. Of these 155 conformed to the legal standards, while 70 were deficient only in solids-not-fat. One hundred and eighty-five samples were below standard in solids, 93 in fat, and 249 in solids-not-fat, 257 samples failing to meet the legal requirements in one or more particulars. Eight samples were skimmed, 106 were watered, 6 both watered and skimmed, and 4 were watered and contained formaldehyde.

The watered samples were taken in Collinsville, Bloomfield, North Branford, North Haven, Norwalk, Milford, Middletown, Newington, Cromwell, Greenwich, Orange, Wallingford, Danbury, Waterbury, Cornwall Bridge, Sharon, Bridgeport, Canaan, Windsor, Manchester, West Haven, Lakeville, Durham, South Manchester, Torrington, Norfolk, Bethlehem, Ridgefield, Avon, Westbrook, Stafford Springs and Goshen. The skimmed samples were taken in Cornwall Bridge, Sharon, Bridgeport, Wethersfield, Waterbury, Thompsonville and Fairfield. The skimmed and watered samples were taken in Greenwich, Sharon and Waterbury. The watered samples also containing formaldehyde were taken in Waterbury.

Skim Milk. Three samples sold as skim milk contained 9.21, 9.20 and 9.47 per cent. solids and 0.15, 0.18 and 0.60 per cent. fat.

Temperance Drinks. Fifty-one samples were examined chiefly for the presence of saccharin and artificial color. The manufacturers of "soft" drinks sold in this state apparently make but little effort to label their products honestly, in fact they are often not labeled at all. Saccharin is widely used, as well as permitted and unpermitted coal-tar colors. Of the fifty-one samples, only sixteen, chiefly ginger ales, were not found adulterated; two were legally labeled compounds; nineteen contained saccharin, six saccharin and a permitted coal-tar color, one saccharin and an unpermitted coal-tar color, and one saccharin and both a per-

mitted and unpermitted coal-tar color; four others contained a permitted, one an unpermitted, and one both a permitted and unpermitted coal-tar color.

Vanilla Extract. A sample of *Alliance Brand* was not found to be adulterated.

Vinegar. This is another food product which is grossly adulterated. Many dealers also sell distilled vinegar as cider or wine vinegar, and compound vinegar as pure cider vinegar. No attempt was made to make a complete analysis of the vinegars, which is essential for the certain detection of adulteration, only acidity, solids and ash being determined. Of 169 samples examined 100 met the legal requirements for acidity and solids for cider vinegar; eight distilled, one malt, two sugar or syrup, three wine, two wood acid and five compound vinegars, were sold under the proper designation. Eight samples of distilled vinegar were sold as wine vinegar, three distilled as cider vinegar, ten compound vinegars as cider vinegar and one compound as syrup vinegar. Eight samples were sold as red vinegar, for which there is no standard in this state. Two cider vinegars were below standard in acidity, three in solids, six in both acidity and solids, and one in ash; two distilled vinegars, two compound vinegars, one wine and one syrup vinegar were below standard in acidity.

Hydrogen Peroxide. Thirty-two samples were examined, ten in bulk, and the remainder in original bottles. While many of the samples exceeded the U. S. P. requirements for acidity, only four were materially below the standard of 3 per cent. peroxide by volume. The deficient samples were *Hydrogen Peroxide,* prepared for East Side Pharmacy, Derby, *Hydro-Oxide,* made by the National Peroxide Co., N. Y., *Hydrogen Peroxide,* prepared for The City Pharmacy, Stamford, and an unnamed sample from a Greenwich druggist, whose name was not supplied to us; these contained 1.67, 1.91 and 2.08 of hydrogen peroxide, respectively, or 55.7, 63.7, 88.7, and 69.3 per cent. U. S. P. strength.

As a number of the brands examined were not included in our inspection of 1909, the analyses of the samples bearing brand names are given below.

Manufacturer and Brand.	Hydrogen peroxide.	Acidity, 25 cc. H_2O_2 = cc. $\frac{N}{10}$ K O H.
American Druggist's Syndicate	3.62	1.65
" " "	3.65	2.90
" " "	3.63	2.95
Aerozone. Lehn & Fink, New York	3.21	3.55
Albany Chemical Co., Albany, N. Y.	3.03	3.05
" " " " "	2.98	3.25
" " " " "	3.02	3.50
" " " " "	2.99	3.25
Prep. for the City Pharmacy, Stamford	2.66	3.20
Earle & Co., New York	2.94	2.70
" " " "	3.04	2.05
Dist. by East Norwalk Pharmacy, E. Norwalk	2.91	2.90
Prep. for East Side Pharmacy, Derby	1.67	2.25
Hydro-Oxide, National Peroxide Co., New York	2.96	2.50
Hydro-Oxide, National Peroxide Co., New York	1.91	1.75
Prep. for The Nicholas & Harris Co., New London	3.05	2.50
Parola. American Peroxide & Chem. Co., Long Island City, N. Y.	3.09	2.75
Parola. American Peroxide & Chem. Co., Long Island City, N. Y.	2.78	2.25
Prep. for Radom's Pharmacy, New Britain	2.96	3.40
Rexall	2.79	3.10
Pyro-Oxygen. The Arthur Chem. Co., New Haven	2.88	3.30
Pyro-Oxygen. The Arthur Chem. Co., New Haven	2.89	3.80
Prep. for Schieffelin & Co., New York	2.81	2.25

Tincture of Iodine. Thirty-nine samples were examined of which nine showed a deficiency greater than 5 per cent. of the 6.86 gms. of iodine required for 100 c c. The results may be summarized as follows:

Number.	Gms. Iodine per 100 cc.	U. S. P. Strength.
21	6.86–8.44	100 –123
9	6.52–6.85	95 – 99.9
5	6.17–6.51	90 – 94.9
3	5.83–6.05	85.3– 88.2
1	5.38	77

The following samples showed a deficiency greater than 5 per cent.

Druggist.	Gms. Iodine per 100 cc.	U. S. P. Strength.
J. H. Clampett, Bridgeport	6.17	90.0
Jennie Hamilton, Bridgeport	5.87	85.6
White's Pharmacy, Bridgeport	6.29	91.7
Joseph H. Lutz, New Britain	6.40	93.3
Ellis Pharmacy, Stamford	6.05	88.2
Clifford Pharmacy, South Norwalk	5.85	85.3
E. T. Vance, Ansonia	5.38	77.0
Mahoney's Corner Drug Store, Shelton	6.44	93.9
H. Monroe, Guilford	6.27	91.4

Turpentine. One hundred and sixty-eight samples were examined, of which eight contained from 9 to 80 per cent. of mineral oil. The names of the brands and of the dealers selling these samples were not supplied to us.

MISCELLANEOUS MATERIALS SENT BY PRIVATE INDIVIDUALS.

Milk. Of the sixty-two samples tested only twenty-eight were unadulterated and of standard quality. Twenty-two samples were watered, four were skimmed, three were below standard in solids and three in both solids and fat. One sample was too badly curdled to analyze, and one sample sent from Waterbury contained formaldehyde.

Cream. Twelve samples were tested. Seven exceeded the legal standard, ranging from 20.5 to 52 per cent. of fat. Four samples, below standard, contained 9.82, 10.48, 12.48 and 12.72 per cent. of fat. One sample sent from Waterbury contained sucrate of lime as a thickener.

Human Milk. The sample analyzed contained 10.73 per cent. solids, 1.08 protein, 1.80 fat, 0.24 ash and 7.61 (sugar) by difference.

Butter. Of six samples examined five were genuine, while one was renovated butter.

Vinegar. Of sixteen samples examined eight satisfied the legal standard for solids and acidity. Three samples each were low in solids and acidity, and two samples were low in both respects.

Asparagus. A sample of *Humbert & Andrews' Acme Brand Asparagus* contained sodium fluoride, a new adulterant for this State and a particularly poisonous one.

Near Beer. Two samples of *Jean Hornig's Carbonated Quaker Beer,* "A Substitute for Ale or Lager. Not Intoxicating," contained 3.65 and 3.37 per cent. of alcohol by volume.

Buckwheat Flour. Three samples from the same source, but sent in by the wholesaler, the retailer and the consumer were examined. The retailer's sample contained 1.36 per cent. ash and 0.12 per cent. insoluble in acid (sand), while the other two samples contained 1.71 and 1.64 per cent. ash, and 0.54 and 0.53 per cent. sand, respectively.

Candy. A sample of "Girl's Head" mixed chocolates was examined. The chocolate coatings contained no other fat than cocoa fat; no paraffin was detected; and no glucose in the sugar fillings. In the caramels glucose was found.

A sample of marshmallows contained 39.7 mgms. of vanillin and 10.6 mgms. of coumarin in two of the candies. The candy was so overflavored as to be practically uneatable.

Cider. A sample of supposed sweet cider contained 1.65 per cent. alcohol by volume, and a sample of hard cider 6.95 per cent.

Color. A dry color intended for use in foods was found to be Tropeolin O, an unpermitted coal-tar color.

Gelatine. Two samples contained 15.14 and 15.37 per cent. nitrogen, and 1.32 and 1.31 per cent. ash, satisfying the U. S. Standard for that product.

Grape Juice. A sample of the home-made product contained 0.60 per cent. alcohol by volume.

Honey. The three samples examined were not found to be adulterated.

Ice Cream. The eleven samples examined contained from 4.0 to 14.5 per cent. of fat; no starch was found in any of the samples. Six samples contained coal-tar colors, four amaranth and two erythrosin, both permitted dyes when declared.

Molasses. The two samples examined were not adulterated.

Olive Oil. The sample examined contained no cotton seed or sesame oil.

Sugar. The two samples of granulated sugar examined contained no adulteration.

Vanilla Extract. Two samples were analyzed. *Highly Concentrated Extract Vanilla Compound,* made by The Bacorn Co., Elmira, N. Y., had a specific gravity at 15.5° C. of 1.02487, and

contained 27.11 per cent. ethyl alcohol by volume, 0.499 per cent. vanillin, 0.104 coumarin, normal lead No. 0.23, resins, very slight, caramel, present. It proved to be a compound extract consisting of vanillin, tonka extract, and a small amount of vanilla extract, colored with caramel. It was not correctly labeled. The other sample of vanilla extract, no brand name, contained no coumarin.

Wheat Flour. Two samples were received, about which complaint had been made as to the presence of greenish-blue specks in the flour. The samples were branded *"Our National Golden Rod Flour, A. F. C. & Co."* The flour bag was blue lined, and it was at first thought that the specks were due to fragments of this paper lining. The lining appeared intact, however, and our final conclusion was that the specks were due to particles of the coal-tar dye mechanically attached to the lining and thus distributed throughout the flour. We were unable to identify the dye with certainty.

Whisky. Two samples suspected of containing "knock-out" drops contained neither chloral hydrate nor wood alcohol.

Wine. One sample examined contained 0.52 gm. of acetic acid per 100 c c. of wine. Another sample of home-made wine was found to be an acid wine with low extract and no appreciable amount of sugar.

Alcohol. The sample examined contained 93.6 per cent. ethyl alcohol, and no wood alcohol.

Alloy. A mass of about twenty-five pounds found in an old barn contained antimony and tin and a small amount of lead.

Ammonia, C. P. The sample, sent by The New Haven Gas Light Co., showed a specific gravity at 15° C. of 0.896, equal to 29.69 per cent. NH_3; 10 c c. gave a residue of .0003 gm. at 100° C. There was a very slight trace of chlorides and of empyreumatic substances; no coloration was produced by neutralization with nitric or sulphuric acids. The sample proved to be of a high degree of purity.

Arctic Chemical Compound. This material, made by the Arctic Chemical Cooler Co., New York City, is intended for refrigeration purposes and claims to effect a considerable saving in ice. The material came to us in two portions, one a dirty-white crystalline material, the other pale pink crystals. The former contained 59.08 per cent. chlorin, equivalent to 97.49 per cent.

common salt; the latter proved to be essentially sodium sulphate, containing possibly some iron-ammonium sulphate; no manganese was detected.

Arsenate of Lead. A sample of *Swift's Arsenate of Lead,* made by the Merrimac Chemical Co., contained 42.20 per cent. water, 37.81 lead oxide and 17.67 arsenic oxide, or on the water-free basis 65.42 per cent. lead oxide and 30.57 per cent. arsenic oxide.

Babbitt's Pure Lye. This proved to be a soda lye and contained no appreciable amount of potash.

Cocaine, Heroin and Morphine. Seventeen samples of these drugs were analyzed in connection with the police crusade against their sale in New Haven. One sample was a mixture of cocaine and B-eucaine with milk sugar. Another sample suspected of being cocaine gave reactions for alkaloids, but too faint for identification. Nine samples proved to be heroin and five morphine. Another sample suspected to be morphine was milk sugar. The examination of these samples, and the testimony given in court in connection with them, resulted in the conviction of distributors of these drugs in New Haven, the most notable of whom was Geo. D. Farovid, a New Haven druggist, who had been convicted a few years previously for selling cocaine. The direct result of this New Haven campaign was the passage of a stringent law by the last legislature regarding the sale of narcotic drugs in this State.

Cow's Stomach. The contents of the stomach of a cow, suspected of having been poisoned by Paris green, showed neither copper nor arsenic.

Disinfectant. The use of this material was reported to have caused gangrene. It proved to be a crude preparation of coal- or wood-tar origin, containing a mixture of phenol and creosote. Commenting on the use of phenol the U. S. Dispensatory, 19th Ed., p. 930, says, "Moreover, in numerous cases the local use of phenol has been followed by severe local symptoms, especially gangrene, so that care is essential."

Emmenagogues. Two samples of materials, intended to cause abortion, were examined for the State Board of Pharmacy Commissioners. A liquid preparation contained pennyroyal and cotton root, with no aloes or ergot. A sample of pills contained savin, hellebore and an iron salt.

Hair Dyes. A partial examination was made of two solutions submitted by a New Haven physician. One solution was an organic tincture, the other an alkaline solution of a chromium salt, probably alkaline chrome hydrate; no acetate of lead was detected.

Linseed Oil Soap. A sample of *Charter Oak Linseed Oil Soap* showed no free alkali

Rubber Nipple. The sample was submitted on the supposition that a child had been poisoned by its use. Human saliva extracted no color or antimony from the nipple.

Soluble Sulphur Compound. This material was made by the Niagara Sprayer Co., Middleport, N. Y. A solution of 10 pounds to 50 gallons of tap water showed the following analysis:

	With heat.	In the cold.
Total Sulphur	56.4	56.3
Lime	none	...
Magnesia	none	...
Sodium oxide	35.8	35.5
Potassium oxide	0.97	0.93
Chlorine	trace	...
Insol. in water	3.7	3.9
Insol. on ignition (iron)	2.6	...

Turpentine. The two samples examined were pure gum turpentine.

Worm Remedy for Hogs and Cattle. The material consisted chiefly of sodium chloride (93.34 per cent.), with some iron and charcoal.

TABLE XVIII:—SUMMARY OF RESULTS OF EXAMINATION OF FOOD AND DRUG PRODUCTS, 1913.

	Not found Adulterated.	Adulterated or below standard.	Compound.	Total number examined.
Sampled by Station.				
Bread	201	..	..	201
Candy	*138	12	†39	189
Dehydro Foods	..	..	..	5
Diabetic Foods	..	..	..	161
Gelatine	4	1	..	5
Ice Cream Powders	..	..	..	10
Jelly Powders	2	..	13	15
Peanut Butter	12	..	..	12
Pumpkin, Canned	16	6	1	23
Wines	..	..	..	38
Miscellaneous Foods	7	..	..	7
Calomel	22	..	..	22
Chloroform	21	..	..	21
Laudanum	1	7	..	8
Saccharin Preparations	..	..	..	17
Total	424	26	53	734
Sampled by Dairy Commissioner.				
Abizol	..	..	..	1
Butter and Butter Substitutes	7	67	..	74
Candy	1	..	..	1
Cheese	12	..	..	12
Colors	..	1	..	1
Cream	11	3	..	14
Honey	2	..	..	2
Ice Cream	17	2	..	19
Milk	155	‡257	..	412
Skim Milk	3	..	..	3
Temperance Drinks	16	33	2	51
Vinegar	116	40	13	169
Vanilla Extract	1	..	..	1
Hydrogen Peroxide	28	4	..	32
Tincture of Iodine	30	9	..	39
Turpentine	160	8	..	168
Total	559	424	15	999
Sampled by Private Individuals.	72	80	..	169
Total from all sources	1055	530	68	1902

* Including 35 samples which were short-weight, and not classing as adulterated marshmallows, gum drops and jelly beans containing gelatine. † Containing permitted coal-tar colors, but not declared. ‡ Including 90 samples below standard in solids not fat.

TESTING OF BABCOCK-TEST GLASS WARE.

During the past year this laboratory has tested a large number of milk and cream bottles and pipettes used in making the Babcock test for fat in milk and cream. The following table summarizes the results of the tests:

	Total.	Broken.	Accurate.	Inaccurate.
Pipette for cream	67	0	66	1
" " milk	41	1	40	0
Testing bottles, cream	40	0	40	0
" " milk	342	8	330	4
Totals	490	9	476	5

PART V.

Commercial Feeding Stuffs.

By JOHN PHILLIPS STREET.*

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

Section 4592 requires that every package of concentrated commercial feeding stuff shall bear a statement giving the name and address of manufacturer or importer, the number of net pounds in the package, the name of the article and the percentages of protein and fat contained in it.

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

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

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

The dairy and food commissioner is charged with the enforcement of the statute.

INSPECTION OF 1913.

In compliance with the above requirements the following report has been prepared. The utmost brevity of discussion is made necessary by the limit imposed by law on the size of the report.

*The chemical work here reported has been done by Messrs. Morison, Shepard and Davis; the microscopical examination by Mr. Street.

During the fall of 1913 the station sampling agent visited 52 towns and villages of this state and collected 189 samples of feeds. The results of the examination of these samples are here discussed, and the chemical analyses are given in Table IV.

The analyses of 48 samples sent by individuals are also separately reported.

The official samples may be grouped as follows:

No.		No.	
19	Cotton seed meal	1	Buckwheat middlings
2	Cotton seed feed	1	Malt sprouts
2	Linseed meal, new process	7	Dried brewers' grains
10	Linseed meal, old process	6	Dried distillers' grains
1	Wheat bran	2	Alfalfa meal
1	Wheat feed	5	Dried beet pulp
1	Wheat gluten feed	9	Corn and oat feeds
18	Corn gluten feed	4	Wheat and corn cob feeds
1	Corn gluten meal	6	Horse feeds
18	Hominy feed	24	Dairy and stock feeds
1	Hominy and corn cob feed	22	Molasses feeds
2	Corn meal	21	Poultry feeds
5	Rye middlings and feed		
		189	total

Comments on Analyses.

Of the 189 official samples, 31 were below guaranty in some particular; 10 in protein, 18 in fat, and 3 in both protein and fat. The tabulation given below shows the individual brands which were deficient.

Cotton Seed Meal averaged one per cent. less protein than last year, with an increased price of $2.32 per ton.

Royal Feed, a mixture of cotton seed meal and cotton seed hulls, about half and half, contained only a little over half as much protein as high-grade meal, and sold for only $6.45 per ton less. Assuming $35 as the average ton price for good cotton seed meal, in this feed the purchaser would pay about $23 per ton for the hulls, certainly an excessive price when malt sprouts sells for $26, or dried brewers' grains for $28.

New Process Linseed Meal showed about two per cent. less protein than in 1912, at $6.50 less per ton. *Old Process Linseed Meal* contained 1.68 per cent. less protein, with the selling price $2.20 lower.

Table I.—Feeds below Guaranty.

Station No.		* Deficiency in Protein.	* Deficiency in Fat.
		%	%
3139	Amer. Cotton Oil Co.'s Prime Cotton Seed Meal	....	0.82
3134	Bunch's Old Gold Brand Cotton Seed Meal	1.99	....
3186	Southern Cotton Oil Co.'s Bonita Brand Cotton Seed Meal	1.74	....
2153	Royal Feed	2.06	....
3111	Mann Bros. Linseed Meal	1.50	....
3110	Cedar Rapids Gluten Feed	1.37	....
3119	Cream of Corn Gluten Feed	....	0.26
3017	Staley's Gluten Feed	....	0.30
3130	" " "	....	0.85
3034	Bufceco Hominy Feed	...	0.58
3072	" " "	....	0.39
3117	" " "	....	0.62
3049	Wirthmore Hominy Feed	....	1.03
3089	Mystic Milling Co.'s Hominy Feed	....	0.84
3189	Blue Ribbon Hominy Feed	....	0.67
3199	Quinebaug Buckwheat Middlings	9.50	2.43
3040	Milwaukee Grains & Feed Co.'s Malt Sprouts	....	0.69
3193	Buckeye Gluten Feed	....	1.32
3054	Eagle 3 D Distillers' Grains	1.87	....
3103	" " " "	2.49	....
3062	Hatch's Horse Feed	2.19	0.28
3018	Maz-All Feed	1.19	....
3030	Schumachers' Calf Meal	2.12	....
3050	Biles Ready Ration	....	0.90
3094	" " "	....	0.29
3171	Allneeda Horse and Mule Feed	....	1.58
3068	Braue's Mixed Feed with Molasses	3.56	1.99
3155	Peerless Dairy Feed	....	3.30
3081	H. O. Dry Poultry Mash	4.06	....
3096	Puritan Laying Mash	....	1.84
3148	" " "	....	2.10

* A deficiency of less than 1 per cent. of protein and 0.25 per cent. if fat is not noted.

Gluten Feed. The chief differences in the ten brands are shown in the percentages of protein and ash, the former ranging from 21.6 to 26.3, the latter from 0.9 to 5.2 per cent. These differences are probably due in large part to the use or exclusion of the "steep liquor," a by-product of glucose manufacture. The decreased percentage of protein as a rule is not reflected in a lowered cost per ton. The five brands, analyzed both this year and last, contained 1.3 per cent. less protein this year, with an increased price of 55 cents per ton.

Hominy Feed contained about the same amount of protein as last year, but cost nearly $2.50 per ton more.

Star Feed. The single sample contained 2.76 per cent. less protein and 1.15 per cent. less fat than an average hominy feed, but cost slightly more. Under no circumstances can this feed be considered an economical purchase.

Rye Products. The samples of feed and middlings showed about the same composition as last year, but were $2.25 per ton cheaper.

Buckwheat Middlings. The sample was far below the standard of the middlings generally sold by this mill, showing a shortage of 9.50 per cent. protein and 2.43 per cent. fat. These deficiencies are due to the unusual presence of excessive hulls, the crude fiber amounting to over 20 per cent., more than double the quantity found in previous inspections of this brand.

Malt Sprouts. The single sample was of average composition, and $2 lower in price than last year.

Dried Brewers' Grains. The seven samples were likewise of standard composition and the price was $1.18 less than in 1912. The relative cheapness of this most excellent feed cannot be overemphasized.

Dried Distillers' Grains. The samples of *Ajax Flakes* and *Eagle 3D Grains* showed little variations from previous years either in composition or cost; two of the samples of the latter brand, however, failed to meet the protein guaranty. *Hiquality Spirits Grains* is another high-grade product selling at the same price as the brands just mentioned, although containing 5 per cent. more protein. *Buckeye Gluten Feed* is not a "gluten feed" as generally understood by the trade and the cattle feeder. It contained about 10 per cent. less protein than the other brands of distillers grains, and sold for $10 less per ton.

Provender and Corn and Oat Feeds. The samples were of normal composition, the higher percentages of fiber in most of the proprietary mixtures indicating that they were not mixtures of whole corn and oats of good quality, but rather that either low-grade oats or excessive oat hulls had been used. As has been stated many times, it is hard to understand why feeders will buy such feeds as these, for from $28 to $40 per ton, when cotton seed meal, gluten feed, dried brewers' grains and malt sprouts may be bought for the same price or less, and especially when an abundant supply of carbohydrates and roughage can be cheaply raised on the farm.

The *Wheat and Corn Cob Feeds* showed the usual composition and cannot be considered an economical purchase when sold for only a few dollars less per ton than standard wheat feed.

Proprietary Horse, Dairy and Stock Feeds. These require no special comment further than to call attention to the fact that while some of the brands are made from excellent materials and show intelligence in their compounding, still others are very ordinary mixtures of very ordinary materials sold at an excessively high price. The horse feeds are fairly uniform in composition, at prices from $32 to $40 per ton. Among the dairy and stock feeds, however, we find feeds containing from 8 to 11 per cent. protein selling for $28 to $31, some containing 10 to 26 per cent. for $32 to $34, and others containing from 11 to 25 per cent. for $35 to $37. In other words the selling price as a rule bears no relation whatever to the composition of the feed. The feeder should understand that there is no mystery in the compounding of these feeds. They are made from well-known materials of varying value and digestibility. When standard feeds of quite as good if not better feeding value, may be secured at prices often no higher and generally much lower than those asked for these special mixtures, the feeder may well hesitate before purchasing the latter if he wishes to run his dairy or stock farm on an economical basis.

Proprietary Poultry Feeds. Certain brands, such as *Purity Poultry Mash, Puritan Laying Mash* and *H.-O. Dry Poultry Mash,* showed wide differences in composition among different samples of the same brand. In other cases the guaranty was an imperfect indication of the quality of the feed, so great was the over-run, especially of protein. Guaranties are meant to convey certain definite information, and, while a deficiency is much more to be deplored than an excess, an over-run of from 8 to 3 per cent. protein, which we find in two of the brands, is also objectionable. It may mislead the careful feeder in compounding his rations, and may cause him to depend on a similar excess in future purchases, an expectation the manufacturer is not legally bound to satisfy.

Molasses Feeds.

Twenty-two samples of this class of feeds were examined. In general they consisted of corn, oats, alfalfa or dried beet pulp, with from 15 to 60 per cent. or more of molasses. In one brand peat was substituted for feed.

The analyses of these feeds presented some difficulties. Previous experience had shown us that it was impossible to determine accurately the fat in the usual way in such mixtures. Accordingly 2 gms. of material were washed with about 200 cc. of water at room temperature, the insoluble residue dried and then extracted with anhydrous ether as usual. Seventeen of the samples showed an increased ether extract by this method, ranging from 0.04 to 1.47 per cent., the increase being most marked where alfalfa was a constituent of the feed. On the other hand five samples gave slightly higher ether extracts without previous extraction with water; these apparently contained some ingredient soluble in both cold water and ether. It is evident from the above results that the use of the conventional method for determining fat in cattle feeds is generally unjust to molasses feeds. The results given in our general tables were secured by the modified method.

The aqueous extract of these feeds was also determined, and in it the soluble ash and nitrogen. (See Table II.) The extract ranged from 14.96 to 62.76 per cent., and in all cases is somewhat higher than the amount of molasses solids that was present. For instance, the writer has shown* that 8.65 per cent. of dried beet pulp is soluble in cold water. It is apparent therefore, that the two samples of *Dried Beet Pulp and Molasses* examined this year did not contain over 10 per cent. of molasses solids. On the other hand the aqueous extracts from the two samples of *Molassine Meal,* 59.92 and 62.76 per cent., are practically all molasses, as peat, their other ingredient, is insoluble in water. So we may say that these feeds contain from 10 to 60 per cent. of molasses solids.

Unusually large amounts of the nitrogen of these feeds were soluble in water, or rather in the aqueous saline solution, as the feeds contained considerable water-soluble potassium and other salts. The soluble nitrogen ranged from 0.28 to 1.24 per cent., or from 12.2 to 82.4 per cent. of the total nitrogen of the feed. This presents another analytical difficulty. This soluble nitrogen undoubtedly is in part derived from the molasses itself and is probably not of a protein nature. The amount of soluble nitrogen precipitated by zinc sulphate ranged from 0.07 to 0.30 per cent.,

* Rept. New Jersey Expt. Station, 1906, p. 44.

or from 8.5 to 41.8 per cent. of the total soluble nitrogen. This indicates what a small proportion of the soluble nitrogen is protein nitrogen, and how unjustified is the use of the conventional protein factor in feeds of this class. In the *Molassine Meal,* for instance, only 8.5 and 9.3 per cent. of the soluble nitrogen is precipitated by zinc sulphate. While our results show that this feed contains only 0.63 per cent. of protein, yet using the conventional factor we are obliged to report 8.60 per cent. protein. It is obviously improper to use this factor with feeds like *Molassine Meal,* and yet with our present knowledge we feel obliged to adopt the conventional method for the present inspection. The difficulty is increased by the fact that in two samples of pure alfalfa meal we found 33.6 per cent. of soluble nitrogen, so that we are not justified in attributing all of the soluble nitrogen in the molasses feeds to molasses.

TABLE II.—MOLASSES FEEDS.

Station No.	Brand	Soluble in Cold Water.				Percentage Solubility in Cold Water.			Fat.	
		Total Extract.	Ash.	Protein (N x 6.25).	Carbohydrates.	Ash.	Protein (N x 6.25).	Carbohydrates.	In Original Material.	In Water-Extracted Material.
3171	Allneeda Horse and Mule Feed	35.24	5.78	3.00	26.46	80.0	33.3	44.7	1.01	1.92
3056	Sucrene Dairy Feed	26.24	4.06	3.13	19.05	51.2	18.9	41.1	6.49	6.24
3097	" " "	25.76	4.72	3.50	17.54	58.6	21.2	36.4	4.97	5.15
3068	Braue's Mixed Feed with Molasses	39.80	5.26	2.88	31.66	71.5	33.9	48.7	0.56	2.03
3155	Peerless Dairy Feed	31.52	4.44	4.88	22.20	58.7	24.4	46.6	3.55	3.70
3067	Commonwealth Alfalfa and Molasses	43.64	6.44	4.25	32.95	74.5	40.9	66.1	0.60	0.94
3063	Missouri Horse and Mule Feed	29.08	4.06	3.00	22.02	76.3	30.0	40.0	3.69	4.02
3093	Boggs' Competition Horse Feed	19.80	2.08	2.25	15.47	72.2	20.5	23.0	3.28	2.79
3190	H. & S. Horse, Mule and Dairy Feed	32.08	3.72	2.00	26.36	45.8	12.2	51.3	3.53	4.21
3137	Husted Molasses Feed	27.88	4.66	4.25	18.97	68.1	18.7	38.9	3.83	4.01
3013	Dried Beet Pulp and Molasses	14.96	1.70	1.88	11.38	45.5	21.2	19.1	0.71	0.38
3090	" " " " "	18.64	1.64	1.75	15.25	35.9	19.3	25.7	0.76	0.50
3038	Molassine Meal	62.76	7.14	7.38	48.24	87.6	82.0	79.5	0.41	0.74
3129	" "	59.92	6.42	6.75	46.75	86.1	82.4	79.3	0.48	0.72
3135	Omaha Alfalfa Meal and Syrup	53.00	6.90	6.13	39.97	73.2	59.5	75.1	0.19	0.76
3123	June Pasture Alfalfa Meal with Molasses	48.84	7.98	7.75	33.11	82.3	60.8	69.7	0.27	0.85
3124	Peter's King Corn Sugar Feed	35.40	5.18	5.50	24.72	81.8	48.9	43.1	1.18	1.95
3086	Green Cross Molasses Horse Feed	23.20	3.28	3.88	16.04	66.5	36.5	26.4	2.65	2.87
3087	Quaker Molasses Dairy Feed	27.48	3.52	4.50	19.46	52.4	27.0	39.3	4.76	4.80
3113	" " " "	28.44	3.70	3.88	20.86	49.5	24.5	42.2	4.31	4.72
3166	Purina Dairy Feed	31.28	5.24	5.00	21.04	69.0	26.2	47.9	2.75	3.24
3167	Purina Molasses Feed	23.92	4.00	4.50	15.42	78.7	39.6	25.6	2.31	2.26

Formerly in the examination of feeds much stress was placed on the fact that in certain feeding stuffs a considerable part of the nitrogen existed in the amid form, and was not regarded as useful for feeding purposes as protein nitrogen. In recent years but little attention has been paid to this fact, and it is a serious question, especially in view of the increasing use of these molasses feeds, whether more attention should not be given to this phase of the feeding problem. In Table III will be found a compilation of analyses made by the writer at the New Jersey station from 1892 to 1899 showing the proportion of protein nitrogen in certain feeds.

TABLE III.—PROPORTION OF NITROGEN IN PROTEIN FORM IN FEEDS.

No. of Analyses.		Per Cent.	No. of Analyses.		Per Cent.
2	Alfalfa hay	82.0	4	Oats, ground	86.1
2	Timothy hay	93.9	7	Corn and oats	95.7
4	Corn stalks	87.0	3	Oat chop	95.0
9	Corn fodder	88.7	5	Corn meal	96.5
1	Mangel wurzels	47.4	8	Gluten meal	98.1
4	Sugar beets	41.3	11	Gluten feed	94.3
28	Cotton seed meal	96.6	5	Hominy feed	93.1
1	Cotton seed feed	93.0	2	Rye bran	84.6
3	Linseed meal, n. p.	94.0	2	Buckwheat middlings	94.4
33	" " o. p.	94.0	11	Dried brewers' grains	94.8
18	Wheat bran	86.9	1	Dried distillers' grains	93.7
14	Wheat middlings	85.8	3	Malt sprouts	73.9

The amounts of soluble ash in the molasses feeds were also very large, ranging from 1.64 to 7.98 per cent. or from 35.9 to 87.6 per cent. of the total ash. This again is chiefly due to the added molasses, which is relatively rich in potassium salts.

UNOFFICIAL SAMPLES.

Forty-eight samples sent in by individuals have also been analyzed in part. The station is not responsible for the sampling, but only for the accuracy of the analysis of these samples.

COTTON SEED MEAL. Three samples of *Dixie Brand,* Humphreys Godwin Co., Memphis, were guaranteed 38.62 per cent. protein; **3299,** sent by G. T. Soule, New Milford, contained 37.63 per cent., **3363,** sent by H. B. Coger, Botsford, contained 40.38 per cent., and **3491,** sent by The C. W. Campbell Co., Westerly, contained 39.13 per cent. Another sample of the same brand, guaranteed 41 per cent. protein, sent by The Coles Co., Middletown, contained 37.94 per cent.

Six other samples credited to Humphreys Godwin Co. were analyzed. **3298,** sent by D. W. Ives, Wallingford, guaranteed 41 per cent. protein, **3361,** sent by H. E. Meeker, Danbury, guaranteed 38.62 per cent. protein, **3328,** sent by Spencer Bros., Suffield, and **3359** and **3492,** sent by The Coles Co., Middletown, without guaranty, and **3369,** sent by Spencer Bros., guaranteed 40.63 per cent. protein, contained 39.38, 42.25, 42.63, 38.63, 41.31 and 42.50 per cent., respectively.

3335, sold by Buckeye Cotton Oil Co., Cincinnati, Ohio, sent by H. H. Waldron, Bethlehem, and **3360,** sent by Apothecaries Hall Co., Waterbury, guaranteed 38.62 per cent. protein, contained 40.06 and 38.50 per cent., respectively.

6171, *Dirigo Brand,* W. Newton Smoth, Baltimore, Md., guaranteed 41 per cent. protein, sent by Norwich Grain Co., Norwich, contained 39.06 per cent.

3003, sent by The Coles Co., Middletown, without guaranty, contained 43.19 per cent. protein.

3004, *Bonita Brand,* Southern Cotton Oil Co., Charlotte, N. C., guaranteed 38.62 per cent. protein, sent by Apothecaries Hall Co., Waterbury, contained 39.50 per cent.

3266, *Owl Brand,* F. W. Brode and Co., Memphis, guaranteed 38.62 per cent. protein, sent by R. H. Ensign, Simsbury, contained 39.63 per cent.

3267, *Forfat Brand,* Humphreys Godwin Co., guaranteed 38.62 per cent. protein, sent by W. E. Wheelock, Quinebaug, contained 37.88 per cent.

3297, J. E. Soper and Co., Boston, guaranteed 40.63 per cent. protein, sent by C. O. Bidwell, Thompsonville, contained 41.81 per cent.

3001, sent by Apothecaries Hall Co., Waterbury, without guaranty, contained 40.63 per cent. protein. **3002,** bought through this dealer by H. H. Waldron, Bethlehem, and sent without guaranty, contained 40.69 per cent.

3334, Southern Cotton Oil Co., Charlotte, N. C., guaranteed 38.62 per cent. protein, sent by H. H. Waldron, Bethlehem, contained 39.50 per cent.

TABLE IV.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
	OIL SEED PRODUCTS.	
	Cotton Seed Meal.	
3139	Prime. American Cotton Oil Co., Albany, Ga.	*Hartford:* G. M. White & Co.
3074	Owl Brand. F. W. Brode & Co., Memphis, Tenn.	*Stamford:* W. L. Crabb
3112	Buckeye. Buckeye Cotton Oil Co., Cincinnati, O.	*Torrington:* F. U. Wadhams
3125	" " " " "	*Waterbury:* Spencer Grain Co.
3142	" " " " "	*Hartford:* Smith, Northam & Co.
3170	" " " " "	*Middletown:* Meech & Stoddard.
3134	Old Gold Brand. T. H. Bunch Comm. Co., Little Rock, Ark.	*Hartford:* Trout Brook Ice & Feed Co.
3037	Dixie Brand. Humphreys, Godwin Co., Memphis, Tenn.	*Meriden:* Meriden Grain & Feed Co.
3092	Dixie Brand. Humphreys, Godwin Co., Memphis, Tenn.	*New Milford:* G. T. Soule.
3104	Dixie Brand. Humphreys, Godwin Co., Memphis, Tenn.	*Winsted:* E. Manchester & Sons
3116	Dixie Brand. Humphreys, Godwin Co., Memphis, Tenn.	*Litchfield;* Litchfield Grain Co.
3024	Forfat Brand. Humphreys, Godwin Co., Memphis, Tenn.	*Wallingford:* E. E. Hall
3162	Forfat Brand. Humphreys, Godwin Co., Memphis, Tenn.	*Willimantic:* H. A. Bugbee
3088	Selden. Memphis Cottonseed Products Co., Memphis, Tenn.	*New Milford:* G. T. Soule
3055	Pilgrim Brand. J. E. Soper Co., Boston	*Bridgeport:* Vincent Bros.
3159	" " " "	*Willimantic:* E. A. Buck
3105	Pioneer. J. E. Soper Co., Boston	*Winsted:* E. Manchester & Sons
3120	Bonita Brand. Southern Cotton Oil Co., Charlotte, N. C.	*Thomaston:* L. E. Blackmer
3186	Bonita Brand. Southern Cotton Oil Co., Charlotte, N. C.	*Yantic:* A. R. Manning
		Average guaranty
		Average of these 19 analyses
		Average digestible
	Cotton Seed Feed.	
3027	Royal Feed. Southern Fibre Co., Portsmouth, Va.	*Meriden:* A. Grulich
3153	" " " " " "	*Manchester:* Little & McKinney.
		Average guaranty
		Average of these 2 analyses
	Linseed Meal, New Process.	
3160	American Linseed Co., Chicago	*Willimantic:* W. D. Grant
3187	" " "	*Yantic:* A. R. Manning
		Average guaranty
		Average of these 2 analyses
		Average digestible
	Linseed Meal, Old Process.	
3014	American Linseed Co., New York	*Branford:* S. V. Osborn
3019	" " "	*East Haven:* F. A. Forbes
3025	" " "	*Wallingford:* E. E. Hall
3126	" " "	*Waterbury:* Spencer Grain Co.

SAMPLED IN 1913.

Station No.	Pounds per Hundred. Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	Price per ton.
3139	8.21	5.70	37.75	10.90	30.26	7.18	35.00
3074	7.20	5.78	42.19	8.33	26.28	10.22	34.00
3112	6.50	6.15	43.25	8.60	28.23	7.27	37.00
3125	7.13	5.80	38.88	11.00	29.34	7.85	36.00
3142	7.00	5.83	39.00	10.83	30.09	7.25	38.00
3170	7.03	5.90	41.00	9.30	29.57	7.20	33.50
3134	7.54	5.38	36.63	12.05	30.52	7.88	36.00
3037	7.48	6.28	41.31	8.93	28.37	7.63	36.00
3092	8.14	5.98	40.75	9.20	28.38	7.55	35.00
3104	7.83	5.88	38.88	8.93	29.20	9.28	35.00
3116	7.80	6.38	40.00	9.65	27.88	8.29	36.00
3024	8.00	5.73	38.63	10.85	27.49	9.30	34.00
3162	8.36	5.70	40.19	10.15	27.93	7.67	34.00
3088	8.21	6.10	41.88	8.70	26.74	8.37	35.00
3055	7.23	5.75	40.75	10.25	27.15	8.87	37.00
3159	7.57	5.73	39.38	9.95	29.47	7.90	36.00
3105	7.73	6.13	41.81	10.18	27.07	7.08	35.00
3120	7.06	5.88	39.50	9.78	29.46	8.32	36.00
3186	8.42	6.08	36.88	11.80	28.58	8.24	35.00
....	....	....	**38.98**	....	.....	**6.05**	.....
....	**7.60**	**5.90**	**39.93**	**9.97**	**28.53**	**8.07**	**35.45**
....	....	....	**33.5**	**3.5**	**22.3**	**7.6**	.....
3027	8.38	4.20	21.88	25.38	35.80	4.36	28.00
3153	8.02	3.95	19.94	25.85	38.47	3.77	30.00
....	....	....	**22.00**	....	.....	**4.00**	.....
....	**8.20**	**4.07**	**20.91**	**25.61**	**37.14**	**4.07**	**29.00**
3160	8.75	5.48	36.25	9.45	37.42	2.65	35.00
3187	9.15	5.50	35.69	8.93	38.08	2.65	34.00
....	....	....	**36.00**	....	.....	**2.00**	.....
....	**8.95**	**5.49**	**35.97**	**9.19**	**37.75**	**2.65**	**34.50**
....	....	....	**30.2**	**6.8**	**30.2**	**2.4**	.....
3014	9.57	5.27	34.13	9.03	36.32	5.68	36.00
3019	8.76	4.83	32.63	8.68	36.77	8.33	36.00
3025	8.67	5.13	32.75	8.85	36.68	7.92	36.00
3126	8.65	5.40	34.38	8.70	35.18	7.69	38.00

TABLE IV.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
	OIL SEED PRODUCTS.—*Continued.*	
	Linseed Meal, Old Process.—Continued.	
3118	Guy G. Major Co., Toledo, O.	*Torrington:* D. L. Talcott
3111	Mann Bros. Co., Buffalo, N. Y.	*Winsted:* Platt & Coe
3069	" " " "	*New Canaan:* C. H. Fairty
3066	Metzger Seed and Oil Co., Toledo, O.	*Greenwich:* J. P. Johnstone
3028	Midland Linseed Products Co., Minneapolis, Minn.	*Meriden:* A. Grulich
3132	Midland Linseed Products Co., Minneapolis, Minn.	*Unionville:* F. D. Lawton & Son
		Average guaranty
		Average of these 10 analyses
		Average digestible
	WHEAT PRODUCTS.	
3070	Bran. (No tags.)	*Springdale:* Monroe & Palmer
		Digestible
3194	Occident Wheat Feed. Russell Miller Mill. Co.	*Meriden:* A. Grulich
		Digestible
3195	Atlantic Gluten Feed. Atlantic Starch Works, Westport	*Middletown:* Meech & Stoddard
		Guaranty
		Digestible
	MAIZE PRODUCTS.	
	Gluten Feed.	
3011	Buffalo. Corn Products Refining Co., New York	*Branford:* S. V. Osborn
3021	* " " " " " " "	*North Haven:* Coöperative Feed Co.
3060	" " " " " " "	*Norwalk:* Holmes, Keeler, Kent Co.
3085	" " " " " " "	*Danbury:* F. C. Benjamin & Co.
		Average guaranty
		Average of these 4 analyses
		Average digestible
3110	Cedar Rapids. Douglas & Co., Cedar Rapids, Ia.	*Winsted:* Platt & Coe
		Guaranty
		Digestible
3158	Clinton. Clinton Sugar Refining Co., Clinton, Ia.	*Stafford Springs:* G. L. Dennis
3185	" " " " " " "	*Yantic:* A. R. Manning
		Average guaranty
		Average of these 2 analyses
		Average digestible
3071	Cream of Corn. American Maize Products Co., New York	*Stamford:* W. L. Crabb
3119	Cream of Corn. American Maize Products Co., New York	*Torrington:* D. L. Talcott
		Average guaranty
		Average of these 2 analyses
		Average digestible
3156	Crescent. Corn Products Refining Co., New York	*Broad Brook:* Broad Brook Mill Co.
		Guaranty
		Digestible
3051	Globe. " " " " " "	*Ansonia:* Ansonia Flour & Grain Co.

* Statement of dealer.

SAMPLED IN 1913—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	
3118	8.91	5.65	32.00	9.83	36.70	6.91	39.00
3111	9.53	4.98	32.50	8.48	36.66	7.85	38.00
3069	9.54	4.98	33.38	8.28	36.14	7.68	37.00
3066	9.42	5.54	31.56	9.50	36.47	7.51	38.00
3028	9.41	5.27	33.13	8.23	35.79	8.17	34.00
3132	9.81	5.05	32.81	8.98	35.21	8.14	36.00
....	....	....	**32.20**	....	.....	**5.60**	.....
....	**9.23**	**5.21**	**32.92**	**8.86**	**36.19**	**7.59**	**36.80**
....	....	....	**29.3**	**5.1**	**28.2**	**6.8**	.....
3070	8.89	6.85	15.31	8.70	55.46	4.79	31.00
....	....	....	....	....	.....	....	.....
3194	10.21	4.78	18.06	7.45	54.12	5.38	30.00
....	....	....	....	....	.....	....	.....
3195	6.25	0.90	33.25	0.73	58.16	0.71	31.00
....	....	....	**28.00**	....	.....	**0.50**	.....
....	....	....	....	....	.....	....	.....
3011	10.30	4.58	24.25	7.20	50.31	3.36	31.00
3021	9.12	3.89	24.56	7.05	52.49	2.89	30.00
3060	9.89	2.95	26.25	7.10	51.30	2.51	33.00
3085	10.13	4.35	25.75	6.53	50.66	2.58	32.00
....	....	....	**23.00**	....	.....	**2.00**	.....
....	**9.86**	**3.94**	**25.20**	**6.97**	**51.19**	**2.84**	**31.50**
....	....	....	**21.4**	**6.1**	**46.1**	**2.3**	.....
3110	9.26	0.90	21.63	7.98	56.58	3.65	33.00
....	....	....	**23.00**	....	.....	**2.00**	.....
....	....	....	**18.4**	**6.9**	**50.9**	**3.0**	.....
3158	8.99	0.98	25.13	7.49	54.12	3.29	32.00
3185	8.49	1.00	24.50	8.28	54.07	3.66	32.00
....	....	....	**20.00**	....	.....	**3.00**	.....
....	**8.74**	**0.99**	**24.82**	**7.88**	**54.09**	**3.48**	**32.00**
....	....	....	**21.1**	**6.9**	**48.7**	**2.8**	.....
3071	7.12	3.36	25.50	6.58	54.95	2.49	34.00
3119	7.77	2.98	26.25	7.60	53.16	2.24	33.00
....	....	....	**24.00**	....	.....	**2.50**	.....
....	**7.44**	**3.17**	**25.88**	**7.09**	**54.05**	**2.37**	**33.50**
....	....	....	**22.0**	**6.2**	**48.6**	**1.9**	.....
3156	8.94	4.00	25.63	6.55	52.54	2.34	32.00
....	....	....	**23.00**	....	.....	**2.00**	.....
....	....	....	**21.8**	**5.7**	**47.3**	**1.9**	.....
3051	10.09	5.18	25.31	7.70	49.73	1.99	31.00

TABLE IV.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
	MAIZE PRODUCTS.—*Continued.*	
	Gluten Feed.—Continued.	
3095	Globe. Corn Products Refining Co., New York	*Canaan:* Ives & Pierce
3107	" " " " " " "	*Winsted:* E. Manchester & Sons
		Average guaranty
		Average of these 3 analyses
		Average digestible
3169	Hubinger. J. C. Hubinger Bros. Co., Keokuk, Ia.	*New Haven:* Crittenden-Benham Co.
		Guaranty
		Digestible
3198	Queen. Corn Products Refining Co., New York	*Danielson:* Young Bros. Co.
		Guaranty
		Digestible
3017	Staley's. A. E. Staley Mfg. Co., Decatur, Ill.	*East Haven:* F. A. Forbes
3130	" " " " " " "	*Bristol:* Eaton Bros.
		Average guaranty
		Average of these 2 analyses
		Average digestible
3099	Union. Union Starch and Refining Co., Edinburg, Ind.	*Norfolk:* A. P. Curtiss
		Guaranty
		Digestible
	Gluten Meal.	
3178	Diamond. Corn Products Refining Co., New York	*Westerly:* C. W. Campbell Co.
		Guaranty
		Digestible
	Hominy Feed.	
3041	Homco. American Hominy Co., Indianapolis, Ind.	*Hamden:* I. W. Beers
3183	" " " " " "	*Yantic:* A. R. Manning
		Average guaranty
3034	Bufceco. Buffalo Cereal Co., Buffalo, N. Y.	*Meriden:* Meriden Grain & Feed Co.
3072	" " " " " "	*Stamford:* W. L. Crabb
3117	" " " " " "	*Litchfield:* I. T. Dickenson
		Average guaranty
3049	Wirthmore. Chas. M. Cox Co., Boston	*Plainville:* F. B. Newton
3075	" " " " "	*Stamford:* H. M. Kent Co.
3102	" " " " "	*New Hartford:* Wallace Case
		Average guaranty
3149	Success. Deutsch & Sickert Co., Milwaukee, Wis.	*So. Manchester:* G. W. Strant
		Guaranty
3020	Evans. Evans Milling Co., Indianapolis, Ind.	*North Haven:* Coöperative Feed Co.
		Guaranty
3152	Badger. Chas. A. Krause Mill. Co., Milwaukee, Wis.	*Manchester:* Little & McKinney
		Guaranty
3044	Steam-Cooked. Miner-Hillard Mill. Co., Wilkesbarre, Pa.	*Cheshire:* G. W. Thorpe
3115	Steam-Cooked. Miner-Hillard Mill. Co., Wilkesbarre, Pa.	*Litchfield:* Litchfield Grain Co.
3144	Steam-Cooked. Miner-Hillard Mill. Co., Wilkesbarre, Pa.	*Hartford:* Smith, Northam Co.
		Average guaranty

SAMPLED IN 1913—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	
3095	10.48	3.63	23.75	7.23	52.88	2.03	31.00
3107	9.30	3.90	26.00	6.95	50.01	3.84	32.00
....	....	....	**23.00**	....	.....	**2.00**	.....
....	**9.96**	**4.24**	**25.02**	**7.29**	**50.87**	**2.62**	**31.33**
....	....	....	**21.3**	**6.3**	**45.8**	**2.1**	.....
3169	9.46	1.60	22.75	6.93	54.59	4.67	30.00
....	....	....	**23.00**	....	.....	**2.00**	.....
....	....	....	**19.3**	**6.0**	**49.1**	**3.8**	.....
3198	8.56	3.10	21.94	6.55	56.69	3.16	31.00
....	....	....	**20.00**	....	.....	**2.00**	.....
....	....	....	**18.6**	**5.7**	**51.0**	**2.6**	.....
3017	8.70	4.28	25.50	6.73	52.59	2.20	30.00
3130	9.38	4.60	25.13	6.35	52.89	1.65	32.00
....	....	....	**23.0**	....	.....	**2.50**	.....
....	**9.04**	**4.44**	**25.32**	**6.54**	**52.73**	**1.93**	**31.00**
....	....	....	**21.5**	**5.7**	**47.5**	**1.6**	.....
3099	8.24	2.38	25.06	7.06	54.32	2.94	33.00
....	....	....	**24.00**	....	.....	**3.00**	.....
....	....	....	**21.3**	**6.1**	**48.9**	**2.4**	.....
3178	7.92	0.98	41.25	2.45	45.66	1.74	38.00
....	....	....	**40.00**	....	.....	**1.50**	.....
....	....	....	**34.7**	....	**40.2**	**1.7**	.....
3041	9.06	2.23	10.31	5.08	66.48	6.84	32.00
3183	9.41	2.50	10.63	5.54	64.50	7.42	32.00
....	....	....	**9.50**	....	.....	**7.00**	.....
3034	8.80	2.70	11.38	5.05	65.65	6.42	33.00
3072	9.26	2.45	10.88	4.90	65.90	6.61	34.00
3117	9.45	2.55	11.13	4.98	65.51	6.38	30.00
....	....	....	**10.00**	....	.....	**7.00**	.....
3049	9.14	2.68	10.88	5.08	65.75	6.47	32.00
3075	8.88	2.53	10.63	4.90	65.21	7.85	32.00
3102	10.15	2.53	10.63	3.80	65.04	7.85	32.00
....	....	....	**9.50**	....	.....	**7.50**	.....
3149	9.77	3.03	11.63	5.05	62.93	7.59	35.00
....	....	....	**11.00**	....	.....	**7.00**	.....
3020	9.38	2.59	11.25	5.05	63.47	8.26	31.00
....	....	....	**10.00**	....	.....	**7.50**	.....
3152	9.11	2.82	10.94	5.30	65.28	6.55	34.00
....	....	....	**10.00**	....	.....	**6.00**	.....
3044	8.54	2.82	11.56	4.79	65.79	6.50	**31.00**
3115	9.79	2.73	11.25	5.03	64.89	6.31	33.00
3144	8.95	2.75	11.38	3.93	66.75	6.24	34.00
...	....	....	**10.00**	....	.....	**5.00**	.....

TABLE IV.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
	MAIZE PRODUCTS.—*Continued.*	
	Hominy Feed.—Continued.	
3089	Mystic Milling Co., Sioux City, Ia.	*New Milford:* G. T. Soule
		Guaranty
3065	Patent Cereal Co., Geneva, N. Y.	*Greenwich:* J. P. Johnstone
		Guaranty
3189	Blue Ribbon. J. E. Soper Co., Boston	*Norwich:* Chas. Slosberg
		Guaranty
3154	Acme. Suffern-Hunt Mills, Decatur, Ill.	*Rockville:* Edward White
		Guaranty
		Average guaranty of all
		Average of these 18 analyses
		Average digestible
	Hominy Feed and Corn Cob.	
3108	Star Feed. Toledo Elevator Co., Indianapolis, Ind.	*Winsted:* Platt & Coe
		Guaranty
	Corn Meal.	
3057	Ground by E. L. Oviatt, Milford	
3100	Ground by A. P. Curtiss, Norfolk	
		Average of these 2 analyses
		Average digestible
	RYE PRODUCTS.	
3133	Feed. H. D. Stone Co., Rochester, N. Y.	*Unionville:* F. D. Lawton & Son
3138	Feed. Washburn-Crosby Co., Minneapolis, Minn.	*Hartford:* G. M. White & Co.
3150	Middlings. " " " " "	*So. Manchester:* G. W. Strant
3163	Middlings. Miner-Hillard Mill. Co., Wilkesbarre, Pa.	*Willimantic:* H. A. Bugbee
3168	Feed. Boutwell Milling and Grain Co., Troy, N. Y.	*New Haven.* Crittenden-Benham Co.
	BUCKWHEAT PRODUCTS.	
3199	Middlings. Quinebaug Grist Mill, Danielson	*Danielson*
		Guaranty
	BREWERY AND DISTILLERY PRODUCTS.	
	Malt Sprouts.	
3040	Milwaukee Grains and Feed Co., Milwaukee, Wis.	*Hamden:* I. W. Beers
		Guaranty
		Digestible
	Dried Brewers' Grains.	
3058	Bull Brand. Farmers Feed Co., New York	*Norwalk:* Holmes, Keeler & Kent Co.
3091	" " " " " " "	*New Milford:* G. T. Soule
		Average guaranty
3039	Crown. Milwaukee Grains and Feed Co., Milwaukee, Wis.	*Hamden:* I. W. Beers
3184	Crown. Milwaukee Grains and Feed Co., Milwaukee, Wis.	*Yantic:* A. R. Manning
		Average guaranty
3012	*Providence Brewing Co., Providence, R. I.	*Branford:* S. V. Osborn
3083	" " " " "	*Danbury.* F. C. Benjamin & Co.
3146	" " " " "	*Thompsonville:* G. C. Phelps
		Average guaranty
		Average of these 7 analyses
		Average digestible

* Statement of dealer.

SAMPLED IN 1913—*Continued.*

Station No.	Pounds per Hundred. Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	Price per ton.
3089	9.21	2.25	10.69	4.95	66.74	6.16	34.00
	....	....	**11.00**	....	.....	**7.00**	.....
3065	10.21	2.60	10.75	5.10	64.54	6.80	36.00
	....	....	**10.00**	....	.....	**7.00**	.....
3189	8.09	2.78	11.25	5.03	66.52	6.33	33.00
	....	....	**10.00**	....	.....	**7.00**	.....
3154	9.24	2.65	10.94	4.80	64.69	7.68	32.00
	....	....	**9.30**	....	.....	**7.10**	.....
	....	....	**9.94**	....	.....	**6.73**	.....
	9.25	**2.62**	**11.01**	**4.91**	**65.31**	**6.90**	**32.78**
	....	....	**7.2**	**3.3**	**58.1**	**6.3**	.....
3108	9.02	2.13	8.25	10.00	64.85	5.75	33.00
	....	....	**7.00**	....	.....	**5.50**	.....
3057	11.35	1.18	9.06	2.08	73.22	3.11	34.00
3100	11.63	1.19	9.69	1.90	71.89	3.70	35.00
	11.49	**1.18**	**9.38**	**1.99**	**72.55**	**3.41**	**34.50**
	....	....	**6.3**	....	**66.7**	**3.1**	.....
3133	10.68	3.18	15.31	4.53	63.38	2.92	31.00
3138	10.75	3.60	17.81	5.33	59.39	3.12	27.00
3150	11.03	4.40	17.31	6.00	57.69	3.57	33.00
3163	10.89	3.60	16.25	3.83	62.09	3.34	29.00
3168	10.20	3.58	16.00	4.15	62.85	3.22	28.75
3199	10.68	3.65	23.25	20.03	36.68	5.71	32.00
	....	....	**32.75**	....	.....	**8.14**	.....
3040	9.74	7.05	26.69	12.08	43.13	1.31	26.00
	....	....	**25.00**	....	.....	**2.00**	.....
	....	....	**21.4**	**4.1**	**29.8**	**1.3**	.....
3058	7.66	3.39	27.00	13.13	42.15	6.67	30.00
3091	7.78	3.04	29.25	12.03	40.70	7.20	28.00
	....	....	**27.23**	....	.....	**6.30**	.....
3039	7.45	3.38	29.13	10.43	43.23	6.38	28.00
3184	7.65	3.33	27.75	14.63	40.62	6.02	28.00
	....	....	**25.00**	....	.....	**5.00**	.....
3012	7.16	3.47	28.63	14.03	41.11	5.60	28.00
3083	7.89	3.38	25.88	13.78	43.21	5.86	28.00
3146	7.26	3.60	26.56	15.03	41.26	6.29	30.00
	....	....	**25.00**	....	.....	**5.00**	.....
	7.55	**3.37**	**27.74**	**13.30**	**41.75**	**6.29**	**28.57**
	....	....	**22.5**	**6.5**	**23.8**	**5.6**	.....

TABLE IV.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand	Retail Dealer.
	BREWERY AND DISTILLERY PRODUCTS.—*Continued.*	
	Dried Distillers' Grains.	
3101	Ajax Flakes. Ajax Mill. and Feed Co., Hammond, Ind.	*New Hartford:* Wallace Case.
		Guaranty
		Digestible
3193	Buckeye Gluten Feed. The Dewey Bros. Co., Blanchester, O.	*Meriden:* A. Grulich
		Guaranty
		Digestible
3054	Eagle 3D Grains. The Dewey Bros. Co., Blanchester, O.	*Bridgeport:* Vincent Bros.
3103	Eagle 3D Grains. The Dewey Bros. Co., Blanchester, O.	*Winsted:* E. Manchester & Sons
3131	Eagle 3D Grains. The Dewey Bros. Co., Blanchester, O.	*Bristol:* Goodsell Bros.
		Average guaranty
		Average of these 3 analyses
		Average digestible
3016	Hiquality Spirits Grains. Donahue-Stratton Co., Milwaukee, Wis.	*East Haven:* F. A. Forbes
		Guaranty
		Digestible
	MISCELLANEOUS FEEDS.	
	**Alfalfa Feeds.*	
3023	Pioneer Alfalfa Meal. Kornfalfa Feed Mill. Co., Kansas City, Mo.	*North Haven:* Coöperative Feed Co.
		Guaranty
3106	Alfalfa. Park & Pollard Co., Boston	*Winsted:* E. Manchester & Sons
		Guaranty
	**Dried Beet Pulp.*	
3043	Continental Sugar Co., Findlay, O.	*Cheshire:* G. W. Thorpe
3161	Menominee River Sugar Co., Menominee, Mich.	*Willimantic:* H. A. Bugbee
3177	Michigan Sugar Co., Saginaw, Mich.	*Westerly:* C. W. Campbell Co.
3114	Owosso Sugar Co., Lansing, Mich.	*Torrington:* F. U. Wadhams
3173	West Bay City Sugar Co., Bay City, Mich.	*Middletown:* Meech & Stoddard.
		Average guaranty
		Average of these 5 analyses
		Average digestible
	PROPRIETARY MIXED FEEDS.	
	Corn and Oat Feeds, and Chop Feeds.	
3052	Bufceco Chop Feed. Buffalo Cereal Co., Buffalo, N. Y.	*Shelton:* Ansonia Flour & Grain Co.
		Guaranty
3098	Provender. Ground by A. P. Curtiss, Norfolk.	
3188	Haskell's Stock Feed. W. H. Haskell & Co., Toledo, O.	*Norwich:* Chas. Slosberg
		Guaranty
3015	De-Fi Feed. The H. O. Co., Buffalo, N. Y.	*Guilford:* Norton & Roberts
		Guaranty
3136	Imperial Steam-Cooked Feed. Imperial Grain and Mill. Co., Toledo, O.	*Hartford:* Trout Brook Ice & Feed Co.
		Guaranty

* See also Molasses Feeds, page 330.

SAMPLED IN 1913—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	
3101	7.24	2.73	30.63	11.75	36.02	11.63	35.00
....	....	....	**30.00**	.....	.....	**11.00**	.....
....	....	....	**22.4**	**11.2**	**29.2**	**11.0**	.....
3193	9.85	3.50	19.69	13.03	50.25	3.68	25.00
....	....	....	**20.00**	.....	.....	**5.00**	.....
....	....	....	**14.4**	**12.4**	**40.7**	**3.5**	.....
3054	7.18	5.03	28.13	7.90	38.32	13.44	25.00
3103	7.10	4.57	27.51	8.80	38.64	13.38	34.00
3131	6.03	1.70	31.88	13.73	32.98	13.68	35.00
....	....	....	**30.00**	.....	.....	**10.00**	.....
....	**6.77**	**3.77**	**29.17**	**10.14**	**36.65**	**13.50**	.....
....	....	....	**21.3**	**9.6**	**29.7**	**12.8**	.....
3016	6.17	1.54	35.94	10.80	30.51	15.04	35.00
....	....	....	**30.00**	.....	.....	**10.00**	.....
....	....	....	**26.1**	**10.3**	**28.7**	**14.3**	.....
3023	8.52	9.55	15.63	26.53	36.76	3.01	32.00
....	....	....	**12.00**	.....	.....	**1.00**	.....
3106	7.46	9.40	14.50	30.63	36.17	1.84	32.00
....	....	....	**12.00**	.....	.....	**1.50**	.....
3043	8.81	3.23	8.75	19.43	58.86	0.92	31.00
3161	7.38	2.68	8.19	19.58	61.58	0.59	29.00
3177	9.15	3.05	7.94	20.39	58.20	1.27	30.00
3114	8.68	2.95	8.50	19.73	59.41	0.73	29.00
3173	7.26	3.20	8.69	19.78	60.18	0.89	29.00
....	....	....	**8.00**	.....	.....	**0.50**	.....
....	**8.26**	**3.02**	**8.41**	**19.78**	**59.65**	**0.88**	**29.60**
....	....	....	**5.4**	**16.6**	**54.3**	.....	.....
3052	8.38	3.39	9.06	10.60	63.61	4.96	31.00
....	....	....	**7.00**	.....	.....	**3.00**	.....
3098	12.09	1.63	10.00	3.68	68.55	4.05	35.00
3188	7.58	3.80	9.88	8.75	63.16	6.83	33.00
....	....	....	**8.00**	.....	.....	**4.00**	.....
3015	9.28	3.50	9.00	14.75	60.14	3.33	30.00
....	....	....	**8.00**	.....	.....	**3.00**	.....
3136	9.93	1.70	9.50	3.58	71.00	4.29	40.00
....	....	....	**9.00**	.....	.....	**4.00**	.....

TABLE IV.—ANALYSES OF COMMERCIAL FEEDS

SAMPLED IN 1913—*Continued.*

Station No.	Brand.	Retail Dealer.	Pounds per Hundred.						Price per ton.
			Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	
	PROPRIETARY MIXED FEEDS.—*Continued.*								
	Corn and Oat Feeds, and Chop Feeds.—Continued.								
3174	Korn-Oato Feed. Meech & Stoddard, Middletown	*Middletown:* Meech & Stoddard.	8.96	3.38	7.31	14.38	62.59	3.38	28.00
		Guaranty	....	....	**7.00**	.....	.....	**3.00**	.....
3197	Mystic Feed. Mystic Mill. and Feed Co., Rochester, N. Y.	*Danielson:* Young Bros. Co.	8.85	3.55	9.69	11.13	62.61	4.17	32.00
		Guaranty	....	....	**8.00**	.....	.....	**3.00**	.....
3151	Boss Feed. Quaker Oats Co., Chicago	*So. Manchester:* G. W. Strant.	9.25	2.85	8.38	9.53	66.42	3.57	33.00
		Guaranty	....	....	**8.00**	.....	.....	**3.00**	.....
3192	Victor Feed. Quaker Oats Co., Chicago	*New Haven:* R. G. Davis	8.82	4.43	9.00	11.33	61.60	4.82	31.00
		Guaranty	....	....	**8.00**	.....	.....	**3.00**	.....
	Wheat and Corn Cob Feeds.								
3172	Holstein Feed. Indiana Milling Co., Terre Haute, Ind.	*Middletown:* Meech & Stoddard.	8.88	4.75	11.38	18.43	52.98	3.58	24.00
		Guaranty	....	....	**12.00**	.....	.....	**3.00**	.....
3109	Sterling Feed. Indiana Milling Co., Terre Haute, Ind.	*Winsted:* Platt & Coe	9.02	3.55	10.06	16.08	58.13	3.16	28.00
3157	Sterling Feed. Indiana Milling Co., Terre Haute, Ind.	*Broad Brook:* Broad Brook Mill. Co.	9.27	3.75	10.50	16.48	56.81	3.19	26.00
		Average guaranty	....	....	**9.80**	.....	.....	**2.75**	.....
3029	Kennebec Feed. J. E. Soper Co., Boston	*Meriden:* A. Grulich	9.24	3.65	9.63	16.45	58.13	2.90	28.00
		Guaranty	....	....	**9.80**	.....	.....	**2.75**	.....
		Average of these 4 analyses	**9.10**	**3.93**	**10.39**	**16.86**	**56.51**	**3.21**	**26.50**
		Average digestible	....	....	**6.5**	**4.7**	**40.1**	**3.0**	.....
	**Horse Feeds.*								
3036	Bufceco Horse Feed. Buffalo Cereal Co., Buffalo, N. Y.	*Meriden:* Meriden Grain & Feed Co.	9.16	3.69	11.38	9.88	61.00	4.89	34.00
3140	Bufceco Horse Feed. Buffalo Cereal Co., Buffalo, N. Y.	*Hartford:* G. M. White & Co.	8.78	3.48	11.25	9.70	62.19	4.60	32.00
		Average guaranty	....	....	**10.00**	....	.....	**4.00**	.....
		Average of these 2 analyses	**8.97**	**3.58**	**11.32**	**9.79**	**61.59**	**4.75**	**33.00**
3077	Algrane Horse Feed. The H. O. Co., Buffalo, N.Y.	*Ridgefield:* S. D. Keeler	8.92	3.95	13.25	9.33	60.52	4.03	36.00
		Guaranty	....	....	**11.00**	....	.....	**4.00**	.....
3062	Hatch's Horse Feed. Holmes, Keeler, Kent Co., So. Norwalk	*So. Norwalk.*	9.79	2.90	11.81	9.05	62.73	3.72	33.00
		Guaranty	....	....	**14.00**	.....	.....	**4.00**	.....
3042	†Peter's Arab Horse Feed. Peter's Mill. Co., Omaha, Neb.	*Cheshire:* G. W. Thorpe	10.99	4.33	10.50	7.60	64.48	2.10	40.00
		Guaranty	....	....	**9.00**	....	.....	**2.00**	.....
3181	Schumacher's Special Horse Feed. Quaker Oats Co., Chicago	*New London:* P. Schwartz Co.	9.58	2.78	9.38	9.13	66.01	3.12	33.00
		Guaranty	....	....	**9.25**	....	.....	**3.25**	.....
	**Dairy and Stock Feeds.*								
3080	Calf Meal. Blatchford's Calf Meal Factory, Waukegan, Ill.	*Ridgefield:* S. D. Keeler	10.75	5.08	26.13	6.80	46.16	5.08	70.00
		Guaranty	....	....	**24.00**	....	.....	**5.00**	.....
3121	Bufceco Creamery Feed. Buffalo Cereal Co., Buffalo, N. Y.	*Thomaston:* L. E. Blackmer.	8.47	4.20	19.75	9.48	52.56	5.54	36.00
		Guaranty	....	....	**18.00**	....	.....	**4.00**	.....
3122	Bufceco Stock Feed. Buffalo Cereal Co., Buffalo, N. Y.	*Thomaston:* L. E. Blackmer.	9.32	3.43	10.19	8.50	64.06	4.50	34.00
		Guaranty	....	....	**8.00**	....	.....	**4.00**	.....
3026	Unicorn Dairy Ration, Chapin & Co., Hammond, Ind.	*Wallingford:* E. E. Hall	7.21	5.65	26.00	10.15	45.55	5.44	33.00
		Guaranty	....	....	**26.00**	....	.....	**5.50**	.....
3047	Wirthmore Balanced Ration. Chas. M. Cox Co., Boston	*Plainville:* Eaton Bros.	8.72	5.45	25.50	8.63	46.47	5.23	35.00
3145	Wirthmore Balanced Ration. Chas. M. Cox Co., Boston	*Thompsonville:* G. C. Phelps	8.74	5.80	25.25	8.93	45.70	5.58	35.00
		Average guaranty	....	....	**25.25**	....	.....	**5.10**	.....
		Average of these 2 analyses	**8.73**	**5.62**	**25.38**	**8.78**	**46.08**	**5.41**	**35.00**

* See also Molasses Feeds, page 330.

† On tag "Arab Balanced Horse Ration, G. E. Rarig, New York."

TABLE IV.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
	PROPRIETARY MIXED FEEDS.—*Continued.*	
	Dairy and Stock Feeds.—Continued.	
3179	Wirthmore Stock Feed. Chas. M. Cox Co., Boston	*Mystic:* Mystic Grain Co.
		Guaranty
3143	White Cross Stock Feed. Albert Dickinson Co., Chicago	*Hartford:* Smith, Northam Co.
		Guaranty
3164	Grandin's Stock Feed. H. Grandin Mill. Co., Jamestown, N. Y.	*New Haven.* Crittenden-Benham Co.
		Guaranty
3078	Algrane Milk Feed. The H. O. Co., Buffalo, N. Y.	*Ridgefield:* S. D. Keeler
		Guaranty
3046	New England Stock Feed. The H. O. Co., Buffalo, N. Y.	*Plainville:* Eaton Bros.
3127	New England Stock Feed. The H. O. Co., Buffalo, N. Y.	*Watertown:* M. D. Leonard Co.
		Average guaranty
		Average of these 2 analyses
3033	Larro-feed for Dairy Cows. Larrowe Mill. Co., Detroit, Mich.	*Meriden:* Meriden Grain & Feed Co.
3048	Larro-feed for Dairy Cows. Larrowe Mill. Co., Detroit, Mich.	*Plainville:* F. B. Newton
3061	Larro-feed for Dairy Cows. Larrowe Mill. Co., Detroit, Mich.	*Norwalk:* Holmes, Keeler, Kent Co.
		Average guaranty
		Average of these 3 analyses
3175	M. & S. Stock Feed. Meech & Stoddard, Middletown	*Middletown*
		Guaranty
3180	Yellow Tag Stock Feed. Miner-Hillard Mill. Co., Wilkesbarre, Pa.	*New London:* P. Schwartz Co.
		Guaranty
3018	Maz-All Feed. Quaker Oats Co., Chicago, Ill.	*East Haven:* F. A. Forbes
		Guaranty
3030	Schumacher's Calf Meal. Quaker Oats Co., Chicago	*Meriden:* A. Grulich
		Guaranty
3022	Schumacher's Stock Feed. Quaker Oats Co., Chicago	*North Haven:* Coöperative Feed Co.
3073	Schumacher's Stock Feed. Quaker Oats Co., Chicago	*Stamford:* W. L. Crabb
3084	Schumacher's Stock Feed. Quaker Oats Co., Chicago	*Danbury:* F. C. Benjamin & Co.
		Average guaranty
		Average of these 3 analyses
3050	Biles Ready Dairy Ration (Union Grains). Ubiko Mill. Co., Cincinnati, O.	*Southington:* Lumber & Feed Co.
3094	Biles Ready Dairy Ration (Union Grains). Ubiko Mill. Co., Cincinnati, O.	*Canaan:* Ives & Pierce
		Average guaranty
		Average of these 2 analyses
	Molasses Feeds.	
3171	Allneeda Horse and Mule Feed. Allneeda Mills, E. St. Louis, Ill.	*Middletown:* Meech & Stoddard
		Guaranty
3056	Sucrene Dairy Feed. American Milling Co., Peoria, Ill.	*Milford:* E. L. Oviatt

SAMPLED IN 1913—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	
3179	8.22	3.28	10.25	8.90	62.47	6.88	31.00
....	....	....	**9.00**	....	.....	**4.00**	.....
3143	10.52	3.68	11.00	4.88	66.53	3.39	37.00
....	....	....	**10.00**	....	.....	**3.50**	.....
3164	7.42	4.65	9.38	11.08	61.95	5.52	31.00
....	....	....	**8.50**	....	.....	**3.50**	.....
3078	8.67	5.23	17.63	12.28	52.12	4.07	36.00
....	....	....	**14.00**	....	.....	**4.00**	.....
3046	8.24	4.03	10.88	9.15	62.78	4.92	32.00
3127	8.40	4.43	10.63	8.85	62.46	5.23	32.00
....	....	....	**9.00**	....	.....	**4.00**	.....
....	**8.32**	**4.23**	**10.76**	**9.00**	**62.62**	**5.07**	**32.00**
3033	8.36	5.35	20.75	12.63	49.22	3.69	36.00
3048	8.28	5.08	20.00	13.00	49.64	4.00	35.00
3061	8.49	4.90	19.38	13.42	49.90	3.91	34.00
....	....	....	**19.00**	....	.....	**3.00**	.....
....	**8.38**	**5.11**	**20.04**	**13.02**	**49.58**	**3.87**	**35.00**
3175	8.79	3.28	9.50	9.78	63.07	5.58	30.00
....	....	....	**9.00**	....	.....	**3.00**	.....
3180	8.51	3.05	10.00	8.58	64.87	4.99	30.00
....	....	....	**9.00**	....	.....	**3.00**	.....
3018	7.67	2.83	8.31	1.43	78.27	1.49	28.00
....	....	....	**9.50**	....	.....	**1.40**	.....
3030	8.89	3.58	16.88	2.25	60.20	8.20	35.00
....	....	....	**19.00**	....	.....	**8.00**	.....
3022	8.18	3.58	11.25	11.63	60.72	4.64	30.00
3073	8.92	3.95	11.38	9.00	62.59	4.16	32.00
3084	9.33	4.20	11.25	9.75	61.39	4.08	30.00
....	....	....	**10.00**	....	.....	**3.25**	.....
....	**8.81**	**3.91**	**11.29**	**10.13**	**61.57**	**4.29**	**30.67**
3050	8.11	5.43	24.13	10.88	45.35	6.10	35.00
3094	8.47	4.58	24.00	9.70	46.54	6.71	35.00
....	....	....	**24.00**	....	.....	**7.00**	.....
....	**8.29**	**5.00**	**24.07**	**10.29**	**45.94**	**6.41**	**35.00**
3171	10.22	7.26	9.00	12.40	59.20	1.92	33.00
....	....	....	**10.00**	....	.....	**3.50**	.....
3056	9.88	7.93	16.56	13.00	46.39	6.24	31.00

TABLE IV.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
	PROPRIETARY MIXED FEEDS.—*Continued.*	
	Molasses Feeds.—Continued.	
3097	Sucrene Dairy Feed. American Milling Co., Peoria, Ill.	*Canaan:* Ives & Pierce
		Average guaranty
		Average of these 2 analyses
3068	Braue's Mixed Feed with Molasses. J. D. Braue, Jordan, N. Y.	*New Canaan:* C. H. Fairty
		Guaranty
3155	Peerless Dairy Feed. Clover Leaf Mill. Co., Buffalo, N. Y.	*Rockville:* Edward White
		Guaranty
3067	Alfalfa and Molasses. Commonwealth Feed Mills Co., St. Louis	*Greenwich:* J. P. Johnstone
		Guaranty
3063	Missouri Horse and Mule Feed. Commonwealth Feed Mills Co., St. Louis	*Greenwich:* J. P. Johnstone
		Guaranty
3093	Boggs Competition Horse Feed. Faramel Mfg. Co., Buffalo, N. Y.	*New Milford:* Geo. E. Ackley Co.
		Guaranty
3190	H. & S. Horse, Mule and Dairy Feed. Dwight E. Hamlin & Co., Pittsburg, Pa.	*New Haven:* R. G. Davis & Sons
		Guaranty
3137	Husted Molasses Feed. Husted Milling Co., Buffalo, N. Y.	*Hartford:* Trout Brook Ice & Feed Co.
		Guaranty
3013	Dried Beet Pulp and Molasses. Michigan Sugar Co., Alma, Mich.	*Branford:* S. V. Osborn
3090	Dried Beet Pulp and Molasses. Michigan Sugar Co., Croswell, Mich.	*New Milford:* G. T. Soule
		Average guaranty
		Average of these 2 analyses
3038	Molassine Meal. The Molassine Co., Boston	*Hamden:* I. W. Beers
3129	" " " " " "	*New Britain:* Stanley Svea Co.
		Average guaranty
		Average of these 2 analyses
3135	Alfalfa Meal and Syrup. Omaha Alfalfa Mill. Co., Omaha, Neb.	*Hartford:* Trout Brook Ice & Feed Co
		Guaranty
3123	June Pasture Alfalfa Meal with Molasses. M. C. Peters Mill. Co., Omaha, Neb.	*Waterbury:* Spencer Grain Co.
		Guaranty
3124	Peters' King Corn Sugar Feed. M. C. Peters Mill. Co., Omaha, Neb.	*Waterbury:* Spencer Grain Co.
		Guaranty
3086	Green Cross Molasses Horse Feed. Quaker Oats Co., Chicago	*Danbury:* O. H. Meeker, Est.
		Guaranty
3087	Quaker Molasses Dairy Feed. Quaker Oats Co., Chicago	*Danbury:* O. H. Meeker, Est.
3113	Quaker Molasses Dairy Feed. Quaker Oats Co., Chicago	*Torrington:* F. U. Wadhams
		Guaranty
		Average of these 2 analyses
3166	Purina Dairy Feed. Ralston Purina Co., St. Louis	*New Haven:* Crittenden-Benham Co.
		Guaranty
3167	Purina Molasses Feed, " " " "	*New Haven:* Crittenden-Benham Co.
		Guaranty

SAMPLED IN 1913—*Continued.*

Station No.	Pounds per Hundred. Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	Price per ton.
3097	9.54	8.06	16.50	12.58	48.17	5.15	29.00
....	....	....	**16.50**	.....	.....	**3.50**	.....
....	**9.71**	**8.00**	**16.53**	**12.79**	**47.27**	**5.70**	**30.00**
3068	9.75	7.36	8.50	7.33	65.03	2.03	34.00
....	....	....	**12.00**	.....	.....	**4.00**	.....
3155	10.95	7.56	20.00	10.08	47.71	3.70	30.00
....	....	....	**21.00**	.....	.....	**7.00**	.....
3067	10.06	8.64	10.38	20.15	49.83	0.94	34.00
....	....	....	**10.00**	.....	.....	**0.70**	.....
3063	11.09	5.32	10.00	14.50	55.07	4.02	36.00
....	....	....	**10.00**	.....	.....	**2.40**	.....
3093	11.03	2.88	11.00	4.60	67.21	3.28	38.00
....	....	....	**9.00**	.....	.....	**3.00**	.....
3190	8.68	8.12	16.38	11.25	51.36	4.21	36.00
....	....	....	**14.00**	.....	.....	**3.50**	.....
3137	10.02	6.84	22.69	7.65	48.79	4.01	34.00
....	....	....	**18.00**	.....	.....	**4.00**	.....
3013	9.36	3.74	8.88	17.80	59.51	0.71	28.00
3090	9.08	4.57	9.06	17.15	59.38	0.76	28.00
....	....	....	**9.00**	.....	.....	**0.50**	.....
....	**9.22**	**4.15**	**8.97**	**17.47**	**59.45**	**0.74**	**28.00**
3038	15.59	8.15	*9.00	5.83	60.69	0.74	40.00
3129	17.99	7.46	*8.19	6.65	58.99	0.72	40.00
....	....	....	**7.00**	.....	.....	**0.05**	.....
....	**16.79**	**7.81**	**8.60**	**6.24**	**59.83**	**0.73**	**40.00**
3135	10.08	9.43	10.31	16.20	53.22	0.76	32.00
....	....	....	**11.00**	.....	.....	**1.00**	.....
3123	10.34	9.70	12.75	18.83	47.53	0.85	39.00
....	....	....	**10.00**	....	.....	**0.50**	.....
3124	10.77	6.33	11.25	12.38	57.32	1.95	36.00
....	....	....	**9.00**	....	.....	**1.50**	.....
3086	10.24	4.93	10.63	10.50	60.83	2.87	35.00
....	....	....	**10.00**	....	.....	**3.00**	.....
3078	11.37	6.72	16.69	10.85	49.57	4.80	28.00
3113	9.87	7.48	15.81	12.65	49.47	4.72	29.00
....	....	....	**16.00**	....	.....	**4.00**	.....
....	**10.62**	**7.10**	**16.25**	**11.75**	**49.52**	**4.76**	**28.50**
3166	8.82	7.59	19.06	17.38	43.91	3.24	32.00
....	....	....	**16.50**	....	.....	**3.00**	.....
3167	11.01	5.08	11.38	9.88	60.34	2.31	34.00
....	....	....	**9.00**	....	.....	**1.50**	.....

* See page 315.

TABLE IV.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand	Retail Dealer.
	PROPRIETARY AND MIXED FEEDS.—*Concluded.*	
	Poultry Feeds.	
3053	Bufceco Poultry Feed. Buffalo Cereal Co., Buffalo, N. Y.	*Shelton:* Ansonia Flour & Grain Co.
		Guaranty
3182	Wirthmore Poultry Mash. Chas. M. Cox Co., Boston	*New London:* Beebe & Bragaw.
		Guaranty
3191	Globe Egg Mash. Albert Dickinson Co., Chicago	*New Haven:* R. G. Davis & Sons
		Guaranty
3128	Queen Poultry Mash. Albert Dickinson Co., Chicago	*Waterbury:* H. S. Coe & Co.
3141	Queen Poultry Mash. Albert Dickinson Co., Chicago	*Hartford:* Smith, Northam & Co.
		Average guaranty
		Average of these 2 analyses
3031	Purity Poultry Mash. Wm. S. Hills Co., Boston	*Meriden:* A. Grulich
3196	" " " " " "	*Putnam:* Bosworth Bros.
		Average guaranty
		Average of these 2 analyses
3045	Dry Poultry Mash. The H. O. Co., Buffalo, N. Y.	*Plainville:* Eaton Bros.
3081	" " " " " " "	*Ridgefield:* S. D. Keeler
		Average guaranty
		Average of these 2 analyses
3079	H. O. Poultry Feed. The H. O. Co., Buffalo, N. Y.	*Ridgefield:* S. D. Keeler
		Guaranty
3059	Hatch's Dry Mash. Holmes, Keeler, Kent Co., Norwalk	*Norwalk*
		Guaranty
3176	Poultry Mash. Meech & Stoddard, Middletown.	*Middletown*
		Guaranty
3147	Puritan Growing Mash, Mystic Mill. and Feed Co., Rochester, N. Y.	*Hazardville:* A. D. Bridge's Sons
		Guaranty
3096	Puritan Laying Mash. Mystic Mill. and Feed Co., Rochester, N. Y.	*Canaan:* Ives & Pierce
3148	Puritan Laying Mash. Mystic Mill. and Feed Co., Rochester, N. Y.	*Hazardville:* A. D. Bridge's Sons
		Guaranty
		Average of these 2 analyses
3032	Dry Mash. Park & Pollard Co., Boston	*Meriden:* Meriden Grain & Feed Co.
3076	" " " " " "	*Stamford:* H. M. Kent Co.
		Guaranty
		Average of these 2 analyses
3035	Growing Feed. Park & Pollard Co., Boston	*Meriden:* Meriden Grain & Feed Co.
		Guaranty
3165	Chicken Chowder Feed. Purina Mills, St. Louis	*New Haven:* Crittenden-Benham Co.
		Guaranty
3082	American Poultry Food. Quaker Oats Co., Chicago	*Danbury:* Keeler Grain Co.
		Guaranty
3064	V-B. Mash for Laying Hens. Vincent Bros., Bridgeport	*Greenwich:* J. P. Johnstone
		Guaranty

SAMPLED IN 1913—*Concluded.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Crude Fat.)	
3053	8.82	3.10	16.50	5.83	60.35	5.40	40.00
....	....	....	**15.00**	....	.....	**4.00**	.....
3182	9.78	3.85	14.13	6.85	62.02	3.37	42.00
....	....	....	**12.00**	....	.....	**3.00**	.....
3191	9.76	5.90	18.25	6.55	55.13	4.41	43.00
....	....	....	**16.00**	....	.....	**3.00**	.....
3128	9.20	7.00	11.00	6.73	62.46	3.61	42.00
3141	10.39	3.23	11.25	6.10	65.66	3.37	42.00
....	....	....	**11.00**	....	.....	**2.50**	.....
....	**9.79**	**5.11**	**11.13**	**6.41**	**64.07**	**3.49**	**42.00**
3031	8.83	8.08	17.13	9.80	51.44	4.72	45.00
3196	8.60	11.08	20.44	6.00	48.26	5.62	42.00
....	....	....	**17.00**	....	.....	**4.00**	....
....	**8.71**	**9.58**	**18.79**	**7.90**	**49.85**	**5.17**	**43.50**
3045	9.00	3.75	19.13	11.78	52.86	3.48	40.00
3081	9.80	4.60	14.94	11.28	55.96	3.42	45.00
....	....	....	**19.00**	....	.....	**3.50**	.....
....	**9.40**	**4.17**	**17.04**	**11.53**	**54.41**	**3.45**	**42.50**
3079	8.73	3.87	17.81	7.65	57.25	4.69	45.00
....	....	....	**17.00**	....	.....	**4.50**	.....
3059	9.81	6.03	17.88	9.08	52.71	4.49	38.00
....	....	....	**16.00**	....	.....	**4.00**	.....
3176	9.26	8.33	22.88	7.38	47.00	5.15	40.00
....	....	....	**12.00**	....	.....	**3.00**	.....
3147	9.96	5.00	22.25	5.99	53.47	3.33	45.00
....	....	....	**14.00**	....	.....	**3.00**	.....
3096	10.84	6.53	22.25	6.40	48.82	5.16	45.00
3148	9.14	7.25	26.13	8.30	44.28	4.90	45.00
....	....	....	**23.00**	....	.....	**7.00**	.....
....	**9.99**	**6.89**	**24.19**	**7.35**	**46.55**	**5.03**	**45.00**
3032	9.35	12.25	22.31	7.68	44.89	3.52	45.00
3076	9.69	11.28	22.13	6.08	47.39	3.43	45.00
....	....	....	**18.00**	....	.....	**3.50**	.....
....	**9.52**	**11.76**	**22.22**	**6.88**	**46.14**	**3.48**	**45.00**
3035	10.25	3.55	15.63	4.52	62.30	3.75	45.00
....	....	....	**10.00**	....	.....	**3.50**	.....
3165	9.07	7.43	20.25	7.93	50.39	4.93	44.00
....	....	....	**17.00**	....	.....	**5.00**	.....
3082	10.46	2.73	13.25	4.35	64.57	4.64	40.00
....	....	....	**12.00**	....	.....	**3.50**	.....
3064	9.69	3.64	20.81	8.70	52.44	4.72	44.00
....	....	....	**21.50**	....	.....	**4.90**	.....

3356, sent by Maine Experiment Station, for check analysis, contained 36.06 per cent. protein.

3554, bought through The Coles Co., Middletown, by J. A. Warner, Tylerville, without guaranty, contained 41.25 per cent. protein.

3553, S. P. Davis, Little Rock, Ark., guaranteed 41 per cent. protein, sent by G. T. Soule, New Milford, contained 39.63 per cent.

WHEAT PRODUCTS. **1818,** *Wheat Feed,* and **2286,** *Wheat Bran,* both sent by W. H. Lee, Orange, contained 18.00 and 15.38 per cent. protein, respectively. Two samples of *Cooked Wheat Feed,* sent by J. W. Varson, Bridgeport, contained 12.88 and 10.88 per cent. protein, and 3.06 and 1.93 per cent. fat, respectively.

CORN PRODUCTS. **2989,** *Buffalo Gluten Feed,* guaranteed 24 per cent. protein, sent by Jewett City Grain Co., Jewett City, contained 24.38 per cent. protein.

3357, *Miner-Hillard's Hominy Feed,* and **3358,** *Wirthmore Hominy Feed,* both sent by R. H. Ensign, Simsbury, without guaranty, contained 9.18 and 9.20 per cent. water, 11.25 and 11.00 per cent. protein, and 6.31 and 6.24 per cent. fat, respectively.

2392, *Corn Flour,* American Hominy Co., Terre Haute, Ind., sent by The Sperry and Barnes Co., New Haven, contained 6.25 per cent. protein.

1655, *Ground Corn Stalks,* sent by F. A. LaPlace, Hamburg, analyzed as follows:

Water	9.12	Fiber	14.74
Ash	4.70	Nitrogen-free extract	61.47
Protein	7.06	Fat	2.91

3362, *Corn Kernels,* sent by L. J. Robertson, Jr., Manchester Green. The field-cured material showed 5,367 lbs. of kernels and 1,482 lbs. per acre. Inasmuch as the kernels contained 20.56 per cent. moisture, the acre yield of dry grain was 4,264 lbs., or 4,958 lbs. on the basis of 14 per cent. moisture.

DISTILLERS' GRAINS. **3551,** Rye Distillers Grains, guaranteed 24 per cent. protein and 11 per cent. fat, sent by Wm. Horwitz, Fairfield, contained 7.45 water, 14.81 protein and 10.71 per cent. fat.

STOCK FEEDS. **1983,** *M. & S. Stock Feed,* made and sent by Meech and Stoddard, Middletown, guaranteed 9 per cent. protein and 3 per cent. fat, contained 6.54 per cent. water, 9.06 protein, 10.82 fiber and 4.84 fat.

2013, *Cremo,* sent by E. E. Hall, Wallingford, without guaranty, contained 19.75 per cent. protein.

BEEF SCRAP. **2010,** Shoemaker and Co., Philadelphia, **2011,** Swift and Co., Newark, N. J., and **2012,** Connecticut Fat Rendering Co., all sent by D. W. Meeker, West Cheshire, contained 57.38, 43.50 and 52.38 per cent. protein, respectively. Their respective guaranties for protein were 55, 50 and 45 per cent., and their selling prices, $3.10, $2.75 and $2.60 per 100 lbs.

GROUND BRUSH. **1656,** sent by F. A. LaPlace, Hamburg, showed the following compositions:

Water	39.30	Fiber	28.33
Ash	1.35	Nitrogen-free extract	27.30
Protein	2.62	Fat	1.10

The analysis of a similar material was reported last year, and it is unnecessary to repeat the comments made at that time.

COCOA SIFTINGS. **2759,** sent by L. M. Lee, New Preston, contained 17.50 per cent. protein and 26.58 per cent. fat. If obtained at a reasonable price this material would appear to have much merit as a stock feed.

PEANUT HEARTS, **2963,** N. E. Vending Co., New Haven, sent by A. B. Hall, Wallingford, contained 3.61 per cent. water, 34.25 per cent. protein and 43.41 per cent. fat. This is an exceedingly rich feed, and is sold at a reasonable price, $2 per hundred pounds.

BAKERY REFUSE. **3340,** *Crackers Refuse,* and **3339,** *Cookies Refuse,* both sent by C. M. Jarvis, Berlin, had the following composition:

	3340	3339
Water	9.03	6.30
Ash	1.62	1.73
Protein	12.69	13.88
Fiber	0.55	0.87
Nitrogen-free extract	72.59	55.75
Fat	3.52	21.47

GRASSES. Two kinds of North Carolina grass, **3332,** with broad leaves, and **3333,** with narrow leaves, both cut when the grass was in seed, were sent by G. D. Howell, Hartford. Their analyses follow:

	3332	3333
Water	6.18	6.61
Ash	8.82	3.56
Protein	6.25	4.69
Fiber	28.25	27.35
Nitrogen-free extract	47.10	55.88
Fat	3.40	1.91

Both grasses are inferior in feeding value to mixed meadow hay.

Meadow Hay, **3508,** sent by D. E. Mills, Bristol, had the following composition:

Water	4.33	Fiber	31.83
Ash	7.33	Nitrogen-free extract	48.34
Protein	5.63	Fat	2.54

A botanical examination of a two-pound sample of this hay showed the following number of heads of the grasses, etc., specified:

48 White bent	2 Bromus secalinus
21 Italian rye grass	1 Panic grass
18 Perennial rye grass	1 Fowl meadow grass
16 Kentucky blue grass	1 Velvet grass
15 Sweet vernal grass	1 Wild oat grass
14 Timothy	1 Rumex acetosella
7 Rhode Island bent	1 Sorrel
7 Orchard grass	2 Ferns
4 Tall oat grass	2 Cruciferous pods
4 Meadow fescue	1 Weeds

The above analysis may not give a correct idea of the composition of the herbage but only represents the species which could be identified by flower or seed at the time of cutting.

Weights of Bagged Feeds.

In answer to complaints as to probable shortages in the net weight of various feeds sold throughout the state, the sampling agent weighed over 200 bags of different feeds at various warehouses. In all cases the claimed weight was 100 lbs. As far as known the stock had not been on hand over six months. It was not practicable to empty the bags and secure an accurate net weight, so only gross weights are recorded, although an allowance of one pound for the empty bag would probably be reasonably accurate.

No. of Bags.	Feed.	Average Weight.
5	Cotton seed meal	101
10	Cotton seed meal	101.5
10	Linseed meal	99.3
10	Linseed meal	99.6
10	Wheat bran	98.3
10	Wheat bran	99.85
10	Wheat bran	98.85
7	Wheat bran	99.3
10	Wheat middlings	99.35
10	Wheat middlings	99.75
10	Wheat mixed feed	100.35
10	Wheat mixed feed	99.25
5	Wheat mixed feed	101.7
10	Gluten feed	100.4
5	Gluten feed	101.3
5	Gluten feed	99.2
10	Hominy feed	99.8
10	Stock feed	100.05
10	Stock feed	100.6
34	Stock feed	100.6
10	Poultry mash	101.4

Nearly all the tags for cotton seed meal, which we have seen, are marked "100 lbs. gross, 99 lbs. net," while linseed meal tags are usually marked "100 lbs. gross." Such a system of tagging cannot be approved. A guaranteed gross weight is meaningless anyway and it is more than probable, should a purchaser wish a ton of any of the brands thus tagged, that he would receive only 20 bags, or a shortage of 20 lbs. per ton. Furthermore the above tabulation shows that the purchaser of the particular 20 bags of linseed meal would receive only 1,989 lbs. gross, or 1969 lbs. net.

The cotton seed meals weighed showed the weights claimed, but all the other feeds, except one lot of wheat feed, one of gluten feed and one of poultry mash, were short-weight from 0.4 to 2.7 lbs. per 100 pound bag. This shortage was especially marked in two lots of wheat bran.

Microscopical Examination of Feeds.

It does not seem necessary to report year after year the ingredients in well-known feeds which have been on the market for some time. The data given below, therefore, apply only to the feeds which are new this year or which we have not previously examined under the microscope.

Hatch's Horse Feed contains corn and oat products, and small amounts of a wheat product and cotton seed meal.

Arab Balanced Horse Ration (*Peter's Arab Horse Feed*) contains corn, oats, alfalfa and molasses.

Yellow Tag Stock Feed contains corn and oat products.

Maz-All Feed contains corn by-products; it is essentially a corn feed meal.

Allneeda Horse and Mule Feed contains corn, oats, alfalfa, a wheat product, molasses and salt.

Braue's Mixed Feed with Molasses contains oats, cracked corn, alfalfa and molasses.

Missouri Horse and Mule Feed contains alfalfa, corn, oats, a peanut product, molasses and salt.

Boggs' Competition Horse Feed contains crushed oats, cracked corn, wheat bran and molasses.

H. and S. Horse, Mule and Dairy Feed contains alfalfa, dried brewers' grains, distillery residues and molasses.

Molassine Meal is essentially peat and molasses, with probably fenugreek and traces of unidentified tissues.

Peter's King Corn Sugar Feed contains corn, oats, alfalfa and molasses.

Green Cross Molasses Feed contains corn, oats, cotton seed meal, alfalfa, oat products, molasses and salt.

Purina Dairy Feed contains dried brewers' grains, corn by-products, cotton seed meal, alfalfa, molasses and salt.

H.-O. Dry Poultry Mash contains oats and wheat products, corn, corn by-products and alfalfa.

Hatch's Dry Mash contains wheat bran, alfalfa, oats products and an animal product.

Average Composition of Fodders and Feeds.

The reports of this station from 1878 to the present time contain the analyses of many samples of fodders and feeds. Many of these reports are out of print and as a matter of convenience to feeders the following table of averages has been compiled. It includes 4,178 analyses of 436 different kinds of feeds.

Table V.—Average Composition of Fodders and Feeds.

Analyzed at the Connecticut Experiment Station, 1878–1913.

Number of Analyses.	Material.	Water.	Ash.	Protein [N x 6.25].	Fiber.	Nitrogen-free Extract.	Ether Extract [Fat].
	GRASSES.						
2	Agrostis vulgaris major (Tall Redtop)	66.7	2.0	2.0	11.9	16.6	0.8
2	" " minor (Fine Bent)	65.6	2.4	2.7	11.3	17.2	0.8
2	Andropogon dissitiflorus (Broom Grass)	64.5	1.3	2.2	13.0	18.3	0.7
1	" provincialis (Blue Stem)	73.1	1.6	2.2	8.5	14.0	0.6
1	" scoparius (Broom Grass)	57.1	1.7	1.7	16.2	22.7	0.6
1	Anthoxanthum odoratum (Sweet Vernal)	74.8	1.5	2.6	7.7	12.5	0.9
2	Arrhenatherum avenaceum (Tall Oat)	73.0	1.6	1.9	9.5	13.4	0.6
2	Avena flavescens (Yellow Oat)	68.4	1.5	2.2	10.7	16.4	0.8
1	Chrysopogon nutans (Indian Grass)	67.0	2.0	2.4	10.0	17.0	0.8
2	Dactylis glomerata (Orchard Grass)	73.8	1.6	2.1	9.5	12.2	0.8
1	Festuca ovina (Sheep's Fescue)	71.8	1.9	2.9	10.0	12.7	0.7
3	" pratensis (Meadow Fescue)	70.2	1.8	2.4	10.7	14.2	0.7
1	Glyceria nervata (Nerved Meadow)	74.9	1.8	2.6	8.4	11.8	0.5
1	Panicum agrostoides (Redtop Panic)	65.0	3.6	2.4	10.4	17.9	0.7
1	" crus-galli, v. hispidum (Barnyard grass)	80.5	1.4	1.4	6.8	9.6	0.3
1	" virgatum (Tall Panic)	65.2	1.9	3.7	10.4	18.0	0.8
2	Poa nemoralis (Wood Meadow)	65.5	1.8	3.0	11.8	17.0	0.9
2	" pratensis (Kentucky Blue)	71.4	1.8	2.6	9.4	14.0	0.8
1	" trivialis (Rough-stalked Meadow)	72.8	1.7	2.7	8.2	13.8	0.8
1	Sorghum halapense (Johnson Grass)	68.6	1.7	2.9	9.4	16.5	0.9
12	Corn (Maize) Fodder	83.6	1.1	1.3	4.8	8.9	0.3
1	Soy Bean Fodder	76.5	3.8	3.6	6.5	9.0	0.6
	SILAGE.						
1	Cabbage Silage	87.6	4.2	1.2	1.6	4.5	0.9
1	Clover and Oats Silage	.....	.....	3.5	.....	.....	1.3
6	Corn (Maize) Silage	80.9	1.2	1.5	6.1	9.8	0.4
	HAY AND DRIED COARSE FODDER.						
8	Alfalfa Hay	17.5	7.2	15.1	25.5	33.0	1.7
12	Black Grass Hay (Juncus gerardi)	9.3	7.3	7.9	25.5	47.5	2.5
1	Cat Tails, leaves only (Typha latifolia)	10.8	5.8	7.0	33.6	39.8	3.0
5	Creek Sedge Hay (Spartina stricta, v. glabra)	8.3	10.7	6.6	26.9	45.4	2.1
1	Fresh Water Cord Grass Hay (Spartina cynosuroides)	8.2	6.2	5.6	30.8	47.4	1.8
2	Goose Grass Hay (Triglochin maritima)	8.1	8.6	9.8	30.7	39.8	3.0
1	Larger Three Square (Scirpus olneyi)	9.5	8.2	10.1	25.1	45.3	1.8
6	Meadow Grass Hay (Mixed)	14.2	5.3	8.0	26.2	44.4	1.9
7	Meadow Grasses and Clover Hay	14.9	5.0	10.5	25.2	42.2	2.2
4	Red Salt Grass Hay (Spartina juncea)	9.1	7.5	5.4	26.7	48.7	2.6
1	Sea Club Rush Hay (Scirpus maritimus)	11.2	8.0	9.2	24.7	44.0	2.9
2	Snip Snap (Two Tail) Hay (Eleocharis rostellata)	8.4	10.1	8.8	24.4	45.9	2.4
1	Spike Grass Hay (Distichlis maritima)	9.2	7.0	5.4	26.4	49.4	2.6
2	Swamp Hay	14.3	7.0	7.0	24.7	45.3	1.7
4	Three Square Hay (Scirpus pungens)	8.1	8.3	7.4	25.7	48.0	2.5
6	Timothy Hay (Phleum pratense)	14.2	4.0	6.1	28.5	45.4	1.8

TABLE V.—AVERAGE COMPOSITION OF FODDERS AND FEEDS.—*Continued.*

ANALYZED AT THE CONNECTICUT EXPERIMENT STATION, 1878–1913.

Number of Analyses.	Material.	Water.	Ash.	Protein [N x 6.25].	Fiber.	Nitrogen-free Extract.	Ether Extract [Fat].
	HAY AND DRIED COARSE FODDER.—CONTINUED.						
6	Timothy and Red Top Hay	14.9	5.1	7.0	26.6	44.4	2.0
3	White Bent Hay (Agrostis alba)	7.9	6.8	7.7	26.2	49.3	2.1
2	Wild Rice (Wild Oats) Hay (Zizania aquatica)	9.0	15.6	7.8	28.3	36.8	2.5
1	Wild Rye Grass Hay (Elymus virginicus)	6.9	7.1	7.6	32.0	44.3	2.1
1	Corn Fodder, dried	14.8	4.5	5.8	25.9	47.5	1.5
9	Corn Fodder, field-cured	36.5	2.7	4.2	16.6	38.4	1.6
1	Cornstalks, ground	9.1	4.7	7.1	14.7	61.5	2.9
1	Corn Stover, dried	14.3	4.4	6.5	28.3	45.0	1.5
48	Corn Stover, field-cured	40.6	3.8	3.9	19.9	31.0	0.8
1	Bean Pods and Leaves	6.0	8.8	5.9	26.4	51.9	1.0
1	Bean Stems	4.7	5.5	6.3	44.4	38.4	0.7
1	Buckhorn Fern (*Osmunda regalis*)	14.6	6.1	10.2	21.6	45.1	2.4
1	Carob Bean Husks	14.2	3.2	4.8	4.8	72.8	0.2
1	Millet Hay	14.3	6.5	6.3	27.9	43.6	1.4
1	Oats Hay	13.8	6.3	8.0	33.6	36.2	2.1
1	Pea Hay (*Lathyrus sylvestris*)	10.3	4.3	26.8	26.5	28.3	3.8
3	Rye Hay	10.0	4.4	5.9	38.0	40.4	1.3
1	Rye Straw	9.7	2.8	2.2	43.3	41.0	1.0
1	Wheat Hay	11.3	3.1	4.6	30.3	40.3	1.4
	ROOTS.						
2	Mangolds	92.1	1.0	1.8	0.8	4.2	0.1
1	Potatoes	78.0	1.0	2.2	0.3	18.4	0.1
1	Sugar Beets	84.4	1.1	1.7	0.9	11.8	0.1
1	Sweet Potatoes	73.4	1.1	1.3	0.9	23.0	0.3
1	Turnips	88.9	0.7	1.3	0.9	8.1	0.1
1	Yams	71.2	0.6	2.1	0.7	25.1	0.3
	GRAIN AND OTHER SEEDS.						
1	Beans	15.0	3.1	20.4	3.2	56.7	1.6
2	*Carum copticum* Seed	6.3	9.7	16.9	11.9	24.2	31.0
1	Carob Beans	12.8	3.3	15.0	7.2	59.9	1.8
136	Corn (Maize)	12.8	1.3	10.2	1.3	69.8	4.6
5	Oats	12.1	3.4	12.0	9.0	58.5	5.1
2	Sorghum Seed	15.9	2.0	7.9	2.6	68.2	3.4
3	Soy Beans	10.0	5.2	34.3	5.4	27.2	17.9
	OIL CAKE PRODUCTS.						
1	Cotton Seed Bran	12.0	2.2	6.4	30.8	47.3	1.3
6	Cotton Seed Feed Meal	9.5	4.3	20.7	22.1	39.0	4.4
2	" " " " (Royal Feed)	8.2	4.1	20.9	25.6	37.1	4.1
205	Cotton Seed Meal	8.5	6.5	41.9	7.7	26.4	9.0
4	Cotton Seed Meal, undecorticated	10.0	5.0	24.0	18.5	35.5	7.0
5	Flax Feed or Flakes	9.9	6.9	16.6	10.9	41.1	14.6
1	Flax Meal	11.2	5.2	40.4	7.6	32.6	3.0

TABLE V.—AVERAGE COMPOSITION OF FODDERS AND FEEDS.—*Continued.*

ANALYZED AT THE CONNECTICUT EXPERIMENT STATION, 1878–1913.

Number of Analyses.	Material.	Water.	Ash.	Protein [N x 6.25].	Fiber.	Nitrogen-free Extract.	Ether Extract [Fat].
	OIL CAKE PRODUCTS.—CONTINUED.						
51	Linseed Meal, new process	10.6	5.8	37.0	8.5	35.4	2.7
96	Linseed Meal, old process	10.2	5.4	33.9	8.2	35.2	7.1
1	Peanut Bran	10.7	10.0	10.5	43.8	20.2	4.8
1	Peanuts, broken	7.3	6.0	22.9	13.7	17.7	32.4
1	Peanut Hearts	3.6	....	34.3	....	....	43.4
1	Peanut Meal	8.1	....	46.3	....	....	8.9
3	Peanut Refuse	4.0	5.4	24.5	6.1	26.6	33.4
1	Rape Seed Meal	9.5	13.9	21.9	14.4	24.7	15.6
	ALFALFA PRODUCTS.						
12	Alfalfa Feed or Meal	9.1	9.5	15.9	26.6	36.8	2.1
3	Alfalfa and Molasses	10.2	9.2	11.1	18.4	50.2	0.9
1	Alfalfa Screenings	8.0	7.1	30.0	14.9	32.9	7.1
	BARLEY PRODUCTS.						
2	Barley, damaged	9.7	2.2	11.8	5.9	68.5	1.9
3	Barley Feed	10.0	4.4	12.6	10.6	58.6	3.8
2	Barley Screenings	12.2	3.6	12.3	7.3	61.8	2.8
	BUCKWHEAT PRODUCTS.						
4	Buckwheat Feed	10.6	3.4	17.3	23.9	40.4	4.4
3	Buckwheat Flour	15.0	0.9	6.5	0.4	76.2	1.0
3	Buckwheat Hulls or Shucks	10.1	2.3	4.0	44.1	38.6	0.9
17	Buckwheat Middlings or Bran	13.1	4.8	29.4	6.4	38.7	7.6
	CORN PRODUCTS.						
2	Cerealine Feed No. 2	8.9	2.5	12.2	2.8	65.3	8.3
9	Corn Bran, or Sugar Feed	9.1	1.5	12.4	9.3	60.8	6.9
10	Corn Cob	8.3	2.0	3.0	29.7	56.4	0.6
1	Corn and Cob Meal	20.9	2.4	8.2	4.4	60.4	3.7
2	Corn Feed, or Screenings	9.8	1.3	8.9	9.4	68.3	2.3
1	Corn Feed, Glen Cove, wet	62.2	0.3	5.7	1.6	28.9	1.3
1	Corn Flour	13.1	0.6	5.8	0.4	77.6	2.5
2	Corn Germ Feed	9.7	1.5	11.1	10.4	57.4	9.9
4	Corn Germ Meal	9.8	2.7	21.6	9.3	46.3	10.3
101	Corn (Maize) Meal	13.3	1.3	9.6	1.9	70.0	3.9
6	Gluten Feed, Bay State	8.9	1.0	19.3	5.6	60.7	4.5
8	" " Buffalo (early analyses)	8.1	0.8	22.9	7.2	49.1	11.8
109	" " Buffalo (later analyses)	9.5	2.5	25.2	6.7	53.0	3.1
5	" " Cedar Rapids	8.1	1.1	20.8	7.0	57.6	5.4
5	" " Clinton	9.5	1.0	24.0	7.3	54.5	3.7
12	" " Cream of Corn	7.8	3.1	26.1	6.8	53.0	3.2
6	" " Crescent	8.9	4.8	26.2	6.6	51.0	2.5
5	" " Davenport	9.3	1.6	27.8	6.4	51.3	3.6
3	" " Diamond	9.7	2.1	24.9	6.3	53.8	3.2
3	" " Douglas (or Grand Rapids)	8.1	1.2	21.1	7.5	57.5	4.6
4	" " Flint	9.0	0.9	20.4	6.4	59.0	4.3

TABLE V.—AVERAGE COMPOSITION OF FODDERS AND FEEDS.—*Continued.*

ANALYZED AT THE CONNECTICUT EXPERIMENT STATION, 1878–1913.

Number of Analyses.	Material.	Water.	Ash.	Protein [N x 6.25].	Fiber.	Nitrogen-free Extract.	Ether Extract [Fat].
	CORN PRODUCTS.—CONTINUED.						
1	Gluten Feed, Geneva	7.9	1.0	26.2	8.3	52.8	3.8
6	" " Glen Cove	8.2	0.7	26.0	5.2	53.9	6.0
65	" " Globe	9.1	3.0	26.8	7.3	50.8	3.0
1	" " Golden	8.4	0.8	27.3	6.6	53.1	3.8
15	" " Hubinger (K. K.)	8.5	1.3	23.4	7.4	55.8	3.6
1	" " Illinois	11.2	1.0	20.9	6.5	57.3	3.1
2	" " Jenks	8.2	0.8	26.6	6.0	48.7	9.7
2	" " Marshalltown	8.2	2.1	27.7	7.1	51.3	3.6
1	" " Michigan	10.2	0.9	19.5	6.0	57.5	5.9
5	" " National Starch Co	8.7	0.6	25.4	5.9	56.3	3.1
1	" " New England	9.0	1.0	24.9	7.4	54.2	3.5
8	" " Pekin	8.7	1.4	26.2	7.5	52.8	3.4
1	" " Piel Bros	9.3	0.9	23.6	5.7	57.9	2.6
8	" " Queen	9.6	1.3	23.2	6.7	56.6	2.6
3	" " Rockford	8.5	0.8	26.0	6.8	54.5	3.4
4	" " Staley's	9.5	4.0	24.9	6.3	52.4	2.9
2	" " Union	8.7	1.5	23.2	6.9	55.7	4.0
16	" " Warner	9.7	1.7	23.8	7.3	54.3	3.2
7	" " Waukegan	9.2	1.1	26.6	6.8	52.4	3.9
1	" " Western	8.7	1.9	22.6	6.4	57.2	3.2
3	Gluten Meal, Atlas	6.5	1.7	36.6	11.5	28.3	15.4
28	" " Chicago	10.1	1.3	36.3	1.8	47.0	3.5
5	" " Cream (early analyses)	7.8	0.7	36.2	1.4	39.2	14.7
17	" " " (later analyses)	9.8	1.0	35.3	1.7	49.3	2.9
1	" " Diamond	7.9	1.0	41.3	2.4	45.7	1.7
2	" " King (early analyses)	7.7	0.8	33.6	1.6	39.4	16.9
2	" " " (later analyses)	8.8	0.8	33.4	1.6	53.0	2.4
304	Hominy Meal, Feed or Chop	9.6	2.6	10.7	4.6	64.5	8.0
19	Hominy and Corn Cob (Star Chop or Feed)	9.4	2.6	8.9	9.4	63.6	6.1
1	Maizo Red Dog Flour	9.0	2.0	9.8	1.9	70.3	7.0
1	Pop Corn Waste	10.5	1.7	11.6	2.3	69.3	4.6
1	Starch Feed, Glen Cove, wet	66.5	0.3	6.0	2.0	22.5	2.7
1	" " " " " dried	11.2	0.5	21.1	3.2	60.7	3.3
1	" " " kiln-dried	9.2	0.6	17.1	5.7	59.0	8.4
1	Sugar Meal, Buffalo, wet	62.9	0.2	3.3	2.0	27.5	4.1
1	" " " " kiln-dried	11.5	1.2	21.8	5.2	49.2	11.1
	CORN AND OAT PRODUCTS.						
113	Corn and Oats (Provender)	11.3	2.1	10.0	4.8	67.6	4.2
7	Corn and Oat Feeds (no brands)	9.9	3.2	8.1	11.2	63.8	3.8
1	Acme Feed	11.2	2.5	8.0	6.9	67.5	3.9
1	Adrian Chop Feed	8.0	3.2	8.7	7.4	66.8	5.9
16	Boss Corn and Oats (or Chop) Feed	9.7	4.2	8.8	10.4	62.6	4.3
2	Bufceco Chop Feed	8.7	3.3	9.4	9.3	64.2	5.1
12	Buffalo Corn and Oats (or Chop) Feed	9.7	3.2	8.7	9.6	64.5	4.3
2	Champion Bell Fodder	8.9	3.6	9.5	13.2	61.0	3.8
1	Defiance Corn and Oat Feed	9.9	4.4	9.4	13.5	59.6	3.2

TABLE V.—AVERAGE COMPOSITION OF FODDERS AND FEEDS.—*Continued.*

ANALYZED AT THE CONNECTICUT EXPERIMENT STATION, 1878–1913.

Number of Analyses.	Material.	Water.	Ash.	Protein [N x 6.25].	Fiber.	Nitrogen-free Extract.	Ether Extract [Fat].
	CORN AND OAT PRODUCTS.—CONTINUED.						
12	De-Fi Corn and Oat (or De-Fi) Feed	8.7	4.2	8.9	14.5	60.5	3.2
1	Dickinson's Stock Feed	9.7	2.8	7.8	11.5	63.9	4.3
2	Durham Corn and Oat (or Durham) Feed	10.1	4.5	8.3	11.8	60.1	5.2
1	Eclipse Feed	11.1	3.2	9.9	7.7	63.5	4.6
3	Excelsior Corn and Oats (Stock or Chop) Feed	9.8	5.1	8.7	11.2	60.0	5.2
1	Friends Concentrated Dairy Feed	....	....	6.6	....	....	3.1
9	Haskell's Stock Feed	8.3	3.1	9.6	7.4	65.2	6.4
3	Husted Corn and Oats	10.8	2.5	9.6	4.3	68.0	4.8
3	Imperial Steam-cooked Feed	9.2	1.8	9.9	3.3	71.5	4.3
1	Iroquois Chop Feed	8.8	3.2	10.1	8.7	64.2	5.0
6	Korn-Oato	9.2	3.2	7.5	12.3	64.8	3.0
2	Lenox Feed	9.7	2.6	8.4	7.8	68.1	3.4
6	Monarch Chop Feed	10.3	3.1	8.5	9.6	64.5	4.0
2	Mystic Feed	9.4	3.5	10.3	10.0	62.7	4.1
1	Niagara Special Feed	11.4	3.7	8.9	12.6	58.0	5.4
2	Pearl Cooked Horse and Cow Feed	10.2	3.2	10.5	6.3	62.8	7.0
1	Pearl Cooked Oat Feed	9.0	3.1	9.4	7.7	64.7	6.1
1	Quaker Corn and Oat Feed	11.5	2.7	8.0	10.7	63.7	3.4
1	Regal Chop Feed	8.9	3.4	8.6	10.6	64.2	4.3
36	Victor Corn and Oat (or Victor) Feed	9.6	3.7	8.8	11.3	62.7	3.9
2	White Diamond Feed	9.3	2.9	9.0	7.3	68.2	3.3
2	Winner Chop Feed	8.7	3.3	9.3	8.9	63.7	6.1
	OAT PRODUCTS.						
1	Oat Chaff	7.8	7.5	5.1	28.5	49.5	1.6
10	Oat Feed (no brands)	7.8	4.9	9.2	20.0	54.9	3.2
14	Oats, Ground	10.2	3.3	11.8	10.7	59.3	4.7
10	Oat Hulls	6.7	5.9	6.4	24.7	53.2	3.1
4	Oat Middlings	7.7	3.7	18.3	6.2	56.6	7.5
1	Crescent Oat Feed	6.4	5.6	7.3	23.2	54.3	3.2
1	Jim Dandy Feed	7.3	5.6	7.6	23.1	53.8	2.6
2	Joliet Oat Feed	8.8	5.2	8.4	21.2	53.5	2.9
1	Oatena	7.1	4.8	8.8	16.2	59.1	4.0
1	Pillsbury's Oat Feed	8.1	6.9	7.1	24.8	51.1	2.0
6	Quaker Oat Feed	7.6	5.2	11.7	16.8	55.1	3.6
3	Royal Oat Feed	7.7	7.5	6.5	25.3	51.0	2.0
4	Vim Oat Feed	8.5	6.0	8.1	23.4	51.2	2.8
	RICE PRODUCTS.						
2	Rice Bran, or Feed	10.6	8.5	12.3	8.3	48.6	11.7
2	Rice Flour, Refuse	7.7	9.9	10.2	15.8	47.6	8.8
1	Rice, Ground	9.3	0.6	7.8	0.1	81.8	0.4
	RYE PRODUCTS.						
7	Rye Bran	11.8	3.4	15.0	3.1	63.9	2.8
51	Rye Feed	11.6	3.6	15.4	4.0	62.4	3.0

TABLE V.—AVERAGE COMPOSITION OF FODDERS AND FEEDS.—*Continued.*

ANALYZED AT THE CONNECTICUT EXPERIMENT STATION, 1878–1913.

Number of Analyses.	Material.	Water.	Ash.	Protein [N x 6.25].	Fiber.	Nitrogen-free Extract.	Ether Extract [Fat].
	RYE PRODUCTS.—CONTINUED.						
3	Rye, Ground	12.7	2.1	10.7	2.0	70.5	2.0
16	Rye Middlings	10.6	3.6	16.4	4.3	61.8	3.3
	WHEAT PRODUCTS.						
405	Wheat Bran	10.3	6.3	15.9	9.5	53.3	4.7
544	Wheat Feed (Mixed Feed)	10.5	5.5	16.8	7.5	55.0	4.7
2	Wheat Flour	12.8	1.0	13.2	0.7	70.7	1.6
2	Wheat, Ground	12.8	3.7	14.7	4.3	61.1	3.4
449	Wheat Middlings	10.8	4.4	17.6	6.2	56.0	5.0
11	Wheat and Corn Product (Colonial Middlings)	10.0	3.5	14.1	5.4	60.6	6.4
1	Wheat and Oats	9.6	3.6	12.9	7.4	61.9	4.6
1	Wheat Shreds	7.1	1.8	11.1	1.9	76.2	1.9
7	Red Dog Flour	10.9	2.6	17.8	2.1	62.0	4.6
1	Atlantic Gluten Meal, extra strong	7.9	1.8	68.9	5.8	15.0	0.6
6	" " "	8.4	2.3	47.6	3.9	35.7	2.1
11	" " "	6.2	1.0	32.0	1.1	59.0	0.7
	WHEAT AND CORN COB PRODUCTS.						
8	Blue Grass Mixed Feed	9.8	4.0	11.5	14.8	56.9	3.0
1	"C" Mixed Feed	8.1	4.7	13.8	13.5	56.3	3.6
7	Dairy Winter Mixed Feed	10.2	5.1	12.0	14.4	54.9	3.4
2	Eclipse Mixed Feed	8.4	4.6	12.5	15.9	55.2	3.4
2	Holstein Mixed Feed	9.0	4.7	11.6	18.0	53.3	3.4
4	Indiana Mixed Feed	9.9	4.9	11.5	15.1	55.4	3.2
12	Jersey Mixed Feed	9.9	4.6	11.6	14.6	56.2	3.1
3	Kennebec Feed	9.6	3.7	10.0	15.4	58.2	3.1
4	Sterling Mixed Feed	9.0	3.9	10.4	15.3	58.1	3.3
	BREWERY AND DISTILLERY PRODUCTS.						
5	Brewers' Grains, wet	77.6	1.1	5.0	3.4	11.7	1.2
35	" " dried	7.8	3.5	27.4	13.0	41.5	6.8
1	Distillery Grains, wet	77.7	0.5	6.0	2.8	10.6	2.4
2	Malt Hulls	8.6	9.1	12.6	22.5	45.8	1.4
39	Malt Sprouts	9.9	5.9	25.8	12.0	44.9	1.5
21	Ajax Flakes	7.2	2.4	31.4	12.0	34.0	13.0
1	A 1 Distillers' Grains	7.5	2.2	21.6	11.7	46.4	10.6
8	Biles' Fourex Distillers' Grains	8.0	2.2	31.2	12.1	33.4	13.1
1	Biles' Rye Distillers' Grains	6.3	1.2	15.7	13.6	55.2	8.0
1	Biles' Twoex Distillers' Grains	8.3	2.8	28.1	11.0	38.5	11.3
1	Buckeye Gluten Feed	9.9	3.5	19.7	13.0	50.2	3.7
1	Climax Distillers' Grains	7.4	2.6	32.6	11.0	34.3	12.1
1	Connecticut Gluten Feed	8.1	4.0	26.3	8.6	41.2	11.8
9	Continental Gluten Feed	7.1	4.0	29.1	9.3	37.8	12.7
1	Corn Distillers' Grains	6.5	1.8	27.6	14.7	36.1	13.3
2	Corn Protegran	7.7	3.1	30.3	9.7	36.6	12.6
1	Dearborn Distillers' Grains	6.3	1.9	24.8	12.5	45.0	9.5

TABLE V.—AVERAGE COMPOSITION OF FODDERS AND FEEDS.—*Continued.*

ANALYZED AT THE CONNECTICUT EXPERIMENT STATION, 1878–1913.

Number of Analyses.	Material.	Water.	Ash.	Protein [N x 6.25].	Fiber.	Nitrogen-free Extract.	Ether Extract [Fat].
	BREWERY AND DISTILLERY PRODUCTS.—CONTINUED.						
1	Dewey Bros.' Distillers' Grains	9.1	3.8	23.2	10.3	45.0	8.6
5	Eagle 3 D Grains	7.4	3.9	28.1	10.0	38.3	12.3
1	Hall's A A A A Distillers' Grains	7.2	1.9	30.6	11.7	36.1	12.5
1	Hiquality Distillers' Grains	6.2	1.5	35.9	10.8	30.5	15.1
1	Husted Distillers' Grains	7.3	1.4	31.3	11.1	36.7	12.2
1	Protein Corn Distillers' Grains	11.8	1.9	26.6	10.2	39.3	10.2
	PROPRIETARY DAIRY AND STOCK FEEDS.						
2	Algrane Milk Feed	8.7	5.1	18.4	12.2	52.0	3.6
3	Badger Dairy Feed	10.5	7.4	18.0	12.1	48.2	3.8
1	Badger Stock Feed	10.5	6.6	13.3	14.9	51.4	3.3
1	Bibby's Oil Cake Feed	7.0	8.7	20.3	8.7	47.0	8.3
20	Biles' Union Grains Ready Ration	8.7	5.8	23.9	9.3	44.8	7.5
16	Blatchford's Calf Meal	10.1	4.9	25.9	5.1	49.1	4.9
2	Blue Ribbon Dairy Feed	8.1	7.0	24.4	10.8	45.8	3.9
2	Bonnie Dairy Feed	11.0	3.1	18.5	6.3	56.7	4.4
1	Braue's Mixed Feed with Molasses	9.8	7.4	8.5	7.3	65.0	2.0
2	Bufceco Creamery Feed	8.6	4.3	19.3	9.5	52.7	5.6
5	Bufceco Stock Feed	9.6	2.9	9.3	8.0	65.2	5.0
11	Buffalo Creamery Feed	9.6	4.0	20.1	10.6	50.6	5.1
2	Buffalo Dairy Feed	7.6	3.3	14.3	13.6	56.7	4.5
1	Buffalo XXX Stock Feed	9.2	3.9	10.1	11.8	59.6	5.4
1	Calf Laval Feed	11.2	4.2	20.4	6.8	47.5	9.9
1	Chester Stock Feed	10.8	2.7	12.9	9.3	60.1	4.2
1	Columbia Cured Feed for Horses and Cattle	11.4	5.5	15.1	7.4	54.9	5.7
6	Daisy Dairy Feed	8.4	7.8	16.0	13.7	51.5	2.6
1	Daniels' Stock Feed	12.5	2.1	9.9	4.8	67.2	3.5
1	Derby Stock Feed	8.7	3.6	12.0	10.8	58.4	6.5
1	Diamond Stock Feed	9.5	3.0	11.6	9.2	60.2	6.5
2	Economy Feed	8.1	3.1	11.1	14.2	58.3	5.2
1	Electric Stock Feed	9.7	6.8	15.3	9.6	56.2	2.4
1	Empire State Cow Feed	9.8	8.7	14.3	15.8	47.7	3.7
1	Empire State Dairy Feed	7.4	2.2	29.5	12.9	36.4	11.6
1	Germaline	7.8	3.8	12.8	5.1	68.5	2.0
2	Grandin's Stock Feed	8.1	4.1	10.3	8.6	62.1	6.8
2	Great Western Dairy Feed	8.9	6.5	10.6	20.8	50.5	2.7
1	Green Diamond Sugar Feed	9.4	6.7	12.8	9.7	59.4	2.0
1	Green Meadow Dairy Feed	17.7	10.9	11.3	15.0	44.5	0.6
1	Gregson Calf Meal	7.8	5.7	28.0	4.7	47.0	6.8
1	Hall's Dairy Ration	9.3	8.5	18.1	7.9	45.8	10.4
2	Hammond Dairy Feed	9.8	7.3	14.8	9.9	54.7	3.5
1	Henkel's Fine White Feed	10.4	3.7	16.5	4.5	61.2	3.7
21	H. O. Dairy Feed	8.7	3.9	18.6	12.6	51.8	4.4
1	H. O. Milk Feed	10.0	4.7	13.8	12.5	54.9	4.1
1	Husted Dairy Feed	9.5	6.0	22.5	6.5	50.1	5.4
3	Husted Molasses Feed	10.7	6.9	21.9	7.7	48.6	4.2
1	Husted Stock Feed	7.9	3.3	9.6	8.6	65.0	5.6

TABLE V.—AVERAGE COMPOSITION OF FODDERS AND FEEDS.—*Continued.*

ANALYZED AT THE CONNECTICUT EXPERIMENT STATION, 1878–1913.

Number of Analyses.	Material.	Water.	Ash.	Protein [N x 6.25].	Fiber.	Nitrogen-free Extract.	Ether Extract [Fat].
	PROPRIETARY DAIRY AND STOCK FEEDS.—CONTINUED.						
4	Larro-Feed for Dairy Cows	8.3	4.9	19.9	12.9	50.2	
7	Lenox Stock Feed	11.3	2.9	9.0	9.5	63.2	3.8
1	Marsden Corn Feed	6.5	5.3	4.4	37.0	46.1	0.7
1	Maz-All Feed	7.7	2.8	8.3	1.4	78.3	1.5
1	Matchless Stock Feed	9.5	4.1	9.8	10.5	59.0	7.1
2	Mayflower Stock Feed	10.0	3.5	10.0	6.0	64.8	5.7
6	Molac Dairy Feed	10.6	6.5	16.9	11.7	50.1	4.2
5	Molasses Beet Pulp, Dried	8.4	4.6	9.2	16.8	60.4	0.6
2	Molassine Meal	16.8	7.8	8.6	6.2	59.9	0.7
1	M. & S. Stock Feed	8.8	3.3	9.5	9.8	63.0	5.6
2	Mueller's Molasses Grains	14.9	6.7	16.6	9.4	50.1	2.3
11	New England Stock Feed	8.8	3.8	9.9	10.4	62.3	4.8
1	Peerless Dairy Feed	11.0	7.8	20.1	10.2	47.2	3.7
1	Peter's King Corn Sugar Feed	10.8	6.3	11.3	12.4	57.2	2.0
1	Presto Molasses Feed	13.2	6.5	14.4	6.8	56.0	3.1
2	Proteina	9.7	2.2	23.8	8.9	46.4	9.0
3	Protena Dairy Feed	8.9	7.2	19.7	16.3	43.8	4.1
1	Purina Dairy Feed	8.8	7.6	19.1	17.4	43.9	3.2
3	Purina Molasses Feed	11.0	5.4	11.8	9.7	59.2	2.9
2	Purity Special Stock Feed	7.9	3.4	10.2	8.6	65.4	4.5
36	Quaker Dairy Feed	8.1	5.1	13.5	16.3	53.4	3.6
5	Quaker Molasses Dairy Feed	9.5	7.3	15.9	12.7	50.5	4.1
7	Schumacher's Calf Meal	8.9	3.4	19.1	2.4	58.2	8.0
1	Schumacher's Starch Feed	9.3	4.8	12.7	9.8	58.8	4.6
35	Schumacher's Stock Feed (Corn, Oats and Barley)	9.4	4.1	11.5	10.3	60.3	4.4
1	Star Cotton Feed	8.5	2.8	10.9	9.0	62.6	6.2
4	Sterling Stock Feed	9.5	4.1	10.9	9.0	61.6	4.9
15	Sucrene Dairy Feed	10.6	7.5	16.8	10.7	50.2	4.2
1	Sugared Dairy Feed	10.4	6.0	17.8	10.8	49.9	5.1
1	Sugarota Calf Meal	9.7	4.3	26.6	4.6	48.7	6.1
3	Sugarota Dairy Feed	10.2	6.9	15.9	15.6	46.1	5.3
2	Sugarota Milk Meal	7.9	8.3	25.2	11.6	43.7	3.3
11	Unicorn Dairy Ration	8.0	4.0	26.5	9.2	45.7	6.6
2	Vincent Bros.' (V-B) Dairy Feed	8.6	3.6	19.8	8.7	54.5	4.8
1	Weiss' Alfalfa Stock Feed	10.9	5.3	12.1	11.7	57.2	2.8
3	White Cross Stock Feed	10.0	3.0	10.4	4.3	68.2	4.1
5	Wirthmore Balanced Ration Feed	8.4	5.2	26.0	8.7	46.3	5.4
7	Wirthmore Stock Feed	8.3	3.4	10.2	7.9	62.9	7.3
1	Yellow Tag Stock Feed	8.5	3.1	10.0	8.6	64.8	5.0
2	Zenith Stock Feed	10.2	3.3	11.3	5.3	64.5	5.4
	PROPRIETARY HORSE FEEDS.						
5	Algrane Horse Feed	8.8	3.9	11.3	10.0	61.6	4.4
1	Allneeda Horse and Mule Feed	10.2	7.3	9.0	12.4	59.2	1.9
4	Blomo Feed	15.6	8.8	15.9	10.5	48.3	0.9
1	Boggs' Competition Horse Feed	11.0	2.9	11.0	4.6	67.2	3.3
5	Bonnie Horse Feed	10.3	2.7	11.7	6.6	64.5	4.2

TABLE V.—AVERAGE COMPOSITION OF FODDERS AND FEEDS.—*Continued.*

ANALYZED AT THE CONNECTICUT EXPERIMENT STATION, 1878–1913.

Number of Analyses.	Material.	Water.	Ash.	Protein [N x 6.25].	Fiber.	Nitrogen-free Extract.	Ether Extract [Fat].
	PROPRIETARY HORSE FEEDS.—CONTINUED.						
3	Bufceco Horse Feed	9.2	3.5	11.4	9.6	61.8	4.5
13	Buffalo Horse Feed	10.8	3.2	12.1	8.8	61.3	4.8
1	Corno Horse and Mule Feed	11.1	4.2	10.3	13.8	56.8	3.8
1	Daisy Horse Feed	7.4	7.5	12.9	13.6	56.8	1.8
1	Green Cross Molasses Horse Feed	10.2	4.9	10.6	10.5	60.9	2.9
1	Hatch's Horse Feed	9.8	2.9	11.8	9.1	62.7	3.7
1	Hexagon for Horses	9.2	4.3	8.5	13.8	58.7	5.5
27	H. O. Horse Feed	9.7	3.2	12.5	9.7	60.5	4.4
1	H. & S. Horse, Mule and Dairy Feed	8.7	8.0	16.4	11.3	51.4	4.2
2	Husted Horse Feed	10.4	3.8	12.1	8.1	60.7	4.9
1	Husted Molasses Horse Feed	10.6	5.0	10.3	6.2	64.1	3.8
2	Husted Steam-cooked Feed	9.9	2.2	10.6	4.9	67.8	4.6
1	Missouri Horse and Mule Feed	11.0	5.3	10.0	14.5	55.2	4.0
4	Molac Molasses Horse Feed	10.8	5.8	12.9	12.9	54.7	2.9
2	Mueller's Molasses Feed for Horses	15.5	6.2	16.3	8.5	51.7	1.8
1	Peter's Arab Horse Feed	11.0	4.3	10.5	7.6	64.5	2.1
4	Schumacher's Special Horse Feed	8.9	3.4	9.5	8.2	66.3	3.7
7	Sucrene Horse Feed	11.4	6.6	13.8	9.0	56.1	3.1
2	Sucrene Horse and Mule Feed	10.2	6.9	10.4	9.6	59.5	3.4
1	Sugared Horse Feed	9.9	5.5	14.8	11.9	54.1	3.8
2	Sugarota Horse Feed	9.8	7.3	13.1	18.0	47.2	4.6
1	Ubiko Horse Feed	8.5	3.6	20.4	9.3	51.0	7.2
2	Vincent Bros.' (V-B) Horse Feed	9.2	2.9	11.3	7.4	64.3	4.9
	PROPRIETARY POULTRY FEEDS.						
1	Algrane Poultry Feed	9.6	3.8	15.9	7.0	58.8	4.9
19	American Poultry Feed	10.5	3.0	13.6	4.6	62.6	5.7
1	Bonnie Dry Mash	9.7	5.6	16.1	7.1	57.0	4.5
3	Bonnie Poultry Feed	10.6	4.8	17.0	5.6	58.0	4.0
2	Bufceco Poultry Feed	9.0	3.0	16.8	5.4	60.5	5.3
8	Buffalo Poultry Feed	10.7	3.1	16.4	4.8	60.2	4.8
2	Cyphers Laying Food	12.4	2.9	15.2	3.4	62.4	3.7
1	Daniels' Poultry Feed	10.8	14.0	9.6	3.5	58.8	3.3
1	Every Morning Mash Feed	9.9	8.9	19.6	10.3	45.8	5.5
1	Gem Poultry Feed	6.8	27.0	12.1	7.6	43.0	3.5
1	Globe Egg Mash	9.8	5.9	18.3	6.5	55.1	4.4
1	Hatch's Dry Mash	9.8	6.0	17.9	9.1	52.7	4.5
2	H. O. Dry Poultry Mash	9.4	4.2	17.0	11.5	54.4	3.5
23	H. O. Poultry Feed	9.7	3.1	17.3	5.1	59.5	5.3
1	H. O. Scratching Feed	12.1	2.3	11.9	2.7	67.3	3.7
2	Husted Alfalfa Poultry Meal	11.8	4.8	12.2	13.8	54.1	3.3
1	Husted Laying Mash	10.6	3.9	17.3	5.1	57.6	5.5
3	Husted Poultry Feed	10.4	3.7	14.1	7.0	60.3	4.5
1	M. & S. Poultry Mash	9.3	8.3	22.9	7.4	47.0	5.1
7	P. & P. Dry Mash Feed	9.5	11.8	20.3	6.5	48.4	3.5
2	P. & P. Fattening Feed	9.6	3.5	11.0	6.2	65.6	4.1
6	P. & P. Growing Feed	10.8	5.7	15.3	3.5	60.5	4.2

TABLE V.—AVERAGE COMPOSITION OF FODDERS AND FEEDS.—*Continued.*

ANALYZED AT THE CONNECTICUT EXPERIMENT STATION, 1878-1913.

Number of Analyses.	Material.	Water.	Ash.	Protein [N x 6.25].	Fiber.	Nitrogen-free Extract.	Ether Extract [Fat].
	PROPRIETARY POULTRY FEEDS.—CONTINUED.						
1	Perfection Mash Mixture	6.3	23.3	18.1	7.7	40.0	4.6
1	Purina Chick Feed	11.2	3.3	12.4	4.4	63.4	5.3
3	Purina Chicken Chowder Feed	9.9	7.0	18.5	7.2	53.5	3.9
2	Purina Mill Feed Mash	10.5	4.9	16.1	8.9	57.3	2.3
1	Puritan Growing Mash	10.0	5.0	22.3	6.0	53.4	3.3
2	Puritan Laying Mash	10.0	6.8	24.2	7.4	46.6	5.0
4	Purity Poultry Mash	8.9	9.8	19.4	6.9	49.4	5.6
4	Queen Poultry Mash	10.6	4.5	11.6	6.8	62.9	3.6
1	Red Comb Meal Mash	11.0	5.3	14.8	7.5	58.7	2.7
1	Reliable Dry Mash Feed	11.4	5.8	10.7	4.1	65.5	2.5
1	Rellom Mash	9.0	7.7	24.2	7.9	44.7	6.5
1	Success Poultry Feed	12.0	4.0	13.4	4.4	61.9	4.3
1	Sugarota Scratch Feed	10.3	1.5	10.3	2.0	71.9	4.0
4	V-B. Dry Mash for Laying Hens	9.3	7.6	21.6	8.9	47.6	5.0
1	V-B. Growing Feed	6.9	8.1	20.0	5.1	53.9	6.0
1	Wirthmore Growing Feed	10.9	2.0	12.9	2.9	68.2	3.1
3	Wirthmore Poultry Mash	9.7	3.7	13.5	7.1	62.2	3.8
1	Wonder Poultry Feed	10.1	4.6	21.3	13.8	43.3	6.9
1	Wyandotte Poultry Feed	12.0	13.3	9.1	3.6	59.8	2.2
24	Animal Meal (much bone)	6.4	41.9	36.0	....	....	11.2
1	Cracklings	21.8	....	46.8	....	....	13.5
1	Fish Meal	10.2	31.4	54.7	....	....	2.0
1	Meat Scrap (mostly meat)	7.4	4.7	66.3	....	....	15.0
29	Meat Scrap (meat and bone)	8.2	26.6	47.9	....	....	13.8
	CONDIMENTAL STOCK AND POULTRY FEEDS.						
2	Banner Stock Food	10.4	13.9	23.3	17.6	28.9	5.9
1	Baum's Poultry Food	7.0	16.7	19.5	15.4	32.6	8.9[1]
1	Baum's Stock Food	9.3	12.3	25.8	19.4	25.1	8.1[2]
1	Benjamin's Food for Horses and Cattle	6.9	5.5	27.8	7.6	45.9	6.3
1	Benjamin's Poultry Food	7.1	5.4	29.2	8.4	42.9	7.0
1	Concentrated Egg Producer	10.1	23.6	14.2	3.4	44.9	3.8
2	Concentrated Feed for Horses	12.5	16.9	14.1	3.9	49.5	3.1
1	Hess' Poultry Panacea	7.0	35.7	11.9	5.2	37.8	2.4
1	Imperial Egg Food for Poultry	3.5	57.0	9.7	5.9	22.5	1.4
1	International Poultry Food	6.8	7.9	14.9	14.0	49.6	6.8
1	International Stock Food	6.1	12.5	14.3	14.5	47.9	4.7
1	Myers' Royal Horse and Cattle Spice	6.1	20.3	17.8	5.8	47.9	2.1
1	Myers' Royal Poultry Spice	6.2	17.0	18.2	7.9	45.4	5.3
2	Nutriotone	6.8	20.5	20.6	6.0	40.0	6.1[3]
1	Orange Electric Food	6.8	4.0	15.1	7.8	58.9	7.4[4]
1	Pasture Stock Food	6.6	12.8	17.1	6.6	53.6	3.3
1	Poultriotone	6.3	18.5	16.9	7.5	47.3	3.5
1	Pratt's Animal Regulator	6.6	12.4	9.7	3.1	63.8	4.4
1	Pratts' Poultry Food	7.0	6.3	14.9	6.0	56.9	8.9[5]
1	Sturtevant's Medicated Meal	6.3	8.9	24.1	11.0	39.1	10.6[6]

[1] 6.7% Sulphur. [2] 3.9% Sulphur. [3] 0.8% Sulphur. [4] 0.4% Sulphur. [5] 0.8% Sulphur. [6] 2.9% Sulphur.

TABLE V.—AVERAGE COMPOSITION OF FODDERS AND FEEDS.—*Concluded.*

ANALYZED AT THE CONNECTICUT EXPERIMENT STATION, 1878–1913.

Number of Analyses.	Material.	Water.	Ash.	Protein [N x 6.25].	Fiber.	Nitrogen-free Extract.	Ether Extract [Fat].
	CONDIMENTAL STOCK AND POULTRY FEEDS.—CON'D.						
1	Triplex Poultry Food	5.8	40.9	18.0	4.6	25.3	5.4[7]
2	Wilbur's Horse and Cattle Food	8.7	10.2	19.6	9.3	47.4	4.8
	MISCELLANEOUS PRODUCTS.						
3	Aloras	11.2	4.9	16.6	7.0	54.3	6.0
5	Apple Pomace	73.8	1.1	1.5	5.3	16.7	1.6
1	Brush, Ground	39.3	1.4	2.6	28.3	27.3	1.1
1	Clover Meal, Pioneer	8.4	6.8	9.5	28.3	44.6	2.4
1	Cocoa Siftings	....	....	17.5	....	....	26.6
1	Cornaline (Coffee Hulls)	6.8	0.9	2.6	64.0	25.4	0.3
4	Cracker Waste	9.2	2.3	10.5	0.6	65.6	11.8
1	Force Screenings	11.3	2.0	10.3	0.5	74.1	1.8
2	Gee's Germ Middlings (Screenings)	7.0	11.7	14.6	9.8	50.2	6.7
1	Gee's Ground Oil Cake Compound (Screenings)	11.4	4.9	14.8	8.9	53.1	6.9
1	Herrings, Salt	52.9	18.9	18.1	....	0.9	9.2
1	Milk Albumen, Bent's	9.5	27.8	46.0	1.5	13.9	1.3
1	Molasses, Extra Vim	25.7	6.2	2.9	....	65.2	....
1	Pea Meal	12.4	3.7	23.1	8.9	50.7	1.2
1	Peas and Beans, Ground	14.0	2.7	20.3	18.4	43.0	1.6
2	Sugar Beet Pulp, wet	90.9	0.5	0.9	2.1	5.5	0.1
14	" " " dried	8.4	3.2	8.7	19.3	59.6	0.8
1	Vegetable Ivory Dust	18.7	1.1	3.4	7.5	68.6	0.7

[7] 0.9% Sulphur.

PART VI.

Report of the Plant Breeder.

H. K. HAYES.

THE CORN PLANT AND SEED SELECTION.

The objects of this paper are, first, to give the results of a series of tests of the commercial value of first generation crosses, and second, to compare the yields of shelled corn of several of the more important Connecticut varieties when grown in the same season under uniform conditions.

Among field plants, the production of seed generally depends on a union of the male reproductive cell, contained in the pollen grain, with the female reproductive cell—the egg cell.

The pollen grains of corn are produced in the tassel and each thread of the silk ends in a female reproductive cell which is attached to the cob. To produce seed the male reproductive cell must pass down along the silk and fuse with this female cell. This process is called "fertilization"; if pollen and silk are borne by the same plant it is "self-fertilization," and if by different plants, "cross-fertilization."

Each variety of corn has "characters," such as color, shape and size of seeds, length of ears and row number, height of plants, time of maturity, etc., which distinguish it from other varieties.

The plant does not acquire these characters during growth. They were all contained potentially in the two cells just noticed, from whose union the individual grew; they are its "inheritance."

The full development of these inherited characters, however, depends on external conditions, such as soil, moisture, fertility and sunlight, which, taken together, are called "environment."

Both inheritance and environment must do their part if large yields of any crop are to be secured. The best of culture will

not make profitable a variety with a poor inheritance; an excellent inheritance may be neutralized by an unfavorable environment. It follows that no variety will prove equally valuable under all of our various Connecticut conditions of soil and climate.

In the last fourteen years we have learned much about the inheritance of characters. We now know that in a large measure each character is inherited independently. The first generation of a cross may have some characters resembling one parent, some resembling the other parent and some of intermediate appearance. In the following generation, however, there is a recombination of characters and consequently a greater variability.

Nearly all corn varieties are in a complex hybrid condition due to the constant cross-fertilization of the plant, which continues this variation. Because some of these characters are more desirable than others, selection is of value in separating the desired characters from the undesirable. As the only correct way to determine the breeding value of an individual plant is to grow and examine its progeny, many corn growers have used the "ear-to-row" method of breeding. By this method each row of the breeding plot is grown from a single selected ear and at maturity the row yields are compared and selection continued from the better yielding row or rows. Other methods of seed selection, such as saving seed from those stalks which under competition give the better yields, or from the better plants at husking, are of value, but the desired results are not obtained so quickly as by the ear-to-row breeding method.

Another feature of the corn plant is that self-fertilization, i. e., the pollination of the silks of a plant by its own pollen grains, causes a loss of vigor. If several different ears of the same variety are self-fertilized and this self-fertilization continued for a number of years, each line will gradually become more uniform in type. In the earlier years, the decrease in vigor due to self-fertilization is often very great, but gradually an end point is reached beyond which there is no further loss of vigor due to this cause. An examination of these several self-fertilized lines will show that some have desirable characters, such as straight rows, good-shaped cobs, etc., while others may have irregular rows and cobs with large butts. Self-fertilization, therefore, tends to uniformity of type in each line, but this uniformity is

obtained by a sacrifice of vigor, although some isolated lines are more vigorous than others.

Any system of selection of corn, if long continued, tends toward a uniformity of type, and if too close a uniformity is obtained, loss of vigor generally results. The comparatively small yields of the Hopson's Longfellow and the Illinois High and Low Protein types of our experiments may, in part, be attributed to the close selection they have undergone.

Selection, however, has an important place in corn breeding and probably many of our best Connecticut varieties could be further improved in this way. After two varieties have been sufficiently improved by selection, an increased yield can be frequently obtained by a first generation cross between these varieties. This is due to the increased stimulus to development which is often obtained in the first generation of a cross between pure types.

In general, the first generation cross between two varieties is more vigorous than the average of the parents, although a few exceptions to this rule have been noted. Many results have also been reported in which the cross is more vigorous than either parent.

The results of a series of such crosses as we have made are given in detail in this paper as a contribution toward the determination of what crosses, if any, are valuable for Connecticut. These results show that the commercial growing of a particular first generation cross should not be taken up until the cross has proved its value in actual competition with the parental varieties.

VARIETIES USED IN THE EXPERIMENTS.

To determine which varieties should be used in the experiments was not easy and we do not claim that we have included all of the better ones. As far as possible, varieties were selected which had been grown under the same conditions for a number of years and which were believed to be among the better varieties of the State.

The following descriptions give the name of the corn, the selection number under which it appears in our tables, the name of the grower from whom the seed was obtained, and some facts about its previous history.

Yellow Flints.

Longfellow, No. 1. From George A. Hopson, Wallingford, Conn.

This variety has been grown by Mr. Hopson for the last six years and is a uniform type with a small cob averaging about 10 inches in length. Selection by the ear-to-row method was practiced for two years, and in other years the seed was selected at husking time. The original seed was obtained from the Longfellow family of Groveland, Mass., and was introduced to the trade about thirty years ago by Mr. Gregory of Marblehead as one of his specialties, and called "Longfellow corn." In all probability the many strains of Longfellow now grown are descendants of the variety produced by the Longfellow family.

Longfellow, No. 21. From S. D. Woodruff & Sons, Orange, Conn.

This is a large flint variety and the ears have a characteristic appearance, averaging about 10 inches in length. The cobs are over-large at the butt and consequently the ears are somewhat difficult to husk. It has been grown on the same kind of land for about eight years and seed has been saved from the better ears.

Canada Improved Flint, No. 2. From O. S. Olmsted, Hazardville, Conn.

This was produced several years ago by crossing a yellow Canada variety with Nantucket Top Over, and selection has been practiced at harvest. The ears are of medium size, cylindrical, and well filled out at the tip and butt, and average about 8 inches in length.

Improved Canada, No. 3 and No. 20. From N. Howard Brewer, Hockanum, Conn.

This type has been grown on the Brewer farm for many years and for the last eight years selection of seed has been made by picking out those stalks which, under competition, gave the better yields. The ears are of uniform appearance but vary considerably in length, averaging from 8 to 10 inches. The stalks are of good size.

Canada Flint, No. 9. From M. C. Hayes, Granby, Conn.

Canada Flint has been grown on the same farm for over twenty years and seed has been saved at husking time from those stalks which produced two good ears. The ears average about 7 inches in length and are of uniform appearance. Under good conditions nearly every stalk produces two ears and many stalks produce three ears.

Canada Flint, No. 23. From Thomas Griswold & Sons, Wethersfield, Conn.

This variety has been grown at the Griswold farm for four years and the better ears have been selected for planting. They average about 8 inches in length and are of good shape.

Yellow Flint, No. 26. From E. E. Burwell, New Haven, Conn.

This has been grown in New Haven for more than twenty-five years. The cob is small with a good butt, but does not tip out very well. The variety is vigorous and the ears average about 10 inches in length.

Newgate Flint, No. 10. From F. B. Walker, Granby, Conn.

This variety is the result of a cross which was made about eight years ago. The ears are somewhat variable in length and have a small cob.

Davis Flint, No. 8. From Perley Davis, Granby, Mass.

This is a uniform variety with good-sized kernels and ears about 9½ inches in length. Selection by the ear-to-row method of breeding has been practiced by Mr. Davis, resulting in corn of a uniform appearance. There is a slight color to the outer hull which makes the kernels dark yellow.

White Flints.

Rhode Island White Flint, No. 28. Obtained through the kindness of S. C. Damon of the Rhode Island Experiment Station, Kingston, R. I.

Selection by the ear-to-row method has been practiced for several years, which, as Mr. Damon informs us, was of consider-

able value in improving the yield, but in later years selection has simply kept the variety in a state of improvement. The ears are of uniform appearance, averaging about 8 inches in length and well filled on tip and butt.

Sanford's White Flint. From F. S. Platt and Company, New Haven, Conn.

The ears are tapering, with small tips, and average about 9 inches in length.

Smut Nose White Flint. Obtained through George A. Hopson, Wallingford, Conn.

This variety has been grown in Wallingford for several years. It receives its name from a slight color of the outer hull. The ears are about 9½ inches in length, well filled out at tip and butt, and cylindrical in shape.

Mammoth White Flint. From O. S. Olmsted, Hazardville, Conn.

This is a large, vigorous flint. Some stalks produce two ears, which average over 12 inches in length. The butts are large and the tips do not fill out well. This corn is used by Mr. Olmsted for silage.

Leamings and other Yellow Dents.

Stadtmueller's Leaming, No. 14. From F. H. Stadtmueller, Elmwood, Conn.

This has been grown by Mr. Stadtmueller for about eight years. The ear-to-row method of breeding was used for two years and seed selection at husking has been practiced in other years. The cobs are of medium size, somewhat tapering, and the seeds are not very long. The corn has a vigorous habit and will give good results under various conditions. The ears average about 18 rows and are of medium size.

Leaming, No. 19. From W. O. Burr, Fairfield, Conn.

This has been grown by Mr. Burr for a number of years and seed selection has been made at husking. It matured late in our tests, but it grows to a large size and might prove valuable for silage.

Dibble's Yellow Dent, No. 16. From C. L. Howes, Stamford, Conn.

Selection has been practiced for two years by the ear-to-row method of breeding. The ears are cylindrical, of medium length, and average about 18 rows.

Brewer's Dent, No. 18. From N. Howard Brewer, Hockanum, Conn.

It produces ears of good length, cylindrical shape and straight rows. It is a selection from Reid's Yellow Dent. With us it has proved too late for a husking corn. Mr. Brewer grows it on strong, heavy land, while our tests have been made on light loam.

Early Dent, No. 15. From Wayne Holcomb, East Granby, Conn.

It has been grown on the Holcomb farm for over twenty years. The ears have been selected at husking from two-eared stalks and, as far as possible, dissimilar ears have been selected, presumably to avoid too close inbreeding. Many of the ears have a sharp point on the seed at the place of attachment of the silk. This variety has been grown on light sandy loam and matures early. The average number of rows on the ear is 12 to 14.

Early Dent, No. 24. From Thomas Griswold & Sons, Wethersfield, Conn.

This variety has been grown on the Griswold farm for four years or more and the better ears have been selected for seed. It is an early maturing dent, averaging from 12 to 14 rows to the ear. The ears are somewhat conical.

White Cap Yellow Dent.

Tyler Dent, No. 25. From W. D. Hall, Wallingford, Conn.

This is an early dent of medium size and good vigor. The cap of the seeds is white and there is some variation in the intensity of the yellow color underneath the cap. The ears fill out well at the tip, but the butt of the cob is over-large.

White Dents.

Illinois High Protein, No. 20. Obtained through the courtesy of L. H. Smith, from the Illinois Experiment Station, Urbana, Illinois.

For over ten years the Illinois Station has selected for high protein content, and the variety now averages about 14 per cent. protein.

Illinois Low Protein, No. 21. The same variety as above, selected for low protein by the Illinois Station, averages between 8 and 9 per cent. protein.

COMPARISON OF COMMERCIAL VARIETIES AND FIRST GENERATION CROSSES BETWEEN THEM.

In order to make a number of crosses with the use of a single isolated breeding plot, several varieties as females were crossed with a single male variety. In general the following methods were used in our tests:

Average seed ears of the different varieties were given a number and stored in our seed room. A sufficient amount of seed of the male variety for every other row of the breeding plot was obtained by mixing a small quantity of kernels from each of the ears to be used as the male parent. Two or three selected ears from each female parental variety were given a variety number. If the variety was given No. 3, the different ears were designated as 3—1, 3—2, etc. A small quantity of seed of each female ear was then planted in the breeding plot and all of the female varieties were detasseled before the pollen appeared. The crosses were then numbered 3—1 × 14, 3—2 × 14, etc., No. 14 representing the male parent. At maturity a number of seed ears of each cross were harvested and also a number of ears of the male parent.

Row tests were then made the following year and comparative results obtained by growing the cross, the female parental remnant ear, a mixture of a small quantity of seed of the several male remnant ears, and a mixture of seed from the male ears of the breeding plot. Thus in each test two male rows were grown, one row from a mixture of seed from two-year old ears and one row from a mixture of seed of one-year old ears, which were grown on the same land as the crossed seed, also one row from a mixture of ears of each cross, and one row from the remnants of each female two-year old parental seed ear.

This method was used to determine whether, in general, different ears of the same variety would give like results, and also

to show the degree of correlation between the yield of the female remnant ears and their respective crosses.

Nearly perfect stands of corn were obtained by planting from four to six seeds in each hill and later thinning the hills to three stalks. After each variety was harvested and the resulting ears weighed, a basket of each was weighed and stored in the crib to further dry. These baskets were reweighed about January first and the yield reduced according to the shrinkage. As a further correction of the yield, each basket of corn was shelled, and corrections made for variations in shelling capacity.

The Stadtmueller's Leaming Crosses at Mount Carmel in 1912.

The corn plot in 1912 was grown at our experimental farm in Mount Carmel on land which had not been cultivated for a number of years and which grew a hay crop in 1911 which was scarcely worth harvesting. The land was given a light coat of manure in the fall of 1911, plowed, and the following spring an average dressing of fertilizer was applied broadcast. The corn was planted about May 15 in hills 3½ feet each way and fifty hills in length. The summer of 1912 was very dry, the old turf did not decompose, and consequently the corn made a small growth.

Table I gives the results obtained from the crosses in which Stadtmueller's Leaming was used as the male parent. The order of planting is given and also the crib-cured yield of the respective rows.

In this table are seven cases in which a row from a mixture of seeds from the original 1910 Stadtmueller's Leaming ears was grown beside a row produced from a mixture of seeds of the 1911 ears which were grown in the breeding plot.

The two-year old seed yielded more than the one-year old in four tests and less in the other three. The total yield from the seven rows grown from the 1910 seed was 344.1 pounds, while the 1911 seed gave a yield of 325.4 pounds. If we discard rows 29 and 30, in which the large difference in yield is certainly not due to the age of the seed, the yield from the one-year old and two-year old seed is nearly the same. Thus we may conclude that carefully stored two-year old seed does not necessarily give a smaller yield than one-year old seed similarly handled.

TABLE I.—YIELD OF CRIB-CURED CORN ON PLOT IN WHICH STADTMUELLER'S LEAMING WAS THE MALE PARENT. LENGTH OF EACH ROW 162 FEET.

Variety.	Selection No.	Row No.	Yield in Pounds.	Variety.	Selection No.	Row No.	Yield in Pounds.
Brewer's Dent	18—1	1	30.0	Ill. High Protein	20—1	26	42.1
Brewer's Dent × Leaming	18—1×14	2	33.6	Ill. High Protein × Stadtmueller's Leaming	20—2×14	27	55.6
Brewer's Dent	18—2	3	37.6	Ill. High Protein	20—2	28	36.1
Brewer's Dent × Leaming	18—2×14	4	45.6	Stadtmueller's Leaming, 1911 Seed	14—10	29	44.5
Stadtmueller's Leaming, 1911 Seed	14—2	5	38.9	Stadtmueller's Leaming, 1910 Seed	14—11	30	56.8
Stadtmueller's Leaming, 1910 Seed	14—3	6	37.7	Ill. Low Protein × Stadtmueller's Leaming	21—2×14	31	51.8
Burr's Leaming × Stadtmueller's Leaming	19—1×14	7	45.7	Ill. Low Protein	21—2	32	37.8
Burr's Leaming	19—1	8	50.4	Ill. Low Protein × Stadtmueller's Leaming	21—1×14	33	53.2
Burr's Leaming × Stadtmueller's Leaming	19—3×14	9	46.4	Ill. Low Protein	21—1	34	45.5
Burr's Leaming	19—3	10	61.1	Stadtmueller's Leaming, 1910 Seed	14—12	35	49.6
Stadtmueller's Leaming, 1910 Seed	14—4	11	47.7	Stadtmueller's Leaming, 1911 Seed	14—13	36	53.1
Stadtmueller's Leaming, 1911 Seed	14—5	12	43.1	Mammoth Flint × Stadtmueller's Leaming	5—1×14	37	59.6
Dibble's Dent × Stadtmueller's Leaming	16—3×14	13	43.7	Olmsted's Mammoth Flint	5—1	38	49.4
Dibble's Dent	16—3	14	52.4	Mammoth Flint × Stadtmueller's Leaming	5—2×14	39	51.8
Dibble's Dent × Stadtmueller's Leaming	16—5×14	15	45.6	Olmsted's Mammoth Flint	5—2	40	48.7
Dibble's Dent	16—5	16	46.4	Stadtmueller's Leaming, 1911 Seed	14—14	41	44.6
Stadtmueller's Leaming, 1911 Seed	14—6	17	50.8	Stadtmueller's Leaming, 1910 Seed	14—15	42	51.1
Stadtmueller's Leaming, 1910 Seed	14—7	18	48.5	Davis' Flint × Stadtmueller's Leaming	8—2×14	43	43.2
Holcomb's Early Dent × Stadtmueller's Leaming	15—5×14	19	47.3	Davis' Flint	8—2	44	37.7
Holcomb's Early Dent	15—5	20	49.8	Newgate Flint × Stadtmueller's Leaming	10—1×14	45	48.7
Holcomb's Early Dent × Stadtmueller's Leaming	15—6×14	21	57.8	Newgate Flint	10—1	46	38.6
Holcomb's Early Dent	15—6	22	55.1	Leaming × Watson's White Flint (self pollinated 3 yrs.)	14×No. 5	47	55.8
Stadtmueller's Leaming, 1910 Seed	14—8	23	52.7	Stadtmueller's Leaming, 1910 Seed	14—16	48	39.6
Stadtmueller's Leaming, 1911 Seed	14—9	24	50.4				
Ill. High Protein × Stadtmueller's Leaming	20—1×14	25	52.8				

Seven tests in the table give an opportunity to compare the yield from the remnants of two ears of each female variety with the respective cross between each female ear and the male parent. In five out of the seven tests the highest yielding cross was produced from the highest yielding female ear, and in two cases opposite results were obtained.

It is also of interest to note that there is a gradual increase of yield from Row 1 to Row 18, presumably due to differences in the land. This is clearly brought out by examination of the respective yields of Stadtmueller's Leaming, Rows 5, 6, 11, 12, 17 and 18.

TABLE II.—COMPARATIVE YIELD OF FIRST GENERATION HYBRIDS AND THEIR PARENTS.

Variety.	Date of Silking.	Date of Maturity.	Height of Plants in Inches.	Yield in Bushels of Shelled Corn per acre.	Comparative Yield in per cent.
Stadtmueller's Leaming	Aug. 15	Sept. 22	88.9	38.9	100.0
Brewer's Dent	" 21	Oct. 5	88.9	38.2	98.2
Cross	" 17	Oct. 3	92.2	40.2	103.3
Stadtmueller's Leaming	" 14	Sept. 17	90.1	42.5	100.0
Burr's Leaming	" 16	Oct. 1	101.1	54.6	133.2
Cross	" 15	Sept. 26	94.3	46.5	108.7
Stadtmueller's Leaming	" 12	" 18	92.3	48.3	100.0
Dibble's Dent	" 14	" 23	97.8	50.2	103.9
Cross	" 15	" 21	95.5	45.4	94.0
Stadtmueller's Leaming	" 11	" 16	93.0	51.4	100.0
Holcomb's Early Dent	" 2	" 9	82.4	53.3	103.7
Cross	" 10	" 11	87.8	53.4	103.9
Stadtmueller's Leaming	" 11	" 17	92.1	50.3	100.0
Ill. High Protein	" 15	Oct. 3	98.6	39.7	78.9
Cross	" 15	Sept. 23	99.4	55.1	109.5
Stadtmueller's Leaming	" 12	" 18	91.5	50.1	100.0
Ill. Low Protein	" 15	Oct. 1	95.4	42.3	84.4
Cross	" 12	Sept. 21	93.5	53.3	106.4
Stadtmueller's Leaming	" 12	" 16	91.3	49.2	100.0
Mammoth White Flint	" 12	" 18	89.3	49.8	101.2
Cross	" 12	" 16	90.5	56.6	115.0
Stadtmueller's Leaming	" 12	" 18	85.1	49.4	100.0
Davis' Flint	July 31	" 5	71.8	40.6	82.1
Cross	" 31	" 7	80.2	46.5	94.1
Stadtmueller's Leaming	Aug. 12	" 18	85.1	49.4	100.0
Newgate Flint	July 31	" 3	72.5	42.1	85.2
Cross	Aug. 8	" 12	78.2	50.6	102.4
Stadtmueller's Leaming	" 12	" 19	85.1	49.4	100.0
S. L. × No. 5, White Flint (inbred 3 yrs.)	" 5	" 5	81.7	55.8	112.9

Table II is a condensed report of the crosses and parents and gives the date of silking, the date of maturity, height of plants, yield in bushels of shelled corn, and comparative yield. As the Stadtmueller's Leaming variety was grown with each cross, this variety has been used as the standard of comparison for the computation of comparative yields.

There is considerable variation in the time of maturity. In all nine tests the crosses are of intermediate habit, three of the crosses maturing later and six earlier than the average of the parents. The average time of maturity of the parents and crosses is, however, nearly the same, if we consider all nine tests together.

In height of plants again, there is an intermediacy of habit, though there are two crosses (Brewer's Dent × Leaming and Illinois High Protein × Leaming) in which the cross surpasses either parent. The average height of the crosses is 90.2 inches and of the parents 89.3 inches.

As shown in the last column of the table there are five crosses which gave a better yield than either parent, one which equalled the better parent, one which gave a larger yield than the average of the parents, one which yielded less than the parental average, and one which yielded less than either parent.

The largest increase over either parent was 13.8 per cent., which was obtained in the Mammoth White Flint × Leaming cross. The only other significant increases in yield, both being over 6 per cent. larger than the better parents, are in the crosses between Stadtmueller's Leaming and the Illinois High and Illinois Low Protein types. The cross between Newgate Flint and Leaming is also a good one, as a slight increase of yield over the better parent was obtained, together with a week's earlier maturity.

The Davis' Flint × Leaming cross, which gave a slight increase in yield over the parental average, matured nearly as early as the Flint parent and twelve days earlier than the Leaming.

The Burr's Leaming × Stadtmueller's Leaming and Dibble's Dent × Leaming crosses both gave a smaller yield than the average of the parents. The Burr's Leaming parent did not mature until October 1, a date much too late to be safe for a husking corn in Connecticut. Dibble's Dent gave a good yield but the cross yielded less than either parent.

Further discussion of results will be made after the presentation of our other data.

TABLE III.—YIELD OF CRIB-CURED CORN IN 1912 ON PLOT IN WHICH HOPSON'S LONGFELLOW WAS USED AS THE MALE PARENT. LENGTH OF EACH ROW 162 FEET.

Variety.	Selection No.	Row.	Yield in Pounds.	Variety.	Selection No.	Row.	Yield in Pounds.
Olmsted's Canada Flint	2—1	1	23.6	Hayes' Canada Flint	9—3	26	53.8
Canada Flint×Longfellow	2—1×1	2	30.9	Hopson's Longfellow, 1910 Seed	1—10	27	35.6
Olmsted's Canada Flint	2—2	3	29.5	Hopson's Longfellow, 1911 Seed	1—11	28	37.0
Canada Flint×Longfellow	2—2×1	4	30.9	Holcomb's Early Dent × Longfellow	15—1×1	29	52.1
Hopson's Longfellow, 1910 Seed	1—2	5	29.8	Early Dent	15—1	30	46.1
Hopson's Longfellow, 1911 Seed	1—3	6	29.8	Holcomb's Early Dent × Longfellow	15—2×1	31	43.1
Newgate Flint × Longfellow	10—3×1	7	40.4	Early Dent	15—2	32	50.1
Newgate Flint	10—3	8	42.1	Hopson's Longfellow, 1911 Seed	1—12	33	37.4
Newgate Flint × Longfellow	10—4×1	9	35.1	Hopson's Longfellow, 1910 Seed	1—13	34	37.4
Newgate Flint	10—4	10	36.4	Olmsted's Mammoth Flint × Longfellow	5—2×1	35	56.1
Hopson's Longfellow, 1911 Seed	1—4	11	32.2	Mammoth Flint	5—2	36	58.9
Hopson's Longfellow, 1910 Seed	1—5	12	31.7	Olmsted's Mammoth Flint × Longfellow	5—3×1	37	44.0
Brewer's Flint × Longfellow	3—1×1	13	34.8	Mammoth Flint	5—3	38	57.6
Brewer's Flint	3—1	14	41.7	Dibble's Dent × Longfellow	16—1×1	39	48.1
Brewer's Flint × Longfellow	3—2×1	15	44.5	Dibble's Dent	16—1	40	65.1
Brewer's Flint	3—2	16	49.1	Stadtmueller's Leaming × Longfellow	14—1×1	41	53.9
Hopson's Longfellow, 1910 Seed	1—6	17	39.8	Stadtmueller's Leaming	14—1	42	66.7
Hopson's Longfellow, 1911 Seed	1—7	18	36.1	Brewer's Dent × Longfellow	18—5×1	43	48.9
Davis' Flint × Longfellow	8—2×1	19	41.6	Brewer's Dent	18—5	44	50.6
Davis' Flint	8—2	20	38.1	Hopson's Longfellow, 1910 Seed	1—14	45	27.7
Hopson's Longfellow, 1911 Seed	1—8	21	39.3	Hopson's Longfellow, 1911 Seed	1—15	46	28.7
Hopson's Longfellow, 1910 Seed	1—9	22	35.6	Hopson's Longfellow × Stadtmueller's Leaming	1—1×14	47	61.0
Hayes' Short Canada Flint × Longfellow	9—1×1	23	44.8	Hopson's Longfellow	1—1	48	28.5
Hayes' Canada Flint	9—1	24	41.3				
Canada Flint × Longfellow	9—3×1	25	53.3				

The Hopson's Longfellow Crosses at Mount Carmel in 1912.

The tests reported in Tables III and IV, in which Hopson's Longfellow was used as the male parent and standard of comparison, were made under the same conditions as the previous crosses of Tables I and II.

Table III gives the row yields and the order of planting. There are seven cases in which row yields from 1910 seed are compared with 1911 seed. In two cases the results are the same, in one case the two-year old seed gave a slightly greater yield, and in four cases the one-year old seed gave the greater yield. The total yield from the two-year old Longfellow seed for the seven rows was 237.6 pounds, and from the one-year old seed 240.5 pounds. The difference, 2.9 pounds in seven rows, is much too small to have any significance.

Of the six tests, in which the remnant of two ears each of the female parents are compared with their respective crosses, there are four cases in which the better yielding female ear gave the better yielding cross. There seems to be a distinct positive correlation between the yields of the Newgate Flint, Brewer's Flint, and Hayes' Flint parental ears and their respective crosses, and an equally large negative correlation in the case of Holcomb's Dent parental ears and crosses.

In considering the date of maturity (Table IV) we find that some crosses are earlier and some later than the parental average. Time of maturity is an inherited character, but somewhat dependent on environmental conditions. The average date of maturity of the parents and crosses for the ten tests is nearly the same.

Height of plants was generally intermediate in these crosses. Two of them slightly exceeded the taller of the parents, while seven were slightly taller and one was slightly shorter than the parental average. The average height of the parents was 76.7 inches and of the crosses 80.4 inches.

The comparative yield given in the last column of the table shows that the Longfellow gave a smaller yield than any of the other varieties, with the exception of Olmsted's Canada Improved. The yield of the Davis' Flint parent was, however, only slightly greater than the Longfellow. The other varieties show from 29 to 98 per cent. greater yield than the Longfellow.

It is, of course, not reasonable to expect an early variety to give as large a yield as a later one and, other conditions being equal, there is a distinct correlation between yield and time of maturity. As four of the female parental types are much later in maturity than the Longfellow parent and as the cross is in general intermediate in time of maturity, it is hardly reasonable,

TABLE IV.—COMPARATIVE YIELD OF FIRST GENERATION HYBRIDS AND THEIR PARENTS.

Variety	Date of Silking.	Date of Maturity.	Average Height of Plants in Inches.	Yield of Bushels Shelled Corn per acre.	Comparative Yield in per cent.
Hopson's Longfellow	July 29	Sept. 3	65.0	30.3	100.0
Olmsted's Canada	" 26	Aug. 27	59.9	29.9	98.7
Cross	" 28	" 29	63.8	31.4	103.6
Hopson's Longfellow	" 30	Sept. 3	66.7	29.2	100.0
Newgate Flint	" 29	Aug. 29	73.9	39.9	136.6
Cross	" 29	" 30	72.7	38.4	131.5
Hopson's Longfellow	" 30	Sept. 1	70.4	35.5	100.0
Brewer's Flint	Aug. 1	" 8	81.4	46.1	129.9
Cross	" 2	" 6	77.1	40.3	113.5
Hopson's Longfellow	July 31	" 3	72.2	38.2	100.0
Davis' Flint	" 29	Aug. 28	77.3	38.6	101.0
Cross	Aug. 2	Sept. 6	74.1	42.3	110.7
Hopson's Longfellow	July 31	" 1	72.6	37.4	100.0
Hayes' Flint	" 29	" 1	74.1	48.3	129.1
Cross	" 30	Aug. 29	75.4	49.8	133.1
Hopson's Longfellow	" 31	" 30	72.4	37.4	100.0
Holcomb's Dent	Aug. 2	Sept. 2	85.5	48.4	129.4
Cross	" 2	" 3	86.2	48.3	129.1
Hopson's Longfellow	July 30	Aug. 30	71.3	37.4	100.0
Mammoth White Flint	Aug. 7	Sept. 15	93.6	55.6	148.6
Cross	" 2	" 12	86.2	49.4	132.1
Hopson's Longfellow	July 30	Aug. 30	71.3	32.8	100.0
Dibble's Dent	Aug. 5	Sept. 14	98.8	64.8	197.5
Cross	" 8	" 12	88.2	49.0	150.6
Hopson's Longfellow	July 30	Aug. 30	71.3	32.8	100.0
Stadt. Leaming	Aug. 8	Sept. 14	99.0	65.1	198.4
Cross	July 31	Aug. 31	92.4	54.5	166.1
Reciprocal Cross	Aug. 2	Sept. 9	....	71.6	218.2
Hopson's Longfellow	July 30	Aug. 30	65.6	32.8	100.0
Brewer's Dent	Aug. 12	Sept. 23	93.5	49.2	150.0
Cross	" 5	" 12	87.5	50.0	152.4

even with an extra stimulus to development, to expect the cross to give as large a yield as the later parent.

Of the ten tests, four gave a slightly larger yield than the better parent, five an increase over the parental average, and one a slight decrease from the parental average.

The beneficial crosses were Olmsted's Flint × Longfellow, which gave 3.6 per cent. increase over the better parent, the Davis' Flint × Longfellow with a 9.7 per cent. increase, the Hayes' Flint × Longfellow with a 4 per cent. increase, and the Brewer's Dent × Longfellow with a 2.4 per cent. increase over the Dent parent and a gain of eleven days in time of maturity.

The Dibble's Dent × Longfellow was the only cross which gave a decrease over the average of the parents. It is a peculiar coincidence that Dibble's Dent also gave negative results when crossed with Stadtmueller's Leaming.

Tests at Bloomfield in 1913.

Several of the crosses and parents which were grown at Mount Carmel in 1912 and 1913 were planted at the Windsor Tobacco Growers' Corporation, in Bloomfield, Conn., on land which was used for tobacco the previous season. Our thanks are due to the Corporation for the use of about an acre of land for the tests.

Many sections of Connecticut suffered severely in 1913 for lack of rainfall, and in no section of the State was this condition more apparent than in Bloomfield. During the early part of the season the rainfall was normal, but from the time of the appearance of tassels on the early varieties until late in the fall, the crop suffered severely.

The results obtained are presented in Table V. Sixty hills from each plot were harvested, husked, and the corn stored in baskets until the last of December, when it was weighed and the yield determined. As the earlier varieties had a more favorable growth period than the later ones, the comparative yields are of little value.

One of the most interesting features of the test was apparent to all who saw the corn in the field, i. e., the fact that the Dents did not suffer so severely for lack of moisture as the Flints. Stadtmueller's Leaming and Mammoth White Flint have about the same height and mature at about the same time under fairly favorable conditions (see 1912 tests), yet in extreme dry weather the Leaming grew much taller than the Mammoth Flint and gave nearly twice as large a yield.

The average yield of the Longfellow, Brewer's and Newgate Flint varieties was 25.6 bushels of shelled corn per acre. The

average yield of the Holcomb's Early Dent, Griswold's Early Dent and Tyler Dent, which mature about the same time as the above flints, was 33 bushels. Observation showed that the early dents withstood the dry weather much better than the early flints.

Of the Stadtmueller's Leaming crosses, Newgate Flint × Leaming and Early Dent × Leaming proved better than their

Table V.—Comparative Yield of First Generation Crosses and their Parents. Bloomfield, 1913.

Variety.	Bushels Shelled Corn per acre.
Stadtmueller's Leaming (male parent)	24.2
Brewer's Dent	15.1
Brewer's Dent × Stadtmueller's Leaming	22.4
Low Protein	15.0
Low Protein × Stadtmueller's Leaming	21.5
High Protein	14.4
High Protein × Stadtmueller's Leaming	23.6
Holcomb's Early Dent	24.0
Early Dent × Stadtmueller's Leaming	27.0
Newgate Flint	24.4
Newgate Flint × Stadtmueller's Leaming	28.4
Mammoth White Flint	12.7
Mammoth White Flint × Stadtmueller's Leaming	21.6
Hopson's Longfellow (male parent)	24.5
Brewer's Dent	15.1
Hopson's Longfellow × Brewer's Dent	19.5
Mammoth White Flint	14.7
Mammoth White Flint × Longfellow	25.7
Brewer's Flint (male parent)	26.0
R. I. White Flint × Brewer's Flint	27.9
Hall's Tyler Dent	33.7
Hall's Tyler Dent × Brewer's Flint	35.7
*Griswold's Early Dent	41.3
Griswold's Early Dent × Brewer's Flint	37.1

*End plot grew beside a flint variety which was planted about 2 weeks after the dent.

parents. The Newgate Flint × Leaming cross also proved to be a good one in the 1912 test.

The Brewer's Dent × Leaming, High Protein × Leaming and Low Protein × Leaming crosses, which gave an increase over the better parent in 1912, gave an increase over the average of the parents in this test but slightly less than the Leaming parent. This may be explained by the fact that the Leaming matured earlier than either the crosses or female parents and consequently suffered less from the drought.

Brewer's Dent × Longfellow gave about the same yield as the parental average. Mammoth White Flint × Longfellow gave an increase over the better parent.

The Rhode Island White Flint × Brewer's Flint and Hall's Tyler Dent × Brewer's Flint crosses yielded more than their parents, and the Griswold's Early Dent × Brewer's Flint cross more than the parental average. The comparatively large yield of Griswold's Early Dent variety may partly be explained by the fact that it was the end plot of our test and was planted ten days earlier than the commercial field at its side.

The average yield of bushels of crib-cured shelled corn of the three male parents was 24.9, of the female parents 21.0, and of the crosses 26.4, or an increase of 14.9 per cent. in favor of the crosses over the average of the parents.

Tests at Mount Carmel in 1913.

The same plot on which corn was grown in 1912 was used for the tests in 1913.

Previous tests indicated that highly selected varieties which matured at about the same date and gave about the same yield, if differing in other characters, would prove the better parents for a first generation cross. Accordingly, as far as possible, such selected varieties were used in this test.

The season was fairly favorable at Mount Carmel, as we were fortunate in having showers to tide over the dry weather period. A moderate dressing of manure and fertilizers was used on the corn plot.

Table VI gives the order of planting and row yields of the parents and crosses. The Brewer's Flint parent was grown for comparison with each cross. In each test three female remnant ears and their crosses were compared with one-year old and two-year old Brewer's Flint seed. As a further attempt to obtain accurate results, the crosses and parents were separated by discard rows which were not used in the computations.

Of the six tests of one and two-year old Brewer's Flint seed, there were three rows in which the 1911 seed gave a slightly greater yield and three cases in which the 1912 seed proved superior. The total yield of the six rows from the two-year old

Table VI.—Yield of Crib-cured Corn in 1913 on plots 1 and 2 in which Brewer's Flint was used as the Male Parent. Length of each row 162 feet.

Variety.	Selection No.	Row No.	Yield in Pounds.
Brewer's Flint	20 discard	1	43.7
" " 1911 Seed	20—1	2	48.6
" " 1912 Seed	20—2	3	52.2
Woodruff's Longfellow.	21 discard	4	40.6
" "	21—1	5	48.1
" "	21—2	6	53.6
" "	21—3	7	42.3
" "	21 discard	8	49.6
Woodruff's Longfellow × Brewer's Flint	21×20 discard	9	62.0
Woodruff's Longfellow × Brewer's Flint	21—1×20	10	61.1
Woodruff's Longfellow × Brewer's Flint	21—2×20	11	59.9
Woodruff's Longfellow × Brewer's Flint	21—3×20	12	57.5
Woodruff's Longfellow × Brewer's Flint	21×20 discard	13	61.6
R. I. White Flint	28 discard	14	53.2
" " "	28—1	15	64.0
" " "	28—2	16	60.4
" " "	28—3	17	55.3
R. I. White Flint × Brewers	28×20 discard	18	67.5
R. I. White Flint × Brewers	28—1×20	19	65.8
R. I. White Flint × Brewers	28—2×20	20	62.1
R. I. White Flint × Brewers	28—3×20	21	64.4
R. I. White Flint × Brewers	28×20 discard	22	62.0
Brewer's Flint	20 discard	23	64.0
" " 1912 Seed	20—3	24	62.0
" " 1911 Seed	20—4	25	58.8
Burwell's Flint	26 discard	26	59.2
" "	26—1	27	68.2
" "	26—2	28	63.8
" "	26—3	29	64.7
" "	26 discard	30	62.6
Burwell's Flint × Brewer's Flint	26×20 discard	31	65.4
Burwell's Flint × Brewer's Flint	26—1×20	32	66.7
Burwell's Flint × Brewer's Flint	26—2×20	33	64.6
Burwell's Flint × Brewer's Flint	26—3×20	34	67.0
Burwell's Flint × Brewer's Flint	26×20 discard	35	66.2
Griswold's Dent	24 discard	36	64.1
" "	24—1	37	60.9
" "	24—2	38	35.6
" "	24—3	39	58.3
" "	24 discard	40	52.7
Griswold's Dent × Brewer's Flint	24×20 discard	41	57.9
Griswold's Dent × Brewer's Flint	24—1×20	42	66.3
Griswold's Dent × Brewer's Flint	24—2×20	43	66.2
Griswold's Dent × Brewer's Flint	24—3×20	44	64.6
Griswold's Dent × Brewer's Flint	24×20 discard	45	69.8
Brewer's Flint, 1911 Seed	20—5	46	57.5
Brewer's Flint, 1912 Seed	20—6	47	55.7
Brewer's Flint	20 discard	48	54.9
" "	20 discard	1	43.7
Brewer's Flint, 1912 Seed	20—7	2	59.3
Brewer's Flint, 1911 Seed	20—8	3	58.1
Sanford's White Flint.	22 discard	4	54.7
" " "	22—1	5	66.0
" " "	22—2	6	57.4
" " "	22—3	7	51.9
" " "	22 discard	8	55.7
Sanford's White × Brewer's Flint	22×20 discard	9	56.5
Sanford's White × Brewer's Flint	22—1×20	10	56.0
Sanford's White × Brewer's Flint	22—2×20	11	59.6
Sanford's White × Brewer's Flint	22—3×20	12	57.3
Sanford's White × Brewer's Flint	22×20 discard	13	57.8
Griswold's Canada	23 discard	14	55.1
" "	23—1	15	60.6

TABLE VI.—YIELD OF CRIB-CURED CORN IN 1913 ON PLOTS 1 AND 2 IN WHICH BREWER'S FLINT WAS USED AS THE MALE PARENT. LENGTH OF EACH ROW 162 FEET—*Continued.*

Variety.	Selection No.	Row No.	Yield in Pounds.	Variety.	Selection No.	Row No.	Yield in Pounds.
Griswold's Canada.....	23—2	16	56.8	Smut Nose White × Brewer's Flint.....	30—3×20	34	59.3
" "	23—3	17	56.6	Smut Nose White × Brewer's Flint.....	30×20 discard	35	65.4
" "	23 discard	18	61.9	Hall's Tyler Dent	25 discard	36	45.5
Griswold's Canada × Brewer's Flint.....	23×20 discard	19	57.9	" " "	25—1	37	52.0
Griswold's Canada × Brewer's Flint.....	23—1×20	20	57.9	" " "	25—2	38	68.1
Griswold's Canada × Brewer's Flint.....	23—2×20	21	60.3	" " "	25—3	39	69.0
Griswold's Canada × Brewer's Flint.....	23—3×20	22	57.7	Tyler Dent × Brewer's Flint.....	25 discard	40	45.9
Griswold's Canada × Brewer's Flint.....	23×20 discard	23	63.6	Tyler Dent × Brewer's Flint.....	25×20 discard	41	65.4
Brewer's Flint, 1911 Seed	20—9	24	62.0	Tyler Dent × Brewer's Flint.....	25—1×20	42	68.0
" " 1912 Seed	20—10	25	60.2	Tyler Dent × Brewer's Flint.....	25—2×20	43	69.5
Smut Nose White Flint	30 discard	26	54.0	Tyler Dent × Brewer's Flint.....	25—3×20	44	65.8
" " " "	30—1	27	50.8	Tyler Dent × Brewer's Flint.....	25×20 discard	45	55.2
" " " "	30—2	28	63.6	Brewer's Flint, 1912 Seed.....	20—11	46	54.3
" " " "	30—3	29	69.7	Brewer's Flint, 1911 Seed.....	20—12	47	59.8
" " " "	30 discard	30	44.1	Brewer's Flint.....	20 discard	48	49.1
Smut Nose White × Brewer's Flint.....	30×20 discard	31	76.1				
Smut Nose White × Brewer's Flint.....	30—1×20	32	63.5				
Smut Nose White × Brewer's Flint.....	30—2×20	33	60.7				

seed was 344.8 pounds and from the one-year old seed 343.7 pounds.

There seems to be no very close correlation in these tests between the slight variations in yield of the female remnant ears and their respective crosses. In three of the five cases in which the cross proved better than either parent, the yield of each female ear remnant was less than its respective cross. In the two opposite cases one of the three female remnant ears slightly exceeded its cross. All who have had experience in plot test work know that many variations occur which cannot be explained entirely by the reproductive capacity of the seed.

Of the three ears of Rhode Island White Flint, obtained through the kindness of Mr. S. C. Damon of the Rhode Island

Experiment Station, 28—1 and 28—2 were from detasseled stalks which had been pollinated by another selected strain of the same variety, while 28—3 was from a crop rotation plot. It is of interest to note that the yields from 28—1 and 28—2 exceeded

TABLE VII.—COMPARATIVE YIELD OF FIRST GENERATION HYBRIDS AND THEIR PARENTS. MT. CARMEL, 1913.

Variety.	Date of Silking.	Date of Maturity.	Yield of Bush. Shelled Corn per acre.	Comparative Yield in per cent.
Brewer's Flint.....	July 26	Aug. 27	53.7	100.0
Woodruff's Longfellow	" 29	Sept. 5	50.0	93.1
Cross	" 30	Aug. 30	62.4	116.2
Brewer's Flint.....	" 28	" 27	63.9	100.0
R. I. White Flint.....	" 22	" 22	65.3	102.2
Cross.....	" 25	" 27	69.9	109.4
Brewer's Flint.....	" 28	" "	63.9	100.0
Burwell's Flint	" 26	" "	70.8	110.8
Cross.....	" "	" "	71.5	111.9
Brewer's Flint.....	" 28	" 31	59.2	100.0
Griswold's Early Dent	" "	" 26	54.2	91.5
Cross.....	" 27	" 28	69.3	117.0
Brewer's Flint.....	" 28	" 27	61.2	100.0
Sanford's White Flint.....	" 31	Sept. 6	60.4	98.7
Cross	" 29	Aug. 30	60.7	99.2
Brewer's Flint.....	" 28	" 27	65.5	100.0
Griswold's Canada Flint	" 26	" "	62.3	95.1
Cross.....	" 25	" "	62.3	95.1
Brewer's Flint.....	" 28	" "	65.5	100.0
Smut Nose White Flint	" 27	" "	67.4	102.9
Cross	" "	" "	65.6	100.2
Brewer's Flint.....	" 26	" 28	60.5	100.0
Hall's Tyler Dent	" 27	" 27	67.4	111.4
Cross	" "	" "	73.0	120.6

that obtained from 28—3, while the crosses gave nearly equal results.

Table VII is a condensed report of the crosses and parents. Little can be said of the time of maturity, as all matured at about the same date. Sanford's White Flint and Woodruff's Longfellow were, however, about a week later than the other varieties and crosses, and Rhode Island White Flint matured about a week earlier.

Of the eight crosses, five gave a larger yield than the better parent, one an intermediate yield, and two the same yield as the poorer parent; 4.9 per cent. was, however, the largest decrease from the better parent, while increases of from 7 to 17 per cent. were obtained in favor of the crosses over the better parent. The highest yield was 73 bushels per acre, which was obtained in the cross between Hall's Tyler Dent and Brewer's Flint, an increase of 9 per cent. over the Dent parent and 20.6 per cent. over the Flint parent.

Sweet Corn Varieties and Crosses in 1913.

In 1912 Stowell's Evergreen Sweet corn was crossed with Golden Bantam and Country Gentleman. The tests reported in Table VIII, for 1913, are a comparison of the yields of the original parent ears of 1911 with the crosses made in 1912.

Two tests were made of each cross, one at the Station grounds in New Haven and the other at the experimental farm in Mount Carmel. The conditions at Mount Carmel were fairly good, while the crops in New Haven suffered severely for lack of rain.

Each test in New Haven consisted of a plot containing forty-two hills, and at Mount Carmel the size of each plot was twenty-four hills. The data for the New Haven plot were taken by Mr. Veitch.

The Golden Bantam × Stowell's Evergreen cross was intermediate in time of maturity although somewhat earlier than the average of the parents.

At the Station test the length of ears of the cross slightly surpassed either parent, while at Mount Carmel the length of ears of the cross was nearly equal to the Evergreen parent and considerably greater than the Golden Bantam parent.

Tested at the Station, the cross outyielded either parent in number of ears, while at Mount Carmel the cross nearly equalled the Golden Bantam in number of ears produced and gave a large increase over the Evergreen parent.

The number of rows per ear was also of intermediate habit and was the only character studied which did not surpass the parental average.

The Golden Bantam has a very fine flavor as a table variety. In cooking tests the Golden Bantam parent was generally considered to have a better quality than the other varieties or crosses.

The Golden Bantam × Stowell's Evergreen cross had a better quality than the Evergreen parent but was not equal to the Bantam parent.

The general faults of the Golden Bantam are small ears and yellow seeds. For this reason it is seldom seen in the market. The size of the ears of the cross between Golden Bantam and Evergreen was good and the cross had good vigor. The ears

TABLE VIII.—SWEET CORN VARIETIES AND CROSSES IN 1913.*

Variety.	Place of Test.	Average Date of Maturity.	Average length of Ear in inches.	Average rows of Ear.	Number of Ears.
Golden Bantam	Mt. Carmel	Aug. 16	6.0	8.1	109
Golden Bantam × Stowells	"	" 23	7.4	10.7	103
Stowells × Golden Bantam	"	" 22	7.6	10.5	107
Stowells' Evergreen	"	" 31	7.8	13.6	86
Golden Bantam	Station Grounds	Aug. 6	7.3	....	80
Golden Bantam × Stowells	"	" 15	7.5	....	96
Stowells' Evergreen	"	" 27	7.0	....	57
Country Gentleman	Mt. Carmel	.....	7.2	....	105
Country Gent. × Stowells	"	.....	7.6	....	103
Stowells' Evergreen	"	.....	7.8	....	86
Country Gentleman	Station Grounds	Aug. 25	7.0	....	78
Country Gent. × Stowells	"	" "	7.2	....	87
Stowells' Evergreen	"	" 27	7.0	....	57

*In the crosses the female parent appears first.

bore a mixture of yellow and white kernels. This cross might prove valuable as a market variety if the general consumer were acquainted with its good qualities.

The Country Gentleman × Stowell's Evergreen cross gave good results in the Station test and, if we consider the average length of ear and ear number under one heading, an increased yield of about 16 per cent. was obtained in favor of the cross over either parent. At Mount Carmel the cross was of intermediate habit in ear length and number of ears but, in both characters, nearly equalled the better parent. Considering both ear length and number of ears together, we find that the cross surpassed either parent in yield by about 4 per cent.

The Country Gentleman is a crooked-rowed variety and the Stowell's Evergreen has straight rows. The cross produced ears which had straight rows like the Evergreen parent, but the kernels of the cross were somewhat smaller than those of the Evergreen variety.

GENERAL CONSIDERATION OF THE VARIETIES AND THEIR CROSSES.

In some characters, as we have already explained, the cross resembles one parent, in other characters the other, while by far the larger number of characters are of intermediate habit.

Characters which Show Dominance.

Cob Color. If we cross a variety which is pure for the character red cobs with a white-cobbed variety, the First Generation Cross will have red cobs. Thus the cross between Tyler Dent, which breeds true for red cobs, and Brewer's Flint, a white-cobbed variety, produced all red cobs.

Colored Pericarp. Similarly a cross between a pure variety which has a colored pericarp (outer hull) and a colorless pericarp variety will have a colored pericarp in the First Generation. Such a cross was Davis' Flint × Longfellow, in which the Davis' Flint parent had a slight color in the outer hull.

Straight Rows. In the cross between Country Gentleman (irregular rows) and Stowell's Evergreen (straight rows) there was a dominance of the straight-rowed character.

Tillering. One difference between Flint and Dent races is that almost, if not all, flint varieties have the habit of producing numerous basal tillers, while dents produce few tillers. A cross between a dent and flint resembles the dent parent in tillering habit, although the cross produces a few more tillers than the pure dent.

Protein Content. The inheritance of protein in the first generation cross is of especial interest. By several years of selection, the Illinois Experiment Station was able to produce strains which contained higher and lower protein content than the average of corn races. Thus Illinois High Protein gives an average of about 14 per cent. protein (dry basis) and Illinois Low Protein an average of about 9 per cent., while ordinary field varieties average from 11 to 12 per cent.

As a result of the close selection which the High and Low Protein races have undergone, the yields have been somewhat decreased. Through the kindness of the Illinois Experiment Station we obtained a few ears of their High and Low Protein races for the purpose of determining their value as parents in producing first generation crosses and also to determine the inheritance of protein in the cross. Mr. C. D. Hubbell and Mr. G. L. Davis analyzed the ears reported in Table IX, under the direction of Mr. J. P. Street, Station chemist.

Table IX.—Inheritance of Protein in the First Generation Crosses between Ill. Low and Ill. High Protein and Stadtmueller's Leaming.

Variety.	No Ears Analyzed.	Variation in Ears in Protein Content.	Average Protein Content, Dry Basis.
Illinois High Protein.....	19	11.95—17.10	14.87
Stadt. Leaming 1910 seed..	13	7.75—16.28	11.85
Cross	12	9.25—14.68	11.85
Illinois Low Protein	16	6.81—11.56	9.41
Stadt. Leaming 1911 seed..	14	8.21—15.94	12.19
Cross	9	7.69—11.86	9.18

In order to offset the effect of off-pollination (if any), a number of ears of each parent and of the crosses were artificially hand-pollinated. This was accomplished by covering both tassel and ear with a Manila paper bag and then dusting the pollen from the tassel over the silk, the bag remaining on the ear until maturity.

There seems to be a complete dominance of Low Protein over High Protein. Thus in the cross between High Protein and Leaming, the High Protein gave an average of 14.87 per cent. protein (dry basis), the Leaming an average of 11.85 per cent. protein, and the cross 11.85 per cent. protein. The cross Low Protein × Leaming gave an average of 9.18 per cent. protein, the Leaming parent 12.19 per cent. protein, and the Low Protein parent 9.41 per cent. protein. If Low Protein were a desirable character such a cross as the above would be a favorable one, as an increase of yield over the Leaming parent was obtained (see Table II) together with a low protein content.

These results indicate the proper procedure for the production of High Protein corn. Two High Protein races should be isolated, and if possible from varieties which are somewhat dissimilar in character but which mature at about the same season. A first generation cross between such varieties would have high protein content together with high yielding capacity.

Variable Characters in the Cross.

Endosperm Color. The immediate resulting color of a cross between yellow and white varieties of corn, no matter which is the female parent, is yellow. If this seed is used the next year, the generation in which the stimulus to development may be expected, ears will be obtained which contain both yellow and white seeds. Such results were obtained in the Rhode Island White Flint × Brewer's Flint cross.

In general, the difference between dent and flint corn is due to the position in which the soft starch is formed. In dent corn the soft starch is produced at the top of the seed and, on drying, an indentation is made. In flint corn, on the contrary, the soft starch is surrounded by the hard or corneous starch. In the greater number of cases a cross between dent and flint races will be no more variable than the parents and of intermediate character. Floury races contain only a small amount of hard starch and the first generation of a cross between flour and flint corn produces ears which contain both floury and flinty seeds.

If the dent and flint parents of a cross differ very greatly in the average amount of soft starch produced in the seed, the cross may appear somewhat more variable than the parents.

Intermediacy of Characters.

By far the greater number of characters are of an intermediate habit in the cross.

Number of Rows. A number of examples of the row number of parents and crosses are given in Table X. There is a greater apparent variability in races which produce many rows than in eight-rowed races. The first generation of a cross is, however, no more variable than the average of the parents. In our tests

the average number of rows per ear of the cross has been slightly less than the average of the parents. Thus the average number of rows of the seven crosses of Table X is 10.9 and of the parents 11.8. Number of rows per ear is the only character which we have studied in which the crosses average less than the parents.

Table X.—Inheritance of Row Number in the First Generation Crosses.

Variety.	No. of rows per Ear.										Average. Rows.
	6	8	10	12	14	16	18	20	22	24	
Brewer's Flint	10	304	8								7.9
Griswold's Dent			11	55	49	15	2				13.1
Cross		34	60	58	2						10.5
Brewer's Flint	10	304	8								7.9
Hall's Tyler Dent			6	57	54	21					13.3
Cross		21	61	51	8						10.6
Hopson's Longfellow	20	100									7.6
Holcomb's Early Dent			15	103	84	28	9				13.2
Cross		64	115	64							10.0
Hopson's Longfellow	20	100									7.6
Brewer's Dent				3	10	29	33	23	5	2	17.6
Cross		1	25	71	19	1					11.8
Stadtmueller's Leaming				1	7	35	57	22	9	3	17.9
Davis' Flint		50	8								8.2
Cross		6	43	24	5						10.7
Stadtmueller's Leaming				1	7	35	57	22	9	3	17.9
Olmsted's Mammoth Flint		26	4	1							8.4
Cross		1	7	23	4						11.7
Stadtmueller's Leaming				1	7	35	57	22	9	3	17.9
Walker's Newgate Flint	45	83									7.2
Cross		10	41	41	2						10.7

Shelling Yield. Shelling yield, that is, the amount of shelled corn produced by each pound of corn on the ear, is of intermediate habit in the crosses, although some variations were observed. The shelling capacity of the crib-cured corn of our Mount Carmel 1912 and 1913 tests varied from 0.79 in Illinois High Protein to over 0.86 in several flints and Holcomb's Early Dent. The average shelling capacity for the crosses was 0.8364, for the male parents 0.8363, and for the female parents 0.8277.

For explanation of "shelling capacity" see page 382.

Date of Maturity. This is, in general, an intermediate character, although in some cases the cross matured earlier and in other cases later than the parental average. Thus our crosses generally gave a greater shrinkage in drying than the earlier parent and less shrinkage than the later maturing parent.

Height of Plant. This was intermediate in the crosses, although their average height slightly exceeded the average of the parents. In a few crosses in which the parents were of about the same height, the average height of the cross slightly exceeded the average height of either parent.

A study of the above results indicates the appearance of each character when the parents differ in several important characters. Thus if one wishes to grow yellow flint corn and yet get the vigor due to crossing he must use yellow flint parents. A medium early variety can be obtained in a cross by using medium early parents or by a cross between a very early and a later variety. In a similar manner we must consider how each character is inherited and then choose parental varieties which will give the desired appearance in the cross.

The important feature of our tests is not, however, the appearance of any special character but the question of whether first generation crosses are of sufficiently greater vigor than their parents to pay for producing first generation hybrid seed.

By actual test, twenty-one first generation crosses have given larger yields than either parent, eleven a larger yield than the average of the parents, and seven a smaller yield than the parental average. The largest decrease in yield from the average of the parents was 7.9 per cent., which was obtained in the cross between Burr's Leaming and Stadtmueller's Leaming. The greatest increase over the better parent (17 per cent.) was obtained at Mount Carmel in 1913 for the Griswold's Early Dent × Brewer's Flint cross.

The Stadtmueller's Leaming crosses, at Mount Carmel in 1912, gave an increase over the parental average of 6.4 per cent., the Hopson's Longfellow crosses an increase over the parents of 13.2 per cent., the Bloomfield crosses an increase over the parents of 14.9 per cent., and the crosses at Mount Carmel (1913) an increase of 8.3 per cent. over the average of the parents. These results seem sufficiently convincing and show that the commercial production of first generation hybrid corn seed would aid in materially increasing our yields of corn.

All tests so far reported clearly prove that a cross between a highly selected variety and a poor yielding one cannot be expected to exceed the better parent and that highly selected varieties will prove the better as parents. The only way of determining what varieties to use for producing first generation seed is to compare the yields of both parents and cross under similar conditions.

ADVANTAGEOUS CROSSES.

The Mammoth White Flint × Stadtmueller's Leaming cross matured at about the same time as the parents and gave 13.8 per cent. more shelled corn than either parent. Under average conditions of fertility and rainfall this cross is a good one.

The cross between Illinois High Protein and Leaming matured a few days later than the Leaming parent and gave 9.5 per cent. more shelled corn than either.

The Newgate Flint × Leaming cross matured a week earlier than the Leaming parent and gave 17 per cent. more corn than the flint parent and 2.4 per cent. more corn than the Leaming. This cross gave good results under the dry weather conditions at Bloomfield.

The cross between Hopson's Longfellow and Brewer's Dent deserves mention as it gave a slightly larger yield than the Dent, with the benefit of eleven days' earlier maturity.

If one desires to grow a large yellow flint, the cross between Woodruff's Longfellow and Brewer's Flint should prove a good one, as an increase of 16.2 per cent. over the better parent was obtained.

The cross between Rhode Island White Flint and Brewer's Flint grew to medium height and gave an increase of 7.2 per cent. over the better parent.

At our Mount Carmel test, Griswold's Early Dent × Brewer's Flint gave 17 per cent. more corn than either parent.

The highest yield, 73 bushels of crib-dried shelled corn, which was obtained at Mount Carmel in 1913, was from the cross between Hall's Tyler Dent and Brewer's Flint. This cross grew to a slightly greater height than the dent parent, giving an increase of 9.2 per cent. in yield over the dent and 20.6 per cent. more corn than the flint parent.

COMPARISON OF VARIETIES.

In many of the western states, where corn is the main crop, there are a few highly selected varieties which have proved their value. Under these conditions it is possible to recommend a definite variety.

Connecticut has a large number of varieties which often have local names and which differ from each other in only a few minor points. For this reason it is almost impossible to name any one variety which will prove the best for a given section. It would, without doubt, be of benefit to Connecticut agriculture if there were fewer varieties and if these were more systematically improved by seed selection. A brief résumé of the varieties which we have grown will be given and an attempt made to classify them according to time of maturity and yield.

The comparative time of maturity would probably not vary greatly under different environmental conditions, while the yielding capacity would show wide variations under such conditions. Our results are a statement of the comparative time of maturity and yield, under the conditions of our Mount Carmel tests.

The results presented in Table XI show the variations in shelling capacity and shrinkage of corn varieties. These were determined by storing a basket of each variety and reweighing and shelling it about January first. The shelling capacity is the amount of shelled corn produced by each pound of ear corn. As the legal weight in Connecticut of a bushel of corn on the ear is 70 pounds and of a bushel of shelled corn is 56 pounds, the standard shelling capacity is 0.8.

The varieties which we have grown varied from 0.79 shelling capacity in Illinois High Protein to a shelling capacity in Newgate Flint of 0.869. In comparing the yield of two varieties it is of considerable importance to determine their shelling capacity.

Variations in shrinkage are also of interest in this connection. Of course the most accurate method is to determine the percentage of moisture of a representative sample, by chemical test. For ordinary purposes, however, fairly accurate results can be obtained by weighing a representative sample of each variety at husking time and then reweighing the samples after the corn is crib-cured. Table XI shows a variation from 8 to 33 per cent. in the shrinkage of our varieties. In general, the amount of shrinkage is dependent on the time of maturity, although large-

cobbed varieties may be expected to shrink more than varieties with small cobs.

Our varieties are placed in four classes for date of maturity, the earlier varieties of each class being placed first. Each class will then be rearranged according to yield, the better yielding ones being placed first.

TABLE XI.—PER CENT. SHRINKAGE AND SHELLING CAPACITY OF THE VARIETIES GROWN AT MT. CARMEL.

1913 Varieties.	Per cent. Shrinkage.	Shelling Capacity.
Rhode Island White Flint	.15	.858
Smut Nose White Flint	.17	.865
Sanford's White Flint	.17	.818
Griswold's Canada Flint	.16	.846
Brewer's Improved Flint	.18	.839
Burwell's Flint	.17	.852
Woodruff's Longfellow	.21	.824
Griswold's Early Dent	.11	.826
Hall's Tyler Dent	.16	.842
1912 Varieties.	**Per cent. Shrinkage.**	**Shelling Capacity.**
Hopson's Longfellow	.08	.840
Olmsted's Canada Improved	.16	.859
Newgate Flint	.12	.869
Brewer's Flint	.18	.842
Davis' Flint	.09	.859
Hayes, Flint	.14	.856
Holcomb's Early Dent	.15	.865
Mammoth White Flint	.23	.798
Stadtmueller's Leaming	.21	.810
Dibble's Dent	.23	.834
Burr's Leaming	.28	.809
Illinois High Protein	.26	.790
Illinois Low Protein	.33	.830

The *very early* varieties were Rhode Island White Flint, Olmsted's Canada Flint, Davis' Flint, Newgate Flint, Hayes' Flint and Hopson's Longfellow. Classified according to yield, the list reads: Rhode Island White Flint, Hayes' Flint, Newgate Flint, Davis' Flint, Olmsted's Canada Flint and Hopson's Longfellow.

The *early* varieties were Griswold's Early Dent, Hall's Tyler Dent, Burwell's Yellow Flint, Smut Nose White Flint, Griswold's Canada Flint and Brewer's Improved Flint. According to yield, the list reads: Hall's Tyler Dent, Burwell's Yellow Flint, Smut

Nose White Flint, Brewer's Flint, Griswold's Canada Flint, Griswold's Early Dent.

The *medium* varieties were Sanford's White Flint, Woodruff's Longfellow, Mammoth White Flint, Stadtmueller's Leaming and Dibble's Dent. According to yield, the list reads: Dibble's Dent, Stadtmueller's Leaming, Mammoth White Flint, Sanford's White Flint and Woodruff's Longfellow.

The *late* varieties were Brewer's Dent, Illinois Low Protein, Illinois High Protein, and Burr's Leaming. Of the late varieties, Burr's Leaming gave the best yield, followed by Brewer's Dent and the Protein strains.

CONCLUSION.

There are many corn varieties in Connecticut and under the conditions of our experiments some proved much better yielders than others. It is not profitable to grow a poor yielding variety if a better one can be obtained. Each grower should therefore determine by actual test whether the variety which he is using is giving him the best possible return for his money.

It would be of advantage to Connecticut agriculture if there were fewer varieties and if these were more carefully improved by seed selection. A variety which has never been improved by the ear-to-row method of breeding will frequently give an increase in yield of from 10 to 20 per cent. by the use of this method. The Station will be glad to coöperate with any corn grower who wishes to improve his variety by systematic breeding.

An increased yield can often be obtained by taking advantage of the extra stimulus to development of a first generation cross. In general, first generation crosses may be expected to give a larger yield than the average of the parents; however, a cross is of no advantage unless it exceeds the better parent. The better results can be expected from a cross between two highly selected varieties. The only sure method of determining the yielding value of a cross is to grow and compare its yield with both parents.

In nearly all reported tests there have been some crosses which gave a sufficiently better yield than any of the parent varieties to more than pay for the trouble of producing crossed seed.

THE "STEWART CUBAN" VARIETY OF TOBACCO.

By H. K. Hayes.

Most of the tobacco now raised under shade in Connecticut is a Cuban type, first grown in this country in 1904 from seed which was brought from Cuba by Mr. William Hazlewood of New York City. The plants in this first crop were very variable in their characters. Hasselbring's* experiments, which have been corroborated by our own,† show that these variations are largely the result of a mixture of seed of various types of tobacco. Cuban growers save seed from the suckers which grow from the base of the harvested stalks without any selection, and such seed, of course, gives a variable progeny.

The better plants of the 1904 Connecticut-grown Cuban were selected and seed was produced under Manila paper bags to prevent crossing. A row of from 200 to 300 plants of each type was grown in each succeeding year until 1909. Each year the different selections were harvested separately and a comparative sorting test was made (see Stewart‡) and one line known as 13-29 proved its superiority. A considerable number of seed plants were saved in 1909 and the seed used for commercial planting in 1910 at the Windsor Tobacco Growers' Corporation in Windsor. This gave a crop of uniform appearance in which no considerable variations were noted. A large quantity of seed was saved from one section of the field but the seed heads were not specially protected as there seemed little danger that crossing would take place under the shade.

The seed collected in 1910 gave good results in 1911 and was again used in 1912 and 135 acres were grown by the Windsor Corporation. The crop of 1912 was a good one and appeared very uniform, but when clearing the field in the fall a workman

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* Hasselbring, H. Types of Cuban Tobacco. The Botanical Gazette, Vol. 53, 113-126; 1912.

† Hayes, H. K. Variation in Tobacco. The Journal of Heredity, Vol. 5, No. 1; 40-46; 1914.

‡ Stewart, J. B. The Production of Cigar Wrapper Tobacco Under Shade in the Connecticut Valley. U. S. Dept. Agr. Bu. Plant Ind. Bull. 138, pp. 31.

discovered that one of the plants he had just cut down bore a large number of unpicked leaves and showed no signs of a flower head. This plant was brought to the attention of the manager, Mr. J. B. Stewart, who recognized in it the ideal tobacco plant. A systematic search of the standing tobacco on the plantation discovered two other such plants. These plants were carefully transplanted and brought to our Station greenhouse. One of them survived and bore 72 leaves, blossoming about January first. Considerable seed was saved from the terminal and sucker blossoms of this plant and was turned over to Mr. Stewart in 1913. This was sown in a section of a seed bed. The seed germinated well and about one-third of an acre, 3,720 plants, were set out under shade.

These plants came true to the new type in all external characters and differed from the normal Cuban in having leaves of a somewhat lighter green shade and in being nearly free from basal suckers. This last is a distinct merit because the present Cuban type of tobacco must be suckered, at considerable expense, when the plants are from one to three feet high. The new type showed no signs of blossoming during the normal period of growth, whereas the normal Cuban variety produces a terminal blossom after producing from 16 to 25 leaves on the main stem. Of the twenty plants of the 1913 crop brought to our greenhouse in New Haven, all but eight were injured during transportation. The eight uninjured plants commenced to blossom about the first of November, the range of leaf counts being from 62 to 80 with the greater number around 70. These data show that this new type is breeding true, and unless it behaves in a manner different from other mutations it should breed true in successive generations.

It has been named the "Stewart Cuban," and in the account of experiments which follows the normal Cuban type is called the Hazlewood Cuban.

The Stewart Cuban was set about 14 inches apart in the row, harvested in the usual manner, and compared with the Hazlewood Cuban from the same field. The season of 1913 was very dry in midsummer and the Stewart Cuban rows were watered once for about half their length, the water being brought to the field in a water wagon. Thus one-half of the Stewart Cuban

had an advantage over the Hazlewood type. The seasonal conditions, on the other hand, were decidedly in favor of the normal type as, other things being equal, it takes more water to develop a plant which produces 60 leaves than one which produces only 30 leaves.

Comparative Yield.

Four pickings of the Hazlewood type and six of the Stewart Cuban were made.

The yield of the Hazlewood was to the yield of the Stewart as 100 to 194. That is, from an equal number of plants, 100 pounds of cured leaf of the Hazlewood were obtained and 194 pounds of Stewart Cuban.

Comparative Leaf Length.

This was determined as the leaf was sized. The percentage weights of the leaves in the crop of the lengths named are given in Table I.

TABLE I.

Percentage Weights of the Leaves of the Lengths Named.

	Comparative leaf lengths (inches) in per cent.								
Variety.	11	12	13	14	15	16	17	18	20
Hazlewood Cuban	6.4	8.8	15.9	21.0	23.0	15.4	8.2	1.3	
Stewart Cuban	1.4	4.4	11.5	16.6	24.0	21.8	14.4	5.4	0.5

For the comparative leaf lengths, the last picking of the Hazlewood Cuban (140 pounds per acre) was not used, but all six pickings of the Stewart Cuban were used.

This table shows that the leaves of the Stewart Cuban average somewhat larger than those of the Hazlewood Cuban. Both produced the largest percentage of leaves in the 15-inch class, but the Hazlewood type produced the second largest amount in the 14-inch class, and the Stewart Cuban its second largest percentage in the 16-inch class. The Hazlewood Cuban yielded a much larger percentage of short leaves of 11- and 12-inch length than the new type.

Counts made in the field showed that an average of 31 leaves per plant were harvested from the Stewart Cuban, while about 18 leaves were picked from the Hazlewood variety.

Comparative Sorting Test.

The Stewart Cuban after being fermented in bulk was sorted and compared with Hazlewood Cuban grown on the same field. The following grades were used in the sorting:

L. Thin, light-brown leaves, uniform color. L. V. Thin, greenish-brown leaves, uniform color. V. Thin, greenish-brown leaves, non-uniform color. L. L. 1 Thin, light-brown leaves, slight yellow spots. K. Thin, light-brown leaves, non-uniform colors. L. M. Medium weight, reddish-brown leaves, uniform color. M. D. Medium weight, greenish, dark-brown leaves, uniform color. D. W. Dark, heavy leaves. B. Seconds with one good side.

TABLE II.

Comparative Sorting Test.

The percentage weight of each grade is given in the table under the heading "Percentage Classes."

	Percentage Classes.								
Variety.	L.	L. V.	V.	L. L. 1.	K.	L. M.	M. D.	D. W.	B.
Hazlewood Cuban ...	20.0	22.0	3.8	15.9	9.0	13.0	4.5	3.3	8.5
Stewart Cuban	16.6	23.3	14.5	19.6	12.4	2.5	3.1	1.7	6.3

TABLE III.

Comparison between the Third Picking of Hazlewood Cuban and the Fifth and Sixth Pickings of Stewart Cuban.

	Percentage Classes.								
Variety.	L.	L. V.	V.	L. L. 1.	K.	L. M.	M. D.	D. W.	B.
Hazlewood Cuban	5.9	23.7	6.8	10.0		29.4	12.0	8.9	3.3
Stewart Cuban	2.1	27.4	23.9	12.9	12.1	1.8	7.8	3.6	8.4

Table II gives the results of the comparative sorting test. The fourth picking of the Hazlewood Cuban was tied up without being sorted and was not used in the computations, while all six pickings of the Stewart Cuban were sorted. The Stewart Cuban gives 74 per cent. of its leaves in the first four grades of the table, the better grades, and the Hazlewood Cuban 61.7 per cent. in these grades. This is certainly a good showing when one remembers that the fourth picking, the dark heavy leaves of the Hazlewood Cuban, were not sorted and not used for these percentage comparisons.

Table III gives a comparison of the percentage of the different grades of the third picking of the Hazlewood Cuban and the fifth and sixth pickings of the Stewart Cuban. 66.3 per cent. of these pickings of the Stewart Cuban are contained in the four better grades, L., L. V., V. and L. L. 1, while the third picking of the Hazlewood type produced only 46.4 per cent. of its tobacco in these grades. The grades L. M., M. D. and D. contain the medium and dark wrappers, which do not sell for so high a price as the light wrappers. The Hazlewood Cuban produced 50.3 per cent. of its leaves in these grades, while the two upper pickings of the Stewart Cuban produced only 13.2 per cent. of its leaves in these grades.

These results certainly indicate that this new type may become of great commercial value.

Production of Seed.

We have had a number of requests for seed of this new type but are not able to supply any seed from the very small stock. It seems advisable to give the tobacco a thorough test this coming season on a somewhat larger scale before it is introduced or in any way recommended to growers. If the Stewart Cuban gives good results this coming season it may then be recommended for extended use.

As this type does not blossom during the normal season of growth it is very difficult to obtain large quantities of seed. Seed has been sown in sterilized soil about January first in the greenhouse and from 200 to 300 plants have been started in pots. These plants will be set out about June first in our garden. These should produce seed in August, and if the new type proves valuable in the second year test we may then have a limited quantity of seed to distribute to the shade growers of the Valley.

Conclusion.

The Stewart Cuban is the result of the selection of a sudden large variation which appeared in 1912 in a field of Cuban shade-grown tobacco. This type bred true in 1913, and when compared with the normal Hazlewood Cuban gave an increase in packed yield of about 90 per cent. The quality of the cured leaves was also very satisfactory.

The Shrinkage of Tobacco Leaves in Curing and Fermentation.

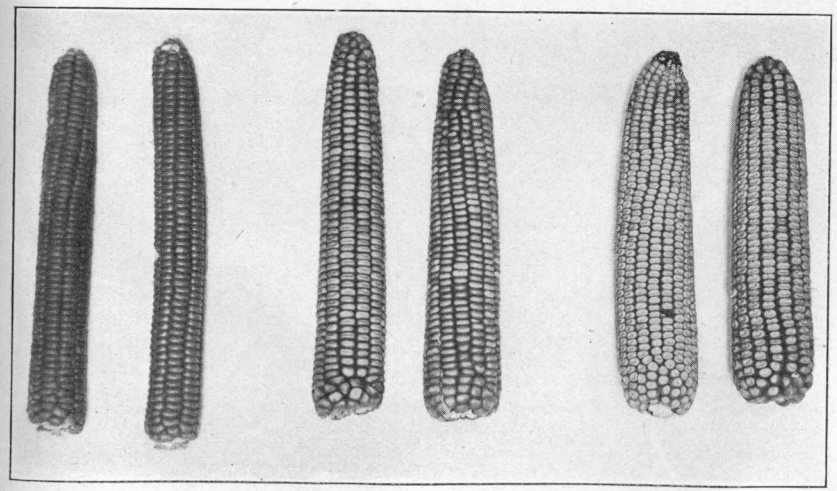
To get an approximate idea of the decrease in size of leaves during curing and fermentation, the outline of such of the middle leaves of 150 outdoor Havana plants as were ready to harvest was carefully traced in pencil on a sheet of paper. The leaves were then strung and hung in the barn to cure. After curing, tracings were again made. The same leaves were then fermented in bulk for a period of about seven weeks and their outline again carefully traced. The length, breadth and area of the tracings appear in the table.

	Length.	Breadth.	Area.
Green leaves	19.5 inches	8.5 inches	116.6 sq. inches
Cured leaves	17.8 "	6.8 "	83.5 " "
Fermented leaves	17.5 "	6.7 "	

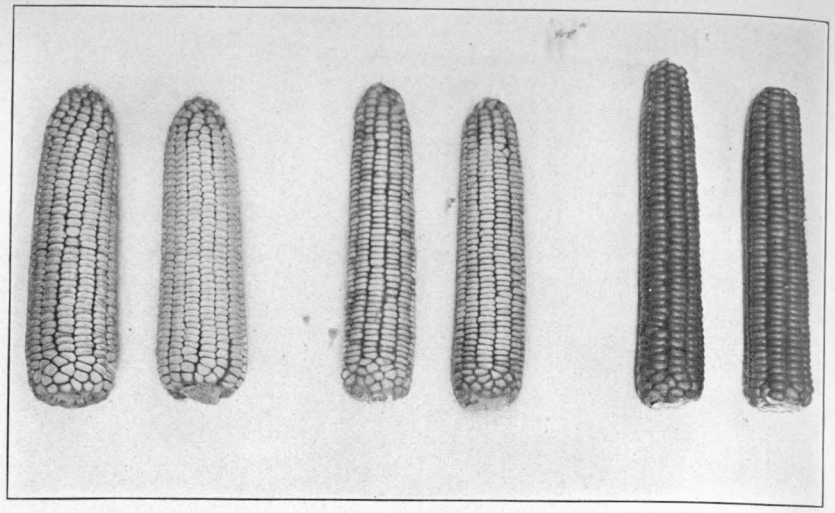
The results show a large shrinkage in the leaf as a result of the curing but only a slight decrease in the size of the cured leaf after fermentation.

The leaves which had an average length of 19.5 inches when green were 17.8 inches in length when fermented, a decrease of 10.4 per cent. The measurements also show a decrease of 20.8 per cent. in average breadth due to shrinkage in curing and fermentation. The area of the cured leaves is 28.4 per cent. smaller than of the same leaves when green.

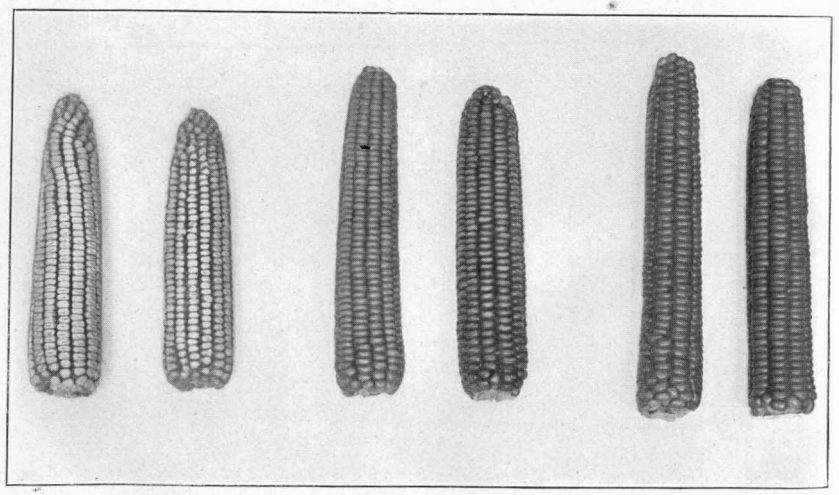
a. Breeding plot for production of cross-bred seed. Plant the parent varieties in alternate rows, and detassel all of one variety. The seed of the detasseled variety will be cross pollinated. (Photo by Moss.)



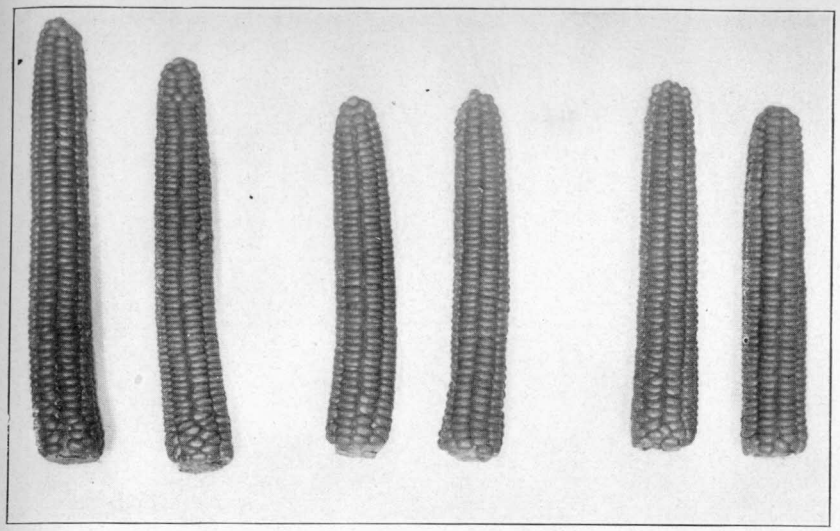
b. At the left and right of the photograph are shown respectively Hopson's Longfellow and Brewer's Dent. The two central ears represent the first generation cross. The cross was intermediate in time of maturity and gave 2.4 per cent. more shelled corn than the Dent parent and 52 per cent. more than the Flint parent.



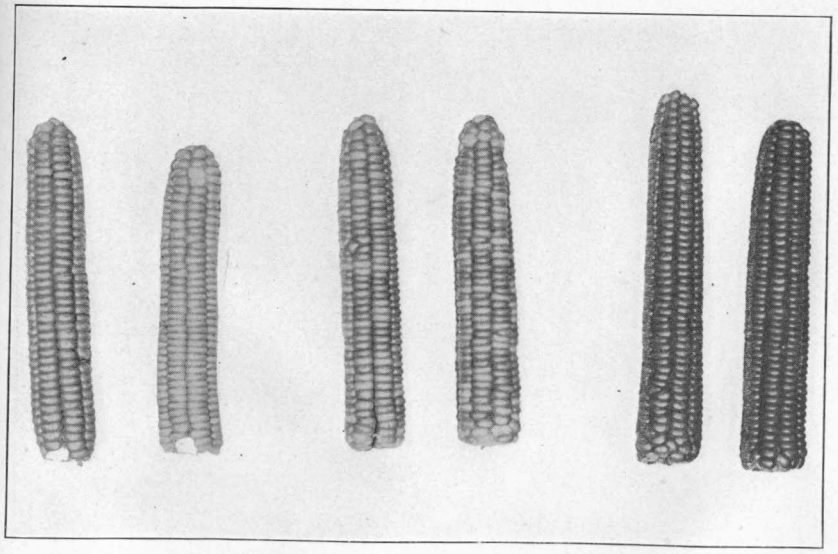
a. At right Brewer's Flint, at left Hall's Tyler Dent and cross in center. The cross yielded 9 per cent. more shelled corn than the Dent and 20 per cent. more than the Flint and proved the most productive of all varieties or crosses at the Mount Carmel test in 1913.



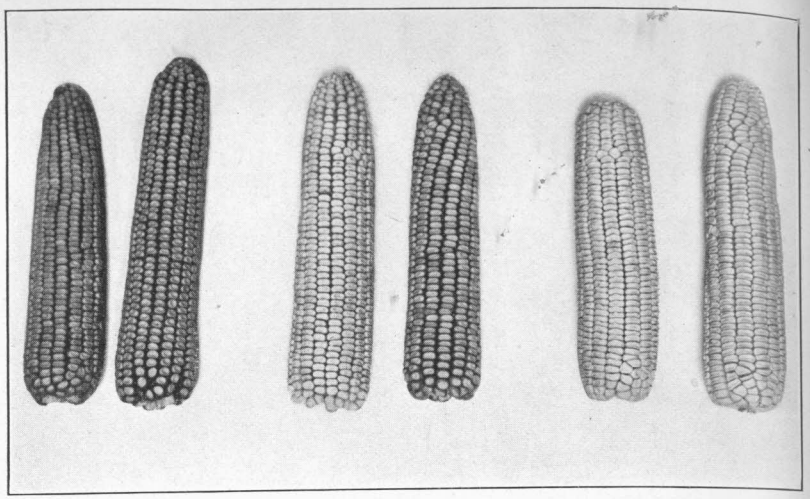
b. Griswold's Early Dent at left, Brewer's Flint at right and cross in center. The cross yielded 17 per cent. more shelled corn than the better parent.



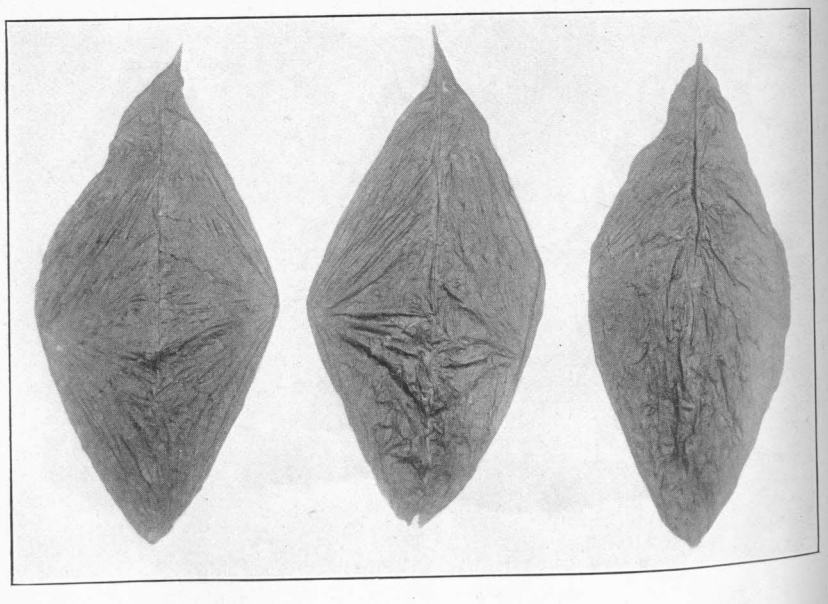
a. The two central ears represent the cross between Brewer's Flint, at right and Woodruff's Longfellow, at left. The parents are both yellow Flints. The cross exceeded either parent in yield.



b. R. I. White Flint at left, Brewer's Flint at right and cross in center. The cross contains both yellow and white seeds and exceeded either parent in yield.



a. At left Stadtmueller's Leaming, at right Illinois Low Protein and cross in center. The cross gave 6.4 per cent. more shelled corn than the better parent.



b. 16-inch Light Wrappers of the fourth picking of Stewart Cuban.

The "Stewart Cuban" shade grown tobacco at Windsor, August 18. These plants have produced over thirty leaves to the stalk and two pickings have already been made.

FORESTRY PUBLICATION, No. 10

SEVENTH REPORT

OF THE

State Forester of Connecticut

WALTER O. FILLEY
Station Forester

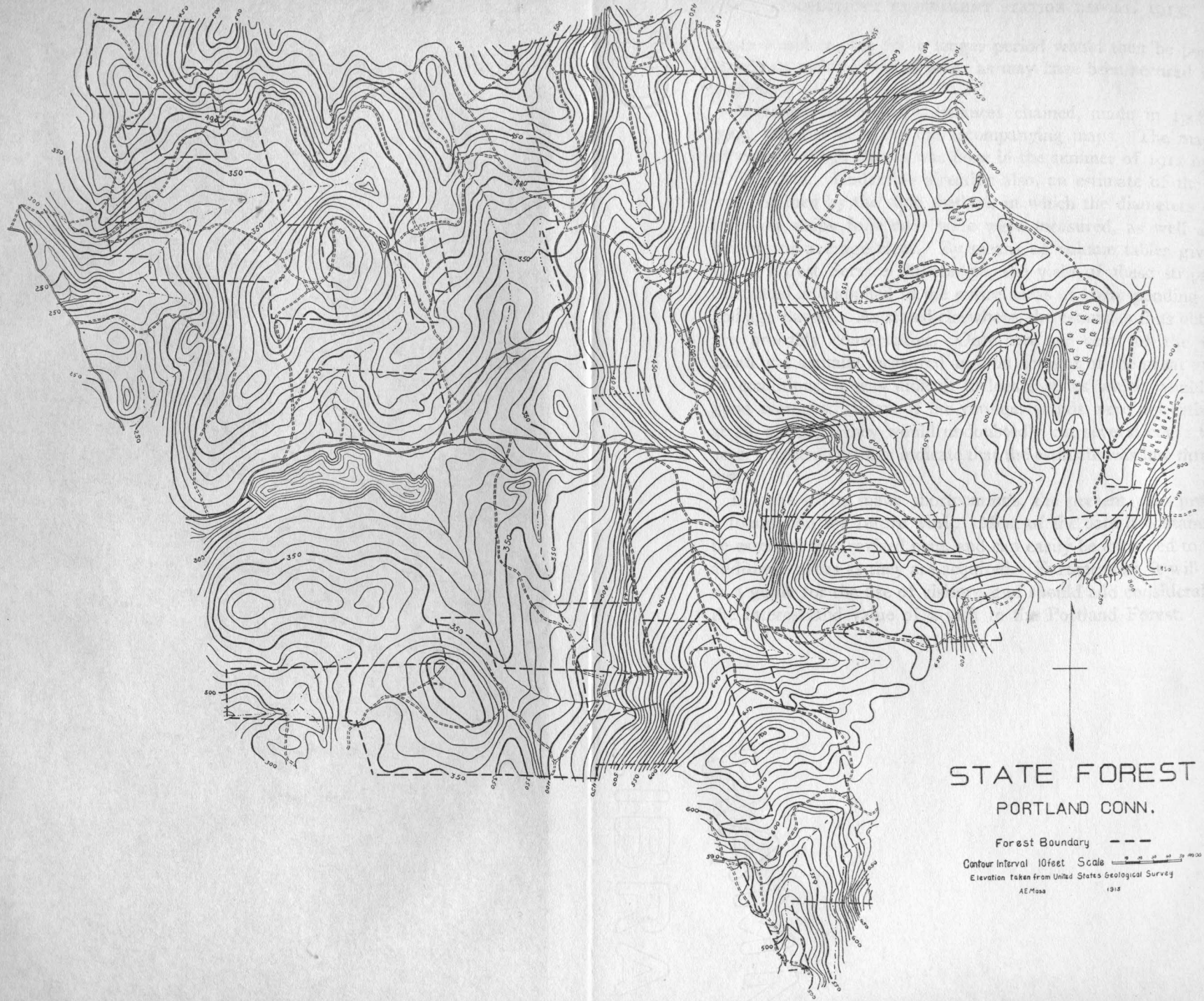
The Station Forester is *ex-officio* State Forester and State Forest Fire Warden, and the work of the Forestry Department was described in detail in the Station report for 1912. It has been continued and extended along the same lines during 1913, but a summary of the routine work of the Department oftener than once in two years seems unnecessary. There are usually several projects uncompleted at the close of each year upon which only a report of progress can be made. This report for 1913 is therefore confined to the most important completed work of the year, which was a preliminary working plan for the Portland State Forest.

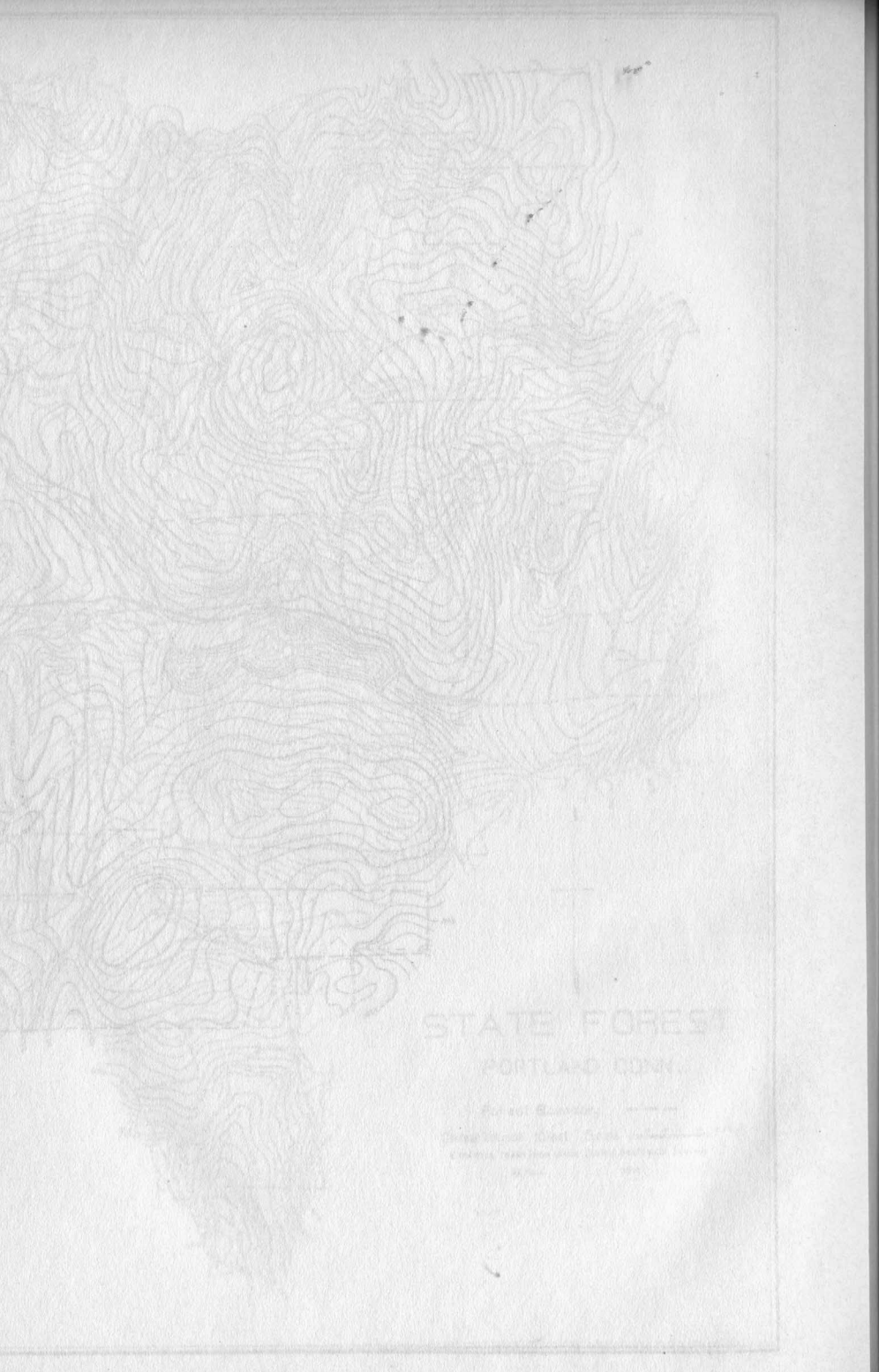
With the establishment of the State Forest at Portland, the need became apparent for a working plan upon which systematic forest management might be based. The preparation of such a plan was at first delayed for lack of an accurate map of the tract, and even when such a map was available, further postponement was necessitated by the pressure of other work. The plan now presented should be considered only as of a preliminary nature, to serve as a basis for future work, but lacking much which should be found in a complete working plan. In view of the small area, however, and the probability of its early increase beyond the present boundaries, a more complete plan is hardly necessary or desirable at present. Specific recommendations have been made for a period of six years only, with the expectation that during that time further data will be gathered, especially concerning growth and yield. The preparation of a

more complete plan for a longer period would then be possible, including such additional areas as may have been secured in the meantime.

A transit survey with distances chained, made in 1908 and 1909, was the basis for the accompanying maps. The mapping of types and age classes was done in the summer of 1912 by Mr. S. V. Klem. Under his direction also, an estimate of the yield was obtained by the strip method, in which the diameters of all trees on strips four rods wide were measured, as well as the heights of average trees. By means of volume tables given in U. S. Forest Service Bulletin 96, the yield of these strips was calculated and applied to the entire areas of corresponding types and age classes. As stated elsewhere, the estimates thus obtained are probably conservative. Only ten per cent. of the entire stand was actually measured and, on account of the great variety of conditions, it was difficult to locate strips which would give good averages. Some of the younger stands were not estimated at all, although they would undoubtedly cut several cords to the acre. Recent cuttings indicate that the estimate was low throughout.

In spite of its many shortcomings, the present plan provides a foundation for future work. Most of the data it contains will be essential to a revised plan, and can easily be extended to cover additional areas as they are acquired. Furthermore, it will serve as a guide for the use of visitors, and should add considerably to the interest and value of a visit to the Portland Forest.


STATE FOREST
PORTLAND CONN.
Forest Boundary
Contour Interval 10 feet Scale
Elevation Taken from United States Geological Survey
A.E. Moss 1913



A PRELIMINARY WORKING PLAN FOR THE PORTLAND STATE FOREST.

By W. O. Filley and A. E. Moss.

PART I—DESCRIPTION.

SIZE AND LOCATION.

The Portland State Forest comprises 1070 acres of land lying east of the Connecticut River in the northern part of Middlesex County, Connecticut, mostly in the town of Portland but extending into the adjoining town of Chatham. It is more or less broken by private holdings, one small farm and the Portland Water Company's reservoir breaking into the western edge so as to give the tract roughly the form of a letter U over a mile and a half wide and with its arms extending for two miles toward the Connecticut River. This form will doubtless remain practically unchanged, but additional land is being acquired from time to time, and it is expected that the forest will eventually include at least 1500 acres. For administration purposes, 2000 or even 2500 acres would be more satisfactory.

Located within five miles of the geographic center of the state, it is fairly accessible from all points. The Middletown railroad station, with trains from five directions, is barely seven miles distant, while the stations at Cobalt and Portland on the Air Line Division are nearer, but less convenient. The trolley line from Middletown to Portland ends at Gildersleeve, which is but four miles from the tract, and the end of the South Glastonbury line from Hartford is within five miles. Should a line eventually be built to connect these two points it will pass within two miles of the state land. Thus from the point of view of accessibility, the area was well chosen and for this as well as other reasons is well adapted for the purpose of demonstrating forestry practise.

PHYSIOGRAPHY.

Topography: The tract is close to the western edge of the eastern highland region of the state, with its eastern boundary following the crest of a ridge extending north and south parallel

The total expenditure by the State in the purchase of land at Portland from January 1, 1903, to September 30, 1913, amounted to $2,425.41. According to the deeds 1150 acres were secured, but an actual survey showed a total of only 1070 acres. On this basis the average cost of purchase has been $2.27 per acre. During the same period, the expense of management was as follows:

	Total.	Per acre.
Survey	$ 384.93	$ .36
Taxes	649.84	.61
Protection	276.57	.26
Cuttings	2,175.36	2.03
Planting	1,352.95	1.26
Supervision and miscellaneous	1,508.60	1.41
Gross expenses	$6,348.25	$5.93
Receipts	1,067.95	1.00
Net expenses	$5,280.30	$4.93
Purchase	2,425.41	2.27
Total net cost	$7,705.71	$7.20

If every portion of the tract is considered to have shared both receipts and expenditures equally (as it would in a complete rotation under management), the average expense per acre for management was $5.93. Adding to this the average cost for purchase gives $8.20 as the gross cost per acre. Cultural operations including cuttings and plantings have so far been confined to a little more than half the area (618 acres), and the cost of these operations has been $3,528.31. Receipts from sales of wood from the same area have amounted to $1,067.95. The net cost of the cultural operations is therefore $2,460.36. This averages $3.98 per acre for the area directly benefited. If figured for the entire forest, the net cost of cultural operations is reduced to $2.30 per acre. Since the average returns from the entire area amounted to $1.00 per acre, the net cost of management was $4.93 per acre, making the total net cost including purchase $7.20 per acre for the 1,070 acres.

The work of the first decade has been largely experimental and without a definite or comprehensive plan. Improvement cuttings in the form of thinnings have been made in various parts of the tract. Timber damaged by fire or disease has been removed in some sections, and several areas have been cut clear on account

of such damage, or because the species was slow-growing and undesirable. On these areas conifers were planted, mostly white pine, since this species promises the most profitable yield in the shortest growing period.

SOCIAL AND INDUSTRIAL CONDITIONS.

The present agricultural population of the region is mostly located along the edge of the valley to the west. Tobacco is the main crop on the valley lands, but back in the hills the crops are more diversified. Numerous feldspar quarries furnish employment for a portion of the population, and make it difficult to secure local labor for woods work. During the winter season it is possible to secure choppers from the Italian colony in Glastonbury, where the fruit industry furnishes them employment the balance of the year. To attract labor from other regions would be out of the question unless permanent employment could be assured.

In the near-by city of Middletown with its suburb of Portland, there is a considerable demand for lumber and wood for use in manufacturing and the building trades. Being situated on the river, however, the local demand for lumber is largely supplied from outside by means of water transportation. Fuel in the form of coal is supplied in the same manner. This makes the demand for cordwood for fuel purposes very small. The larger part of the wood cut in the region is turned into charcoal. A number of brick yards within ten miles use a large quantity of cordwood, but the distance is too great to allow wood on the state land to be profitably disposed of in this way.

PRESENT STAND.

Type Classification.

For the purpose of this plan the following six forest types have been distinguished:

Chestnut	28.4	acres
Oak	231.1	"
Chestnut and oak	577.2	"
Mixed hardwoods	172.8	"
White pine	46.0	"
Old field	14.6	"
	1070.1	"

The composition of the present stand has been used as the basis for type classification. In most cases, these types are evidently transitional rather than permanent. Probably the only natural or climax type on the forest is the stand of mixed hardwoods found along one of the mountain streams.

Type Descriptions.

The chestnut type comprises stands in which more than seventy-five per cent. of the trees are chestnut. The determination of this type is complicated by infections of chestnut blight (*Endothia gyrosa var. parasitica*) which have killed many chestnut trees and thus considerably reduced the percentage of this species in many stands. For this reason, many of those where chestnut formerly predominated must now be classed as of another type. Because of the continued spread of the disease, only stands having a sufficient proportion of the species to make its continued predominance probable are classed as of the chestnut type. Consequently this type is only found on first quality sites where the percentage of other species is small and the disease has not caused great damage as yet.

The oak type is characteristic of the poorer sites, especially the rocky ridges. It includes stands in which sixty per cent. or more of the trees are some species of oak.

The chestnut and oak type is the most extensive in the forest at present, and includes all stands in which the principal species are chestnut and oak in nearly equal proportions. Many of these stands were second and third quality chestnut before the percentage of this species was reduced by disease.

The mixed hardwood type appears mostly along the brooks and bottom-lands where there is considerable moisture. It is made up of oak, chestnut, tulip, ash, birch and other hardwoods with no one species predominating. The composition varies considerably, the species found in the swampy areas of the bottom-lands being different from those found on better drained sites. Along one of the mountain streams it might almost be classed as a northern hardwood type since it contains species typical of northern regions, such as beech, birch, and hard maple. The area is not great enough, however, to warrant classing it as a separate type.

The white pine type, consisting almost entirely of white pine, is found in one volunteer stand only in the forest. The balance

of the type consists of plantations made since the tract was acquired by the State. These plantations include other species of conifers besides white pine, but not in sufficient quantity to warrant distinguishing another type.

The old field type comprises areas formerly pastured or cultivated which are naturally reverting to forest, but upon which true forest conditions are not completely established.

Age Classes.

As clear cutting has usually been the practise in the past, most of the present stands are even-aged. The range in age is probably from one to seventy-five years although there are doubtless single trees of greater age. Table I, which shows the area and volume of each compartment by ten year age classes, indicates that the greater part of the forest is less than forty years old. In fact, nearly one half the growth is of less than thirty years. This includes about fifteen acres of old field which is not even-aged, but has been abandoned less than thirty years. Nearly one-fourth the area has not been cut clear of recent years and is therefore many-aged, with the entire range of age classes represented in most cases.

Volume.

It was not practicable or desirable to make an accurate estimate of present yield, and the figures given in Table I are only approximate. They are stated in cords, since most of the stand would be sold as cordwood if cut at the present time. The estimates are undoubtedly conservative, for they are based on a strip survey of less than ten per cent. of the area estimated. It is probable that the estimate would underrun the actual cut by as much as twenty-five per cent.

The estimated total yield is 10,462 cords, which is only 9.8 cords per acre. The average yield for all stands more than twenty years old is 17 cords per acre and for the stands over forty (including the many-aged stands) the average yield is 19.8 cords.

Growth.

Chestnut has formed so large a part of the total stand in the past, and its future is now so uncertain on account of the blight, that detailed growth studies were considered impracticable. Such

TABLE I.—AREA AND VOLUME BY COMPARTMENTS AND AGE CLASSES.

Compartment.	1–10 Years.	11–20 Years.		21–30 Years.		31–40 Years.	
	Area Acres.	Area Acres.	Volume Cords.	Area Acres.	Volume Cords.	Area Acres.	Volume Cords.
I	37.4	48.1	....	19.7	227	25.9	259
II	86.	80.0	....	36.7	247	99.0	1332
III	12.4	33.8	43	69.0	1097	43.1	672
IV	1.6	10.9	....	....	....	18.0	249
V	45.	62.0	....	23.0	411	....	....
	182.4	234.8	43	148.4	1982	186.0	2512

41–50 Years.		50 + Years.		Many-Aged.		Old Field.	Total.	
Area Acres.	Volume Cords.	Area Acres.	Volume Cords.	Area Acres.	Volume Cords.	Area Acres.	Area Acres.	Volume Cords.
16.9	351	6.8	108	4.4	15	....	159.2	996
....	...	12.9	285	102.9	1850	....	417.5	3714
13.5	323	....	...	99.2	1989	14.6	285.6	4124
21.5	435	....	...	12.4	296	....	64.4	980
....	...	10.3	135	3.4	102	....	143.7	648
			...	10.3				
51.9	1109	30.0	528	222.3	4288	14.6	1070.4	10462

studies will be made in the future for stands in which it is anticipated that the present type will be maintained, or to prove the undesirability of maintaining the present type on account of its slow growth.

Chestnut Blight.

The presence of the chestnut bark disease, or chestnut blight, on the State Forest was first discovered in the spring of 1910. Older infections were afterward found on adjoining property, and it seems probable that the disease was at work in the region as early as 1906. A survey made in 1911 indicated that it was present in most of the chestnut stands throughout the State land, and experiments in control were begun in the fall of that year. Sub-Compartments A, B, C, D, E and H of Compartment 1 were thoroughly inspected and all infected trees marked for cutting. During the following winter all such marked trees were removed, the brush and bark being destroyed by burning. All wood which could not be disposed of in the form of peeled ties, posts, etc., was burned for charcoal. An adjacent tract was also inspected, and all infected trees counted but not removed, thus serving as a check on the experiment in controlling the spread of the disease by cutting.

This work has been repeated during the two succeeding winters, but the results of the three seasons' work are not very encouraging. In fact, the last inspection after two years' work showed more increase in the number of infected trees on the area from which they had been removed, than on the check area where the infected trees were left. There seems to be no evidence that the careful removal of all trees which show evidence of infection on a definite area will check the spread of the disease on that area. If the work could be carried out over a larger area, better results might be secured, but the irregular spreading throughout a region which seems characteristic of the fungus, indicates the impracticability of such work. It is too expensive for private owners, or even for the State unless complete elimination of the disease could be assured.

The experimental work along this line will probably be continued, as the presence of the blight-killed timber is undesirable and its removal by damage cuttings will benefit the remaining stand. The disease causes the greatest damage in young stands of small merchantable value. In such cases, a damage cutting would not be warranted and clear cutting followed by planting will be a more profitable operation. The possibility of sprout regeneration from the stumps of diseased trees is rather doubtful, for although the stumps sprout well in many cases, most of the young sprouts are usually infected and killed within three years. Further information regarding the chestnut blight may be obtained from Bulletin 178 or the Annual Report of the Connecticut Agricultural Experiment Station for 1912.

PART II—MANAGEMENT.

OBJECT.

To improve the condition of the present stand when possible; to remove the present stand when necessary, replacing it with a better one; and in the shortest possible time, to establish a satisfactory rotation which will assure a maximum annual yield in the future.

The State Forest at Portland was established with two aims in view. One was to furnish a demonstration of the best forestry practise for the benefit of other forest land owners. The other was to develop a future supply of timber of size and quality best suited to the needs of the community, and eventually to assure the State a satisfactory revenue from its investment. Since the future aim can only be attained in such measure as the present aim is fulfilled, the latter might be considered as of most immediate importance. Present practise, however, must be largely governed by present conditions, such as the existing stand, market prices, damage by fungus, insects and fire, but no matter what operations the exigencies of the present day demand, the effect on future conditions must be considered, and all operations must be, so far as possible, in accordance with future aims. Hence, the present object of management must be sufficiently comprehensive to include the needs of the future as well as those of the present. It must also be sufficiently flexible to permit changes in methods of management on account of unforeseen conditions, both physical and economic.

The production of saw timber is more desirable for many reasons than the production of cordwood. It requires a longer investment, but the ultimate returns are greater. The present stand, however, being composed mostly of slow-growing hardwoods is not suitable for this purpose, and will be converted as soon as possible into a more rapid growing coniferous type. Pine will be planted on all shallow soils, as well as on all ridges and steep slopes where practicable. Hardwoods will be retained only on deep bottom-lands and on swamp areas. In such locations, the policy will be to improve the composition of the stands by means of improvement cuttings which will favor tulip, ash and red oak over other species. If sufficient reproduction is not secured naturally it will be supplemented by planting.

SILVICULTURAL TREATMENT.

Cutting.

For the scope of the present plan, the only cuttings necessary in the *pine type* will be improvement cuttings or cleanings to remove undesirable trees of other species which may be overtopping and injuring the pine. The one mature stand will probably need little attention for a number of years. Eventually, natural reproduction may be secured in it by making a reproduction cutting, removing enough trees to make openings in which seed from the remaining trees will germinate.

In the *hardwood types,* the cuttings made during the next five years will be of two kinds: (1) Clear cuttings where the present growth is undesirable, and another type is to be established by planting; (2) damage cuttings where the removal of trees infected with chestnut blight will leave a sufficient stand to justify a partial cutting instead of a clear cutting. Such cuttings will be practically reproduction cuttings in some cases.

Rotation.

To obtain the best results with the present hardwood stands, a rotation of seventy to one hundred years seems necessary. The longer time would be required in the oak type while the shorter rotation would probably be sufficient for mixed hardwood stands on the better sites. If chestnut coppice could be depended upon for the future, the chestnut type might be handled on a rotation of less than seventy years. Under existing conditions, at least seventy years will probably prove necessary for all hardwood types. Available yield tables indicate a fifty-year rotation as most profitable for white pine. Although a longer period may later prove desirable, for the present, fifty years will be considered the rotation to be established for the pine type. Until complete growth studies have been made no regulation of the yield can be attempted. The cutting policy for the next five years will largely be determined by the necessity for damage and removal cuttings as a result of the chestnut blight devastation. This work will be done under direction of the warden except where cordwood can

be sold to advantage on the stump. Where ties, posts or poles can be cut, they can usually be sold more profitably after cutting. Brush and tops will be disposed of by burning when necessary to lower the cost of planting, or to reduce the fire danger.

The limited market for small materials prevents cutting when most desirable in many cases, and will probably retard the transformation in type to a certain extent. On the other hand, the spread of the chestnut blight will hasten the cutting of many immature stands and their regeneration by planting with conifers.

Planting.

The plantations thus far established have been very successful but rather expensive on account of the brush being piled and burned. The removal of brush makes planting easier and reduces the fire danger, but is not a necessary operation, and the results seldom justify the expense. Future plantings, like most of those in the past, will be of conifers. With the present available funds, not more than thirty acres a year can be planted. This is enough to cover the area now owned inside the rotation, but if it proves possible to increase the area to more than 1500 acres it will be necessary to increase the amount of planting done each year.

Most of the planting will be for the purpose of replacing with better species, undesirable stands which have been clear cut. As further purchases of cut-over lands are made, the policy will be to assure a satisfactory stand by planting, rather than to trust to natural regeneration. The small area of old field type must be planted in the near future, as well as any land of similar type which may later be acquired. There will also be occasion for under planting, as well as group planting in openings, where conditions make desirable a gradual conversion of type, or the supplementing of natural reproduction. The species so far used have been white and red pine and Norway spruce. These will be used in the future, together with Scotch pine and European larch. White pine will probably continue to be the principal tree in plantations but the other species will be mixed with it according to the site; spruce and larch on the better soils, with red pine or Scotch pine on the poorer. On sites suited for hardwoods, ash, red oak and other desirable species may be planted to supplement natural reproduction, and in case the chestnut blight disappears, the planting of chestnut may again be practicable.

In planting conifers, transplant stock will be used in most cases, the three-year stock once transplanted being the most satisfactory for the purpose. Larger stock is not only too expensive, but harder to handle. It may be used to advantage, however, for filling failures in the plantations. Two-year Scotch pine seedlings can be used successfully in most cases, and are less expensive to handle than older stock of this species. Where hardwoods are planted, one-year seedling stock will be used. On cut-over land, or wherever existing tree growth will permit, coniferous stock is planted with a spacing of six by six feet. This requires twelve hundred trees to the acre on open land, but the number is considerably reduced where natural growth can be taken advantage of. The object of close planting is to cause the crowns of the trees to meet and form a complete forest cover in a very few years, thus preventing the development of underbrush and other vegetation which is intolerant of shade. As a result of the lack of light in a crowded stand, intolerant trees lose their lower limbs at an early age, and the trees grow up toward the light with straight clean boles free from large side branches which would form bad knots in the mature trees. Where there are many failures in a plantation, it is therefore desirable to fill the blanks within a year or two in order that there may be no large gaps in the crown cover. In time, a crowded stand will need a thinning in which those trees promising the best future development may be favored.

ADMINISTRATION.

Since its establishment, this forest has been under the supervision of a local warden or ranger who receives an annual retainer for keeping a general oversight of the tract at all times. He has charge of all cutting and planting operations, being paid by the day when so employed. No more extensive organization is practicable at the present time. With the enlargement of the area and the development of a more valuable type of forest, it may become possible and desirable to employ one man throughout the year as a ranger under the direction of the warden. His primary duty would be to protect the forest from fire and trespass, but when not directly employed in this way he could be kept busy chopping, improving roads, making fire lines, etc. It would be desirable to have such a man reside at a point where he could

overlook most of the forest, but as there are few houses so located, the building of a lookout tower, or even a shack on a high point, might be necessary.

FIRE PROTECTION.

The fire hazard is not great on account of the location of the forest, and a comparatively small amount of protection work is necessary. The few fires occurring in the past have been due to carelessness, either on the forest or outside. The railroad is too far away to be considered as a source of fire danger, and on account of the steep grades, there is very little travel over the highways which cross the tract. This reduces the chance for fires due to carelessness on the part of the traveling public. The State land is posted against fishing and hunting, as is most of the adjoining land, so that danger of fires from this source is also reduced to a minimum. Carelessness and lawlessness must be reckoned with, however, and during certain seasons of the year it will probably be necessary to patrol the forest as a measure of protection. Such work can be done by the ranger as already suggested. The posting of fire-warning notices along the highways will also help to educate the public to the need of care with regard to fire.

The greatest danger from fires originating outside the forest would naturally be from the direction of the prevailing winds, which are westerly. The region directly west of the forest is farming land, however, with very little wooded area, and there is practically no danger of fires on that side except along the highway. Both to the north and to the south of the State land there are extensive forest areas, and there is liability of fire starting in either direction. Fortunately highways break these forest areas, and since the general slope of the country is to the west, a smoke to the north or south would be visible before the fire could gain much headway. The practically unbroken forest stretching to the eastward for several miles might prove a great source of fire danger, except for the fact that the prevailing winds are in the opposite direction.

As a protective measure the numerous logging roads already existing throughout the tract should be improved by cutting out the brush and removing the rocks where necessary to make them passable. They can then be kept in usable condition at small

expense, and will not only serve as fire lines, but make all parts of the forest easily accessible for logging as well as fire fighting purposes. At first this work will be done only where it seems most necessary for protection from fire, but eventually a complete system of roads and trails will be established. Springs, and holes in brooks near the roads will be deepened to provide available water sources in case of fire. Where these are not located on the roads, trails will be made to them, and guide signs put up for the benefit of fire fighters. Fire fighting equipment will be provided at the most practicable point, probably at the house of the warden or ranger. This equipment will consist of bucket pumps, canvas water bags, galvanized iron buckets, axes, rakes, shovels, etc. In case of a fire the ranger will call on the local fire warden for assistance. It will be desirable to have the ranger or the forest warden appointed a district fire warden for the town, so that he may have power to summon assistance and assume charge of the fire fighting, both on the State land and in the surrounding region.

DIVISION OF AREA.

For management purposes the forest has been divided into compartments and sub-compartments. This division is somewhat arbitrary on account of interior holdings which do not belong to the State. While it is not necessarily permanent, and will be subject to change with new acquisitions of land, it is in accordance with a definite system which can be followed in future revisions of the working plan.

The compartments are based primarily on topography and are usually separated by ridges, streams or public roads which form easily recognized boundaries. So far as possible, they form working units the entire area of which can be logged in one direction. Five compartments have been made of the present area. Future acquisitions will probably be added to these, although the formation of new compartments may prove necessary. Those now established, however, will probably be maintained.

Sub-compartments are subdivisions of the compartments, based on forest types and age classes. Sub-compartments consist of individual stands which differ from adjoining stands in type or age class, and a single sub-compartment usually contains only one type and only one age class. In this plan it was thought best to class as a single sub-compartment some stands differing in age

but which would eventually be thrown together by removing the present growth. Some of the present sub-compartments, therefore, will be found to contain several age classes. The sub-compartment boundaries are indicated only by the lines of difference between types and age classes in most cases. These boundaries are not permanent, but will be subject to revision from time to time.

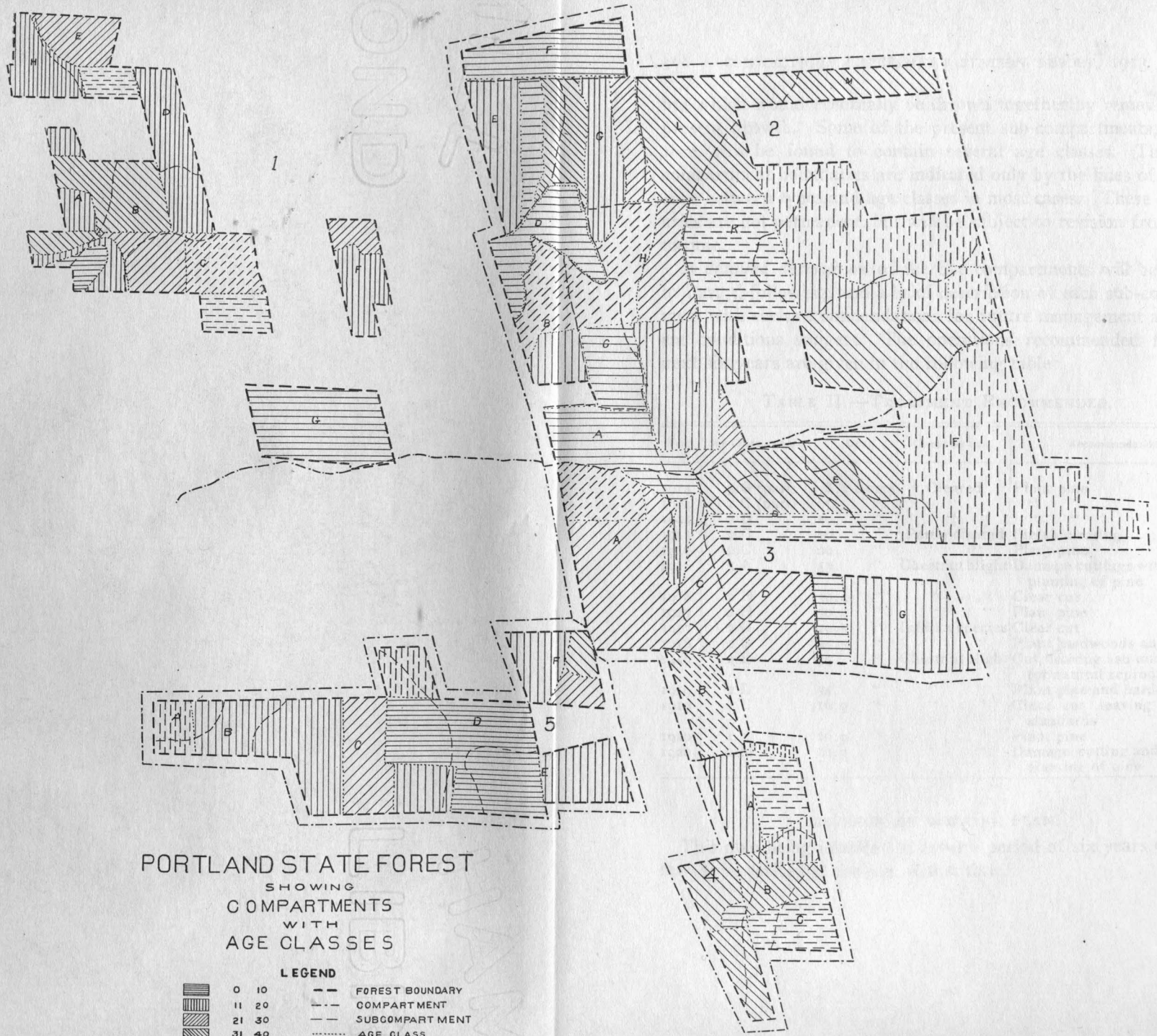
A detailed description of the five compartments will be found in Part 3, following, and a brief description of each sub-compartment with such recommendations for future management as present conditions suggest. The operations recommended for the next six years are given in the following table:

TABLE II.—TREATMENT RECOMMENDED.

Year.	Sub-Compartment.	Area.	Condition 1914.	Recommendation.
1914	3 G (part)	8.7 Acres	Cleared	Plant pine
1914	1 G (part)	5. "	"	" "
1915	2 B	20. "	"	" "
1915	2 C	20. "	Partly cleared	Finish clearing
1916	2 C	20. "	" "	Plant pine
1916	3 A	53. "	Chestnut blight	Damage cuttings with group planting of pine
1916	2 H	30.4 "	" "	Clear cut
1917	2 H	30.4 "	" "	Plant pine
1917	2 G	29.5 "	Inferior species	Clear cut
1918	2 G	29.5 "	" "	Plant hardwoods and pine
1918	2 L	34. "	Chestnut blight	Cut, leaving ash and tulip for natural reproduction
1919	2 L	34. "	" "	Plant pine and hardwoods
1919	1 E	16.9 "	" "	Clear cut, leaving oak standards
1920	1 E	16.9 "	" "	Plant pine
1920	2 M	12.9 "	" "	Damage cutting and group planting of pine

REVISION OF WORKING PLAN.

This plan being intended to cover a period of six years only, it should be revised at the end of that time.


1
2
3
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PORTLAND STATE FOREST
SHOWING
COMPARTMENTS
WITH
AGE CLASSES
LEGEND
0 10
11 20
21 30
31 40
41 50
MANY AGED
OLD FIELD
50+
FOREST BOUNDARY
COMPARTMENT
SUBCOMPARTMENT
AGE CLASS
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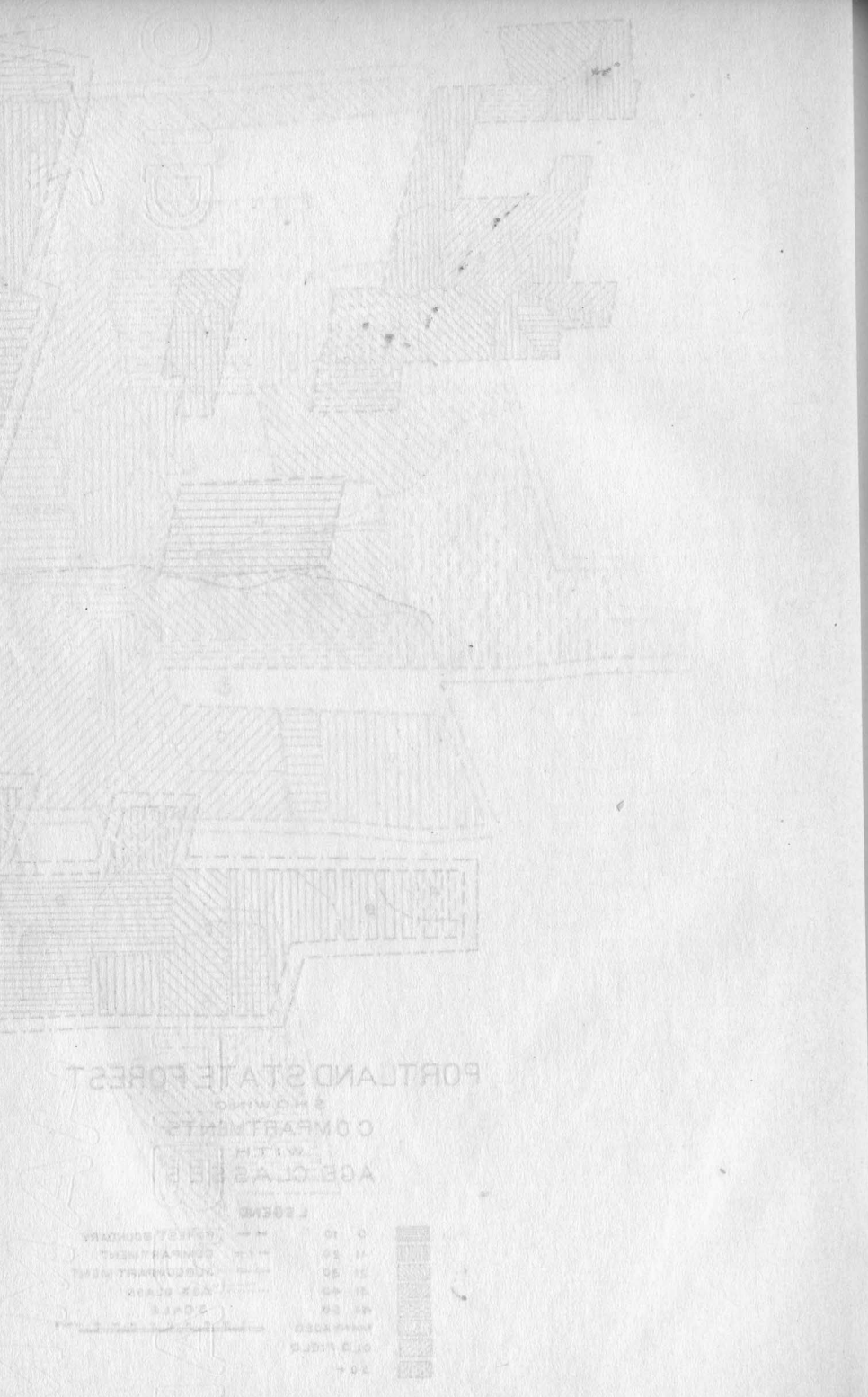

PART III—COMPARTMENTS AND SUB-COMPARTMENTS.

COMPARTMENT I.

This compartment consists of three separate areas lying north of the reservoir and west of a road which turns north near its head. These areas are practically continuous, being separated only by small private holdings. A ridge crosses the compartment from southwest to northeast, reaching a height of 140 feet above the level of the pond. A small semi-permanent brook flows parallel with but north of this ridge and empties into the main brook three-quarters of a mile below the pond. Northwest of this brook an elevation of 180 feet above the pond is reached.

There are a number of low rocky outcrops which cross the drainage, making swamp areas which are flooded at certain seasons. The ridges have medium to gentle slopes with few boulders, except in certain well-defined areas where they are very numerous. The soil is medium to deep clay loam with good humus conditions, as this compartment has not been burned in a number of years. The greatest fire danger is to the north, since on this side there is an unbroken timber area for at least one mile, while the roads form fire lines to the east, south and west.

The compartment is made up of twelve separate lots which had been cut over from time to time by former owners. The resulting stand is entirely coppice, and while the age varies greatly, the composition denotes the soil and moisture conditions fairly accurately. Of recent years, inferior species in the mixture have increased as a result of the poor cordwood market which has necessitated the use of a selection system in cutting, only the better trees being cut for special purposes. At the present time, there are limited areas of very good chestnut and oak stands, but the area as a whole will require clear cutting and a substitution of more valuable species, such as pine, by planting. At the time of this change, a number of lots may be wholly or partially combined to make a new sub-compartment based on soil and topographic conditions, instead of on present age class and lot lines. Adjoining land will be purchased as it is placed on the market, in order to secure a solid holding, but not to extend present boundaries to the north or west.

This compartment is well situated as to market, being easily accessible to the railroad and having a limited local demand for cordwood. The system of log roads is well developed and in good condition. With the exception of Sub-Compartment 1 G and the southern portion of 1 F, all material will pass out over one main road which follows the drainage to the west and offers a down grade almost the entire distance to market. The individual lots are rarely so rocky as to make logging difficult, and in no case is there an inaccessible area. The time of cutting for the sub-compartments will depend upon when the youngest age class becomes merchantable and the oldest age class begins to deteriorate.

COMPARTMENT 2.

This compartment extends north of the Portland-Marlborough road with the eastern boundary along the top of Meshomasick Mountain and the western boundary nearly due north from the Anderson farm. The boundaries are irregular, due to following old lot lines.

The general slope is to the west with a permanent stream along the western edge and a branch of the same closely following the northern edge. The slopes are gentle to steep with a few very rocky areas, both outcrops and loose boulders. The latter are especially numerous near the top of the mountain. The soil is shallow on the ledges but very deep and fine on the benches and in the valleys. The humus is deep except over a limited area where a surface fire in 1908 destroyed the old accumulations. The greatest fire danger is to the north and east where unbroken forest areas extend for some distance.

This land was bought in the form of small lots from time to time, and comprises some eighteen separate holdings. This has resulted in a large number of age classes, as every lot has been handled without regard to the adjoining land. The effect of market conditions is also apparent in clear cuttings for coal and cordwood near the market, and selection cuttings for poles and ties on the more remote areas. The compartment will be divided into sub-compartments of about thirty acres, each of which will comprise similar topographic and soil conditions. These, while more or less arbitrary in shape, will be fairly uniform in size, because in changing the species, planting will be necessary, and

thirty acres a year is as much as the present biennial appropriation will permit.

The tracts requiring immediate attention are those situated on the lower levels near the brook. At present these contain a large percentage of chestnut which is diseased to a considerable extent, and will have to be cut within the next five years in order to save the growth already on the ground. As the slope increases and the soil becomes more shallow, oak crowds out the chestnut and forms an almost pure stand. The soil on the comparatively gentle slope near the top of the ridge is shallow, with large areas of rock outcrop which makes a site very unfavorable for many native species, and has resulted in a stand of scarlet oak and pitch pine. There is a good stand of chestnut at the bottom of a small drain where the soil is a little deeper.

This area forms a logging unit from which all material will pass out over the Marlborough road, or that which crosses the pine plantations. There is a well-defined system of logging roads which will require a certain amount of repair work, but on the whole are in good condition, and this renders the entire tract readily accessible.

COMPARTMENT 3.

The east and west boundaries of Compartment 3 are practically southerly extensions of the east and west boundaries of Compartment 2. It lies south of the highway to Marlborough and includes the greater part of the drainage area of the south brook which empties into the reservoir. This brook forks, making three distinct drainage systems within the area. The valleys, while shallow as a whole, are very rocky, being filled with fields of loose rocks. The slopes are generally moderate with only a few portions that are steep. The soil is medium to deep, except near the stream beds and the tops of the higher ridges where the rock approaches the surface. The humus is medium over the entire area with the exception of an area near the southern border which was burned in 1913. This fire approached from the south, crossing Compartment 4, and was checked by the town wardens along a road within Compartment 3. Much of the standing timber on the area burned over was either injured or killed and the forest floor was destroyed. The greatest fire danger is to the

south and east as the highways to the southwest and north form a slight fire protection.

This compartment is of especial interest because of a well defined "Northern Hardwoods" area along the stream and in a site so rocky as to make it almost inaccessible. The remainder of the stand shows chestnut and oak on the better sites, with mixed hardwoods in the damp situations and scarlet oak on the ridges. A portion of the area is pasture reverting to woodlot in which pine and chestnut have seeded to a large extent. In most portions, a series of thinnings and damage cuttings will be carried out, followed by planting of conifers. Group planting with the object of establishing seed trees of more valuable species will be attempted on areas too rocky to be fully restocked by planting.

Selection cuttings will be made in the oak stands, for the present, with tie stock as the principal product. Diseased chestnut will be removed on the stands which are of merchantable size and the areas under-planted with pine to fill the openings. In these selection cuttings, the brush will be lopped and left on the ground. A portion of the area in which the fire damage was the greatest will be cut clear and planted. Permanent sample plots have been established on this compartment, which will necessitate the handling of these tracts for a time as maintenance of the experiments requires.

COMPARTMENT 4.

Compartment 4 extends south from Compartment 3 in a narrow tract and is only separated from the latter compartment because it forms a separate logging unit. It lies along both sides of a small stream which drains to the south and west. The northern portion of 4 occupies the divide between this stream and that which crosses 3 from the south. This divide has a number of ledge outcrops with a relatively shallow soil. The intermediate benches have medium to deep soil but the stream beds have numerous boulders and less depth of soil. The slopes on the north side are gradual but those on the south tend to be steep.

An abandoned highway crosses from southwest to northeast which at present is used entirely as a wood road. The fire which burned a number of hundred acres of woodland in the spring of 1913 crossed this compartment but only burned the area north of this road. On the burned area the humus and litter conditions

are poor. South of the road the humus is medium to deep with good forest litter. The greatest fire danger is to that portion of the compartment which is south of the highway, as in this direction there is a long, unbroken stretch of woodland.

The ridges are forested with scarlet oak and inferior quality chestnut, with chestnut and red oak on the benches. The bottomland has tulip, maple, oak, hickory and chestnut. A few scattering pine seed trees occur on this area with very good pine reproduction under the hardwoods as a result. This compartment has a direct road to the river and material taken out will be hauled over it. For the present the area will be left as it is, but in the 5-10 year period thinnings will possibly be made to secure natural reproduction of pine, tulip, ash and oak. Under-planting will be required in some situations.

COMPARTMENT 5.

This compartment extends west from Compartment 3 and lies along a low ridge south of the reservoir. It drains both into the reservoir and into the brook below the dam. The slopes are gentle, with deep, fine soil over a large part. Boulders and rock outcrops only appear along the south side in a limited area. As there have been no recent fires in this compartment, good humus is found over the greater part of it. There is a series of very good springs along the foot of the slope near the east edge. At least one of these springs will be cleaned out and developed as a water supply for fire protection. The area is protected on the north by the reservoir and on the west by open land, but toward the south and east there is more or less fire risk.

Logging on this area will be to the highway near the reservoir, or to a cross road west of it. Much of the land has been cut over within the last few years and will be left to grow naturally for the present. Thinnings with under-plantings may be made on the eastern sub-compartments later. Portions of the chestnut stands were thinned a number of years ago. Dense brush occurs in the openings and in swamp areas, but this will be shaded out by future tree growth. Chestnut and oak form the largest portion of the stand, but maple, tulip, ash and hickory occur on suitable sites. Natural reproduction of the more valuable species will be secured where possible.

DESCRIPTION OF SUB-COMPARTMENTS.

Sub-Compartment 1A comprises 19.1 acres chestnut and oak type. Soil medium depth and fine. Three age classes represented. 31-40 year class is in good growing condition, and is a typical mixture of chestnut and oak on the flats, with the percentage of oak increasing on the ridges. 11-20 and 1-10 year classes are chestnut and oak sprouts, much diseased. A portion of the stand has been thinned for sample plots. Damage cuttings have removed the diseased chestnut. To be clear-cut and planted when 11-20 year class reaches merchantable size.

Sub-Compartment 1B comprises 27.8 acres mixed hardwoods. Soil moist and rocky. Four age classes represented but with same general form. Mixture is maple, birch, oak, tulip, ash and elm. The stand is in good growing condition but the older age classes have been slightly culled. Originally clear-cut and later culled, very little chestnut being left. To be clear-cut and planted in the 5-10 year period, leaving tulip reproduction and seed trees.

Sub-Compartment 1C comprises 28.4 acres chestnut type. Soil deep and fine. Four age classes represented. The south portion is even-aged tie and pole size chestnut, very little diseased. The remainder has been culled, leaving a more or less uneven stand containing much diseased chestnut. Stand has been culled and damage cuttings have removed a large part of the chestnut except the older age class. To be clear-cut and planted when the market conditions warrant cutting of chestnut.

Sub-Compartment 1D comprises 13.2 acres of chestnut and oak type. Soil is fair to medium in depth. Two age classes are represented. Dense chestnut and oak coppice with oak of fair growth and chestnut much diseased. Stand was clear-cut. Will be left for 10-15 years when present stand will be removed, planting with pine.

Sub-Compartment 1E comprises 16.9 acres of chestnut and oak type. Soil is shallow and rocky. Three age classes are represented. 11-20 year class is oak and chestnut, badly diseased and of inferior quality. 21-30 year class culled, with stands of inferior formed trees and poor species. 41-50 year class is coppice, slow-growing and defective. Stand was clear-cut and portion culled. To be clear-cut and planted, leaving oak standards for increased growth.

Sub-Compartment 1F comprises 14.6 acres chestnut and oak type. Soil medium deep and swampy. Two age classes represented, 11-20 year chestnut and oak with tulip, birch and maple in moister places. 31-40 year pole chestnut with good form. Stand was culled. Will be left as it is for next 5-10 years.

Sub-Compartment 1G comprises 28.2 acres pine and spruce type. Soil fine to deep sandy loam. This stand was planted in spring seasons of 1913-14 with red pine, white pine and Norway spruce. Field was originally cultivated, later reverted to forest, then was clear-cut and planted.

Sub-Compartment 1H comprises 10.1 acres chestnut and oak type. Soil is shallow and fine. Stand is 11-20 year oak coppice with scattering clumps of badly diseased chestnut. Some natural pine reproduction. Area was clear-cut. Will be left as it is for 10-15 years and planted at the same time as Sub-Compartment 1D.

Sub-Compartment 2A comprises 16 acres of chestnut and oak type. Soil medium deep and rocky. Two age classes of coppice, in fair condition. Area was clear-cut. To be left for 15-20 years, then clear-cut and planted.

Sub-Compartment 2B comprises 20.1 acres chestnut and oak type. Soil is medium deep and moist. Three age classes are represented. This stand will be cut during the winter of 1913-14, and planted with pine in 1915.

Sub-Compartment 2C comprises 20.1 acres chestnut and oak type. Soil medium to deep. Three age classes are represented. 1-10 year class clear-cut with much slash remaining. The 11-20 year class is coppice with scattering over-story. Many-aged class culled; a mixed stand, birch, hickory and oak. Area has been logged, leaving the culled trees. To be clear-cut and planted.

Sub-Compartment 2D comprises 17.8 acres pine. Soil deep and moist. There are two plantations, one six and the other three years old. The older plantation is white pine, the younger white and red mixed. Area was cleared of timber before planting.

Sub-Compartment 2E comprises 30.6 acres chestnut and oak. Soil shallow and dry. Two age classes represented. 11-20 year ridge type of slow growth but in fair condition. 31-40 year class is on lower slope and of slightly open growth. Some natural pine reproduction. Stand to be cut when merchantable and area replanted.

Sub-Compartment 2F comprises 22.5 acres chestnut and oak. Soil is medium to deep. Present stand 1-10 year coppice, much brush on ground. Clear-cut two years ago. To be left until underbrush is smothered, then clear and plant.

Sub-Compartment 2G comprises 29.5 acres mixed hardwoods. Soil is deep and moist. Four age classes are represented. 1-10 and 11-20 year classes are small, dense coppice of inferior species. 21-30 year chestnut and oak with tulip and ash. 31-40 year swamp hardwoods of value only as cordwood. The better species have been clear-cut. To be cleared and planted within five years.

Sub-Compartment 2H comprises 30.4 acres chestnut and oak. Soil medium to deep. Four age classes are represented. 1-10 and 11-20 year classes are of inferior species with much underbrush. 21-30 year class and many-aged stands are chestnut and oak in which the chestnut is badly diseased. Formerly clear-cut or culled. To be cleared and planted.

Sub-Compartment 2I comprises 31 acres chestnut and oak. Soil medium to shallow. Three age classes represented. 11-20 year class in fair condition with large percentage of oak. 21-30 and 31-40 year classes are in fair condition but of slow growth with large percentage of oak. Area was clear-cut and coaled. To be cleared and planted in 10-15 year period.

Sub-Compartment 2J comprises 52.9 acres chestnut and oak. Soil shallow and rocky. Three age classes represented. 11-20 year chestnut and oak coppice, fair condition, slow growth. 31-40 year chestnut and oak, dense but small size. Many-aged chestnut and oak culled, leaving over-mature trees more or less decayed. Area was clear-cut in the even-aged stands, remainder being culled for tie material. Selection system to be used at present, but to be replanted eventually.

Sub-Compartment 2K comprises 47.8 acres oak. Soil medium to shallow. Four age classes represented. In fair condition. Scattering chestnut badly diseased. Portion has been thinned, leaving almost pure oak. Area has been clear-cut, thinned and a portion culled. To be cut clear during 5-10 year period and planted.

Sub-Compartment 2L comprises 34 acres chestnut and oak. Soil fine, deep and moist. Two age classes represented. 21-30 year class is mixed stand of hickory, chestnut, oak, tulip, ash, maple and birch. Very rapid growing. 31-40 year chestnut and oak. Disease has changed this stand from pure chestnut into chestnut and oak type. Area was formerly clear-cut and culled. To be cut, leaving tulip and ash, and planted to pine and hardwoods during next five years.

Sub-Compartment 2M comprises 12.9 acres chestnut and oak type. Soil is medium to deep. One age class, 31-40 years. Stand of chestnut, oak and tulip. Formerly clear-cut. To be thinned if condition of chestnut warrants; otherwise clear-cut.

Sub-Compartment 2N comprises 51.8 acres oak type. Soil is shallow with many ledges. Two age classes represented. 11-20 year class on the best soil is largely oak, making good growth. Remainder of stand is over 70 years of age and is in poor condition. Has been culled for ties. To be handled by selection system.

Sub-Compartment 3A comprises 3 acres chestnut and oak type. Soil is deep. Three age classes represented. Present stand consists of chestnut, oak, birch and pine. A portion of stand is tie size, many trees being diseased. A few pine seed trees on this area are rapidly restocking the northwest portion with natural seedlings. Area formerly clear-cut and a portion cultivated. Damage cutting to be made removing diseased chestnut, followed by pine planting in openings.

Sub-Compartment 3B comprises 14.6 acres old field, originally cleared and used as a pasture. Soil is deep. Scattering chestnut, birch, maple and cedar have seeded in. To be planted with pine.

Sub-Compartment 3C comprises 26.5 acres mixed hardwoods. Soil is medium to deep and moist. Three ages represented. 21-30 year class has largest area; dense stand of good form. 11-20 year and many-aged classes are also represented. A few standards are scattered over the area. This area has been logged and coaled. To be thinned and handled by selection system with group planting.

Sub-Compartment 3D comprises 36.6 acres chestnut and oak type. Soil is medium to shallow, rocky. Four age classes are represented; all chestnut and oak coppice, good form, even-aged, with a few scattering trees left over from previous rotation. Formerly clear-cut. Will eventually be clear-cut and replanted.

Sub-Compartment 3E comprises 23.6 acres mixed hardwoods. Soil is shallow, rocky and moist. Three age classes represented. Many-aged class containing maple, birch and oak is of northern

hardwood type. Formerly clear-cut. To be handled by selection system with group planting and natural reproduction.

Sub-Compartment 3F comprises 95.1 acres oak type. Soil medium to shallow, rocky. Three age classes are represented. Present stand of oak, chestnut, tulip, beech, birch, maple, hickory and ash is of slow growth with much inferior material. Has been culled and logged, slower growing oaks being left. To be handled by the selection system with group planting of conifers in openings.

Sub-Compartment 3G comprises 36.5 acres oak. Soil medium to shallow. Two age classes represented. Chestnut and oak coppice under 20 years of age. Fire damage in spring of 1913. Has been clear-cut and culled. To be cleared and planted.

Sub-Compartment 4A comprises 41.6 acres chestnut and oak type. Soil shallow, rocky. Four age classes are represented. Main part of stand is oak with scattering chestnut. Formerly cut for cordwood and coal. Burned over in 1913 without killing the trees. Some pine reproduction. To be cut so as to favor pine where possible, during 10-15 year period.

Sub-Compartment 4B comprises 12.9 acres mixed hardwoods. Soil moist, rocky. Three age classes from 31-40 years to many aged represented. Stands consist of hickory, tulip, maple, ash, oak and chestnut. Good form and mature. Area will be handled to secure natural regeneration.

Sub-Compartment 4C comprises 10.6 acres chestnut and oak type. Soil medium to shallow. Two age classes represented. 1-10 and 41-50 years; chestnut and oak of inferior growth. Has been culled for ties and poles. To be left until merchantable.

Sub-Compartment 5A comprises 6.6 acres chestnut and oak. Soil medium to deep. Two age classes represented. 11-20 year chestnut and oak, medium growth, fair condition. 61-70 year mature chestnut and oak. Formerly cut for wood. To be planted when cleared after 11-20 year class becomes merchantable.

Sub-Compartment 5B comprises 10.1 acres mixed hardwoods. Soil deep and moist. Two age classes represented. 11-20 year dense, much brush, fairly rapid growth. 61-70 year over-mature ash, maple, tulip, hickory, oak and chestnut. Formerly clear-cut. To be held until 11-20 year class is merchantable and then plant.

Sub-Compartment 5C comprises 56.9 acres chestnut and oak. Soil medium to deep. Four age classes represented. Chestnut and oak coppice of different ages but same form; fairly rapid growth. Very little disease. Formerly clear-cut. A portion of the 21-30 year class thinned very heavily for increased growth. To be replanted at the end of the rotation.

Sub-Compartment 5D comprises 25.4 acres mixed hardwoods. Soil moist and deep. Three age classes represented. Larger portion is dense stand of inferior species 1-10 years old. 11-20 year class is similar but slightly older. 51-60 year class mature birch, maple, tulip and ash. This area was logged and coaled. To be clear-cut and planted when the 1-10 year class becomes merchantable. 51-60 year class to be thinned for natural reproduction.

Sub-Compartment 5E comprises 27.6 acres chestnut and oak. Soil medium to deep. Two age classes represented. 1-10 year class over-mature when cut with no coppice resulting. Inferior species seeding in. 11-20 year class chestnut and oak coppice, fair growth, very dense. Formerly logged and cordwood removed. To be clear-cut and replanted when merchantable.

Sub-Compartment 5F comprises 16.9 acres mixed hardwoods. Soil medium to deep. Two age classes represented. 11-20 and 21-30 years. The stands consist of oak, chestnut, maple, tulip and hickory. Very rapid growing. Was cut for cordwood. Reproduction cuttings favoring ash, tulip and oak will be made.

FOREST FIRES IN CONNECTICUT DURING 1913.

TABLE I.—SUMMARY BY COUNTIES.

County.	Total No. fires.	Causes.						Acres burned.	Estimated damage to standing timber.	Estimated damage to forest products and buildings.	Cost of fighting.	Cost of protection.
		Unknown.	Railroad.	Careless.	Incendiary.	Fireworks.	Brush burning.					
Fairfield	63	28	25	9	1	...	...	2,851	$ 6,411.00	$ 453.00	$ 589.99	$194.75
Hartford	132	45	44	30	2	4	7	7,211	24,412.00	1,979.50	1,684.85	192.96
Litchfield	152	41	74	24	3	1	9	4,492	11,155.00	199.50	2,241.40	68.14
Middlesex	43	20	16	4	2	...	1	2,934	4,688.00	1,620.00	567.64	134.61
New Haven	87	41	18	16	1	3	8	1,938	2,875.00	240.00	553.59	51.25
New London	42	19	5	16	...	1	1	1,051	1,775.00	1,728.00	330.33	6.20
Tolland	86	33	34	10	6	...	3	2,198	28,625.00	1,524.00	925.36	12.33
Windham	90	18	50	14	1	...	7	1,676	7,718.00	727.00	1,171.91	24.67
TOTAL	695	245	266	123	16	9	36	24,351	$87,659.00	$8,471.00	$8,065.07	$684.91

TABLE II.—NUMBER OF FIRES BY MONTHS.

County.	Total number.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Fairfield	63	0	1	6	24	18	0	2	4	0	0	5	3
Hartford	132	1	0	4	36	25	14	13	21	0	5	11	2
Litchfield	152	1	0	12	43	43	9	15	21	0	2	6	0
Middlesex	43	0	4	5	5	10	1	5	8	0	0	3	2
New Haven	87	0	0	6	34	21	1	9	4	0	0	8	4
New London	42	0	0	1	10	11	1	5	10	0	0	2	2
Tolland	86	1	0	10	28	23	8	5	6	0	1	4	0
Windham	90	0	2	4	32	23	3	10	9	1	0	4	2
TOTAL	695	3	7	48	212	174	37	64	83	1	8	43	15

TABLE III.—NUMBER AND AREA OF FIRES.

	All fires.	Fires less than 100 acres in extent.	Fires 100 or more acres in extent
Number	695	615	50
Total acreage burned	24,352	9,118	15,234
Average acreage per fire	35.2	14.8	306.5

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