

TABLE III.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
PROPRIETARY MIXED FEEDS—Continued.		
Horse, Dairy and Stock Feeds—Continued.		
6476	Purina Feed with Molasses. Purina Mills, St. Louis, Mo.	New Haven: Crittenden-Benham Co. Guaranty
6541	Blue Ribbon Dairy Feed. Quaker Oats Co., Chicago, Ill.	So. Manchester: G. W. Strant Guaranty
6486	Green Cross Horse Mixed Feed with Molasses. Quaker Oats Co., Chicago, Ill.	Hamden: I. W. Beers Guaranty
6585	Schumacher's Calf Meal. Quaker Oats Co., Chicago, Ill.	Stamford: C. E. Slauson Co. Guaranty
6509	Schumacher's Special Horse Feed. Quaker Oats Co., Chicago, Ill.	Chester: Leet Bros. Guaranty
6473	Schumacher's Stock Feed. Quaker Oats Co., Chicago, Ill.	New Haven: Crittenden-Benham Co. Guaranty
6472	Victor Feed. Quaker Oats Co., Chicago, Ill.	New Haven: Crittenden-Benham Co. Guaranty
6565	Republic Dairy Feed. Republic Mill. Co., E. St. Louis, Ill.	Wallingford: E. E. Hall Guaranty
6567	Republic Horse Feed. Republic Mill. Co., E. St. Louis, Ill.	Wallingford: E. E. Hall Guaranty
6566	Supreme Dairy Feed. Republic Mill. Co., E. St. Louis, Ill.	Wallingford: E. E. Hall Guaranty
6498	Creamo Calf Meal. Ryde and Co., Chicago, Ill.	Willimantic: H. A. Bugbee Guaranty
6582	Syragold Stock Feed. Syracuse Mill. Co., Syracuse, N. Y.	So. Norwalk: S. Roodner Guaranty
6497	Biles Ready Ration (Union Grains). Ubiko Mill. Co., Cincinnati, O.	Willimantic: H. A. Bugbee Guaranty
6547	Stock Feed. Vincent Bros. Co., Bridgeport	Bridgeport: Manufacturer Guaranty
6528	Xtra Vim Feed. Xtra Vim Molasses Feed Co., Boston, Mass.	Norwich: Norwich Grain Co. Guaranty
POULTRY FEEDS.		
6649	Bufceco Poultry Mash. Buffalo Cereal Co., Buffalo, N. Y.	New Haven: R. G. Davis and Sons Guaranty
6605	Iroquois Poultry Mash. Buffalo Cereal Co., Buffalo, N. Y.	Thomaston: L. E. Blackmer Guaranty
6574	Wirthmore Growing Feed. Chas. M. Cox Co., Boston, Mass.	Meriden: Grain and Feed Co. Guaranty
6511	Wirthmore Poultry Mash. Chas. M. Cox Co., Boston, Mass.	Chester: Leet Bros. Guaranty
6467	J. T. B. Mash. Crittenden-Benham Co., New Haven	New Haven: Manufacturer

SAMPLED IN 1915—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.)	
6476	11.60	5.65	9.44 8.30	9.60	61.38	2.33 1.70	\$33.00
6541	9.56	7.45	25.00 25.00	12.78	41.60	3.61	34.00
6486	11.22	5.40	9.88 10.00	11.80	59.10	3.50 2.60	34.00
6585	8.58	4.55	18.88 19.00	2.50	56.94	2.50 8.55	34.00
6509	10.56	2.98	9.69 9.25	7.23	65.70	3.84	34.00
6473	8.66	4.30	12.00 10.00	11.93	58.69	4.42 3.25	32.00
6472	8.91	3.95	9.56 8.00	11.43	61.04	5.11 3.00	31.00
6565	9.55	11.20	18.94 16.50	14.10	43.03	3.18	25.00
6567	10.15	7.35	10.38 9.00	15.63	55.34	*1.15	31.00
6566	9.67	5.73	21.94 25.00	13.08	46.37	2.00 3.21	30.00
6498	10.55	5.30	23.38 25.00	5.83	49.85	3.00 5.09	60.00
6582	8.91	4.93	10.00 10.00	12.38	61.33	*2.45 3.00	31.00
6497	7.49	5.70	24.88 24.00	10.10	44.79	7.04	34.00
6547	7.91	5.05	9.06 16.40	16.40	57.27	7.00 4.31	32.00
6528	15.25	6.55	8.43 4.44	6.80	66.60	*0.36 1.27	34.00
			4.61	...	...	0.81	...
6649	9.76	3.58	17.19 16.94	5.20	59.27	5.00	40.00
6605	9.15	4.30	15.00 14.00	8.60	55.82	4.00 4.00	43.00
6574	10.88	5.53	14.13 15.00	3.93	62.40	5.19 4.50	45.00
6511	9.90	7.28	18.13 17.00	7.53	54.69	3.13 2.47	46.00
6467	9.78	10.83	16.56 17.00	8.83	48.96	5.04	41.00

* See page 239.

TABLE III.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
POULTRY FEEDS—Continued.		
6468	W. E. C. Mash. Crittenden-Benham Co., New Haven	New Haven: Manufacturer
6647	Dickinson's Egg Mash. Albert Dickinson Co., Chicago, Ill.	New Haven: R. G. Davis & Sons
	Guaranty	Guaranty
6636	Queen Poultry Mash. Albert Dickinson Co., Chicago, Ill.	Hartford: Smith Northam & Co.
	Guaranty	Guaranty
6615	Dry Mash. R. H. Ensign Mills, Simsbury	Simsbury: Manufacturer
6492	Blue Ribbon Laying Mash. Globe Elevator Co., Buffalo, N. Y.	W. Cheshire: G. W. Thorpe
	Guaranty	Guaranty
6645	H. O. Poultry Feed. H. O. Co., Buffalo, N. Y.	New Britain: C. W. Lines Co.
	Guaranty	Guaranty
6581	H. O. Dry Poultry Mash. H. O. Co., Buffalo, N. Y.	So. Norwalk: S. Roodner
	Guaranty	Guaranty
6555	Bonnie Poultry Mash. Holmes, Keeler & Kent Co., Norwalk	Norwalk: Manufacturer
	Guaranty	Guaranty
6590	M. & S. Dry Mash Feed. Meech & Stoddard, Middletown	Middletown: Manufacturer
	Guaranty	Guaranty
6628	Growing Feed. Park & Pollard Co., Boston, Mass.	Hazardville: A. D. Bridge Sons Co.
	Guaranty	Guaranty
6534	Lay or Bust Dry Mash. Park & Pollard Co., Boston, Mass.	Yantic: A. R. Manning
	Guaranty	Guaranty
6579	Plato Laying Mash. Frank S. Platt Co., New Haven	New Haven: Manufacturer
	Guaranty	Guaranty
6542	American Poultry Feed. Quaker Oats Co., Chicago, Ill.	So. Manchester: G. W. Strant
	Guaranty	Guaranty
6474	Purina Chicken Chowder. Ralston Purina Co., St. Louis, Mo.	New Haven: Crittenden-Benham Co.
	Guaranty	Guaranty
6666	Shredded Wheat Waste. Shredded Wheat Co., Niagara Falls, N. Y.	Washington Depot: Washington Supply Co.
	Guaranty	Guaranty
6548	V.B. XXXX Mash. Vincent Bros. Co., Bridgeport	Bridgeport: Manufacturer
	Guaranty	Guaranty

SAMPLED IN 1915—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.)	
6468	9.89	7.18	18.00	6.65	53.08	5.20	\$41.00
6647	10.82	5.30	21.25 16.00	6.23	51.82	4.58 3.00	43.00
6636	11.01	3.70	11.69 11.00	6.08	63.01	4.51 2.50	40.00
6615	10.13	8.20	17.56	9.30	50.89	3.92	42.00
6492	9.99	9.13	20.19	8.65	47.08	4.96	41.00
	.....	.....	20.00	.....	.....	3.00	.....
6645	9.52	4.13	18.25	6.20	57.46	4.44	39.00
	.....	.....	17.00	.....	.....	4.50	.....
6581	9.01	4.63	18.56	11.35	52.33	4.12	44.00
	.....	.....	18.00	.....	.....	3.50	.....
6555	9.82	10.15	17.69	8.00	50.28	4.06	44.00
	.....	.....	16.00	.....	.....	4.00	.....
6590	9.48	11.20	20.19	5.85	47.89	5.39	37.00
	.....	.....	12.00	.....	.....	3.00	.....
6628	10.58	5.38	13.81	4.50	61.27	4.46	42.00
	.....	.....	10.00	.....	.....	3.50	.....
6534	9.45	15.95	21.63	6.45	42.56	3.96	44.00
	.....	.....	18.00	.....	.....	3.50	.....
6579	9.31	17.33	19.13	6.63	42.21	5.39	40.00
	.....	.....	18.00	.....	.....	4.00	.....
6542	10.66	3.48	13.38	4.95	62.46	5.07	38.00
	.....	.....	12.00	.....	.....	3.50	.....
6474	9.80	7.85	19.50	7.55	50.62	4.68	44.00
	.....	.....	17.00	.....	.....	3.00	.....
6666	9.54	2.80	10.63	1.90	73.53	1.60	47.00
	.....	.....	10.00	.....	.....	1.50	.....
6548	8.32	7.80	17.44	10.98	50.73	4.73	39.00
	.....	.....	21.50	.....	.....	4.90	.....

Canary Brand, Lanier Bros., Nashville, Tenn. **5687**, sent by G. T. Soule, New Milford; **5773**, sent by K. B. Musser, Storrs.

Connecticut Brand, Meech and Stoddard, Middletown. **5863**, sent by The Coles Co., Middletown.

Robin Brand, Geo. B. Robinson, Jr., New York. **5530**, sent by G. S. Phelps, Warehouse Point.

5355, sold by Meech and Stoddard, Middletown, sent by E. H. Rollins, Granby. **5529**, sold by Humphreys, Godwin Co., Memphis, Tenn., sent by J. L. Blackman, West Redding. **5597**, sold by J. E. Soper Co., Boston, Mass., sent by The Coles Co., Middletown. **5806**, sold by International Agricultural Corporation, Montgomery, Ala., sent by A. J. Ensign, Silver Lane. **6404** and **6405**, sent by The Coles Co., Middletown.

Protein Content of Cotton Seed Meals.

No.	Found.	Guar.	No.	Found.	Guar.	No.	Found.	Guar.
5247	40.31	38.62	5691	37.44	38.50	5530	38.19	41.00
5423	42.75	41.00	5862	40.31	38.50	5355	41.63	.....
5424	38.31	41.00	6981	37.81	41.00	5529	38.31	41.00
5859	41.00	38.62	5672	38.88	41.00	5597	38.81	41.00
5528	40.94	41.00	5690	38.56	38.62	5806	39.88	41.00
5624	43.87	41.00	5687	41.88	41.00	5895	39.88	41.18
5531	41.31	41.00	5773	40.56	41.00	6404	40.19	.....
6980	37.56	40.63	5863	39.00	41.00	6405	38.38	.....

Cocoanut Meal, **5417**, and *Peanut Meal*, **5418** and **5419**, sold by Dwight E. Hamlin, Pittsburgh, Pa.

Wheat Bran, **6836**, and *Wheat middlings*, **6837**, Mansfield Milling Co., Mansfield, O., both sent by W. C. Kennedy, Putnam.

	5417	5418	5419	6836	6837
Water	6.42	5.05	6.49	9.30	9.30
Ash	4.50	8.84	4.41	6.38	4.18
Protein (N x 6.25)	25.81	43.13	36.00	14.13	16.75
Fiber	9.50	2.75	7.95	11.38	6.60
Nitrogen-free extract	45.03	33.10	35.47	53.03	56.97
Ether extract	8.74	7.13	9.68	5.78	6.20

Palmo Middlings, **6886**, sold by Henry Jennings, Boston, Mass., contained 16.69 per cent protein.

Buffalo Corn Gluten Feed, **6873**, sent by R. F. Porter, Turnerville, contained 25.50 per cent protein. Another sample of *Gluten Feed*, **5732**, sent by the Storrs station, contained 23.38 per cent protein.

Provender, **6258**, sent by F. H. Snyder, New Hartford, contained 10.56 per cent protein.

Oats, **6319**, sent by E. D. Bartlett, Guilford, who complained that his horses did not relish these oats. No appreciable amount of sulphur dioxid was found and no smut. The oats, however, were not of good quality and somewhat musty, only 10 per cent of them germinating.

Fleischmann's Dried Grains, **6381**, sold by Western Grains and Feed Co., Chicago, Ill., sent by Meech and Stoddard, Middletown, guaranteed 18 per cent protein and 6.5 fat. The sample contained 8.14 per cent moisture, 19.31 per cent protein and 6.32 per cent fat.

Supreme Dairy Feed, **6394** and **6395**, made by Republic Milling Co., East St. Louis, Ill., and both sent by T. A. Stanley, New Britain; *Hog Fattening Feed*, **6838**, sold by Dwight E. Hamlin, Pittsburgh, Pa., said to be composed of corn flakes, distillers' grains and molasses, and sent by C. M. Jarvis, Berlin; and **6380**, a commercial mixed feed, said to contain corn, oats and molasses, also sent by Mr. Jarvis showed the following composition:

	6394	6395	6838	6380
Water	11.98	10.68	8.29	14.44
Ash	5.33	6.13	3.58	7.43
Protein (N x 6.25)	19.94	18.50	8.88	13.88
Fiber	12.88	18.30	3.30	9.39
Nitrogen-free extract	47.87	43.14	74.83	53.14
Ether extract	2.00	3.25	1.12	1.72

Clover Leaf Dairy Feed, **5598**, and *Clover Leaf Horse Feed*, **5599**, made by Clover Leaf Milling Co., Buffalo, N. Y., and sent by C. H. Davenport, Washington, contained 17.81 and 10.63 per cent protein, respectively.

Horse Feed, **6329**, and *Cattle Feed*, **6330**, sent by W. E. Barrett, Southport, contained 11.71 and 13.74 per cent moisture, 12.81 and 13.31 per cent protein, and 0.43 and 3.20 per cent fat, respectively.

Platco Laying Mash, **6325**, made by Frank S. Platt Co., New Haven, contained 11.00 per cent moisture, 20.31 per cent protein and 5.54 per cent fat.

Alfalfa, **6378**, first cutting, and **6379**, third cutting, both sent by C. M. Jarvis, Berlin.

Dried Brewers' Grains Siftings, **6392**, and *Dried Distillers' Grains Siftings*, **6393**, analyzed for T. B. Osborne of this station.

	6392	6393	6378	6379
Water	7.35	10.67	13.53	13.06
Ash	3.22	3.70	8.03	8.60
Protein (N x 6.25)	43.65	30.19	14.71	20.01
Fiber	6.24	6.13	27.37	26.54
Nitrogen-free extract	32.94	41.50	34.36	29.96
Ether extract	6.60	7.81	2.00	1.83

Alfalfa Meal, 5868, sent by W. B. Dayton, Greens Farms, contained 15.75 per cent protein.

Cracker Wastes, sent by C. M. Jarvis, Berlin. 6894, clear crackers; 6895, with large proportion of cookies and cakes; 6896, mixture with crackers predominating; 6897, mixture with cookies predominating; 6898, heavier and darker colored than 6895, and 6897; 6899, mixture of crackers and cookies with some bread; 6900, a mixture of the other six samples in approximately equal amounts by measure.

	6894	6895	6896	6897	6898	6899	6900
Water	6.59	5.61	5.60	6.62	7.31	5.07	6.08
Ash	1.60	19.35	26.83	1.60	8.10	1.00	7.58
Protein (N x 6.25)	7.94	7.25	7.44	8.00	8.63	9.44	8.75
Nitrogen-free extract and fiber	73.06	59.94	55.08	71.23	66.44	74.26	68.52
Ether extract	10.81	7.85	5.05	12.55	9.52	10.23	9.07

Pastura Cattle Powder, 5689, sent by L. A. Osborn, Litchfield, contained 10.43 per cent protein, 25.68 per cent ash and 24.30 per cent charcoal. The organic matter, other than charcoal, consisted chiefly of weed seeds (probably from screenings), some flaxseed and cotton seed meal. Magnesia, sulphates, chlorides, iron, lime and phosphates were present in the ash.

Mangels. Ten varieties grown on the experimental field at Greens Farms contained the following percentages of protein in the water-free material:

6811	Golden Tankard	11.47	6817	Mammoth Long Red ..	9.15
6812	Riverhall Giant	12.58	6818	Mammoth Long Red ..	9.31
6813	Sugar	11.04	6819	Norbiton Giant Long	
6814	Prize Winner	16.03		Red	9.03
6815	Intermediate Red	13.11	6820	Giant Half Sugar	10.33
6816	Colossal Long Red	7.82			

Ensilage Corn, 17 samples, *Corn Grain*, 72 samples, and *Soy Bean Fodder*, 21 samples, were analyzed in connection with experimental work at the station farm at Mt. Carmel. The results will be published elsewhere.

PART V.

Twentieth Report on Food Products and Eighth Report on Drug Products, 1915.

By JOHN PHILLIPS STREET.*

Of the 756 samples collected by the station agent 174 were adulterated, misbranded or below standard, exclusive of the 49 proprietary medicines. The Dairy and Food Commissioner submitted to the laboratory 1,397 samples, chiefly butter, cheese, milk, soda water syrups, temperance drinks and drug products. Of these 522 were adulterated, misbranded or below standard, and 24 were legally labeled compounds. Besides the above, 257 samples have been examined for city and health officials and other individuals. In all 2,200 samples were analyzed of which 806 were adulterated, misbranded or below standard (exclusive of proprietary medicines), showing that the pure food millennium has not yet arrived.

The station again emphasizes the impossibility of examining samples for manufacturers and dealers. This is work for a commercial chemist. State funds cannot properly be used in making analyses for individuals to be used solely in the course of their business or to satisfy curiosity.

I. FOOD PRODUCTS.

CEREAL BREAKFAST FOODS.

Fourteen samples of the newer brands of cereal breakfast foods were examined. Only a few of these require special notice.

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

Cero-Vita claims to be "rich in vitamines and phosphates." Since this is the first time we have met with the claim that a food product contains "vitamines" it seems worth while to explain the meaning of this term.

Feeding experiments with "purified or partly purified" foods, or with artificial mixtures containing all of the *known* ingredients heretofore supposed to be essential for the support of life, have shown that some still unknown substance or substances must be present in a food in order to make it capable of long supporting life. The nature of these substances is at present entirely unknown, their existence being assumed from the effect produced by adding small amounts of extracts of or parts of

TABLE I:—

Station No.	Brand and Manufacturer.	Net Weight.									
		Price per Package.	Claimed.	Found.	Water.	Ash.	Protein (N x 6.25).	Fiber.	Nitrogen-free Extract.	Ether Extract.	Starch by Dian-tase Method.
5551	Cero-Vita (Toasted Cereal Flakes). Kellogg Food Co., Battle Creek, Mich.	10	8	9.5	4.60	3.45 ²	8.88	0.33	82.07	0.67	52.26
5558	Comet Cereal (Rice Breakfast Food). Seaboard Rice Milling Co., Galveston, Tex.	..	16	16.1	11.25	0.33 ³	7.19	0.20	80.70	0.33	*
5563	F. B. A. Laxative Health Biscuit. F. B. A. Biscuit Co., New York.	..	..	...	11.13	3.13	6.13	0.68	77.20	1.73	*
5560	Granose Flakes. Kellogg Food Co., Battle Creek, Mich.	..	6	10.2	5.90	3.93	10.31	0.48	55.46	3.93	55.46
5548	Laxa. Kellogg Food Co., Battle Creek, Mich.	..	..	7.6	6.60	5.03 ³	12.38	6.58	66.63	2.78	*
5541	Sanitas Granuto. Kellogg Food Co., Battle Creek, Mich.	50	16	16.4	4.89	1.25	10.13	0.35	81.66	1.72	43.43
5544	Toasted Rice Biscuit. Kellogg Toasted Rice Flake & Biscuit Co., Battle Creek, Mich.	15	6	8.7	4.98	3.65	10.06	0.18	80.80	0.33	57.38
5553	Toasted Rice Flakes. Kellogg Toasted Rice Flake & Biscuit Co., Battle Creek, Mich.	10	8	10.7	4.71	3.35	10.00	0.18	81.40	0.36	55.74
5550	Toasted Rye Flakes. Kellogg Food Co., Battle Creek, Mich.	15	6	4.7	8.10	2.23	11.44	0.60	76.09	1.54	45.68
5549	Toasted Wheat Biscuit. Kellogg Food Co., Battle Creek, Mich.	15	12.5	14.7	5.80	2.35	14.19	1.53	74.76	1.37	45.79
5552	Toasted Wheat Flakes. Kellogg Food Co., Battle Creek, Mich.	15	8	10.6	5.21	2.65	9.25	1.15	80.61	1.13	57.04
5041	Uncle Sam Health Food. Uncle Sam Breakfast Food Co., Omaha, Neb.	15	12	12.3	6.25	3.10	21.25	3.98	40.99	24.43	*
5559	Whole Wheat Wafers. Battle Creek Sanitarium Co., Battle Creek, Mich.	15	12	12.7	6.04	1.88	10.44	0.63	73.38	7.63	*
5545	Zwieback. Battle Creek Sanitarium Co., Battle Creek, Mich.	15	14	15.6	6.21	1.63	14.25	0.23	76.07	1.61	60.41

* Not determined.

¹ Ash insoluble in acid, 0.006%.

² Contains 0.26% P₂O₅ and 0.11% iron and alumina phosphates, only a trace of iron being present.

³ Contains 2.41% P₂O₅ and 0.20% iron and alumina phosphates, only a trace of iron being present; much lime present.

various vegetable or animal tissues to the above mentioned inefficient diets. Probably the so-called "vitamines" include a variety of chemical substances which are widely distributed throughout the animal and vegetable tissues. As a consequence nearly all of the unmanipulated food products contain enough of these vitamines to supply the requirements of normal nutrition.

The claim that a food is "rich in vitamines," even if true, adds little to its value, for, however essential these substances may be, they are so widely distributed among all of the common articles of food that every person who has an ordinary normal diet gets quite enough of them. The phrase does not carry with it the idea of any special process having been used, or even

BREAKFAST FOODS.

any special food having been selected, but rather that natural, unmanipulated foods are present, and that the manufacturer, alert to the advertising value of a new catch phrase, claims for his product a virtue common to the majority of our most familiar foods.

The claim that *Cero-Vita* is "rich in phosphates" is not supported by the analysis, which shows only 0.26 per cent of phosphoric acid to be present. The common cereal grains, corn, oats, rye and wheat, contain from 0.61 to 0.96 per cent of phosphoric acid, while wheat bran contains nearly 3 per cent. In fact *Cero-Vita* differs but little from the better-known cereal breakfast foods except that it contains somewhat less protein and fat, and considerably more ash; the amount of this last ingredient, however, is affected very little by the small amount of phosphoric acid present.

F. B. A. Laxative Health Biscuit appears to contain what is claimed: "flaxseed, bran and agar agar."

Granose Flakes claimed to "enrich the blood," which they probably do in the same sense that any nutritious, digestible food does.

The claim that *Laxa* contains "sterilized wheat bran and Ceylon moss (agar agar)," appears to be true. The claim "rich in iron and phosphates" is not so tenable. *Laxa* contains 2.41 per cent of phosphoric acid, which is about 80 per cent of the amount found in average unmixed wheat bran; this phosphoric acid, however, is not present as phosphates but chiefly in the form of nucleic acid. Only a trace of iron is present in the food, the total iron and alumina phosphates (chiefly the latter) amounting to but 0.20 per cent.

Granuto is claimed to be "thoroughly dextrinized and pre-digested by the diastase of malt." Our analysis, however, shows that 43.43 per cent of unaltered starch is present, indicating that over half of the carbohydrates of the food have escaped the dextrinization and diastatic action of the malt.

Uncle Sam Health Food is claimed to be composed of "flaxseed and whole wheat flavored with salt and celery." The claim seems to be correct, and the composition stated by the manufacturer agrees reasonably well with that found by us.

Laxa bore no statement of net weight as required by law; *Toasted Rye Flakes* claimed 6 oz., only 4.7 oz. being found.

The other samples as a rule considerably exceeded the net weights claimed for them.

CHEESE.

The standard for cheese is as follows:

"Cheese is the sound, solid, and ripened product made from milk or cream by coagulating the casein thereof with rennet or lactic acid, with or without the addition of ripening ferments and seasoning, and contains, in the water-free substance, not less than fifty (50) per cent of milk fat."

Eighty-six samples of cheese were examined for the Dairy and Food Commissioner in a study of the variations in its content of water and fat, and of the presence of foreign fats. Sixty-one samples were sold as "Cream Cheese," 13 as "Whole Milk Cheese" or "Milk Cheese," 10 simply as "Cheese" and one each as "Swiss Cheese" and "Skim Milk Cheese."

The term "Cream" or "Full Cream" as applied to cheese made from whole milk has caused much misunderstanding and confusion. While long established trade practice may perhaps excuse the use of these terms, it is obviously just as misleading to brand a cheese made simply from milk as "Full Cream Cheese" as was the former practice of branding unsweetened condensed milk as "Evaporated Cream."

It is apparent from the analyses herewith reported that the terms "Cream," "Full Cream," "Whole Milk" and "Milk" cheese are used interchangeably in this State. The question of the nomenclature of cheese is now under consideration by the Federal Committee on Food Definitions and Standards, and pending the committee's report the samples examined in the present inspection will be discussed solely as regards their content of water and fat.

Three of the samples although sold as "Cream" or "Whole Milk" cheese were made from partly skimmed milk; they contained only 45.9, 40.0 and 31.1 per cent of fat in the water-free material. A fourth sample sold as "Skim Milk Cheese" was true to name. Three of these four samples contained high percentages of water, 43.7, 46.9 and 45.7 per cent, a condition quite natural for cheeses of this grade.

The other 81 samples of Cheddar cheese satisfied the standard of 50 per cent fat in the water-free substance. The fat ranged

TABLE II:—CHEESE.

Sold as	Water.	Fat.		Sold as	Water.	Fat.		
		Original Cheese.	Water-free Cheese.			Original Cheese.	Water-free Cheese.	
Cream Cheese	29.7	37.5	53.3	Cream Cheese	32.8	36.0	53.6	
" "	29.4	39.0	55.2	" "	36.0	36.0	56.3	
" "	34.0	35.3	53.5	" "	33.1	37.5	56.1	
" "	31.7	38.3	56.1	" "	39.6	36.0	59.6	
" "	30.4	36.8	52.9	" "	36.1	36.0	56.3	
" "	35.8	36.0	56.1	" "	36.2	36.0	56.4	
" "	33.6	37.5	56.5	" "	31.9	39.0	57.3	
" "	32.0	38.3	56.3	" "	34.1	40.5	61.5	
" "	36.3	36.0	56.5	" "	33.4	39.0	58.6	
" "	32.9	37.5	55.9	" "	34.1	37.5	56.9	
" "	26.5	40.5	55.0	" "	35.5	39.0	55.8	
" "	37.5	36.0	57.6	" "	37.5	36.0	57.6	
" "	33.5	37.5	56.4	" "	33.1	36.0	53.8	
" "	32.9	36.8	54.8	" "	37.9	36.0	58.0	
" "	34.4	36.0	54.9	Whole Milk, or				
" "	38.5	35.3	57.4	Milk Cheese		35.9	39.0	
" "	36.4	34.5	54.2	" "	" "	34.0	38.3	
" "	36.8	36.0	56.9	" "	" "	32.0	36.0	
" "	32.1	37.5	55.2	" "	" "	30.6	36.0	
" "	33.0	36.0	53.7	" "	" "	33.5	37.5	
" "	32.3	39.0	57.6	" "	" "	34.1	35.3	
" "	32.9	39.0	58.1	" "	" "	38.4	33.0	
" "	30.2	40.5	58.0	" "	" "	29.2	39.8	
" "	31.5	42.8	62.5	" "	" "	33.5	37.5	
" "	35.2	39.0	60.2	" "	" "	33.6	39.0	
" "	39.1	34.5	56.7	" "	" "	*40.9	*16.5	
" "	31.0	39.0	56.5	" "	" "	32.0	36.0	
" "	32.3	39.0	57.5	" "	" "	32.0	40.5	
" "	27.4	39.0	53.7	Cheese	29.4	40.5	57.4	
" "	31.6	37.5	54.8	"	30.8	37.5	54.2	
" "	35.8	36.0	56.1	"	32.7	37.5	55.7	
" "	34.0	35.3	53.5	"	26.0	40.5	54.7	
" "	34.1	34.5	52.4	"	36.1	36.8	57.6	
" "	37.0	36.0	57.1	"	34.3	39.0	59.4	
" "	36.3	36.0	56.5	"	38.0	33.8	54.5	
" "	32.8	37.5	55.8	"	36.0	36.0	56.3	
" "	*34.7	*30.0	*45.9	"	32.8	38.3	57.0	
" "	*43.7	*22.5	*40.0	"	30.0	39.0	55.7	
" "	35.1	36.0	55.5	Swiss Cheese ..	32.7	36.0	53.5	
" "	37.5	34.5	55.2	Skim Milk				
" "	33.5	37.5	56.4	Cheese	*45.7	*19.5	*35.9	
" "	34.0	37.5	56.8	Maximum ...		39.6	42.8	
" "	35.9	37.5	58.5	Minimum ...		26.0	33.0	
" "	32.8	37.5	55.8	Average		33.7	37.3	
" "	32.7	37.5	55.7					
" "	33.9	39.0	59.0					
" "	33.4	37.5	56.3					

* Omitted from the average.

from 33.0 to 42.8 per cent in the original cheese, or from 51.9 to 62.5 on the water-free basis.

It has been claimed frequently that cheese manufacturers are incorporating more and more water in their product. Our present inspection does not bear out this contention, the water content ranging from 26.0 to 39.6 per cent. While all of our samples were taken from whole cheeses and were analyzed immediately on receipt, it is possible of course that the cheeses contained much more water originally than our figures show. However, our analyses indicate the composition of the cheese at the time it reached the consumer, the point in which we are chiefly interested. From the standpoint of quality too little water is almost as objectionable as too much.

No foreign fat was detected in any of the samples, and we may assume that the sale of "filled cheese" for the genuine product no longer is practiced in this State.

COCOA AND CHOCOLATE PREPARATIONS.

5536. *Health Koko Mixture* "consisting of Cocoa, Nuts, Meltose, Sugar. Theobromin removed." The Kellogg Food Co., Battle Creek, Mich. Price 25 cents per box of 8 oz.

5301. *Hygima Food-Recuperative*. Dr. Theinhardt's Food Co., Stuttgart-Cannstatt, Germany. Price one dollar per can of 18 oz.

6389. *Ziegler's Breakfast Cocoa*. George Ziegler Co., Milwaukee, Wis.

6387. *Achor's Choco-Lactine*. "High Grade Chocolate, Pure Evaporated Milk, Pure Refined Sugar, Nothing Else." Achor Choco-Lactine Co., Philadelphia, Pa. Small bags of the mixture averaged one ounce in net weight.

6462. *Broken Cocoa (Nibs)*. S. S. Pierce Co., Boston, Mass.

The analysis of *Health Koko* shows that cocoa makes up certainly less than three-fourths of its weight. The claim is made that the theobromine has been removed. Analyses made in this laboratory show that pure cocoa contains on the average 1.15 per cent of theobromine and 0.16 per cent of caffeine. Our analysis shows 0.13 per cent of these combined bases in this particular preparation, indicating therefore, only about one-tenth the amount usually found in cocoa. Undoubtedly much of the

theobromine has been removed as claimed, but the apparent reduction may be due, at least in part, to the "nuts, meltose, and sugar" which, according to the label, are ingredients of the compound. "Meltose" by the way is the Kellogg name for the well-known sugar, maltose. In spite of the claim on the label that no cane sugar is used in the preparation of this cocoa, we found 27.41 per cent present.

TABLE III:—COCOA AND CHOCOLATE.

	Health Koko.	Ziegler's Hygiama.	Achor's Cocoa.	Choco- Lactine.	Broken Cocoa.
5536	5301	6389	6387	6462	
Water	5.17	4.55	6.95	3.12	2.83
Ash	1.80	3.54*	7.09	2.22	3.88
Protein (N x 6.25)	16.88	20.25	21.50	9.38	14.69
Fiber	4.10	1.40	6.62	1.24	4.32
Nitrogen-free extract	54.50	60.23	37.34	69.49	22.86
Fat	17.55	10.03	20.50	14.55†	51.42
Sol. in water at 100° C.	31.50	....	22.20	68.16	....
Theobromine and Caffeine	0.13	0.05	....	....	....
Starch	11.20	13.16	10.62	3.43	7.48
Sucrose	26.77	27.41	‡	56.48	§
Lactose	....	†	‡	7.20	....
Invert sugar, from direct reduction	....	3.20	....	....	....
Gums, dextrins, as dextrose	....	4.83	....	....	....
Undetermined carbohydrates	....	11.63	....	2.38	15.38
Polarization at 25° C., direct	+26.8	....	+1.4	....	....
Polarization at 25° C., after inversion	-5.6	....	±0.0	....	....

Hygiama is recommended as a "Food-Recuperative," and as "an Ideal Food Beverage" for all sorts and conditions of people, well and sick, including "Food Reformers." An analysis printed on the label conforms very closely with our own. According to Zipperer¹¹ *Hygiama* is made from defatted cocoa, condensed milk and cereals. Our analysis appears to confirm this statement, although we could not obtain evidence of the presence of milk sugar by mucic acid formation. However, if lactose is present it is included mainly in the water-soluble carbo-

* 1.00% phosphoric acid.

† See text.

‡ Not sweetened.

¶ Reichert-Meissl No. 7.0 (5 gms. fat).

§ Water-soluble carbohydrates by direct reduction, none; after hydrolysis, 0.94%.

|| The Manufacture of Chocolate, p. 256.

hydrates, which, after excluding sucrose, we have calculated as dextrose; a part of the lactose may also have been included in our value for invert sugar. The ash of this food contains 1.00 per cent of phosphoric acid, alluded to by the manufacturer as "bone forming and digestive matter," which suggests that wheat bran may be one of the constituents of the food.

Hygiama, as far as we have been able to learn, makes no claim as to a reduced theobromine content. We find, however, only 0.05 per cent of theobromine and caffeine, about one-twenty-fifth of the amount usually found in cocoa. As in *Health Koko* this reduction may be caused in part by the presence of the other ingredients of the compound.

The price of *Hygiama*, one dollar for 18 ounces, certainly removes it from the category of cheap foods.

Ziegler's Breakfast Cocoa has the composition of a normal cocoa, the high ash indicating that the so-called "Dutch" process was used in its manufacture. Its ash showed an alkalinity of 6.7 cc. of tenth-normal acid per gram of cocoa.

Achor's Choco-Lactine claims to be composed of chocolate, evaporated milk and sugar, a claim confirmed by our analysis. The Reichert-Meissl No. of 7.0 for 5 grams of fat indicates the presence of considerable milk fat, and accordingly that condensed whole milk had been used. The cane sugar makes up over 56 per cent of the compound.

While the manufacturer's claim as to composition is correct, other claims made for the product are open to serious objection. For instance:—"Instantly soluble in hot water"; we find only 68 per cent of the compound to be soluble in boiling water and 56 per cent of this soluble material is cane sugar. "Perfectly digestible"; it is well known that cocoa fat is far from being perfectly digestible and it is by no means certain that a 56 per cent solution of cane sugar could "be retained by the weakest stomach without distress, though every other form of food is rejected." "Unrivalled as a brain and nerve food"; the idea that any food is specifically a food for the brain or nerves or in fact for any organ or tissue of the body long ago joined the numerous company of scientific myths.

Pierce's Broken Cocoa (apparently cocoa nibs of average composition) was examined at the request of an authority on diabetes to determine the amount of sugars in the finished

beverage as offered to the patient. The method of preparing the cocoa infusion was as follows:—

Place a teacupful of the cocoa in a pot together with three pints of boiling water. Allow the mixture to boil on the stove for nine hours, adding boiling water from time to time to maintain the volume of three pints; strain through a fine sieve before serving.

The cocoa beverage thus prepared showed a specific gravity of 1.0020, and 0.032 gm. of direct reducing sugars and 0.138 gm. of total reducing sugars per 100 cc., both calculated as dextrose.

HYGIENIC COFFEES.

Four brands of coffee making special claims as regards healthfulness have been examined and compared with a sample of commercial Java coffee.

5040. *Kaffee Hag*, "Perfect Coffee, 95 per cent of the Caffeine Removed," "Pure Coffee," Kaffee Hag Corporation, New York.

6333. *G. Washington Prepared Coffee, Crystal*, "Absolutely Pure Soluble Coffee," "Does not contain Chicory or any other Adulterant. Refined from Selected Coffee Beans."

6335. *Café des Invalides*, "A compound of the Finest Coffees and other Vegetable Substances." "This compound is not all coffee, but contains about seven-eighths coffee, of the finest grades, blended with vegetable substances, which have been found to render it more healthful than pure coffee, in that it does not produce nervousness or wakefulness. It may be taken freely by many who have found ordinary coffee to be harmful to them, and will be especially gratifying to those who have tried to like cereal substitutes." S. S. Pierce Co., Boston.

6336. *Richelieu Brand Vacuum Improved Coffee*, "Subjected before roasting to the Evers Vacuum Process. This process is purely mechanical, no drugs or chemicals being used, the only agencies employed are vacuum and superheated steam." Sprague, Warner and Co., Chicago.

6334. *Java Coffee*. A high-grade commercial coffee.

In 1907 this station exposed certain brands of coffee sold under fraudulent claims as to the removal of either the caffeine or the tannins, or both. Such brands as *De-Tan-ated Coffee*, *Digesto Coffee* and *Royal Dutch Coffee* enjoyed a short-lived popularity

until the fraudulency of their claims was established. For the purpose of comparison with the four brands recently examined by us, the percentages of caffetannic acid and caffeine found in 1907 are given below, as well as the amounts of these ingredients found in three grades of commercial coffee.

	Caffetannic Acid.	Caffeine.
De-Tan-ated Coffee	9.89	1.14
Digesto Coffee	9.45	1.11
Royal Dutch Coffee	9.96	1.12
Java Coffee	9.51	1.13
Mocha Coffee	9.96	1.26
Rio Coffee	9.47	1.13

The above tabulation shows very clearly that the "special processes" used gave resultant products scarcely distinguishable from ordinary coffee.

The brands examined this year are in a somewhat different category.

Kaffee Hag claims the removal of 95 per cent of the caffeine, with no reference to the caffetannic acid.

G. Washington Prepared Coffee on its label uses the indefinite word "refined." One of the company's circulars states that "The coffee berry contains anti-digestive, deleterious substances, which are not essentials of the true coffee when refined.—Mr. Washington's refining process eliminates these harmful indigestible substances, along with all the other waste." These extracts intimate more or less directly that the "refining" consists in at least a partial elimination of coffee's objectionable ingredients.

Café des Invalides makes no direct claim as to either caffeine or caffetannic acid, but asserts "that it does not produce nervousness or wakefulness" results generally attributed to these ingredients. Likewise we are told that "it may be taken freely by many who have found ordinary coffee to be harmful."

Richelieu Brand Improved Coffee lays emphasis on a "vacuum process" of preparation. The claims made for this process will be discussed below.

In view of these claims, in which the reduction or elimination of the objectionable ingredients of coffee is maintained with more or less directness, it seemed desirable to determine to what

extent these claims were fulfilled. In this discussion we will not attempt to consider the physiological effects of coffee drinking, other than to call attention to the possibly somewhat undue emphasis which has been placed on the harmfulness of caffeine, while the possible harmful effect of the caffetannic acid has been in the main ignored.

TABLE IV.—HYGIENIC COFFEES.

	5040	6333	6335	6336	6334
Water	5.42	8.58	5.03	4.57	5.62
Solids soluble in cold water	22.60	90.30	27.53	22.41	23.01
Petroleum ether extract	16.38	0.26	13.68	16.43	16.57
Ash, total	4.57	16.68	5.04	4.21	4.27
Ash, water-soluble	3.65	13.36	4.03	3.31	3.29
Ash, water-insoluble	0.92	3.32	1.01	0.90	0.98
Ash, acid-insoluble	0.02	0.02	0.09	0.03	0.03
Alkalinity of water-soluble ash ...	4.55*	18.34*	3.90*	4.07*	4.09*
Alkalinity of water-insoluble ash ..	2.26*	7.40*	2.30*	2.10*	2.08*
Phosphoric acid, water-soluble ...	0.06	0.40	0.17	0.15	0.12
Phosphoric acid, water-insoluble ..	0.32	1.23	0.29	0.29	0.32
Potash	2.29	8.92	2.09	2.07	2.01
Chlorine	0.06	0.09	0.49	0.01	0.01
Nitrogen	1.92	3.42	2.31	2.32	2.22
Caffeine, from residue	0.04	5.11	1.00	1.18	1.22
Caffeine, calculated from N in residue	0.03	4.96	0.97	1.15	1.20
Caffetannic acid	11.47	48.04	11.56	11.82	11.37
Reducing sugars, as dextrose	0.72	4.04	2.70	1.11	0.98
Sucrose from increase after inversion	1.01	2.06	2.57	0.80	0.73
Carbohydrates insoluble in 95% alcohol and convertible by diastase (starch, dextrins, etc., calculated as dextrose)	6.56	13.50	7.25	5.00	6.75

The table gives a detailed analysis of the four brands, together with that of a sample of commercial Java coffee as a basis for comparison.

All the samples are unadulterated coffees, in the sense that no foreign ingredient has been added, except *Café des Invalides*, which on the label claims to be only seven-eighths coffee, the balance being vegetable matter, apparently chiefly chicory.

* cc. N/10 HCl per gram of coffee.

KAFFEE HAG. The claim that 95 per cent of the caffeine has been removed is a just one; we find but 0.03 per cent as compared with 1.20 per cent in ordinary Java coffee. It contains, however, quite as much caffetannic acid as ordinary coffee, but concerning this ingredient no claim is made. That this product is "Perfect Coffee," as the label claims, is not strictly tenable, for a characteristic, probably the most distinctive, ingredient of coffee has been almost entirely eliminated.

G. WASHINGTON PREPARED COFFEE. This brand was also analyzed by us in 1911 and the present analysis is in substantial agreement with the previous one. Its composition indicates that it is probably a finely pulverized dessicated coffee extract. The only respects in which it differs from normal coffee is its almost complete solubility, which naturally excludes most of the fat and oil (petroleum ether extract) and the insoluble nitrogenous compounds and carbohydrates. The other analytical data show that with these exceptions it is about four times as concentrated as ordinary coffee. This concentration likewise affects the content of caffeine and caffetannic acid, the percentages found, 4.96 and 48.04, respectively, being somewhat over four times as much as shown in normal coffee. Whatever the Washington refining process has done, it has caused no diminution whatever in the two ingredients to which the harmful effect of coffee is generally attributed.

CAFÉ DES INVALIDES. The analysis represents what would be expected in a mixture of seven parts of coffee and one part of chicory and other vegetable substances. The caffeine is reduced from 1.20 to 0.97 per cent, while the caffetannic acid is somewhat higher than in the sample of Java coffee, indicating that a coffee of high tannin content had been used. The slight reduction in caffeine is due simply to the diluent vegetable substances employed, and is without significance. If normal coffee will cause "nervousness and wakefulness" we would expect the same results to follow from the use of this special brand, if these results are to be attributed to the caffeine and caffetannic acid present.

RICHELIEU BRAND VACUUM IMPROVED COFFEE. In a folder issued by the manufacturer, entitled "For the Merchant and his Clerks," we are told

Both the virtue and the harm in coffee have long been credited to the caffeine which it contains. * * * Until only a comparatively short time ago caffeine was the only one of these properties which was commonly known, and as it was recognized that its consumption in quantity was disturbing in its effect, it was but natural that it should have been considered the uncomfortable disturber to large numbers of people. The results of investigations, experiments and tests which have been performed by recognized authorities in very recent years, and the determined campaign of research which we have conducted in reference to coffee, have convinced us that caffeine, in such quantities as is contained in coffee, as ordinarily consumed, is not a harmful property, but on the contrary is a beneficial one.

The circular then states that coffee, when roasted in the ordinary manner, develops certain oils, both fixed and volatile, "whose effects are disturbing to persons of nervous or sensitive temperaments." The Vacuum Improved Process, it goes on to say, requires so much less heat than the ordinary methods in which this preliminary treatment is not employed, that while these coffees contain "all the desirable elements which make of coffee the most delicious and satisfying drink known to man, they contain the disturbing properties in such small quantities as to make these coffees a safe and harmless drink, no matter what may have been the results produced by the drinking of other coffees."

It may be that the above abstract from the manufacturer's literature refers to the work of Burmann, who reported in 1913 in the *Bulletin général de la therapeutique*, 166, 379, that he had discovered certain compounds in coffee, which he called "Coffeotoxins." These products were so poisonous that "certain people who are sensitive to coffee effects, which cause them to have headache, nervous trembling and insomnia, need not even drink coffee but only inhale the vapors which develop while brewing the coffee, to develop the above symptoms." Burmann completely ignored the fact that his discovery (?) had been anticipated by Erdmann in 1902, *Ber. deut. chem. Gesell.*, 35 (2) 1846, who by exactly the same process isolated from 150 kilograms of coffee 83.5 grams of "Caffeol," or 0.0557 per cent. This caffeol was not a homogeneous substance as claimed by Burmann, but contained about 50 per cent of furfuralcohol and small quantities of phenols. Based on the caffeol content as determined by Erdmann a cup of coffee, therefore, made from 5 grams of

pulverized coffee, might contain from 0.0007 to 0.0010 gm. of this "poison," which, according to Burmann's claims for its toxicity would almost class it with strychnine for deadliness, as even the vapors from a cup of coffee containing this infinitesimal amount are alleged to have shattered the nerves of "certain people who are sensitive to coffee effects."

Our analysis of this brand is almost identical with that of our sample of Java coffee. Whatever the Evers Vacuum Process may have removed, it seems to have had no effect on the caffeine and caffetannic acid content of the resultant product, which are present in quite as large amounts as in untreated roasted Java coffee.

To summarize, *Kaffee Hag* is almost caffeine-free, but contains the normal amount of caffetannic acid. *G. Washington Coffee* contains about four times as much caffeine and caffetannic acid as normal coffee. *Café des Invalides* contains about 80 per cent as much caffeine as ordinary coffee, the decrease being due to its dilution with other vegetable substances; its caffetannic acid content is somewhat higher than in normal coffee. *Richelieu Vacuum Coffee* contains practically the same amounts of caffeine and caffetannic acid as ordinary coffee.

COFFEE SUBSTITUTES.

5546. *Caramel Cereal*. Kellogg Food Co., Battle Creek, Mich. Price 15 cents per package of 18.4 oz.

3562. *Minute Brew (Caramel Cereal, Concentrated)*. "Made wholly from Grain." Kellogg Food Co., Battle Creek, Mich. Price 35 cents per can of 8.6 oz.

5574. *Monco*. The Monroe Co., Quincy, Ill. "A Healthful Drink, made of pure grains and vegetables, etc. Does not contain a particle of coffee or any other harmful ingredients." Price 25 cents per can of 16 oz.

	5546	3562	5574
Water	5.04	6.98	5.90
Ash	4.93	5.68	2.22
Protein (N x 6.25)	16.19	13.31	13.75
Fiber	12.60	6.81	7.43
Nitrogen-free extract	58.95	66.04	68.96
Ether extract	2.29	1.18	1.74
Soluble in water .....	...	44.08	...
Caffeine	none	none	none

It is difficult from the analytical data to see in what way *Minute Brew* is a concentrated form of *Caramel Cereal*, as it contains considerably less protein and fat. *Minute Brew* yields 328 Calories, while *Caramel Cereal* yields only slightly less, 321. None of the three samples contained caffeine, indicating the absence of coffee.

DIABETIC FOODS.

Nine new "diabetic" preparations have been examined this year. Their descriptions were as follows:

5561. *Casein Flour*, Lyster Bros., Whitefield, N. H.
 5562. *Casein Bread*, Lyster Bros., Whitefield, N. H.
 6267. *Allison's Cotton Seed Flour*, Schulenburg Oil Mill, Schulenburg, Tex.
 6268. *Gluten Zwieback*, Loeb's Diabetic Food Bakery, N. Y.
 6269. *Gluten Almond Zwieback*, Loeb's Diabetic Food Bakery, N. Y.
 5869. *Gluten Bread*, Weston's Bakery, Boston, Mass.
 5870. *Gluten Cookies*, Weston's Bakery, Boston, Mass.

	5561	5562	6267	6268	6269	5869	5870
Water	5.70	38.27	9.38	8.39	7.84	....	....
Ash	5.78	4.24	5.95	1.45	2.38	....	....
Protein (N x 6.25)	84.50	36.57	50.38	46.69	42.56	20.87	30.40
Fiber	0.05	0.05	2.70	0.18	0.60	....	....
Nitrogen-free extract	0.37	2.49	20.35	29.84	26.03	....	....
Ether extract	3.60	18.38	11.24	13.45	20.59	....	....
Starch	none	none	1.07	23.43	19.13	28.16	19.59

6265. *Champagne Vin Nature sans Sucre*, A. Pierlot & Cie., Bouzy-Reims.

6266. *Brauneberger* (Moselle Wine), Wilhemi, Hock & Co., Frankfurt a.M., Germany.

	6265	6266
Spec. gr. at 15.5° C.	0.9922	0.9952
Alcohol by volume	11.97	11.10
Total sugars as invert	0.36	0.25

Attention is also called to *Carrick's Soluble Food*, whose analysis is given in the section on Infant's Foods, page 328. The manufacturer of this food claims that "in diabetes, diarrhoea, phthisis and pregnancy it is the food 'par excellence,'" in spite of the fact that our analysis shows the presence of 25.99 per cent of starch and 53.45 per cent of water-soluble carbohydrates.

FIG PREPARATIONS.

It is one of the most unfit foods for the diabetic patient that we have ever examined.

FIG PREPARATIONS.

5554. *Fig Marmalade*. Cudahy Orchards Co., Chicago, Ill.

5402. *Black Fig Marmalade Mixture*. "Composed of Black Figs, Prunes, Meltose." Kellogg Food Co., Battle Creek, Mich. Price 40 cents per jar of 16.5 oz.

5401. *White Fig Marmalade Mixture*. "Composed of White Figs, Meltose." Kellogg Food Co., Battle Creek, Mich. Price 40 cents per jar of 16.0 oz.

5542. *Fig Bromose*. Kellogg Food Co., Battle Creek, Mich. Price 30 cents per tin of 7.3 oz.

	5554	5402	5401	5542
Water	27.62	48.92	37.92	10.06
Ash	0.96	0.96	1.14	1.87
Protein (N x 6.25)	1.21	1.28	1.78	15.75
Fiber	2.27	1.49	1.77	1.93
Nitrogen-free extract	67.40	46.85	56.69	51.29
Ether extract	0.54	0.50	0.70	19.10
Polarization at 23° C., direct	+29.4	+45.4	+52.2	+83.0
Polarization at 23° C., after inversion	-18.7	+45.1	+50.4	+78.1

No artificial color, saccharin or preservatives were found. The first sample was made with cane sugar; the other three with "Meltose" the Kellogg name for maltose.

FLAVORING EXTRACTS.

One hundred and twenty-one samples of flavoring extracts were examined, including all the common extracts, except vanilla, and a number of those which are less frequently analyzed.

ALMOND EXTRACT.

Standard almond extract is

"the flavoring extract prepared from oil of bitter almonds, free from hydrocyanic acid, and contains not less than 1 per cent by volume of oil of bitter almonds."

Fourteen samples were analyzed. 5336 and 5103 were deficient in oil; the other twelve samples ranged from 1.00 to 3.85 gms. per 100 cc. Cane sugar (sucrose) was present in three samples, 1.12 gms. per 100 cc. in 5314, 12.34 gms. in 5042, and a trace

in 5085. None of the samples contained nitrobenzol, hydrocyanic acid, artificial color or wood alcohol. The alcohol was extremely variable, ranging from 28.79 to 78.16 per cent.

TABLE V:—ALMOND

Station No.	Brand.
5336	Finest Extract of Lemon. Acker, Merrill & Condit Co., New York
5314	Sunbeam Pure Food Extract Almond. Austin, Nichols & Co., New York
5058	Pure Extract Almond. Baker Extract Co., Springfield, Mass.
5316	Crown Aster Finest Extract Almond. A. F. Beckmann & Co., New York
5267	Superior Extract of Almond. Jos. Burnett Co.
5340	Tiger-Head Pure Extract of Bitter Almond. Edwin J. Gillies & Co., New York
5042	A. & P. Almond Extract. The Great Atl. & Pac. Tea Co., Jersey City, N. J.
5310	Howco Brand Pure Extract Almond. Howland's, Bridgeport
5103	Mohican Pure Extract of Almond. The Mohican Co.
5296	True Extract Almond. Wm. B. Riker & Son Co., New York. "76% Alcohol"
5454	Foss' Pure Extract Almond. Schlotterbeck & Foss Co., Portland, Maine
5074	Foss' Pure Extract Almond. Schlotterbeck & Foss Co., Portland, Maine
5085	Robin Hood Brand Pure Flavoring Extract Almond. R. C. Williams & Co., New York
5050	Williams' Extract of Almond. The Williams & Carleton Co., Hartford

Four samples, 5058, 5316, 5296 and 5074, bore no statement of net volume as required by law. The other samples satisfied the claims made for them.

GINGER EXTRACT.

Standard ginger extract is

"the flavoring extract prepared from ginger, and contains in each 100 cc. the alcohol-soluble matters from not less than 20 grams of ginger."

Seven samples were analyzed. From a study of genuine extracts made in this laboratory in 1910 it was concluded that a properly made standard ginger extract shall contain from one

to two per cent of solids (dependent upon the variety of ginger used), practically all of which should be soluble in 95 per cent alcohol, and not over 15 per cent of it soluble in cold water.

EXTRACT (grams per 100 cc.)†

Price per Bottle, cts.	Volume.		Specific Gravity @ 15.6° C.	Ethyl Alcohol by Volume.	Non-volatile Solids.	Sucrose.	Almond Oil.
	Claimed, fl. oz.	Found, fl. oz.					
25	2	2.1	.9310	51.65	.004	0	0.84
25	2	2.1	.9448	45.95	1.20	*1.12	1.37
23	..	2.1	.9001	34.25	.05	0	1.18
15	..	2.3	.9668	28.79	.01	0	1.17
25	2	1.9	.9355	49.45	.008	0	2.33
10	1	{ 0.9 0.8 }	.9401	46.75	.016	0	1.50
25	2	2.0	.9660	59.45	13.12	*12.34	2.25
13	1.5	1.4	.8965	67.40	0	0	1.30
20	2	2.2	.9406	46.71	.05	0	0.76
21	..	1.5	.8692	78.16	.04	0	1.00
25	2	2.1	.8732	76.56	0	0	1.35
25	..	1.9	.8762	75.32	.008	0	1.38
25	2	2.1	.9507	40.73	.23	*Trace	3.85
20	2	1.9	.9401	46.75	.11	0	2.48

* Trace of reducing sugar.

† No nitrobenzol or hydrocyanic acid present.

The samples examined this year showed from 1.14 to 2.03 per cent of solids, of which from 84 to 99 per cent was soluble in 95 per cent alcohol, and from 7 to 29 per cent soluble in cold water. While all the samples are sufficiently high in solids, 5350 and 5051 show a comparatively low solubility in 95 per cent alcohol and a rather high amount of water-soluble material. It is noticeable also that these two samples contain much less alcohol, 65.25 and 65.75 per cent, than the other brands which range from 83.31 to 91.41 per cent.

TABLE VI:—

Station No.	Brand.
5350	Colton's Essence or Extract of Jamaica Ginger. "Alcohol 70%" . . .
5051	Benefit Brand Pure Jamaica Ginger. Direct Importing Co., Boston . . .
5462	Grand Union Extract Ginger. Grand Union Tea Co., Brooklyn, N. Y. "Alcohol 93%" . . .
5482	Osgood's Extract Jamaica Ginger. Lee & Osgood Co., Norwich. "Alcohol 84.6%" . . .
5477	Sauer's Pure Extract Ginger. The C. F. Sauer Co., Richmond, Va. "90% Alcohol" . . .
5321	Sauer's Pure Extract Ginger. The C. F. Sauer Co., Richmond, Va. "90% Alcohol" . . .
5288	Van Duzer's Jamaica Ginger. Van Duzer Extract Co., New York. "90% Alcohol" . . .

5477 and 5321, both from the same manufacturer, bore no statement of net volume on the label. The other samples substantially agreed with their claims.

TABLE VII:—

Station No.	Brand.
5337	Finest Extract of Lemon. Acker, Merrill & Condit Co., New York
5186	Republic Extract Lemon. Austin, Nichols & Co., New York . . .
5317	Crown Aster Finest Extract Lemon. A. F. Beckmann & Co., New York . . .
5077	Surpassing Brand Extract of Lemon. H. C. Bibeau, Meriden . . .
5108	Monogram Brand Finest Extract Pure Lemon. Bridgeport Public Market, Bridgeport . . .
5268	Burnett's Lemon. Jos. Burnett Co. . . .
5346	Colton's Select Flavors Lemon. The J. W. Colton Co., Springfield, Mass. . . .
5046	Benefit Brand Pure Lemon. Direct Importing Co., Boston . . .
5188	Country Club Pure Extract Lemon. The John T. Doyle Co., New Haven . . .
5079	A. & P. Lemon Extract. The Great Atl. & Pac. Tea Co., Jersey City, N. J. . . .

GINGER EXTRACT.

Price per bottle.	Volume.		Specific Gravity @ 15.6° C.	Ethyl Alcohol by Volume.	Solids.		
	Claimed.	Found.			Total.	Soluble in Cold Water.	Soluble in 95% Alcohol.
cts.	fl. oz.	fl. oz.					
25	2	2.1	.9012	65.25	1.14	0.33	0.96
13	2	2.1	.8996	65.75	2.03	0.46	1.73
25	2	2.1	.8229	91.41	1.65	0.09	1.56
20	3 3/4	3.5	.8543	83.31	1.48	0.21	1.29
10	..	{ 0.7 }	.8281	91.00	1.76	0.13	1.66
10	..	{ 0.7 }	.8308	90.00	1.83	0.13	1.81
25	2	2.1	.8408	90.15	1.90	0.18	1.71

LEMON EXTRACT.

Standard lemon extract is

"the flavoring extract prepared from oil of lemon, or from lemon peel, or both, and contains not less than 5 per cent by volume of oil of lemon."

LEMON EXTRACT.

Price per bottle.	Volume.		Specific Gravity @ 15.6° C.	Ethyl Alcohol by Volume.	Lemon Oil by Volume.		Color.
	Claimed.	Found.			Mitchell Precipitation Method.	Polariscope Method.	
cts.	fl. oz.	fl. oz.					
50	4	4.1	.8278	85.79	5.9	5.9	Natural
25	4	4.0	.8487	81.53	5.8	*6.8	"
50	..	3.5	.8483	80.96	4.2	3.9	"
35	..	3.7	.8457	79.38	7.7	7.3	"
40	4	3.8	.8355	82.75	6.7	6.7	"
50	4	3.6	.8186	85.37	9.8	10.2	"
50	4	3.7	.8460	81.21	6.0	5.7	"
13	2	{ 2.3 }	.8403	83.81	5.8	5.8	"
10	..	{ 0.9 }	.8357	83.06	6.5	6.6	"
25	2	{ 1.9 }	.8342	86.25	5.2	5.3	"

* Contains 1.35% sucrose.

TABLE VII:—

Station No.	Brand.
5311	Howco Brand Pure Extract Lemon. Howland's, Bridgeport
5287	Rogers' Lemon. McMonagle & Rogers, Middletown, N. Y.
5344	Miller's Extract of Lemon. The Miller Mfg. Co., New York
5101	Mohican Pure Extract of Lemon. The Mohican Co.
5070	Foss' Pure Extract Lemon. Schlotterbeck & Foss Co., Portland, Maine
5452	Foss' Pure Extract Lemon. Schlotterbeck & Foss Co., Portland, Maine
5178	White Rose Brand Extract of Lemon. Seeman Bros. New York ..
5096	Village Store Co. Pure Extract of Lemon. G. W. Smith, Bridgeport
5458	Standard Brand Pure Extract Lemon. The Standard Pickle Co., Hartford
5071	Polo Brand Pure Lemon. Stoddard, Gilbert & Co., New Haven ...
5339	Thompson's Extract Pure Lemon. J. E. Thompson, New York ...
5097	Sovereign Pure Lemon Extract. The Union Pacific Tea Co., New York
5090	Williams' Choice Extract of Lemon. The Williams & Carleton Co., Hartford
5080	Charter Oak Brand Pure Lemon. The Williams & Carleton Co., Hartford
5313	Whiting's Extract Pure Lemon. R. T. Whiting, Bridgeport
5122	Un-X-LD Absolutely Pure Extracts Lemon. Wise, Smith & Co., Hartford
<i>Terpeneless Lemon Extracts</i>	
5307	Atlas Brand Pure Flavoring Extracts Terpeneless Lemon. Andrew Davey, New York
5338	Atlas Brand Terpeneless Lemon. Andrew Davey, New York
5326	Premium Pure Extract of Lemon Terpeneless. East India Tea Co., So. Norwalk
5086	†St. John's Extract of Lemon. St. John & Co., New York
5088	‡Union Brand Lemon Substitute. Union Tea Co., New Britain ...

† "Formula compound: 70 parts hydro-alcoholic solution oil lemon, 30 parts water. Colored artificially with trace of tumeric."

‡ "Made from citral, alcohol and water. Artificially colored."

LEMON EXTRACT—Continued.

Price per bottle.	Volume.		Specific Gravity @ 15.6° C.	Ethyl Alcohol by Volume.	Lemon Oil by Volume.		Color.
	Claimed.	Found.			Mitchell Precipitation Method.	Method. Polariscopic	
cts.	fl. oz.	fl. oz.					
13	1 1/2	1.5 1.5 1.8	.8443	80.85	5.5	5.6	Natural
20	..	1.9	.8209	88.28	7.0	7.4	"
35	4	2.9	.8323	84.24	6.7	6.9	"
33	..	4.0	.8301	84.94	6.6	6.7	"
25	2	1.9 1.8	.8360	80.58	8.9	9.1	"
25	2	1.9 1.9	.8352	80.47	9.1	9.3	"
20	2	2.0 0.9 1.0 1.1 1.2	.8457	81.77	6.5	6.6	"
10	1	1.0 1.1 1.2	.8472	80.37	5.4	5.2	"
10	1	1.0 1.1 1.0 1.0 1.0 0.9 1.0	.8565	76.80	5.2	5.5	"
10	1	1.8 1.9 1.9	.8191	88.84	5.1	5.3	"
20	2	1.9 1.9	.8265	85.33	6.7	6.7	"
20	2	1.9	.8381	85.00	5.9	5.8	"
45	4	3.9 1.0	.8370	84.48	6.2	5.9	"
10	1	1.0	.8388	83.72	5.7	5.6	"
40	4	3.9 2.0	.8374	83.78	6.2	6.3	"
15	2	2.0 2.0	.8416	81.25	5.5	5.2	"
45	4	3.9 1.9	.9387	46.90	0	Trace	"
25	2	1.9 2.0	.9354	49.30	0	0	"
20	2	2.0 1.8	.9096	61.67	0.5	Trace	"
10	..	1.7	.9607	34.40	0	0	Turmeric Naphthol
25	4	4.3	.9545	39.40	0	0	Yellow S.

Thirty-one samples were analyzed, all of them, with five exceptions sold as the genuine extract. Five were sold as terpeneless extracts the quality of the latter being more or less clearly indicated on the label.

The twenty-six brands of alleged pure extract contained from 4.2 to 9.8 per cent of oil, 5317 being the only brand below standard. 5186 contained 1.35 per cent of cane sugar, but with the proper amount of oil of lemon. No artificial color was observed in any of these twenty-six samples, and the alcohol, all of which was ethyl, ranged from 76.80 to 88.84 per cent.

The terpeneless extracts contained no lemon oil, or not more than a trace. In three of them the color was natural, while in 5086, turmeric, and in 5088 the permitted coal-tar dye, Naphthol Yellow S, were employed. The alcohol, all ethyl, ranged from 34.40 to 61.67 per cent.

5086 was labeled "St. John's Extract of Lemon," with a separate sticker reading "Formula compound: 70 parts hydroalcoholic solution oil lemon, 30 parts water. Colored artificially with trace of tumeric." The sample is clearly misbranded, as it is a terpeneless, not a pure, extract of lemon, and the alleged formula is absolutely meaningless.

Six samples, 5317, 5077, 5188, 5287, 5101 and 5086, did not bear the required statement of net volume. While there was a general tendency to shade under the claimed volume, 5344 showed the only serious shortage, claiming 4 oz. and delivering only 2.9 oz.

ORANGE EXTRACT.

Standard orange extract is

"the flavoring extract prepared from oil of orange, or from orange peel, or both, and contains not less than 5 per cent by volume of oil of orange."

The twelve samples examined were of standard quality, the oil ranging from 5.5 to 10.7 per cent, and no artificial color being detected. The alcohol, all of which was ethyl, ranged from 76.18 to 88.77 per cent.

5054 and 5087 did not bear the required statement of net volume; the other samples satisfied the claims made for them.

TABLE VIII:—ORANGE EXTRACT.*

Station No.	Brand.	Price per bottle.	Volume.		Specific Gravity @ 15.6° C.	Ethyl Alcohol by Volume.	Orange Oil by Volume.
			Claimed.	Found.			
5269	Burnett's Superior Extract of Orange. Jos. Burnett Co.	25	2	{ 2.0 }	0.8170	88.10	9.0
5312	Howco Brand Pure Extract Orange. Howland's, Bridgeport	13	1.5	1.5 { 0.9 }	0.8229	82.37	6.4
5054	Imperial Pure Orange Extract. Packed at 27 Hampden St., Springfield, Mass.	10	..	{ 1.0 }	0.8265	88.77	6.0
5091	A. & P. Orange Extract. Great Atl. & Pac. Tea Co., Jersey City, N. J.	25	2	{ 2.2 }	0.8301	83.83	5.5
5087	Cabinet Brand Pure Extract Orange. The Miller Mfg. Co., New York	15	..	{ 1.2 }	0.8454	76.18	6.6
5455	Sauer's Pure Extract Orange. The C. E. Sauer Co., Richmond, Va.	25	2	{ 1.9 }	0.8568	76.89	6.6
5089	Foss' Pure Extract Orange. Schlotter- beck & Foss Co., Portland, Maine	20	2	{ 2.0 }	0.8303	85.88	8.4
5177	White Rose Brand Extract Orange. See- man Bros., New York	20	2	{ 2.1 }	0.8380	87.70	5.7
5483	Slade's Absolutely Pure Orange Extract. D. & L. Slade Co., Boston	20	2	{ 1.9 }	0.8234	81.42	10.7
5319	Sovereign Pure Orange Extract. Union Pacific Tea Co., New York	20	2	{ 2.1 }	0.8486	80.06	6.8
5187	Orange Extract. Van Duzer Extract Co., New York	25	2	{ 2.0 }	0.8280	84.74	6.6
5484	Williams' Pure Extract Orange. Wil- liams & Carleton Co., Hartford	25	2	{ 1.8 }	0.8360	80.87	6.5
				{ 2.0 }			

WINTERGREEN EXTRACT.

Standard wintergreen extract is

"the flavoring extract prepared from oil of wintergreen, and contains not less than 3 per cent by volume of oil of wintergreen."

Eight samples were analyzed, no effort being made to determine whether or not they were made from oil of wintergreen, oil of birch, or from methyl salicylate. The methyl salicylate was determined and calculated in terms of oil of wintergreen. All the samples contained an amount of methyl salicylate corresponding to the oil of wintergreen of the standard, except 5327, which contained only 0.95 per cent one-third the required amount.

* Color natural in all the samples.

This sample also was colored with a coal-tar dye, although on the carton label "artificial color veg." was claimed and it bore no statement of net volume. The alcohol, all ethyl, ranged from 45.20 to 82.85 per cent. The other brands were what was claimed for them.

TABLE IX:—WINTERGREEN EXTRACT.

Station No.	Brand.	Price per bottle.	Volume.		Specific Gravity @ 15.6° C.	Ethyl Alcohol by Volume.	Wintergreen Oil by Volume.	Color.
			Claimed.	Found.				
5265	Burnett's Essence of Wintergreen. Jos. Burnett Co.	cts 25	fl oz 2	fl oz 2.1	0.8373	82.85	5.00	Natural
5253	Colton's Select Flavors, Wintergreen	25	2	2.0	0.9239	50.45	3.65	Natural
5052	Benefit Brand Pure Wintergreen. Direct Importing Co., Boston ..	13	2	2.1	0.9231	54.60	3.51	Natural
5327	*Acme Highly Concentrated Extract Wintergreen. East India Tea Co.	20	..	1.6	0.9478	45.20	0.95	Coal-tar
5463	Grand Union Extract Wintergreen. Grand Union Tea Co., Brooklyn, N. Y.	25	2	2.1	0.9112	57.95	3.29	Natural
5076	A. & P. Flavoring Extracts Wintergreen Birch. Great Atl. & Pac. Tea Co.	25	2	1.9	0.9089	61.60	3.43	Natural
5043	Mohican Pure Extract Wintergreen. The Mohican Co.	21	2	2.0	0.8912	71.05	2.97	Natural
5099	Sovereign Pure Wintergreen Extract. Union Pacific Tea Co., New York	20	2	2.0	0.8824	67.40	4.12	Natural

* Carton labelled "artificial color veg. .02"; no statement of color on bottle.

MISCELLANEOUS EXTRACTS.

Here are included a number of the less commonly used, and still less frequently analyzed, flavoring extracts. Some of them are almost always synthetic, such as banana, pineapple, raspberry and strawberry, while for others definite standards have already been determined. These have been grouped somewhat arbitrarily in our tables into two classes, those in which an essential oil is present, and those which are either synthetic or which depend on some other principle than an essential oil for their flavoring effect.

The following standards have been established for certain of these extracts.

Celery extract, the flavoring extract prepared from celery seed, or from oil of celery, or both, and contains not less than 0.3 per cent by volume of oil of celery seed.

Cinnamon extract, the flavoring extract prepared from oil of cinnamon, and contains not less than 2 per cent by volume of oil of cinnamon.

Clove extract, the flavoring extract prepared from oil of cloves, and contains not less than 2 per cent by volume of oil of cloves.

Nutmeg extract, the flavoring extract prepared from oil of nutmeg, and contains not less than 2 per cent by volume of oil of nutmeg.

Peppermint extract, the flavoring extract prepared from oil of peppermint, or from peppermint, or both, and contains not less than 3 per cent by volume of oil of peppermint.

Rose extract, the flavoring extract prepared from otto of roses, with or without red rose petals, and contains not less than 0.4 per cent by volume of otto of roses.

Spearmint extract, the flavoring extract prepared from oil of spearmint, or from spearmint, or both, and contains not less than 3 per cent by volume of oil of spearmint.

In the following lists of extracts no wood alcohol was found in any case, and no coal-tar dyes except where indicated. The chemical data regarding these samples appear in Tables X and XI.

Celery Extract. Two of the samples contained much more oil of celery seed than the standard requires, and one only half as much.

Cinnamon Extract. The sample tested was of standard composition.

Clove Extract, Nutmeg Extract. The single samples tested of each were nearly of standard strength. Too much significance should not be given to the apparent shortage of oil in the nutmeg extract, as the methods for determining this oil give scarcely more than approximate results.

Peppermint Extract. The five samples tested met requirements as to strength. 5270 bore no statement of net volume, and 5478 and 5320 were "spirit" of peppermint rather than "extract."

Rose Extract. Three samples were of standard quality. 5465, however, has less than one-fourth of the standard amount of otto of roses and 5284 had no statement of net volume.

Spearmint Extract. The single sample was of standard strength.

Imitation Banana Extract, Imitation Cherry Extract. A single sample of each bore no statement of net volume. The former was colored with Naphthol Yellow S, and the latter with Amaranth, both permitted coal-tar colors.

Chocolate Extract, Coffee Extract. The single samples tested of each were genuine but bore no statement of net volume.

Onion Extract. As appears in Table XI the three samples probably contained oil of onion, but they were very unlike in their chemical composition.

TABLE X:—
(CELERY, CINNAMON, CLOVE, NUT

Station No.	Manufacturer and Brand.
	<i>Celery Extract.</i>
5078	H. C. Bibeau, Meriden. Surpassing Extract of Celery
5203	Jos. Burnett Co., Boston. Superior Extract of Celery
5404	Grand Union Tea Co., Brooklyn, N. Y. Grand Union Extract Celery
	<i>Cinnamon Extract.</i>
5264	Jos. Burnett Co., Boston. Superior Extract of Cinnamon
	<i>Clove Extract.</i>
5258	Jos. Burnett Co., Boston. Superior Extract of Clove
	<i>Nutmeg Extract.</i>
5260	Jos. Burnett Co., Boston. Superior Extract of Nutmeg
	<i>Peppermint Extract.</i>
5257	Colton's Select Flavors, Peppermint
5045	Direct Importing Co., Boston. Benefit Brand Pure Peppermint
5075	Great Atl. & Pac. Tea Co., Jersey City, N. J. A. & P. Peppermint
5478	The Nichols & Harris Co., New London. Essence Peppermint
5320	The C. F. Sauer Co., Richmond, Va. Sauer's Pure Extract Pepper-mint ¹
	<i>Rose Extract.</i>
5259	Jos. Burnett Co., Boston. Superior Extract of Rose
5254	Colton's Select Flavors, Rose
5285	Francis H. Leggett & Co., New York. Premier Flavoring Extracts, Rose
5405	Seeman Bros., New York. White Rose Brand Extract of Rose
	<i>Spearmint Extract.</i>
5252	Colton's Select Flavors, Spearmint

¹ Claims on label "10% oil."

Imitation Peach Extract. The two samples were quite unlike in composition; nothing was found not permitted by law.

Pineapple Extract. Two of the samples were claimed to be genuine, and five were imitations. One of the latter, 5341, was colored with Naphthol Yellow S, a permitted coal-tar dye. 5102 and 5107 bore no statement of net volume.

Pistachio Extract. The sample tested was an imitation.

Raspberry Extract. Five samples were tested and were not found adulterated.

FLAVORING EXTRACTS.

(MEG, PEPPERMINT, ROSE, SPEARMINT.)

Price per bottle.	Volume.		Specific Gravity @ 15.6° C.	Ethyl Alcohol by Volume.	Oil.	Color.
	Claimed.	Found.				
cts.	fl. oz.	fl. oz.	%	%		
20	2	1.8	0.8334	89.60	1.40	Natural
25	2	1.9	0.8227	93.65	0.71	"
25	2	1.9	0.8179	94.70	0.13	"
25	2	2.1	0.8230	91.49	2.33	"
25	2	2.1	0.8218	94.02	1.91	"
25	2	1.9	0.8200	92.13	2.80	"
25	..	1.9	0.8905	69.00	3.80	None
13	2	1.9	0.8868	70.00	4.00	"
25	2	1.9	0.8514	77.30	3.40	No coal tar or tumeric
10	1	{ 1.0 }	0.8309	86.29	11.40	" " " "
10	0.8	{ 0.8 }	0.9004	64.00	11.40	" " " "
25	2	2.0	0.8203	92.50	0.38	Natural
25	..	2.2	0.8326	88.85	0.47	"
25	2	1.9	0.8282	89.65	0.37	"
20	2	2.0	0.9598	37.65	0.09	(?)
25	2	2.1	0.8557	87.30	3.00	No coal-tar or tumeric

² Only an approximate determination.

Imitation Raspberry Extract. Two of the three samples tested contained a coal-tar dye, 5176 Erythrosin, and 5342 (probably) Amaranth.

TABLE XI:—MISCELLANEOUS
(BANANA, CHERRY, CHOCOLATE, COFFEE, ONION, PEACH,

Station No.	Manufacturer and Brand.	Price per bottle.	Volume.		Specific Gravity @ 15.6° C.	Ethy. Alcohol by Volume.	Non-volatile Solids, gms. per 100 cc.	Glycerine, gms. per 100 cc.	Ash, gms. per 100 cc.	Alkalinity of Soluble Ash, (cc. N/10 acid per 100 cc.)	Esters, (cc. N/10 KOH per 100 cc.)	Reducing Sugars as Dextrose.		Specific Gravity @ 15.6° C.	Ethy. Alcohol by Volume.	Non-volatile Solids, gms. per 100 cc.	Glycerine, gms. per 100 cc.	Ash, gms. per 100 cc.	Alkalinity of Soluble Ash, (cc. N/10 acid per 100 cc.)	Esters, (cc. N/10 KOH per 100 cc.)	Reducing Sugars as Dextrose.		Specific Gravity @ 15.6° C.	Ethy. Alcohol by Volume.	Non-volatile Solids, gms. per 100 cc.	Glycerine, gms. per 100 cc.	Ash, gms. per 100 cc.	Alkalinity of Soluble Ash, (cc. N/10 acid per 100 cc.)	Esters, (cc. N/10 KOH per 100 cc.)	Reducing Sugars as Dextrose.	
			Claimed.	Found.								Direct, gms. per 100 cc.	After inversion, gms. per 100 cc.	Acidity, (cc. N/10 NaOH per 100 cc.)																	
4851	<i>Banana Extract.</i> 1 ^{Seeman Bros., New York. White Rose Imitation Banana Flavor}	cts 20	fl oz ²⁰ **	fl oz 1.8	0.9519	44.80	202.7	Naphthol Yellow S.		
5053	<i>Cherry Extract.</i> The Mohican Co. Pure Extract of Imitation Cherry ...	21	... 2.1	2.1	0.9241	60.40	....	....	....	....	50.0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	Amaranth
5348	<i>Chocolate Extract.</i> Colton's Select Flavors, Chocolate	25	... 2.0	2.0	1.0187	31.90	22.32	17.76	0.31	27.5	*	Tr.	Tr.	Tr.	Natural		
5255	<i>Coffee Extract.</i> Colton's Select Flavors. Coffee	25	... 2.1	2.1	1.0060	17.20	7.85	0.00	0.84	89.5	†	Tr.	Tr.	Tr.	"		
5459	<i>Onion Extract.</i> Baker Extract Co., Springfield, Mass. Pure Extract Onion	25	2 2.0	2.0	1.0449	13.40	20.79	12.46	0.45	28.5	‡	3.94	4.10	52.0	No coal-tar		
5261	Jos. Burnett Co., Boston. Imitation Onion Flavoring ...	25	2 2.0	2.0	0.9160	59.15	0.06	0.00	0.02	‡	0.00	0.00	1.0	" "		
5453	The Williams & Carleton Co., Hartford. Williams' Pure Extract Onion	25	2 2.0	2.0	0.9471	44.35	1.43	0.00	0.07	‡	0.62	0.62	333.0	" "		
5460	<i>Peach Extract.</i> 2 ^{Baker Extract Co., Springfield, Mass. Imitation Peach Flavor}	25	2 2.0	2.0	0.9602	44.90	9.16	6.77	0.09	....	91.0	1.28	1.32	....	....	....	....	....	....	....	....	....	....	....	....	....	....	" "
5262	Jos. Burnett Co., Boston. Imitation Peach Flavoring ...	25	2 2.0	2.0	0.8232	92.10	16.0	None		
5461	<i>Pineapple Extract.</i> 2 ^{Baker Extract Co., Springfield, Mass. Imitation Pineapple Flavor}	25	2 2.2	2.2	0.9640	45.70	10.12	6.99	0.11	8.0	87.0	1.48	1.73	....	....	....	....	....	....	....	....	....	....	....	....	....	....	No coal-tar
4849	Jos. Burnett Co., Boston. Superior Extract of Pineapple	25	2 2.0	2.0	0.9905	38.80	8.78	0.00	0.41	23.5	13.0	6.78	7.01	....	....	....	....	....	....	....	....	....	....	....	....	....	....	" "
5341	³ E. J. Gillies & Co., New York. Tiger Head Brand Imitation Pineapple Flavor	10	1 { 1.0 }	{ 1.0 }	0.9659	42.50	....	....	....	....	12.5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	Naphthol Yellow S.
5335	The Miller Mfg. Co., New York. Artificial Pineapple Flavor	25	2 1.8	1.8	0.9386	51.80	....	....	....	....	143.0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	None
5102	The Mohican Co. Pure Extract of Finest Pineapple Flavor Artificial	20	.. 1.8	1.8	0.9547	44.60	....	....	....	....	146.0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	"
5107	"Wightman's Extract of Pineapple	15	.. 1.9	1.9	0.9173	56.30	....	....	....	....	192.0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	No coal-tar
5457	Schlotterbeck & Foss Co., Portland, Me. Foss' Pure Extract Pineapple	25	2 2.0	2.0	1.0252	23.40	14.60	5.77	0.42	28.5	14.5	7.00	7.00	....	....	....	....	....	....	....	....	....	....	....	....	....	....	" "

¹"Harmless artificial color."

²"Artificial oil 10.72, alcohol 42.89, glycerin 5.69, fruit juice 16.08, water 24.62."

³"Artificially colored."

"On bottle "Extract of Ethereal Pineapple."

Strawberry Extract. Three samples were sold as genuine and no evidence of adulteration was found.

Imitation Strawberry Extract. Five samples were examined. 5044 bore no statement of net volume.

FLAVORING EXTRACTS.
PINEAPPLE, PISTACHIO, RASPBERRY AND STRAWBERRY.)

Specific Gravity @ 15.6° C.	Ethy. Alcohol by Volume.	Non-volatile Solids, gms. per 100 cc.	Glycerine, gms. per 100 cc.	Ash, gms. per 100 cc.	Alkalinity of Soluble Ash, (cc. N/10 acid per 100 cc.)	Esters, (cc. N/10 KOH per 100 cc.)	Reducing Sugars as Dextrose.	Specific Gravity @ 15.6° C.	Ethy. Alcohol by Volume.	Non-volatile Solids, gms. per 100 cc.	Glycerine, gms. per 100 cc.	Ash, gms. per 100 cc.	Alkalinity of Soluble Ash, (cc. N/10 acid per 100 cc.)	Esters, (cc. N/10 KOH per 100 cc.)	Reducing Sugars as Dextrose.
0.9519	44.80	....	....	....	....	202.7	....	....	....	....	....	....	....	....	....
0.9241	60.40	....	....	....	....	50.0	....	....	....	....	....	....	....	....	....
1.0187	31.90	22.32	17.76	0.31	27.5	*	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.
1.0060	17.20	7.85	0.00	0.84	89.5	†	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.
1.0449	13.40	20.79	12.46	0.45	28.5	‡	3.94	4.10	52.0	....	....	....	....	....	....
0.9160	59.15	0.06	0.00	0.02	....	‡	0.00	0.00	1.0	....	....	....	....	....	....
0.9471	44.35	1.43	0.00	0.07	....	‡	0.62	0.62	333.0	....	....	....	....	....	....
0.9602	44.90	9.16	6.77	0.09	....	91.0	1.28	1.32	....	....	....	....	....	....	....
0.8232	92.10	....	....	....	....	16.0	....	....	....	....	....	....	....	....	....
0.9640	45.70	10.12	6.99	0.11	8.0	87.0	1.48	1.73	....	....	....	....	....	....	....
0.9905	38.80	8.78	0.00	0.41	23.5	13.0	6.78	7.01	....	....	....	....	....	....	....
0.9659	42.50	....	....	....	....	12.5	....	....	....	....	....	....	....	....	....
0.9386	51.80	....	....	....	....	143.0	....	....	....	....	....	....	....	....	....
0.9547	44.60	....	....	....	....	146.0	....	....	....	....	....	....	....	....	....
0.9173	56.30	....	....	....	....	192.0	....	....	....	....	....	....	....	....	....
1.0252	23.40	14.60	5.77	0.42	28.5	14.5	7.00	7.00	....	....	....	....	....	....	....

* Contains 0.27 gm. caffeine and theobromine per 100 cc.

† Contains 2.68 gms. caffeine per 100 cc.

‡ Sulphur compounds present.

TABLE XI:—MISCELLANEOUS

Station No.	Manufacturer and Brand.	Price per bottle.	Volume.	
			Claimed.	Found.
5349	<i>Pistachio Extract.</i> Colton's Select Flavors, Imitation Pistachio	25	2	1.9
5266	<i>Raspberry Extract.</i> Jos. Burnett Co., Boston. Superior Extract of Raspberry	25	2	2.1
5256	Colton's Select Flavors, Raspberry	25	2	2.2
5342	^a E. J. Gillies & Co., New York. Tiger Head Brand Imitation Raspberry Flavor	10	1	{ 0.9 }
5286	Schlotterbeck & Foss Co., Portland, Me. Foss' Pure Extract Raspberry	25	2	2.0
5456	Schlotterbeck & Foss Co., Portland, Me. Foss' Pure Extract Raspberry	25	2	2.0
5176	^a Seeman Bros., New York. White Rose Brand Imitation Raspberry Flavor	20	2	2.1
5318	Union Pacific Tea Co., New York. Sovereign Pure Raspberry Extract	25	2	2.1
5308	^a Made at Hartford. High Grade Imitation of Raspberry	25	2	2.0
4850	<i>Strawberry Extract.</i> Jos. Burnett Co., Boston. Superior Extract of Strawberry	25	2	2.0
5347	Colton's Select Flavors, Strawberry	25	2	1.9
5343	^a E. J. Gillies & Co., New York. Tiger Head Brand Imitation Strawberry Flavor	10	1	{ 0.8 }
5304	Great Atl. & Pac. Tea Co., Jersey City, N. J. A. & P. Imitation Strawberry Flavoring	25	2	2.1
5309	^a Hartford Extract Co., Hartford. Stuart Brand Improved Substitute for Strawberry	25	1.5	1.7
5044	The Mohican Co. Pure Extract of Finest Strawberry Flavor Artificial	21	..	2.0
5476	Schlotterbeck & Foss Co., Portland, Me. Foss' Pure Extract Strawberry	25	2	2.1
5098	Union Pacific Tea Co., New York. Sovereign Imitation Strawberry	20	2	2.1

^a "Artificially colored."

CANNED FRUITS.

This investigation was undertaken to test the accuracy of the net weights claimed for the various fruits, the relative amounts of fruit and liquor in the different brands, the variations in the densities of the syrups used, and to secure data which might

FLAVORING EXTRACTS—Concluded.

Specific Gravity @ 15.6° C.	Ethyl Alcohol by Volume.	Non-volatile Solids, gms. per 100 cc.	Glycerine, gms. per 100 cc.	Ash, gms. per 100 cc.	Alkalinity of Soluble Ash, (cc. N/10 acid per 100 cc.)	Esters, (cc. N/10 KOH per 100 cc.)	Reducing sugars as Dextrose.		Color.
							Direct, gms. per 100 cc.	After Inversion, gms. per 100 cc.	
1.0179	32.05	18.07	8.77	0.14	...	6.0	0.69	6.98	....
1.0099	13.00	5.96	0.00	0.23	20.0	12.0	4.29	4.29	“ “
1.0293	16.80	12.09	0.00	0.46	42.0	28.0	8.09	8.22	“ “
0.9553	47.60	...	...	...	...	8.0	...	...	Probably amaranth
1.0659	18.00	24.72	6.32	0.30	26.0	21.0	14.98	15.34	....
1.0625	21.70	25.41	6.60	0.30	25.0	22.0	14.77	15.12	“ “
0.9787	34.90	...	...	...	...	68.0	...	...	Erythrosin
1.0436	25.70	18.28	0.00	0.66	59.0	8.0	12.65	12.75	....
0.9629	35.10	...	...	...	...	8.0	...	...	No coal-tar
0.9575	48.00	5.11	0.00	0.05	...	19.0	3.52	3.55	“ “
1.0539	20.10	18.71	0.00	1.03	90.0	23.0	12.40	12.75	“ “
0.9680	40.30	...	...	...	...	12.0	...	...	Probably amaranth
0.9788	39.80	...	...	...	...	34.0	...	...	No coal-tar
0.9749	23.90	...	...	...	...	15.5	...	...	Amaranth
0.9644	38.60	...	...	...	...	19.5	...	...	“
1.0690	19.40	25.80	5.26	0.34	32.0	9.0	16.78	16.98	....
0.9946	41.70	...	...	...	...	72.0	...	...	“ “

possibly assist in preparing definitions for the different grades of canned fruits.

Three hundred and three samples, representing 101 brands were analyzed, with the results given in Table XII. The method of examination was as follows:—After weighing the can with its contents, the can was opened and the liquor drained from the

fruit through a sieve. The drained solids and the separated liquid were then weighed, and the specific gravity of the liquid portion calculated from the gravity reading by a Brix spindle. In all cases, except with cherries and sliced peaches, the number of pieces of fruit was counted to determine the relative size of the fruit used. The fruit was examined as to whether it was hard or soft, and an attempt was made to determine its quality

TABLE XII:—

Station No.	Brand.	Can Size.	Price per Can.	Net Weight		Weight of Drained Fruit. oz.	Drained Fruit. % oz.	Liquid. % oz.	Spec. Gravity of Liquid @ 15.6° C. —	Sugar in Liquid from Spec. Grav. —	No. of Pieces of Fruit. —	Av. Weight of Pieces of Fruit. oz.	Quality.
				Claimed.	Found.								
5479	<i>Apples.</i>			cts.	oz.								
5479	Social Brand. Dist. by Edward D. Depew & Co., New York	3	15	30	29.5	17.8	60	40	1.0252	6.4	11	1.62	Good
				30	29.8	20.1	67	33	1.0282	7.1	15	1.34	"
5474	Oswego Brand. Oswego Preserving Co., Oswego, N. Y.	3	10	29	33.7	17.0	59	41	1.0280	7.1	22(?)	0.77(?)	Very soft
				29	33.2	18.2	54	46	1.0281	7.1	27	0.67	Good
5119	Waverly Brand. Seeman Bros., Dist., New York	3	10	29	33.7	18.7	56	44	1.0283	7.1	23	0.81	"
				30	31.8	16.9	50	50	1.0204	6.7	25	0.68	"
				30	32.2	22.3	70	30	1.0331	8.3	33	0.68	"
5447	Mt. Parnassus Brand Baldwins and Greenings, Fancy. Geo. C. Smith, East Haddam, Conn.	3	13	30	30.8	22.8	71	29	1.0355	8.9	34	0.67	"
				30	32.5	22.2	69	31	1.0355	8.9	43	0.51	"
5082	Robin Hood Brand Choice. Dist. by R. C. Williams & Co., New York	3	12	30	32.2	21.6	70	30	1.0349	8.8	35	0.62	Fair; many small pieces
				30	32.1	22.6	70	30	1.0349	8.8	37	0.61	" " " "
				30	30.4	21.7	71	29	1.0352	8.8	34	0.64	" " " "
5445	Robin Hood Brand. R. C. Williams & Co., Dist., New York	3	10	30	32.2	20.5	64	36	1.0285	7.2	39	0.53	Many small broken pieces
				30	32.1	20.5	64	36	1.0280	7.3	40	0.51	" " " "
				30	31.7	18.5	58	42	1.0278	7.0	21	0.88	Better than other two
						18.2	58	42	1.0266	6.7	29	0.63	Pieces of various shapes and sizes in all three cans
						20.3	63	37	1.0283	7.1	38	0.53	
						21.0	66	34	1.0322	8.1	29	0.72	
5473	<i>Apricots.</i>												
5473	Davisco Brand California. Packed for F. H. Davis & Co., New London	2½	25	32	29.9	17.0	57	43	1.0736	17.8	25	0.68	Good
				32	31.3	18.2	58	42	1.0798	19.2	25	0.73	"
				32	31.6	18.4	58	42	1.0868	18.6	22	0.84	"
5092	Hunt's Staple Quality. Hunt Bros. Co., Hayward, Cal.	?	15	32	17.7	10.6	60	40	1.0975	23.2	23	0.46	Appearance poor; taste good, skins on
				16	17.7	10.1	57	43	1.1051	24.8	19	0.53	Appearance poor; taste good, skins on
				16	17.6	9.2	53	47	1.1156	27.1	19	0.48	Appearance poor; taste good, skins on

from the standpoint of taste, a matter of course depending in large part on the taster himself. Allowing for all possible differences of judgment, however, it was clear that some of the finest appearing fruit was quite deficient in taste and flavor, showing that when quality is to be considered mere size and appearance are by no means the determining factor.

TABLE XII:

Station No.	Brand.	Can Size.	Price per Can.	Net Weight		Weight of Drained Fruit.	Drained Fruit.	Liquid.	Spec. Gravity of Liquid @ 15.6° C.	Sugar in Liquid from Spec. Grav.	No. of Pieces of Fruit.	Av. Weight of Pieces of Fruit.	Quality.
				Claimed.	Found.								
5271	Hunt's Staple Quality. Hunt Bros. Co., Hayward, Cal.	2½	cts. 25	oz. 30	oz. 32.0	oz. 17.8	oz. 56	oz. 44	1.1159	27.1	26	oz. 0.68	Soft
				30	32.5	19.4	60	40	1.1043	24.6	31	0.63	"
5081	Nabob. Dist. by Francis H. Leggett & Co., New York	2½	25	30	31.6	19.6	60	40	1.1050	24.8	26	0.75	"
				30	32.0	17.6	56	44	1.0976	23.2	24	0.73	Good. Skins not removed
				30	32.0	18.2	57	43	1.0972	23.1	21	0.87	" " " "
5446	Libby's California Fruits, Extra. Libby, McNeill & Libby, Chicago	2½	25	30	31.5	18.6	58	42	1.0940	22.4	22	0.85	" " " "
5480	Warfield Brand. Seeman Bros., Dist., New York ...	2½	25	30	32.1	16.8	53	47	1.1001	23.7	17	0.99	"
				30	31.9	19.2	60	40	1.1001	23.7	22	0.87	"
				30	31.7	20.0	63	37	1.0940	22.4	21	0.95	"
5426	Famous Royal Scarlet Brand, Peeled. R. C. Williams & Co., New York	2½	28	0	32.6	18.8	59	41	1.0983	23.3	25	0.75	"
				0	32.8	16.6	53	47	1.1045	24.7	22	0.75	"
				0	33.1	17.9	56	44	1.0999	23.7	26	0.68	"
<i>Cherries.</i>													
5334	Noreca Brand Extra Standard Quality Royal Anne. Packed for Acker, Merrill & Condit Co., New York	2½	24	0	31.3	19.9	64	36	1.0671	16.3	..	..	Large and fine
				0	30.7	19.4	63	37	1.0672	16.4	..	..	" " "
				0	31.2	19.2	62	38	1.0671	16.3	..	..	" " "
5067	Preferencia Brand Syrup White. Dist. by Austin, Nichols & Co., New York	2	15	21	22.0	9.9	45	55	1.1018	24.1	..	..	Good
				21	21.3	10.0	47	53	1.0961	22.8	..	..	"
				21	21.6	10.0	46	54	1.0966	23.0	..	..	"
5323	Crown Aster Brand Royal Anne White. Packed for A. F. Beckmann & Co., New York	2½	25	30	31.6	17.4	55	45	1.0938	22.3	..	..	"
				30	32.1	16.6	52	48	1.0999	23.7	..	..	"
				30	31.6	16.6	53	47	1.0988	23.4	..	..	"
5332	Oval Brand White Wax, Extra Syrup. The Booth Packing Co., Baltimore, Md.	2	18	21	21.0	12.2	58	42	1.0623	15.2	..	..	"
				21	21.1	12.0	57	42	1.0600	16.8	..	..	Fair; poor taste
				21	20.7	11.7	57	43	1.0544	13.4	..	..	Small fruit
5056	American Club Brand Pitted Red. The Burt Olney Canning Co., Oneida, N. Y.	2	25	0	22.7	11.0	49	51	1.1900	42.0	..	..	Good
				0	23.0	10.4	45	55	1.2022	44.4	..	..	"
				0	22.6	11.3	50	50	1.1857	41.2	..	..	"
5443	Meadow Brook Brand Pitted Red, Best Quality. The Burt Olney Canning Co., Oneida, N. Y.	2	25	21	21.4	11.5	54	46	1.1606	36.3	..	..	"
				21	22.4	12.2	55	45	1.1709	38.3	..	..	"
				21	21.5	11.0	51	49	1.1706	38.3	..	..	"
5487	Blue Seal Royal Anne. Packed for Lewis DeGroff & Son, New York	?	15	15	16.0	10.0	62	38	1.0916	21.9	..	..	"
				15	17.5	9.6	55	45	1.0901	21.5	..	..	"
				15	17.6	10.0	56	44	1.0951	22.6	..	..	"

TABLE XII:—

Station No.	Brand.	Can Size.	Price per Can.	Net Weight		Weight of Drained Fruit.	Drained Fruit.	Liquid.	Spec. Gravity of Liquid C. @ 15° C.	Sugar in Liquid from Spec. Gray.	No. of Pieces of Fruit.	Av. Weight of Pieces of Fruit.	Quality.
				Claimed.	Found.								
5277	Pride of Egypt Brand Red Sweet. Egypt Canning Co., Egypt, N. Y.	2	15	0 oz.	0 oz.	12.8	60	40	1.0779	18.8	..	..	Good
				0	21.5	12.9	60	40	1.0878	21.0	..	..	Can blown
				0	21.9	13.6	62	38	1.0881	21.1	..	..	Good
5109	Ajax Brand Royal Anne. Golden Gate Packing Co., San José, Cal.	2½	22	30	32.2	21.8	68	32	1.0840	20.2	..	..	"
				30	31.8	21.4	67	33	1.0830	20.0	..	..	"
				30	31.7	20.5	64	36	1.0820	19.7	..	..	"
5111	Sultana Brand. Dist. by The Great Atl. & Pac. Tea Co., Jersey City, N. J.	2½	20	30	30.6	20.9	68	32	1.0679	16.5	..	..	"
				30	30.6	21.1	69	31	1.0627	15.3	..	..	"
				30	31.3	18.4	60	40	1.0863	20.7	..	..	"
5302	Anchor Brand White Wax in Syrup. H. F. Hemingway, Baltimore, Md.	2	15	18	21.3	11.7	55	45	1.0665	16.2	..	..	"
				18	21.1	10.8	51	49	1.0664	16.2	..	..	"
				18	21.0	11.2	53	47	1.0656	16.0	..	..	"
5272	Libby's Extra Royal Anne California. Libby, McNeill & Libby, Chicago	2½	30	30	32.0	18.0	56	44	1.0891	21.3	..	..	Very fine
				30	31.6	17.2	54	46	1.0907	21.7	..	..	"
				30	31.7	17.3	55	45	1.0874	20.9	..	..	"
5475	Mon-Ro-Co Brand White Sweet in Granulated Sugar Syrup. Dist. by Monroe Canning Co., Brockport, N. Y.	2	15	19	21.0	12.5	60	40	1.0722	17.5	..	..	Good
				19	21.0	11.6	55	45	1.0723	17.5	..	..	"
				19	21.0	11.4	54	46	1.0763	18.4	..	..	"
5325	Tiger Brand White Wax in Syrup. Platt & Co., Baltimore, Md.	2	15	21	22.1	11.9	54	46	1.0903	21.6	..	..	"
				21	21.6	11.6	54	46	1.0888	21.2	..	..	"
				21	21.8	11.7	53	47	1.0848	20.4	..	..	"
5431	White Birch Brand Red. Sodus Canning Co., Sodus, N. Y.	1	10	19	11.7	7.6	65	35	1.0699	17.0	..	..	"
				19	11.9	7.0	58	42	1.0847	20.3	..	..	"
				19	11.7	6.7	57	43	1.0734	17.8	..	..	"
5183	White Birch Brand White. Sodus Canning Co., Sodus, N. Y.	2	15	19	21.7	14.0	65	35	1.0796	19.2	..	..	Lavender color
				19	21.9	12.9	59	41	1.0919	21.9	..	..	White
				19	21.4	12.2	57	43	1.0834	20.0	..	..	Lavender color
5481	Hermitage Brand California White, Our Finest Quality. Packed for Stoddard, Gilbert & Co., New Haven	2½	30	30	32.8	18.6	57	43	1.1141	26.7	..	..	Good
				30	32.9	18.2	55	45	1.1219	28.4	..	..	"
				30	32.9	18.8	60	40	1.0890	21.3	..	..	"
5450	Big Elm White, in Syrup. Victor Preserving Co., Victor, N. Y.	2	15	18	21.4	13.4	63	37	1.0667	16.3	..	..	"
				18	20.9	14.2	68	32	1.0558	13.7	..	..	"
				18	21.3	15.4	72	28	1.0623	15.2	..	..	"
5084	Webster's Best Brand White, in Syrup. Webster-Butterfield Co., Baltimore, Md.	2	18	20	21.3	11.7	55	45	1.0823	19.8	..	..	Several rotten spots
				20	21.4	11.8	55	45	1.0822	19.8	..	..	"
				20	21.8	11.6	53	47	1.0728	17.7	..	..	"

TABLE XII:

Station No.	Brand.	Can Size.	Price per Can.	Net Weight Pounds. Canned.	CANNED FRUIT—Continued.								Quality.
					Weight of Drained Fruit. oz.	Drained Fruit. %	Liquid. %	Spec. Gravity of Liquid @ 15.6° C.	Sugar in Liquid from Spec. Grav.	No. of Pieces of Fruit.	Av. Weight of Pieces of Fruit. oz.		
5069	Red Line. Dist. by R. C. Williams & Co., New York	2½	cts. 15	oz. 30 29.7 30 30.6 30 30.1	oz. 20.6 69 31 19.3 63 37 20.7 69 31	1.0382 9.6 1.0503 12.4 1.0287 7.2	..	..	..	..	..	Mostly small fruit Some exudation on opening; small fruit	
	<i>Peaches.</i>												
5333	Noreca Brand Extra Standard Quality Yellow Cling. Packed for Acker, Merrill & Condit Co., New York	2½	19	30 30.6 30 30.4 30 30.1	19.7 64 36 18.2 60 40 19.7 66 34	1.0783 18.9 1.0806 19.4 1.0728 17.7	12	1.64	Good	“	“	“	“
5118	Scottish Chief Crawford California. Austin, Nichols & Co., Dist., New York	2½	25	30 30.2 30 30.4 30 31.4	21.2 70 30 20.1 66 34 18.8 60 40	1.0368 9.2 1.0740 17.9 1.0938 22.3	16	1.33	Soft and broken; poor taste	“	“	“	“
5324	Crown Aster Brand Lemon Cling. Dist. by A. F. Beckmann & Co., New York	2½	25	30 29.0 30 30.6 30 30.1	19.6 65 35 21.2 69 31 19.6 65 35	1.0838 20.1 1.0980 23.3 1.0866 20.8	11	1.78	Good	“	“	“	“
5055	American Club Brand Sliced Yellow Crawford, Best Quality. The Burt Olney Canning Co., Oneida, N. Y.	2	22	0 23.0 0 23.1 0 22.0	16.5 72 28 16.3 71 29 16.4 75 25	1.1399 32.1 1.1484 33.9 1.1252 29.1	Slices	..	..	“	“	“	Some exudation on opening
5064	Navy Brand Extra Quality. Cobb Preserving Co., Fairport, N. Y.	2	18	20 21.0 20 21.4 20 20.9	11.2 54 46 10.9 51 49 11.5 55 45	1.0912 21.8 1.1142 26.8 1.0996 23.6	15	0.75	Fair	“	“	“	Good
5113	Yellow Extra Quality. Curtice Bros. Co., Rochester, N. Y.	2½	25	31 31.0 31 32.1 31 31.3	19.5 63 37 19.5 61 39 18.3 59 41	1.1075 25.3 1.1335 30.8 1.1154 27.0	17	1.15	Good taste; poor appearance	“	“	“	“
5315	Atlas Brand Lemon Cling. Dist. by Andrew Davey, N. Y.	2½	25	30 30.6 0 32.5 0 31.9	21.4 70 30 18.5 57 43 18.6 58 42	1.0579 14.2 1.0664 22.9 1.1020 24.1	13	1.65	Good	“	“	“	“
5331	Health Brand Yellow Crawford. Lewis DeGroff & Son, New York	2½	25	30 30.8 30 31.1 30 30.9	17.1 55 45 17.1 55 45 17.5 57 43	1.0860 20.6 1.0940 22.4 1.0804 19.4	11	1.55	Good taste; poor appearance	“	“	“	“
5048	California Yellow Free. Emery Food Co., Chicago ..	2½	15	29 29.0 29 29.7 29 29.2	15.8 57 43 16.2 54 46 15.9 54 46	1.0409 10.2 1.0409 10.2 1.0412 10.3	10	1.71	“	“	“	“	“
5068	Silver Dale Brand California Lemon Cling. Emery Food Co., Chicago	2½	15	29 29.8 29 29.9 29 29.3	20.0 67 33 22.0 74 26 19.4 66 34	1.0474 11.8 1.0514 12.7 1.0468 11.6	8	2.50	Fine color and appearance; flavor	“	“	“	poor
5305	Fiesta Brand Cling, 10% Syrup. Golden Gate Canning Co., Ontario, Cal.	2½	15	28 29.3 28 29.3 28 30.0	20.6 70 30 21.8 74 26 20.7 69 31	1.0446 11.1 1.0447 11.1 1.0450 11.2	12	1.67	“	“	“	“	“
								2.16	“	“	“	“	“
								0.94	“	“	“	“	“

TABLE XII:

Station No.	Brand.	Can Size.	Price per Can.	Net Weight.		Quality.
				Claimed.	Found.	
5060	Nysa Brand Yellow Cling, Extra Standard Quality, in Heavy Syrup. Golden Gate Packing Co., San José, Cal.	2½	19	30	31.5	Good
				30	30.3	
				30	30.8	
5428	Lawson Pink Brand Lemon Cling. Lawson Pink Food Prod. Co., Boston	2½	22	30	30.8	“
				30	30.7	
				30	29.9	
5284	Nabob Yellow Cling. Francis H. Leggett & Co., Dist., New York	2½	20	30	31.5	Fine flavor
				30	31.1	
				30	31.3	
5120	Libby's Extra Lemon Cling. Libby, McNeill & Libby, Chicago	2½	25	30	31.0	Fine taste and appearance
				30	31.2	
				30	31.2	
5427	Tree Brand Lemon Cling, California. Libby, McNeill & Libby, Chicago	2½	15	29	29.8	Good
				29	30.4	
				29	30.4	
5433	Pala Brand California Yellow Cling. J. F. Pyle & Son, San José, Cal.	2½	15	29	30.4	“
				29	29.4	
				29	30.2	
5449	Hermitage Brand California Lemon Cling, Our Finest Quality. Packed for Stoddard, Gilbert & Co., New Haven	2½	23	30	31.4	“
				30	31.3	
				30	31.5	
5182	Polo Brand Yellow Crawford. Packed for Stoddard Gilbert & Co., New Haven	2½	20	30	28.8	Soft Good
				30	30.9	
				30	30.8	
5448	Brownie Brand Yellow Cling, Choice Extra. R. C. Williams & Co., Dist., New York	2½	20	30	30.7	“
				30	30.8	
				30	30.1	
5328	Robin Hood Brand. R. C. Williams & Co., Dist., New York	Odd	15	15	17.5	“
				15	17.5	
				15	17.5	
5094	White Top Brand, California. Dist. by R. C. Williams & Co., New York	2½	15	30	29.9	“
				30	29.2	
				30	29.6	

CANNED FRUIT—Continued.

Weight of Drained Fruit.	Drained Fruit.	Liquid.	Spec. Gravity of Liquid @ 15.6° C.	Sugar in Liquid from Spec. Grav.	No. of Pieces of Fruit.	Av. Weight of Pieces of Fruit.
20.0	63	37	1.0874	20.9	10	2.00
20.0	66	34	1.0792	19.1	11	1.82
19.7	64	30	1.0825	19.8	10	1.97
20.9	68	32	1.0710	17.2	13	1.61
18.6	61	39	1.0835	21.1	9	2.07
22.4	75	25	1.0429	10.7	12	1.87
20.2	64	36	1.0933	22.2	11	1.84
19.2	62	38	1.0952	22.7	11	1.75
18.0	58	42	1.1011	23.9	11	1.64
19.4	62	38	1.0952	22.7	10	1.94
20.4	65	35	1.0917	21.9	11	1.85
19.8	63	37	1.0884	21.2	11	1.80
21.1	71	29	1.0590	14.5	16	1.32
21.2	70	30	1.0594	14.6	18	1.18
21.6	71	29	1.0620	15.2	18	1.20
20.9	69	31	1.0545	13.4	13	1.61
19.9	70	30	1.0534	13.2	13	1.53
21.5	71	29	1.0505	12.5	17	1.27
20.3	65	35	1.0999	23.7	10	2.03
18.8	60	40	1.1111	26.1	9	2.09
21.2	67	33	1.1037	24.5	9	2.36
18.0	63	37	1.0713	17.3	9	2.00
18.6	60	40	1.0850	20.4	9	2.07
18.4	60	40	1.0754	18.2	6	3.07
21.0	68	32	1.0732	17.7	14	1.50
21.6	70	30	1.0724	17.6	13	1.66
19.5	65	35	1.0722	17.5	11	1.77
9.3	53	47	1.0749	18.1	Slices	...
10.6	60	40	1.0705	17.1	“	“
10.7	61	39	1.0711	17.3	“	“
22.4	75	25	1.0391	9.8	15	1.49
21.3	73	27	1.0386	9.7	12	1.78
21.8	74	26	1.0321	8.1	14	1.56

TABLE XII:

Station No.	Brand.	Can Size.	Price per Can.	Net Weight		Weight of Drained Fruit.	Drained Fruit.	Liquid.	Spec. Gravity of Liquid @ 15.6° C.	Sugar in Liquid from Spec. Grav.	No. of Pieces of Fruit.	Av. Weight of Pieces of Fruit.	Quality.	
				Claimed.	Found.									
<i>Pears.</i>														
5061	Garland Brand Choice, Extra Heavy Syrup. W. F. Assan Canning Co., Baltimore, Md.	2	10	20	21.5	11.9	55	45	1.0886	21.2	9	1.32	Fair	
				20	21.6	12.0	56	44	1.0831	20.0	7	1.71	Some dirt present	
				20	21.4	12.8	60	40	1.0873	20.9	11	1.16	Fair	
5283	Staple Brand Extra Standard. Austin, Nichols & Co., Dist., New York	3	15	35	37.0	24.7	67	33	1.0739	17.9	15	1.65	Rather hard	
				35	36.9	25.2	68	32	1.0674	16.4	18	1.40	" "	
				35	37.3	25.6	69	31	1.0805	19.4	15	1.71	" "	
5270	Triacan Brand Bartlett. Packed for The F. C. Bushnell Co., New Haven, by The Wm. H. Geer Co., New York	2	15	21	21.2	13.8	65	35	1.0654	16.0	14	0.99	Fair	
				21	20.5	13.3	65	35	1.0591	14.5	15	0.89	"	
				21	20.6	13.5	66	34	1.0591	14.5	17	0.79	"	
5330	Byron Brand Bartlett. No name of manufacturer ..	2	15	20	20.7	13.8	66	34	1.0558	13.7	15	0.92	Mushy; one bad spot; dirt on pears and in bottom of can	
				20	20.1	13.2	66	34	1.0563	13.8	23	0.57		
				20	21.3	13.5	64	36	1.0638	15.6	14	0.96		
5115	Emerald Brand, First Quality. Cherry Creek Canning Co., Cherry Creek, N. Y.	2	15	20	21.1	13.2	63	37	1.0777	18.8	17	0.78	Good	
				20	21.0	13.0	62	38	1.0810	19.5	16	0.81	One bad spot	
				20	21.1	13.3	63	37	1.0803	19.3	..	...	Good
5049	Prize Winner Brand Bartlett, Fancy Quality. Cherry Creek Canning Co., Cherry Creek, N. Y.	2	13	19	21.3	12.9	60	40	1.0628	15.4	11	1.17	"	
				19	20.7	11.2	54	46	1.0638	15.6	11	1.02	"	
				19	21.4	12.4	58	42	1.0644	15.7	11	1.13	"	
5306	Bridgeton Brand, Extra. Clinton B. Ayars Canning Co., Bridgeton, N. J.	3	15	32	36.2	18.9	53	47	1.0686	16.7	13	1.45	"	
				32	36.3	19.1	53	47	1.0658	16.1	13	1.47	"	
				32	36.3	19.4	53	47	1.0630	15.4	14	1.39	"	
5065	Navy Brand Bartlett, Extra Quality. Cobb Preserving Co., Fairport, N. Y.	2	15	20	21.7	12.9	60	40	1.0705	17.1	16	0.81	One bad spot	
				20	21.5	12.4	58	42	1.0664	16.2	15	0.83	Good	
				20	21.6	11.5	53	47	1.0786	19.0	13	0.88	"	
5112	Bartlett, Extra Quality. Curtice Bros. Co., Rochester, N. Y.	2½	24	31	31.7	23.0	72	28	1.0947	22.5	22	1.05	Rather soft; broken pieces	
				31	31.1	22.9	74	26	1.0914	21.8	18	1.27	Fair	
				31	31.3	23.1	74	26	1.0880	21.1	21	1.10	"	
5300	Compass Brand. D. E. Foote & Co., Baltimore, Md.	2	10	18	21.0	12.6	60	40	1.0676	16.5	16	0.79	"	
				18	21.0	13.2	63	37	1.0653	15.9	8(?)	1.65(?)	Many small pieces; 2 bad spots	
					18	20.7	13.2	63	37	1.0687	16.7	14	0.94	Fair; some small pieces
5104	Pride of Cedarville Brand. Fruit Farm Pres. Co., Cedarville, N. J.	3	14	32	37.5	18.6	50	50	1.0462	11.5	20	0.93	One bad spot	
				32	36.9	18.9	51	49	1.0427	10.6	25	0.76	Three bad spots	
				32	37.1	18.8	51	49	1.0446	11.1	28	0.67	Fair	
5062	Iona Brand. Dist. by The Great Atl. & Pac. Tea Co., Jersey City, N. J.	2	10	19	21.3	12.5	59	41	1.0551	13.6	23	0.54	Small pieces and trimmings; two seeds and one core; good flavor	
				19	21.1	12.5	59	41	1.0605	14.8	17	0.74		
				19	21.2	12.2	58	42	1.0658	16.1	20	0.61		

CANNED FRUIT—Continued.

Station No.	Brand.	Can Size.	Price per Can.	Net Weight		Weight of Drained Fruit.	Drained Fruit.	Liquid.	Spec. Gravity of Liquid @ 15.6° C.	Sugar in Liquid from Spec. Grav.	No. of Pieces of Fruit.	Av. Weight of Pieces of Fruit.	Quality.	
				Claimed.	Found.									
<i>Pears.</i>														
5061	Garland Brand Choice, Extra Heavy Syrup. W. F. Assan Canning Co., Baltimore, Md.	2	10	20	21.5	11.9	55	45	1.0886	21.2	9	1.32	Fair	
				20	21.6	12.0	56	44	1.0831	20.0	7	1.71	Some dirt present	
				20	21.4	12.8	60	40	1.0873	20.9	11	1.16	Fair	
5283	Staple Brand Extra Standard. Austin, Nichols & Co., Dist., New York	3	15	35	37.0	24.7	67	33	1.0739	17.9	15	1.65	Rather hard	
				35	36.9	25.2	68	32	1.0674	16.4	18	1.40	" "	
				35	37.3	25.6	69	31	1.0805	19.4	15	1.71	" "	
5270	Triacan Brand Bartlett. Packed for The F. C. Bushnell Co., New Haven, by The Wm. H. Geer Co., New York	2	15	21	21.2	13.8	65	35	1.0654	16.0	14	0.99	Fair	
				21	20.5	13.3	65	35	1.0591	14.5	15	0.89	"	
				21	20.6	13.5	66	34	1.0591	14.5	17	0.79	"	
5330	Byron Brand Bartlett. No name of manufacturer ..	2	15	20	20.7	13.8	66	34	1.0558	13.7	15	0.92	Mushy; one bad spot; dirt on pears and in bottom of can	
				20	20.1	13.2	66	34	1.0563	13.8	23	0.57		
				20	21.3	13.5	64	36	1.0638	15.6	14	0.96		
5115	Emerald Brand, First Quality. Cherry Creek Canning Co., Cherry Creek, N. Y.	2	15	20	21.1	13.2	63	37	1.0777	18.8	17	0.78	Good	
				20	21.0	13.0	62	38	1.0810	19.5	16	0.81	One bad spot	
				20	21.1	13.3	63	37	1.0803	19.3	..	...	Good
5049	Prize Winner Brand Bartlett, Fancy Quality. Cherry Creek Canning Co., Cherry Creek, N. Y.	2	13	19	21.3	12.9	60	40	1.0628	15.4	11	1.17	"	
				19	20.7	11.2	54	46	1.0638	15.6	11	1.02	"	
				19	21.4	12.4	58	42	1.0644	15.7	11	1.13	"	
5306	Bridgeton Brand, Extra. Clinton B. Ayars Canning Co., Bridgeton, N. J.	3	15	32	36.2	18.9	53	47	1.0686	16.7	13	1.45	"	
				32	36.3	19.1	53	47	1.0658	16.1	13	1.47	"	
				32	36.3	19.4	53	47	1.0630	15.4	14	1.39	"	
5065	Navy Brand Bartlett, Extra Quality. Cobb Preserving Co., Fairport, N. Y.	2	15	20	21.7	12.9	60	40	1.0705	17.1	16	0.81	One bad spot	
				20	21.5	12.4	58	42	1.0664	16.2	15	0.83	Good	
				20	21.6	11.5	53	47	1.0786	19.0	13	0.88	"	
5112	Bartlett, Extra Quality. Curtice Bros. Co., Rochester, N. Y.	2½	24	31	31.7	23.0	72	28	1.0947	22.5	22	1.05	Rather soft; broken pieces	
				31	31.1	22.9	74	26	1.0914	21.8	18	1.27	Fair	
				31	31.3	23.1	74	26	1.0880	21.1	21	1.10	"	
5300	Compass Brand. D. E. Foote & Co., Baltimore, Md.	2	10	18	21.0	12.6	60	40	1.0676	16.5	16	0.79	"	
				18	21.0	13.2	63	37	1.0653	15.9	8(?)	1.65(?)	Many small pieces; 2 bad spots	
					18	20.7	13.2	63	37	1.0687	16.7	14	0.94	Fair; some small pieces
5104	Pride of Cedarville Brand. Fruit Farm Pres. Co., Cedarville, N. J.	3	14	32	37.5	18.6	50	50	1.0462	11.5	20	0.93	One bad spot	
				32	36.9	18.9	51	49	1.0427	10.6	25	0.76	Three bad spots	
				32	37.1	18.8	51	49	1.0446	11.1	28	0.67	Fair	
5062	Iona Brand. Dist. by The Great Atl. & Pac. Tea Co., Jersey City, N. J.	2	10	19	21.3	12.5	59	41	1.0551	13.6	23	0.54	Small pieces and trimmings; two seeds and one core; good flavor	
				19	21.1	12.5	59	41	1.0605	14.8	17	0.74		
				19	21.2	12.2	58	42	1.0658	16.1	20	0.61		

TABLE XII:

Station No.	Brand.	Can Size.	Price per Can.	Net Weight.		Weight of Drained Fruit. oz.	Drained Fruit. oz.	Liquid. oz.	Spec. Gravity of Liquid @ 15.6° C.	Sugar in Liquid from Spec. Grav.	No. of Pieces of Fruit.	Av. Weight of Pieces of Fruit. oz.	Quality.
				Claimed.	Found.								
5486	Champion Brand. H. J. McGrath Co., Baltimore, Md.	3	cts. 10	oz. 32	oz. 34.3	18.2	53	47	1.0429	10.7	12	1.52	Rather soft
				32	33.9	17.9	53	47	1.0422	10.5	10	1.79	" "
5059	Capital Brand. Thos. J. Myer & Co., Baltimore, Md.	2	8	18	34.5	18.0	52	48	1.0397	9.9	11	1.64	One bad spot
				18	20.5	11.8	58	42	1.0453	11.3	11	1.07	One rotten spot; fishy odor
5057	Huntress Brand Bartlett, Fancy Quality. Oswego Preserving Co., Oswego, N. Y.	2	15	20	20.9	10.8	52	48	1.0454	11.3	9	1.20	One rotten spot
				20	20.7	9.9	49	51	1.0440	10.9	9	1.10	Can blown
5488	Monroe Brand Bartlett. Packed for Rochester Pres. Co., Rochester, N. Y.	2	15	0	20.6	14.0	67	33	1.0702	17.1	20	0.70	Some small and broken pieces
				0	19.8	14.6	71	29	1.0595	14.6	19	0.77	Good
				0	20.4	12.7	64	36	1.0617	15.1	16	0.79	" " " "
5184	White Birch Brand Bartlett. Sodus Canning Co., Sodus, N. Y.	2	15	19	21.1	14.0	69	31	1.0615	15.1	18	0.78	" " " "
5106	Polo Brand Bartlett. Packed for Stoddard, Gilbert & Co., New Haven	2	15	19	21.8	13.4	63	37	1.0747	18.1	9	1.49	Soft; many raspberry seeds
				19	21.2	14.4	68	32	1.0731	17.7	14	1.03	" " " "
				19	21.1	13.6	65	35	1.0743	18.0	12	1.13	" " " "
5066	Golden Tip Brand Preserved Bartlett, Extra Selected. A. J. Tanner Co., Oakfield, N. Y.	2	15	20	20.7	14.5	70	30	1.0577	14.2	16	0.91	Mushy
				20	20.7	14.6	72	28	1.0657	16.0	15	0.97	"
				20	20.6	14.9	73	27	1.0555	13.7	19	0.78	Mushy and broken
5185	Big Elm Brand Bartlett, in Syrup. Victor Preserving Co., Victor, N. Y.	2	15	18	21.2	11.8	56	44	1.0667	16.3	13	0.91	Good
				18	21.1	13.0	62	38	1.0574	14.1	14	0.93	"
				18	21.1	13.1	62	38	1.0698	17.0	15	0.87	"
<i>Pineapple.</i>													
5047	Carmelo Hawaiian Sliced. Austin, Nichols & Co., Dist., New York	2	16	20	21.2	13.8	65	35	1.0886	21.2	8	1.73	Good
				20	21.1	12.7	60	40	1.0981	23.3	7	1.81	"
				20	21.1	13.0	61	39	1.0933	22.2	8	1.63	"
5299	Elite Brand Grated Hawaiian. Packed for Clark, Chapin & Bushnell, New York	2	20	20	21.5	10.2	47	53	1.1011	23.9	grated	...	"
				20	21.1	10.3	49	51	1.1010	23.9	...	...	"
				20	21.2	11.0	52	48	1.1021	24.2	...	...	"
5063	Hills-Dale Brand Sliced Hawaiian. Emery Food Co., Chicago	2 1/2	15	30	30.7	20.1	65	35	1.0903	21.6	10	2.01	"
				30	29.6	18.8	64	36	1.0854	20.5	8	2.35	"
				30	30.4	18.4	61	39	1.0815	19.6	9	2.04	"
5114	San Marcos Brand, Sliced, Eyeless, Coreless. D. E. Foote & Co., Baltimore, Md.	2	15	18	21.6	10.8	50	50	1.1183	27.6	12	0.90	Small, thin slices
				18	21.5	10.3	48	52	1.1271	29.5	12	0.86	" " "
				18	21.8	11.7	54	46	1.1146	26.8	12	0.98	" " "

CANNED FRUIT—Continued.

Station No.	Brand.	Can Size.	Price per Can.	Net Weight.		Weight of Drained Fruit. oz.	Drained Fruit. oz.	Liquid. oz.	Spec. Gravity of Liquid @ 15.6° C.	Sugar in Liquid from Spec. Grav.	No. of Pieces of Fruit.	Av. Weight of Pieces of Fruit. oz.	Quality.
				Claimed.	Found.								
5486	Champion Brand. H. J. McGrath Co., Baltimore, Md.	3	cts. 10	oz. 32	oz. 34.3	18.2	53	47	1.0429	10.7	12	1.52	Rather soft
				32	33.9	17.9	53	47	1.0422	10.5	10	1.79	" "
5059	Capital Brand. Thos. J. Myer & Co., Baltimore, Md.	2	8	18	34.5	18.0	52	48	1.0397	9.9	11	1.64	One bad spot
				18	20.5	11.8	58	42	1.0453	11.3	11	1.07	One rotten spot; fishy odor
5057	Huntress Brand Bartlett, Fancy Quality. Oswego Preserving Co., Oswego, N. Y.	2	15	20	20.9	10.8	52	48	1.0440	10.9	9	1.10	Can blown
				20	20.7	9.9	49	51	1.0702	17.1	20	0.70	Some small and broken pieces
5488	Monroe Brand Bartlett. Packed for Rochester Pres. Co., Rochester, N. Y.	2	15	0	20.6	14.0	67	33	1.0747	18.1	9	0.77	Some dirt in cans
				0	19.8	14.6	71	29	1.0595	14.6	19	0.79	" " " "
5184	White Birch Brand Bartlett. Sodus Canning Co., Sodus, N. Y.	2	15	19	21.1	13.4	63	37	1.0747	18.1	9	1.49	Soft; many raspberry seeds
				19	21.2	14.4	68	32	1.0731	17.7	14	1.03	" " " "
5106	Polo Brand Bartlett. Packed for Stoddard, Gilbert & Co., New Haven	2	15	19	21.8	11.5	53	47	1.0904	21.6	12	0.96	Good
				19	21.6	11.8	54	46	1.0892	21.3	14	0.84	"
				19	21.9	11.6	53	47	1.0860	20.6	14	0.83	"
5066	Golden Tip Brand Preserved Bartlett, Extra Selected. A. J. Tanner Co., Oakfield, N. Y.	2	15	20	20.7	14.5	70	30	1.0577	14.2	16	0.91	Mushy
				20	20.7	14.6	72	28	1.0657	16.0	15	0.97	"
				20	20.6	14.9	73	27	1.0555	13.7	19	0.78	Mushy and broken
5185	Big Elm Brand Bartlett, in Syrup. Victor Preserving Co., Victor, N. Y.	2	15	18	21.2	11.8	56	44	1.0667	16.3	13	0.91	Good
				18	21.1	13.0	62	38	1.0574	14.1	14	0.93	"
				18	21.1	13.1	62	38	1.0698	17.0	15	0.87	"
<i>Pineapple.</i>													
5047	Carmelo Hawaiian Sliced. Austin, Nichols & Co., Dist., New York	2	16	20	21.2	13.8	65	35	1.0886	21.2	8	1.73	Good
				20	21.1	12.7	60	40	1.0981	23.3	7	1.81	"
				20	21.1	13.0	61	39	1.0933	22.2	8	1.63	"
5299	Elite Brand Grated Hawaiian. Packed for Clark, Chapin & Bushnell, New York	2	20	20	21.5	10.2	47	53	1.1011	23.9	grated	...	"
				20	21.1	10.3	49	51	1.1010	23.9	...	...	"
				20	21.2	11.0	52	48	1.1021	24.2	...	...	"
5063	Hills-Dale Brand Sliced Hawaiian. Emery Food Co., Chicago	2 1/2	15	30	30.7	20.1	65	35	1.0903	21.6	10	2.01	"
				30	29.6	18.8	64	36	1.0854	20.5	8	2.35	"
				30	30.4	18.4	61	39	1.0815	19.6	9	2.04	"
5114	San Marcos Brand, Sliced, Eyeless, Coreless. D. E. Foote & Co., Baltimore, Md.	2	15	18	21.6	10.8	50	50	1.1183	27.6	12	0.90	Small, thin slices
				18	21.5	10.3	48	52	1.1271	29.5	12	0.86	" " "
				18	21.8	11.7	54	46	1.1146	26.8	12	0.98	" " "

TABLE XII:—

CANNED FRUIT—Continued.

Weight of Drained Fruit.	Drained Fruit.			Spec. Grav. of Liquid @ 15.6° C.	Sugar in Liquid from Spec. Grav.	No. of Pieces of Fruit.	Av. Weight of Pieces of Fruit.	Quality.
	oz.	%	Liquid.					
15.0	72	28	1.0884	21.2	8	1.88	Good	
15.2	73	27	1.0840	20.2	8	1.90	"	
15.0	73	27	1.0796	19.2	8	1.88	"	
15.2	69	31	1.1265	29.4	8	1.90	"	
14.4	65	35	1.1323	30.6	8	1.80	"	
14.4	64	36	1.1338	30.9	8	1.80	"	
19.5	59	41	1.0244	6.2	grated	...	Eyes not removed; not sweet	
21.2	63	37	1.0238	6.0	"	...	" " " " "	
21.3	66	34	1.0273	6.9	"	...	" " " " "	
10.1	53	47	1.0705	17.1	21	0.48	Cubes	
11.5	59	41	1.0677	16.5	27	0.43	"	
11.5	62	38	1.0629	15.4	31	0.37	" ; some seeds	
14.4	68	32	1.0861	20.6	11	1.31	Small fruit	
14.0	66	34	1.0887	21.2	10	1.40	" "	
14.4	70	30	1.0900	21.5	10	1.44	" "	
8.6	41	59	1.1034	24.4	grated	...	Good	
8.5	42	58	1.1039	24.5	"	...	"	
7.9	38	62	1.1079	25.4	"	...	"	
14.9	68	32	1.1148	26.9	8	1.86	"	
14.4	65	35	1.1247	29.0	8	1.80	"	
14.6	67	33	1.1159	27.1	8	1.83	"	
10.2	49	51	1.0867	20.8	crushed	...	"	
10.0	48	52	1.0861	20.7	"	...	"	
8.6	40	60	1.0909	21.7	"	...	"	
14.4	68	32	1.0950	22.6	9	1.60	"	
14.2	67	33	1.0956	22.7	9	1.58	"	
12.8	62	38	1.1011	23.9	9	1.42	"	
19.9	62	38	1.1091	25.7	8	2.49	"	
20.0	65	35	1.1047	24.7	8	2.50	"	
20.0	65	35	1.1073	25.3	8	2.50	"	
17.5	56	44	1.0626	15.3	25	0.70	Soft	
18.0	58	42	1.0602	14.8	26	0.69	Good	
17.5	56	44	1.0633	15.5	23	0.76	"	
15.8	50	50	1.0918	21.9	8	1.98	"	
15.1	49	51	1.0977	23.2	12	1.26	"	
17.6	55	45	1.0937	22.3	9	1.96	"	

TABLE XII:

Station No.	Brand.	Can Size.	Price per Can.	Claimed.	Net Weight. /	TABLE XII:								
						cts.	oz.	oz.	Found.	oz.	%	%		
5279	Pride of Egypt Brand Green Gage. Egypt Canning Co., Egypt, N. Y.	2	15	0	21.6		13.3	62	38	1.0620	15.2	19	0.70	Very soft
				0	21.4		11.1	52	48	1.0612	15.0	17	0.65	"
				0	21.2		11.0	51	49	1.0636	15.5	16	0.69	"
5432	Clover Orchard Brand Gage, in Syrup. Fruit Belt Pres. Co., East Williamson, N. Y.	2	13	20	21.5		8.8	41	59	1.0824	19.8	21	0.42	"
				20	21.7		9.4	43	57	1.0830	20.0	21	0.45	"
				20	21.5		9.2	43	57	1.0823	19.8	22	0.42	"
5273	Pickwick Club Brand California Egg, Extra Standard Quality. Golden Gate Packing Co., San José, Cal.	2½	22	30	32.2		15.2	47	53	1.0972	23.1	10	1.52	Very soft
				30	32.8		16.3	50	50	1.0964	22.9	10	1.63	" "
				30	33.0		17.1	52	48	1.1136	26.6	9	1.90	" "
5303	Sultana Brand. Put up for The Great Atl. & Pac. Tea Co., Jersey City, N. J.	2½	15	30	30.9		13.3	43	57	1.0843	20.2	20	0.67	Mushy
				30	31.9		15.6	49	51	1.0810	19.5	25	0.62	Good
				30	32.1		16.6	52	48	1.0780	18.8	43	0.39	Small fruit
5472	Bewley Brand Niagara Egg, in Syrup. Lockport Canning Co., Lockport, N. Y.	2	15	20	21.8		11.8	54	46	1.0638	15.6	18	0.66	Good
				20	21.9		12.6	57	43	1.0619	15.1	18	0.70	"
				20	21.7		11.4	52	48	1.0632	15.5	21	0.54	"
5444	Sodus Brand Red. Sodus Canning Co., Sodus, N. Y.	2	15	19	21.7		12.5	57	43	1.0655	15.8	19	0.66	"
				19	21.8		12.5	57	43	1.0667	16.3	22	0.57	"
				19	21.6		11.5	53	47	1.0689	16.8	18	0.64	"
5430	White Birch Brand. Sodus Canning Co., Sodus, N. Y.	2	12	22	21.4		10.5	49	51	1.0688	16.7	19	0.55	"
				22	21.6		12.3	57	43	1.0698	17.0	18	0.68	"
				22	21.6		12.3	57	43	1.0692	16.8	21	0.59	"
5425	Crescent Brand Lombard. The Springfield Canning Co., Barker, N. Y.	2	12	20	21.3		11.6	54	46	1.0668	16.3	21	0.55	"
				20	21.5		12.6	58	42	1.0643	15.7	23	0.55	"
				20	21.4		11.8	55	45	1.0656	16.0	21	0.56	"
5110	Robin Brand Lombard. The Springfield Canning Co., Barker, N. Y.	2	10	20	21.7		12.5	58	42	1.0741	17.9	26	0.48	"
				20	21.6		12.4	57	43	1.0736	17.8	26	0.48	"
				20	21.5		12.0	56	44	1.0723	17.5	25	0.48	"
5451	Hermitage Brand. Stoddard, Gilbert & Co., Dist., New Haven	In glass	25	18	23.4		10.9	46	54	1.1456	33.3	19	0.57	Very fine
				18	23.1		12.3	53	47	1.1303	30.1	25	0.49	" "
				18	22.6		12.4	55	45	1.0986	23.4	21	0.59	" "

APPLES.

All of the 18 samples were packed in No. 3 cans. One brand claimed 29 oz. net weight, all the others 30 oz. All the brands satisfied these claims except 5479, Social Brand, the three cans

CANNED FRUIT—Concluded.

Station No.	Brand.	Can Size.	Price per Can.	Claimed.	Net Weight. /	CANNED FRUIT—Concluded.							
						Weight of Drained Fruit. oz.	Drained Fruit. %	Liquid. %	Spec. Gravity of Liquid @ 15.6° C.	Sugar in Liquid from Spec. Grav.	No. of Pieces of Fruit.	Av. Weight of Pieces of Fruit.	Quality.
5279	Pride of Egypt Brand Green Gage. Egypt Canning Co., Egypt, N. Y.	2	15	0	21.6	13.3	62	38	1.0620	15.2	19	0.70	Very soft
				0	21.4	11.1	52	48	1.0612	15.0	17	0.65	"
				0	21.2	11.0	51	49	1.0636	15.5	16	0.69	"
5432	Clover Orchard Brand Gage, in Syrup. Fruit Belt Pres. Co., East Williamson, N. Y.	2	13	20	21.5	8.8	41	59	1.0824	19.8	21	0.42	"
				20	21.7	9.4	43	57	1.0830	20.0	21	0.45	"
				20	21.5	9.2	43	57	1.0823	19.8	22	0.42	"
5273	Pickwick Club Brand California Egg, Extra Standard Quality. Golden Gate Packing Co., San José, Cal.	2½	22	30	32.2	15.2	47	53	1.0972	23.1	10	1.52	Very soft
				30	32.8	16.3	50	50	1.0964	22.9	10	1.63	" "
				30	33.0	17.1	52	48	1.1136	26.6	9	1.90	" "
5303	Sultana Brand. Put up for The Great Atl. & Pac. Tea Co., Jersey City, N. J.	2½	15	30	30.9	13.3	43	57	1.0843	20.2	20	0.67	Mushy
				30	31.9	15.6	49	51	1.0810	19.5	25	0.62	Good
				30	32.1	16.6	52	48	1.0780	18.8	43	0.39	Small fruit
5472	Bewley Brand Niagara Egg, in Syrup. Lockport Canning Co., Lockport, N. Y.	2	15	20	21.8	11.8	54	46	1.0638	15.6	18	0.66	Good
				20	21.9	12.6	57	43	1.0619	15.1	18	0.70	"
				20	21.7	11.4	52	48	1.0632	15.5	21	0.54	"
5444	Sodus Brand Red. Sodus Canning Co., Sodus, N. Y.	2	15	19	21.7	12.5	57	43	1.0655	15.8	19	0.66	"
				19	21.8	12.5	57	43	1.0667	16.3	22	0.57	"
				19	21.6	11.5	53	47	1.0689	16.8	18	0.64	"
5430	White Birch Brand. Sodus Canning Co., Sodus, N. Y.	2	12	22	21.4	10.5	49	51	1.0688	16.7	19	0.55	"
				22	21.6	12.3	57	43	1.0698	17.0	18	0.68	"
				22	21.6	12.3	57	43	1.0692	16.8	21	0.59	"
5425	Crescent Brand Lombard. The Springfield Canning Co., Barker, N. Y.	2	12	20	21.3	11.6	54	46	1.0668	16.3	21	0.55	"
				20	21.5	12.6	58	42	1.0643	15.7	23	0.55	"
				20	21.4	11.8	55	45	1.0656	16.0	21	0.56	"
5110	Robin Brand Lombard. The Springfield Canning Co., Barker, N. Y.	2	10	20	21.7	12.5	58	42	1.0741	17.9	26	0.48	"
				20	21.6	12.4	57	43	1.0736	17.8	26	0.48	"
				20	21.5	12.0	56	44	1.0723	17.5	25	0.48	"
5451	Hermitage Brand. Stoddard, Gilbert & Co., Dist., New Haven	In glass	25	18	23.4	10.9	46	54	1.1456	33.3	19	0.57	Very fine
				18	23.1	12.3	53	47	1.1303	30.1	25	0.49	" "
				18	22.6	12.4	55	45	1.0986	23.4	21	0.59	" "

containing 29.5, 29.8 and 28.8 oz., although 30 oz. were claimed. The net weight in the eighteen cans ranged from 29.5 to 33.7 oz.

The drained solids constituted from 50 to 71 per cent, average 63 per cent by weight, of the total contents. Apparently sugar

is not added to canned apples in any considerable quantity, the percentages found in the liquid portion being very uniform, ranging from 6.4 to 8.1 per cent.

The size and quality of the fruit packed showed a wide range. In some brands fine large fruit, in others small fruit, practically culls, were used. The number of pieces per can ranged from 11 to 43, while the average weight of the pieces ranged from 0.51 to 1.62 oz. The *Mt. Parnassus* and *Robin Hood* brands contained many small pieces of various sizes and shapes.

The cost per can ranged from 10 to 15 cents.

The following is a summary for the 18 cans of apples:

	Max.	Min.	Av.
Net weight claimed, oz.	30	29	29.8
" " found, oz.	33.7	29.5	31.7
Weight of drained fruit, oz.	22.8	17.0	20.1
Per cent of drained fruit, oz.	71	50	63
Per cent of sugar in liquor	8.1	6.4	7.6
No. of pieces of fruit	43	11	30
Ave. weight of pieces of fruit, oz.	1.62	0.51	0.75
Cost per can, cents	15	10	12

APRICOTS.

One brand was packed in odd-sized cans, containing 17.7 oz. of material. The other 18 samples were in No. 2½ cans. 5426, *Famous Royal Scarlet Brand*, bore no statement of net weight. Of the other 15 samples all but three satisfied their claims of from 30 to 32 oz., 5473, *Davisco Brand*, containing only 29.9, 31.3 and 31.6 oz., although 32 oz. were claimed. The net weight of material in the No. 2½ cans ranged from 29.9 to 33.1 oz.

The drained fruit in No. 2½ cans made up from 52 to 63 per cent of the total contents and the sugar in the liquor ranged from 23.2 to 27.1 per cent.

The size and quality of the fruit was much more uniform than in the case of apples. In two brands the fruit was rather soft, and in two the skins had not been removed. The cans contained from 19 to 23 pieces of fruit, weighing from 0.46 to 0.53 oz. per piece.

The cost of No. 2½ cans ranged from 25 to 28 cents.

The following is a summary for the 18 samples packed in No. 2½ cans:

CANNED FRUIT.

	Max.	Min.	Av.
Net weight claimed, oz.	32	30	30.3
" " found, oz.	33.1	29.9	32.0
Weight of drained fruit, oz.	20.0	16.6	18.2
Per cent of drained fruit	63	52	57
Per cent of sugar in liquor	27.1	23.2	25.0
No. of pieces of fruit	23	19	20
Ave. weight of pieces of fruit, oz.	0.53	0.46	0.49
Cost per can, cents	28	25	25.5

CHERRIES.

Three samples were packed in No. 1 cans, thirty-three in No. 2, twenty-one in No. 2½, and three in odd-sized cans. 5431, *White Birch Brand Red Cherries*, in No. 1 cans, although claiming 19 oz. net weight, contained only 11.7, 11.9 and 11.7 oz. Probably this shortage was not intentional, but arose from using the wrong labels on this particular lot. The cherries in this brand were of good quality and made up 60 per cent of the total contents of the can.

The 33 samples packed in No. 2 cans claimed from 18 to 21 oz. net weight. Six samples bore no statement of net weight, and one can of 5332, *Oval Brand*, showed a slight shortage of 0.3 oz. The net weight in all the No. 2 samples ranged from 20.7 to 23.0 oz. The weight of drained fruit in No. 2 cans ranged from 45 to 72 per cent of the total contents. In six samples the drained solids amounted to less than 50 per cent, although in all of these the quality of the fruit was good. The percentage of sugar in the liquor in this size cans showed a wide range from 13.4 to 44.4 per cent, and the cost from 15 to 25 cents per can.

Twenty-one samples were packed in No. 2½ cans. 5334, *Noreca Brand*, bore no statement of net weight. One can of 5069, *Red Line*, contained 0.3 oz. less than claimed. The claimed weight ranged from 29.7 to 32.9 oz. The weight of drained solids in cans of this size ranged from 52 to 69 per cent of the total contents; the sugar in the liquor from 7.2 to 28.4 per cent; and the cost of the cherries ranged from 15 to 30 cents per can.

The three cans packed in odd sizes claimed a net weight of 15 oz., and actually averaged 17 oz.

The cherries were not counted, but they ranged from fine large cherries to small, partially rotten fruit. One can of 5277, *Pride of Egypt Brand*, was blown, and two cans of 5069, *Red Line*, showed some gas on opening. The three cans of 5084, *Webster's*

Best Brand, contained several cherries with rotten spots. **5183**, *White Birch Brand White*, showed one can of white cherries, the other two being of a faded-lavender color, showing carelessness in picking or branding.

The following is a summary for the 33 samples packed in No. 2 cans and the 21 samples in No. 2½ cans:

	No. 2 Cans.			No. 2½ Cans.		
	Max.	Min.	Av.	Max.	Min.	Av.
Net weight claimed, oz.	21	18	19.8	30	30	30
" " found, oz.	23.0	20.7	21.6	32.9	29.7	31.5
Weight of drained fruit, oz.	15.4	9.9	11.9	21.8	16.6	18.7
Per cent of drained fruit	72	45	56	69	52	61
Per cent of sugar in liquor	44.4	13.4	22.6	28.4	7.2	19.1
Cost per can, cents	25	15	17	30	15	24

PEACHES.

Six samples of sliced peaches were examined, three being packed in No. 2 cans and three in cans of an odd size. The former, **5055**, *American Club Brand*, bore no statement of net weight, and contained on the average 22.7 oz. In this brand the fruit made up 73 per cent of the contents, while in the other brand of sliced peaches, **5328**, *Robin Hood Brand*, only 58 per cent was fruit. Likewise **5055** contained 31.7 per cent of sugar in the liquor, while **5328** contained only 17.5 per cent. The price of the former was 22 cents per can, that of the latter 15 cents.

Three samples of halved fruit were packed in No. 2 cans. These claimed 20 oz. net weight and contained 21.1 oz. The drained fruit made up 73 per cent of the contents and the percentage of sugar in the liquor was 31.7.

Most of the samples of halved fruit were packed in No. 2½ cans. Of the 57 thus packed, 52 satisfied the claims as to net weight. One can of **5182**, *Polo Brand*, contained 28.8 oz. against 30 oz. claimed; two cans of **5094**, *White Top Brand*, contained 29.2 and 29.6 oz. against 30 oz. claimed; while two cans of **5315**, *Atlas Brand*, bore no statement of weight. The net weight claimed ranged from 28 to 31 oz.; the actual weight from 29 to 32.5 oz. The weight of drained fruit ranged from 54 to 75 per cent and the sugar in the liquor from 8.1 to 30.8 per cent. The number of pieces of fruit in the can ranged from 6 to 25, with a corresponding variation in weight from 0.82 to 3.07 oz. The quality of the fruit likewise was quite variable, in some cases the fruit being overripe, in others of poor appearance but of excellent flavor, while in still others fine appearing fruit was

deficient in flavor. The cost in No. 2½ cans ranged from 15 to 25 cents.

The following is a summary for the 57 samples packed in No. 2½ cans:

	Max.	Min.	Av.
Net weight claimed, oz.	31	28	29.7
" " found, oz.	32.5	29.0	30.5
Weight of drained fruit, oz.	22.4	15.8	19.8
Per cent of drained fruit	75	54	65
Per cent of sugar in liquor	30.8	8.1	17.8
No. of pieces of fruit	25	6	12
Ave. weight of pieces of fruit, oz.	3.07	0.82	1.71
Cost per can, cents	25	15	20

PEARS.

Forty-five samples were packed in No. 2 cans. **5488**, *Monroe Brand*, bore no statement of net weight. Two cans of **5270**, *Triacan Brand*, contained 20.5 and 20.6 oz., 21 oz. being claimed. The claimed net weight in 42 samples ranged from 18 to 21 oz., the actual weight from 19.8 to 21.9 oz. The weight of drained solids ranged from 49 to 73 per cent of the can contents. The sugar in the liquor ranged from 10.9 to 21.6 per cent. The number of pieces of fruit from 7 to 23, and the weight of the pieces from 0.54 to 1.71 oz. The cost in No. 2 cans ranged from 8 to 15 cents.

Three samples were packed in No. 2½ cans. These claimed a net weight of 31 oz., 31.4 oz. being found. The drained fruit made up 73 per cent of the sample, and an average of 20 pieces was present, weighing 1.14 oz. These samples cost 24 cents per can.

Twelve samples were packed in No. 3 cans. Nine claimed a net weight of 32 oz., and three 35 oz. All satisfied the claims made, the net weight ranging from 33.9 to 37.5 oz., average 36.2 oz. The drained fruit ranged from 17.9 to 25.6 oz., or from 50 to 69 per cent. The sugar in the liquor ranged from 9.9 to 19.4 per cent, the number of pieces of fruit from 10 to 28, and the weight from 0.67 to 1.79 oz. Pears in cans of this size cost from 10 to 15 cents.

The quality of the pears was not always good. In **5283** the fruit was rather hard; in **5330** the pears were mushy, one piece was partly rotten and there was dirt in the bottom of the cans; in one can each of **5115** and **5065** rotten spots were present; in **5300** many small pieces were present some of which had rotten

spots; in 5104 rotten spots were present; 5062 consisted chiefly of small pieces and trimmings, with a core and a few seeds; in 5486 the fruit was quite soft, a piece in one can showing a rotten spot; in 5059 one can was blown (fermented), the other two containing fruit with rotten spots, and the cans having a fishy odor; in 5488 dirt was present; and in 5184 many raspberry seeds.

The following is a summary for the 45 samples in No. 2 cans and the 12 in No. 3 cans:

	No. 2 Cans.			No. 3 Cans.		
	Max.	Min.	Av.	Max.	Min.	Av.
Net weight claimed, oz.	21	18	19.4	35	32	32.8
" " found, oz.	21.9	19.8	21.0	37.5	33.9	36.2
Weight of drained fruit, oz.	14.9	9.9	12.8	25.6	17.9	20.3
Per cent of drained fruit	73	49	62	69	50	56
Per cent of sugar in liquor	21.6	10.9	16.5	19.4	9.9	13.9
No. of pieces of fruit	23	7	14	28	10	16
Ave. weight of pieces of fruit, oz.	1.71	0.54	0.91	1.79	0.67	1.37
Cost per can, cents	15	8	13.5	15	10	13.5

PINEAPPLES.

Twenty-seven samples of sliced pineapple in No. 2 and 2½ cans, 12 of grated pineapple in No. 2 and 3 cans, and three of pineapple cubes in an odd-sized can, were examined.

The samples in cube form claimed a net weight of 18 oz., and an average of 19.1 oz. was found.

All of the samples of sliced pineapple in No. 2 cans satisfied their claimed net weight, which ranged from 18 to 20 oz., while the actual weight ranged from 20.6 to 22.3 oz. The drained fruit ranged from 48 to 73 per cent of the can contents; three samples contained less than 55 per cent of drained fruit, while all of the other samples contained over 60, and most of them over 65 per cent. The number of slices ranged from 7 to 12, depending chiefly on the size of the fruit. The average weight of the slices ranged from 0.86 to 1.86 oz., the samples showing considerable uniformity except 5114, *San Marcos Brand*, in which small, thin slices were present with an average weight of only 0.91 oz., about one-half that found in the other samples. The sugar in the liquor ranged from 19.2 to 30.9 per cent, and the cost of the No. 2 cans from 15 to 20 cents.

All but one of the six samples of sliced pineapple in No. 2½ cans satisfied their claimed net weight, one can of 5063, *Hillsdale Brand*, being 0.4 oz. short weight. The claimed net weight

ranged from 28 to 30 oz., that found from 29.6 to 31.9 oz. The drained fruit ranged from 61 to 65 per cent of the can contents. The number of slices was very uniform, ranging from 8 to 10, the average weight per slice from 2.01 to 2.50 oz., the sugar in the liquor from 19.6 to 25.2 per cent, and the cost of these samples from 15 to 25 cents per can.

All of the 9 samples of grated or crushed pineapple in No. 2 cans satisfied their claimed net weights of 19 or 20 oz. The actual weights ranged from 20.5 to 21.5 oz., and the drained fruit from 7.9 to 11.0 oz., or from 29 to 52 per cent of the can contents. The three different brands averaged 51, 40 and 46 per cent of the drained fruit, the sugar in the liquid ranged from 20.7 to 25.4 per cent, and the cost of the grated fruit in No. 2 cans from 20 to 23 cents.

Three cans of grated pineapple in No. 3 cans claimed 30 oz. net weight, from 32.4 to 33.7 oz. being found. The drained fruit ranged from 19.5 to 21.3 oz., or from 59 to 66 per cent. The sugar in the liquor was very low, ranging from 6.0 to 6.9 per cent, and the eyes had not been removed. This fact was plainly stated on the label, and coupled with the low price of 10 cents per can, indicated that the preparation was not intended by the manufacturer to be a high-grade product.

The following is a summary for the 21 samples of sliced pineapple in No. 2 cans, for 6 samples of sliced in No. 2½ cans, for 9 samples of grated in No. 2 cans, and for 3 samples of grated in No. 3 cans.

	Sliced.					
	No. 2 Cans.			No. 2½ Cans.		
	Max.	Min.	Av.	Max.	Min.	Av.
Net weight claimed, oz.	20	18	19.3	30	28	29
" " found, oz.	22.3	20.6	21.4	31.9	29.6	30.7
Weight of drained fruit, oz.	15.2	10.3	13.8	20.1	18.4	19.5
Per cent of drained fruit	73	48	65	65	61	64
Per cent of sugar in liquor	30.9	19.2	24.6	25.7	19.6	22.9
No. of pieces of fruit	12	7	9	10	8	9
Ave. weight of pieces of fruit, oz.	1.86	0.86	1.63	2.50	2.01	2.31
Cost per can, cents	20	15	16	25	15	22.5

	Grated.					
	No. 2 Cans.			No. 3 Cans.		
	Max.	Min.	Av.	Max.	Min.	Av.
Net weight claimed, oz.	20	19	19.3	30	30	30
" " found, oz.	21.5	20.5	21.0	33.7	32.4	33.1
Weight of drained fruit, oz.	11.0	7.9	9.5	21.3	19.5	20.7
Per cent of drained fruit	52	38	45	66	59	63
Per cent of sugar in liquor	25.4	20.7	23.3	6.9	6.0	6.4
Cost per can, cents	23	20	21	10	10	10

PLUMS.

Twenty-one samples of plums were packed in No. 2 cans, twelve in No. $2\frac{1}{2}$ cans, and three in glass jars, about equivalent to No. 2 cans.

The three samples in glass claimed a net weight of 18 oz., an average of 23 oz. being found. The drained fruit ranged from 10.9 to 12.4 oz., or from 46 to 55 per cent. The sugar in the liquor was high, ranging from 23.4 to 33.3 per cent, and the number of plums ranged from 19 to 25, weighing from 0.49 to 0.59 oz. These samples were plums of a very fine quality packed in a rather heavy syrup.

Three samples packed in No. 2 cans bore no statement of net weight. The other eighteen samples of this size claimed from 19 to 22 oz., all but the three cans of 5430, *White Birch Brand*, satisfying their claims; the latter samples showed deficiencies of 0.6, 0.4 and 0.4 oz. The net weight in the 21 samples ranged from 21.2 to 21.9 oz., and the drained fruit from 41 to 62 per cent, four samples containing less than 50 per cent. 5432, *Clover Orchard Brand*, averaged only 42 per cent, compared with 55 per cent in the other brands. The sugar in the liquor ranged from 15 to 20 per cent; the number of plums from 16 to 26; and the average weight of the fruits from 0.42 to 0.70 oz. The cost of No. 2 cans ranged from 10 to 15 cents.

The twelve samples packed in No. $2\frac{1}{2}$ cans satisfied their claimed net weights of from 29 to 30 oz., the actual weights ranging from 30.7 to 33.0 oz. The drained fruit ranged from 43 to 58 per cent. 5303, *Sultana Brand*, averaged only 48 per cent of drained fruit, about 5 per cent less than the other brands. The sugar in the liquor ranged from 14.8 to 26.6 per cent, the number of plums from 8 to 43, and the average weight of the fruits from 0.39 to 1.98 oz. The three cans of 5303, *Sultana Brand*, contained 20, 25 and 43 plums, the last being very small fruit. The cost of cans of this size ranged from 15 to 22 cents.

Aside from the great variations in size, in some of the samples the fruit was very soft and mushy, and by no means of attractive appearance.

The following is a summary for the 21 samples packed in No. 2 cans, and for the 12 packed in No. $2\frac{1}{2}$ cans:

GRAHAM FLOUR.

	No. 2 Cans.			No. $2\frac{1}{2}$ Cans.		
	Max.	Min.	Av.	Max.	Min.	Av.
Net weight claimed, oz.	22	19	20.2	30	29	29.8
“ “ found, oz.	21.9	21.2	21.6	33.0	30.7	31.8
Weight of drained fruit, oz.	13.3	8.8	11.6	18.0	13.3	16.3
Per cent of drained fruit	62	41	53	58	43	51
Per cent of sugar in liquor	20.0	15.0	16.8	26.6	14.8	20.3
No. of pieces of fruit	26	16	21	43	8	18
Average weight of fruits, oz.	0.70	0.42	0.57	1.98	0.39	1.17
Cost per can, cents	15	10	13	22	15	18

GRAHAM FLOUR.

Standard Graham Flour “is made from well cleaned and dusted wheat, but not bolted.”

Many of the so-called Graham-flours on the market are imitation products made from various mixtures of bran or middlings with flour. A true Graham flour is characterized by a higher ash and fiber content than ordinary wheat flour. Owing to the variation in composition of the various wheats, mere chemical data are not always sufficient to differentiate between true and imitation Graham flour. A mechanical separation of the bran, shorts and middlings in the flour affords valuable criteria for judgment, but not having the proper appliances for this separation we were obliged to omit it in the present examination, which was concerned more with the food value of the flours than with their genuineness.

Without attempting to judge the ten samples examined too strictly, 5117 appears to contain much lower percentages of ash and fiber than found in genuine Graham flour. The high ash in 5470 is due to the leavening chemicals used.

5116 was not labeled as Graham flour but as “Coarse Flour” “prepared with bran for making coarse bread.” However, it was sold by the dealer to our agent in answer to a request for Graham flour.

5293 was similarly sold, although the label frankly declares the removal of a “portion of bran and coarser particles.” This brand and the one last referred to showed more protein than any of the other samples.

The samples generally showed a tendency towards short weight.

TABLE XIII:—

Station No.	Brand.	GRAHAM FLOUR.									
		Net Weight.		Price.		Water.	Ash.	Protein (N x 6.25).	Fiber.	Nitrogen-free Extract.	
Claimed.	Found.	Per Package.	Per Pound.								
oz.	oz.	cts.	cts.								
5471	Sunbeam Pure Food Hygienic Graham Flour. Austin, Nichols & Co., New York	48	48.1	15	5.0	11.78	1.50	10.56	1.68	72.44	2.04
5470	Obelisk Self-Rising Whole Wheat Graham Flour. Ballard & Ballard Co., Louisville, Ky.	*28	28.7	10	5.6	9.14	6.63	11.25	1.88	69.22	1.88
4470	Banner Graham Flour. Banner Milling Co., Buffalo, N. Y.	80	77.2	25	5.2	11.87	1.96	12.75	2.52	68.92	1.98
5117	Pure Fresh Ground Health Graham Flour. Dayton Milling Co., Towanda, Pa. ....	..	77.4	18	3.7	10.11	1.13	10.19	1.05	75.96	1.56
5345	Pure Genuine Crescent Graham Flour. Farwell & Rhines, Water- town, N. Y.	*80	73.5	40	8.7	9.45	1.58	10.44	1.85	74.67	2.01
4471	Grandmother's A. & P. Graham Flour. The Great Atl. & Pac. Tea Co., New York	56	55.4	15	4.3	11.86	1.89	13.88	1.83	67.71	2.83
5292	Pure Wheat Graham Flour. The Hecker Cereal Co., New York ..	*56	55.8	16	4.6	10.12	1.93	13.38	2.18	70.46	1.93
5116	†Big "G" Brand Hygienic Coarse Flour. Potter & Wrightington, Boston, Mass.	*80	79.0	25	5.1	9.42	2.35	16.94	2.13	65.53	3.63
5293	‡Schumacher XXX Graham Flour. The Quaker Oats Co., Chicago ..	80	78.8	25	5.1	9.92	1.83	16.44	1.88	67.25	2.68
4472	Fancy Graham Flour. Thornton & Chester Mill Co., Buffalo, N. Y.	*80	79.6	18	3.6	12.00	1.79	12.25	2.02	69.53	2.41

† "Prepared with bran for making coarse bread."

‡ "With portion of bran and coarser particles removed."

INFANT FOODS.

In 1908 this station examined all of the special foods for infants for sale in this state. The examination has been repeated this year, first, to determine the uniformity in composition of these foods at widely separated intervals, and second, to determine the changes which the foods as sold undergo in the process of preparation directed by the manufacturer. It is obvious that it is not fair to a manufacturer to condemn his food because ordinary methods of analysis show large percentages of unaltered starch, when if his directions for preparation are carried out most, if not all, of the starches may be converted into soluble forms.

Of the 27 brands examined all except the four *Cereo* preparations, the two barleys, *A. D. S. Malted Milk* and *Lacnut* were also examined in 1908.

DESCRIPTION OF SAMPLES AND CLAIMS MADE FOR THEM.

5290. *A. D. S. Malted Milk*. American Druggists' Syndicate, New York. "A scientifically prepared milk food." "Prepared by adding water only. No cooking required." Price 15 cents per 2 oz.

* Weight when packed.

5437. *"Allenburys" Milk Food No. 1*. Allen & Hanburys, London, Eng. "An efficient substitute for mother's milk." "Specially adapted to the first 3 months of infant life." "Made from carefully tested cows' milk, so modified as to present all the constituents of human milk in their true relative proportions." Price 45 cents for 9.7 oz.

5436. *"Allenburys" Milk Food No. 2*. Allen & Hanburys, London, Eng. "Closely resembling the mother's milk." "Specially adapted to the second 3 months of infant life." "Contains all the elements of human milk in their natural proportions. To these is added a small proportion of the soluble product of the action of malt upon wheat." "Absolutely free from starch in the unaltered conditions." "Also free from an excess of casein." Price 43 cents for 10 oz.

5466. *"Allenburys" Malted Food No. 3*. Allen & Hanburys, London, Eng. "A cooked food, ready for use without either boiling or straining." "An improved form of malted food." Price 30 cents for 12 oz.

5298. *Benger's Food*. Benger's Food, Manchester, Eng. "A farinaceous food containing in itself a natural digestive principle which changes the farinaceous material into soluble substances." Price 21 cents for 4.7 oz.

5434. *Borden's Malted Milk. Eagle Brand*. Borden's Condensed Milk Co., New York. "A perfected Milk Food, wholesome and delicious, prepared by the most improved process whereby all the nutritive elements

of the richest cows' milk and strengthening cereals are scientifically combined." Price 39 cents for 8.5 oz.

5469. *Brooks' Baby Barley*. Brooks Barley Co., Boston, Mass. Price 25 cents for 16.4 oz.

5440. *Carnrick's Lacto-Preparata*.⁴ Reed and Carnrick, Jersey City, N. J. "A prepared Human Milk for Infants." "Is the nearest approach to Mother's Milk that can ever be produced and remain permanent." "Is prepared from cow's milk so as to perfectly resemble human milk solids in food value and digestibility. It is necessary to mix this food with water only to represent human milk." Price 45 cents for 8.3 oz.

5441. *Carnrick's Soluble Food*. Reed & Carnrick, Jersey City, N. J. "Is rich in flesh, muscle and brain forming elements." "In diabetes, diarrhoea, phthisis and pregnancy it is the food 'par excellence'." Price 90 cents for 20 oz.

5438. *Cereal Milk*. Wells, Richardson & Co., Burlington, Vt. "A pre-digested food." "Made of whole Vermont dairy milk, pure sugar of milk, the finest wheat gluten flour, so combined with malt diastase that no free starch is present. It is a complete food, thoroughly cooked, and the simple addition of water makes it ready for use." Price 25 cents for 2.3 oz.

5384. *Cereo Gruel Flour, Barley*. Cereo Co., Tappan, N. Y. "Each ounce yields about 3.9 gms. of Protein and 109 Calories and imparts to a quart of gruel or food about 0.48% protein and 2.4% Carbohydrates." Price 25 cents for 16.4 oz.

5382. *Cereo Gruel Flour, Oat*. Cereo Co., Tappan, N. Y. "Each ounce yields about 4.5 gms. of Protein and 115 Calories and imparts to a quart of gruel or food about 0.48% Protein and 2.4% Carbohydrates." Price 25 cents for 16.7 oz.

5383. *Cereo Gruel Flour, Wheat*. Cereo Co., Tappan, N. Y. "Each ounce yields about 3.4 gms. of Protein and 107 Calories and imparts to a quart of gruel or food about 0.40% Protein and 2.5% Carbohydrates." Price 25 cents for 16.3 oz.

5280. *Eskay's Albumenized Food*. Smith, Kline & French Co., Philadelphia, Pa. "Contains egg albumen together with other food principles that buildup tissues, and when prepared for use with fresh cows' milk forms an invaluable substitute for healthy human milk." Price 20 cents for 4 oz.

5282. *Horlick's Malted Milk*. Horlick's Malted Milk Co., Racine, Wis. "Composed of an extract of selected wheat flour and barley malt and rich pasteurized cows' milk. The starch is converted into soluble dextrin and maltose." Price 39 cents for 6.9 oz.

5295. *Imperial Granum Food*. The Imperial Granum Co., New York. "A pure unsweetened food derived from the finest growths of wheat, rendered by a special process capable of being thoroughly assimilated by the weakest stomach with least tax on the digestive organs." Price 25 cents for 4.4 oz.

5291. *Justfood (Just's Dietetic Cereal Food)*. Justfood Co., Syracuse, N. Y. "Intended for use with fresh milk with which it forms a com-

plete and perfect food for all ages." "Prepared from selected barley malt, wheat and corn." "Free from cane sugar, sugar of milk, dried milk and raw starch." Price 50 cents for 10 oz.

5534. *Lacnut*. Lacnut Food Co., Battle Creek, Mich. "The Milk of Nuts." "The Nearest Approach to Mother's Milk." "A preparation of almonds and other nuts especially designed for infants." "The composition is nearly identical with that of mother's milk, which it more clearly resembles in its properties than does any other food." Price one dollar for 23.6 oz.

5442. *Lactated Food for Infants and Invalids*. Wells, Richardson & Co., Burlington, Vt. "Containing the most important elements of mother's milk with the nutritive principles of the cereal grains." Price 25 cents for 5.3 oz.

5489. *Meadow Brand Malted Milk*. Borden's Condensed Milk Co., New York. "Made from full-cream milk and choice cereals, malted." Price 45 cents for 7.4 oz.

5381. *Mellazea*. Cereo Co., Tappan, N. Y. "A cereal product derived from *Zea mays*." "Is highly nutritious, digests with great ease and is readily assimilated." "Each ounce yields about 2 gms. of Protein and 105 Calories and imparts to a quart of gruel or food about 0.28% Protein and 2.5% Carbohydrates." Price 25 cents for 16.4 oz.

5289. *Mellin's Food for Infants and Invalids*. Mellin's Food Co. of No. America, Boston, Mass. "Carefully and scientifically prepared from barley malt and wheat." "Does not contain starch, dried milk, cane sugar, nor any other element indigestible or undesirable for an infant's food, but, on the contrary, it does contain all the elements which are necessary for the proper nourishment and development of a baby's body." Price 50 cents for 5.4 oz.

5281. *Nestlé's Food*. Henri Nestlé, Vevey, Switz. "A perfect nutrient for infants, children and invalids, the basis of which is the best cows' milk." "A compound of milk, baked flour, barley malt and sugar only." "In its composition shows a close resemblance to mother's milk." Price 19 cents for 6.3 oz.

5467. *Peptogenic Milk Powder*. Fairchild Bros. & Foster, New York. "Modifies Cows' milk so that it becomes practically identical with mother's milk." "Does not contain starch, glucose, cane sugar or malt sugar." "Contains no digestive ferment, no aid to digestion." Price 50 cents for 7.8 oz.

5297. *Ridge's Food*. Ridge's Food Co., Boston, Mass. "The Milk Modifier." "Made from selected cereals, milk sugar and soluble salts." Price 21 cents for 8.8 oz.

5435. *Robinson's Patent Barley for Infant's Food, Barley Water and Pudding*. Keen, Robinson & Co., London, Eng.

5439. *Wampole's Milk Food*. Henry K. Wampole & Co., Philadelphia, Pa. "Malted cereals, beef and milk with wheat phosphates." Price 45 cents for 7.8 oz.

TABLE XIV:—

Station No.	Brand.	Water.	Fat.	Fiber.	Ash.
5290	A. D. S. Malted Milk	5.93	6.75	0.13	3.08
5437	"Allenburys" Milk Food No. 1	4.98	13.80	0.00	3.98
5436	" Milk Food No. 2	4.20	14.20	0.08	3.70
5466	" Malted Food No. 3	8.58	0.78	0.15	1.18
5298	Benger's Food	10.55	0.83	0.15	1.00
5434	Borden's Malted Milk, Eagle Brand ..	5.18	7.15	0.05	3.45
5469	Brooks' Baby Barley	9.88	1.03	0.28	0.88
5440	Carnrick's Lacto-Preparata	2.90	1.60	0.03	3.38
5441	" Soluble Food	1.87	1.05	0.45	1.30
5438	Cereal Milk	5.10	3.55	0.08	2.38
5384	Cereo Gruel Flour, Barley	9.75	2.03	0.43	1.48
5382	" " Oat	8.78	6.40	0.88	2.53
5383	" " Wheat	8.78	1.30	0.10	0.48
5280	Eskay's Albumenized Food	3.08	1.28	0.33	1.58
5282	Horlick's Malted Milk	2.03	8.10	0.15	4.00
5295	Imperial Granum Food	6.23	0.50	0.18	0.50
5291	Justfood	6.95	0.03	0.10	0.30
5534	Lacnut	3.75	31.30	1.15	2.10
5442	Lactated Food	8.53	0.55	0.10	0.88
5489	Meadow Brand Malted Milk	3.20	5.20	0.30	3.28
5381	Mellazea	10.48	2.20	0.40	0.60
5289	Mellin's Food	2.98	1.80	0.20	4.45
5281	Nestlé's Food	3.65	5.70	0.18	1.45
5467	Peptogenic Milk Powder	2.50	0.03	0.10	1.43
5297	Ridge's Food	9.43	0.33	0.18	0.75
5435	Robinson's "Patent Barley"	10.58	1.40	0.23	0.85
5439	Wampole's Milk Food	1.65	5.25	0.15	4.83

COMPARATIVE COMPOSITION IN 1908 AND 1915.

The differences in composition shown by the various brands in the two inspections seven years apart as a rule were not great. The main variations shown by the later analyses were as follows:—

Allenburys Malted Food No. 3; 2% less protein, 6% less starch.
 Benger's Food; 1.25% less protein.
 Borden's Malted Milk; 1% more fat, 2% more protein.
 Carnrick's Lacto-Preparata; 2% more protein.
 Carnrick's Soluble Food; 10% more starch.
 Eskay's Albumenized Food; 1% more protein, 3.5% more starch.
 Horlick's Malted Milk; 2% more protein.
 Lactated Food; 6% more starch.
 Meadow Malted Milk; 1% more each of protein and fat.

INFANT FOODS.

INFANT FOODS.

Protein (N x 6.25).	Nitrogen-free Extract.	Starch.	Reducing Sugars, as Dextrose.		Water-Soluble.		
			Direct.	After Inversion.	Total.	Protein.	Ash.
14.06	70.05	None	30.64	70.12	77.82	7.81	3.04
9.88	67.36	None	35.56	61.52	73.92	7.19	3.93
9.75	68.07	None	35.80	64.84	77.32	7.25	3.67
9.38	79.93	60.92	6.92	14.56	20.96	2.38	1.04
10.75	76.72	57.66	2.68	8.24	19.16	8.50	0.97
15.38	68.79	None	29.64	67.80	78.32	8.88	3.14
8.69	79.24	68.51	0.72	3.48	7.36	1.50	5.12
13.03	78.46	None	49.12	74.80	84.44	6.63	3.01
12.44	82.89	25.99	19.24	49.52	57.58	2.94	1.19
11.00	77.89	1.74	36.72	73.00	78.72	4.56	2.21
14.88	71.43	58.39	0.76	5.20	10.24	1.56	1.13
16.88	64.53	56.31	0.12	2.36	5.24	0.69	0.77
12.81	76.53	67.61	0.84	3.32	7.68	2.56	0.24
7.75	85.98	31.95	31.60	48.88	51.12	0.69	1.24
15.00	70.72	None	30.28	68.88	77.56	7.88	3.64
13.88	78.71	72.79	0.40	2.12	3.36	0.94	0.42
0.63	91.99	3.32	14.80	95.84	91.24	0.63	0.31
22.19	39.51	2.31	12.04	37.08	41.34	3.88	1.38
8.81	81.13	47.93	16.92	28.52	31.54	1.00	0.67
14.50	73.52	None	31.52	71.04	79.84	8.50	3.25
5.75	80.57	74.36	0.84	1.60	2.50	0.44	0.44
11.31	79.26	None	34.24	77.64	84.50	5.13	4.10
11.94	77.08	20.25	13.88	50.24	61.60	4.88	1.24
0.19	95.75	None	64.48	90.32	92.42	0.19	1.34
10.31	79.00	70.93	0.80	2.96	5.04	1.44	0.48
6.75	80.19	70.20	0.92	2.92	5.70	0.81	0.58
9.19	78.93	None	28.76	66.84	76.56	7.50	3.92

Nestlé's Food; 4% more starch.

Ridge's Food; 1% less fat, 1.5% less protein, 2% more starch.

Wampole's Milk Food; 6% less protein.

INSPECTION OF 1915.

The preparations examined may be divided roughly into five classes; first, those prepared from cow's milk with various additions or alterations, and prepared for use simply by the addition of water; second, farinaceous foods, in which the starch has been partly, or wholly, converted into malt sugar or dextrin, and which are fed with cow's milk; third, cereal preparations, to which an enzyme preparation is added at the time of preparation for feeding; fourth, barley products for the preparation of barley water; and fifth, miscellaneous preparations.

The first group, or those which are prepared from cow's milk with various amendments, includes

A. D. S. Malted Milk.	Horlick's Malted Milk
Allenburys' Milk Food No. 1	Lactated Food
" " " No. 2	Meadow Malted Milk
Borden's Malted Milk	Cereal Milk
Carnrick's Lacto-Preparata	Nestlé's Food
" Soluble Food	

In these eleven brands the protein ranges from 8.8 to 15.4 per cent, and the fat from 0.6 to 14.2 per cent, showing the wide difference of opinion among manufacturers as to the proper food for infants. While seven of the brands contain no starch, *Cereal Milk* contains a small amount, and *Nestlé's Food*, *Carnrick's Soluble Food* and *Lactated Food* contain 20, 26 and 48 per cent of starch, respectively. These last three foods likewise show low water-solubilities, namely, 62, 58 and 32 per cent, while in the other eight brands of this group from 74 to 84 per cent of water-soluble material is present. While the ash in all the brands was almost completely soluble in water, the protein showed a wide range of water-solubility, the extremes being *Lactated Food* with 11 per cent and *Allenburys' Milk Food No. 2* with 74 per cent. The two *Allenburys'* preparations contained much more fat than any of the others.

The second group, farinaceous foods in which the starch had been rendered more or less soluble, includes

Allenburys' Malted Food No. 3	Justfood
Benger's Food	Mellin's Food
Imperial Granum	Ridge's Food

In four of these foods a malting process has been employed, in *Benger's Food* a pancreatic enzyme is claimed to be present, while in *Ridge's Food* dependence for the starch conversion has apparently been placed on simple baking. A characteristic of these foods is their low content of fat, *Mellin's Food* with 1.8 per cent being the only one containing more than 0.8 per cent (it must be remembered, however, that all of these are directed to be used in conjunction with milk). These are essentially carbohydrate foods, the protein in five brands ranging from 9.4 to 13.9 per cent, while in *Justfood* only 0.63 per cent of protein is present, this food consisting almost entirely of soluble carbohydrates and water. *Mellin's Food* contains no starch and *Justfood* about 3

per cent, while the other four brands contain from 58 to 73 per cent. The extent to which this starch is converted into soluble forms at the time of the food's preparation will be discussed on a later page. In the foods as analyzed the starch conversion has been extremely small except in *Justfood* and *Mellin's Food*, in which 90 and 75 per cent, respectively, of the carbohydrates are soluble in water. The soluble carbohydrates in the other brands range from 2 per cent in *Imperial Granum* to 17.5 per cent in *Allenburys' Malted Food No. 3*. The solubility of the protein in *Benger's Food* is 80 per cent, and in *Mellin's Food* 45 per cent, while in the others only from 6 to 26 per cent is soluble in water. *Ridge's Food* claims the presence of milk sugar, but as only 3 per cent of soluble carbohydrate is present, no more than is found in ordinary cereal flours, the amount of this ingredient cannot be large.

The third group includes four foods of the *Cereo Co.*, in the preparation of which for the child's use an enzyme preparation called *Cereo*, supplied by the same company, is directed to be used. These brands are

Cereo Gruel Flour, Barley	Cereo Gruel Flour, Wheat
Cereo Gruel Flour, Oat	Mellazea

The following is our analysis of a sample of *Cereo*:

Water and volatile	34.38	Total reducing sugars as
Alcohol by volume	4.50	maltose
Solids	65.62	Dextrose
Glycerine	37.50	Other non-sugar solids ...
Protein	3.63	Amylase
Ash	0.70	present

A later analysis of *Cereo* showed alcohol 2.50, solids 71.75 and glycerine 48.80 per cent.

The four *Cereo* flours show about the usual composition of flours from the respective grains. They are naturally high in starch and their solubility in water is low. For the effect of *Cereo* in converting their starch into soluble carbohydrates see page 337.

The fourth group includes two barley preparations, not intended to be fed as they are, but offered as a means of preparing barley water. The two brands are quite similar in composition. Barley water made from *Brooks' Baby Barley* according to directions we found to have the following composition:

Water	98.40	Carbohydrates	1.42
Protein	0.14	Ash	0.04

The miscellaneous group includes *Eskay's Albumenized Food*, a preparation made from egg albumen and cereals, and directed to be fed with cow's milk; it is rather low in both protein and fat and contains about 32 per cent starch. *Lacnut* is made from almonds and other nuts and its composition is claimed to be "nearly identical with that of mother's milk, which it more clearly resembles in its properties than does any other food." Our analysis does not show this identity. This food is by far the richest in protein and fat of any of the foods listed in our table; it also contains but little starch. *Peptogenic Milk Powder* is chiefly milk sugar and contains no starch. *Wampole's Milk Food* is made from "Malted cereals, beef and milk with wheat phosphates." It contains no starch and 65 per cent of water-soluble carbohydrates. It exceeds in ash all the other foods given in the table.

COMPOSITION OF FEEDING MIXTURES MADE FROM THESE FOODS AS DIRECTED.

The dietitian is not concerned so much with the composition of these foods as the analyst finds them, though that of course is important, as he is with the actual composition of the feeding mixtures made from them when the manufacturer's directions are implicitly followed. Table XV gives this information, in which the three months' old feeding period has been arbitrarily selected for purposes of comparison. *Allenburys' Malted Food No. 3* is not included as it is not intended for infants under six months; nor are the two barley preparations and *Lacnut*, no feeding directions being supplied with our sample of the last named. In preparing this table we have assumed the following average composition for cow's milk, and have analyzed a sample of top milk as follows:

	Cow's Milk.	Top Milk.
Spec. gr. @ 60° Fahr.	1.0300	1.0300
Water	87.40	82.84
Protein	3.80	4.36
Fat	3.60	8.05
Lactose	4.50	4.05
Ash	0.70	0.70

TABLE XV.—COMPOSITION OF DAY'S FEEDING, WHEN FOODS ARE PREPARED ACCORDING TO DIRECTIONS FOR INFANTS 3 MOS. OLD.

Infant Food.	Formula and Quantities of Food Used.	Grams Supplied in Day's Feeding					
		Total Amount of Mixture Fed.	Mixture Fed.	Cost of Food per Day.	Protein.	Fat.	Carbo-hydrates.
A. D. S. Malted Milk	18.68 gms. in 5 oz. water; 126.56 gms. in 7 feedings	35	33	17.79	8.54	88.82	3.90
"Allenburys" Milk Food No. 1	14.18 gms. in 3 oz. water; 99.26 gms. in 7 feedings	21	16	9.81	13.70	66.86	3.95
"No. 2"	28.35 gms. in 6 oz. water; 99.23 gms. in 7 feedings	21	15	9.67	14.09	67.63	3.67
Benger's Food	7.72 gms. + 140 cc. milk + 160 cc. water; 23.16 gms. food + 420 cc. milk in daily feeding	30	8	18.93	15.74	37.27	3.26
Borden's Malted Milk, Eagle Brand	18.38 gms. in 5 oz. water; 128.66 gms. in 7 feedings	35	21	19.79	9.20	88.57	4.44
Carrick's Lacto-Preparata	6.09 gms. in 4.5 oz. water; 23.75 gms. in 7 feedings of 2.5 oz. . .	17.5	5	3.24	0.38	18.64	0.80
"Soluble Food"	12.96 gms. in 4.5 oz. water; 69.12 gms. in daily feeding	24	11	8.60	0.73	57.60	0.90
Cereal Milk	16.45 gms. in 4 oz. water; 131.60 gms. in 8 feedings	32	52	14.48	4.67	102.61	3.13
Cereo Gruel Flour, Barley	48.78 gms. + 24 oz. water + 16 oz. top milk + 23 gms. sugar + 5.99 gms. Cereo . . .	40	33	29.01	40.76	79.53	4.22
" " " Oat	48.78 gms. + 24 oz. water + 16 oz. top milk + 23 gms. sugar + 5.99 gms. Cereo . . .	40	33	29.99	42.89	76.39	4.73
" " " Wheat	48.78 gms. + 24 oz. water + 16 oz. top milk + 23 gms. sugar + 5.99 gms. Cereo . . .	40	33	28.01	40.40	81.86	3.73
Eskay's Albumenized Food	27.5 gms. + 16 oz. water + 16 oz. milk	32	10	20.77	18.00	45.81	3.86
Horlick's Malted Milk	16.94 gms. in 4.25 oz. water; 118.58 gms. in 7 feedings	29.75	24	17.79	9.60	84.04	4.74
Imperial Granum Food	21.9 gms. + 22 oz. water + 20 oz. milk	42	10	26.52	22.36	55.09	4.44
Justfood	13.92 gms. + 4 oz. water + 8 oz. milk; 31.32 gms. + 18 oz. milk in 6 feedings	27	11	21.33	20.03	53.87	3.98
Lactated Food	18.3 gms. + 8 oz. water + 8 oz. milk; 40.08 gms. + 525 cc. milk in feedings	35	11	22.13	10.54	39.16	3.94
Meadow Brand Malted Milk	18.98 gms. in 5 oz. water; 132.86 gms. in 7 feedings	35	28	19.26	6.91	98.08	4.36
Mellazea	48.78 gms. + 24 oz. water + 16 oz. top milk + 23 gms. sugar + 5.99 gms. Cereo . . .	40	33	24.56	40.84	83.98	3.79
Mellin's Food	19.53 gms. + 8 oz. water + 8 oz. milk; 34.18 gms. + 14 oz. milk in 7 feedings	28	15	20.31	16.20	46.63	3.18
Nestlé's Food	9.39 gms. in 5 oz. water; 60.1 gms. in 8 feedings (32 oz.)	32	6	7.18	3.43	46.43	0.87
Peptogenic Milk Powder	26.82 gms. + 18 oz. water + 8 oz. milk + 3 oz. top milk	27	10	13.48	10.56	40.58	2.76
Ridge's Food	24.24 gms. + 18 oz. water + 16 oz. milk	34	7	21.29	17.88	41.44	3.64
Wampole's Milk Food	23.22 gms. in 4 oz. water; 185.76 gms. in 8 feedings	32	38	17.07	9.75	146.90	8.97
800 gms. Mother's Milk				8.00	8.00	53.00	1.60

According to Hutchinson* the average three months' old infant should consume daily about 800 gms. of human milk. Mother's milk at the three months' period contains on the average 1.0 per cent of protein, 2.9 per cent of fat, 6.7 per cent of carbohydrates and 0.2 per cent of ash, so that a daily feeding of 800 gms. would supply to the child 8.0 gms. of protein, 23.2 gms. of fat, 53.6 gms. of carbohydrates and 1.6 gms. of ash. Granting the accuracy of the figures quoted from Hutchinson, Table XV shows very conclusively how little the preparations made from these special infant's foods resemble mother's milk either in the kind or amount of nutriment supplied. It also shows very strikingly the large excess of protein supplied by most of the feeding mixtures, sixteen of them supplying from two to three times as much protein as human milk. In one brand, *Carnrick's Lacto-Preparata*, less than one-half the amount of protein is supplied, one-sixtieth of the fat, one-third of the carbohydrates and one-half of the ash. As a rule there is a great deficiency in fat, the foods prepared with water alone supplying only from one-sixtieth to one-third the proper amount. The four *Cereo* preparations yield a food very rich in fat, due to the use of top milk and not to the food itself. The two *Carnrick* foods, the malted milks, *Cereal Milk* and *Nestlé's Food* are very deficient in this important ingredient. The carbohydrate content of the feeding mixtures more nearly approximates the amount found in human milk than either the protein or the fat. In *Cereo Milk*, the malted milks and *Wampole's Milk Food* carbohydrates are present in great excess. The ash in the mixtures is generally high, from two or three times the amount supplied by human milk; the two *Carnrick* foods and *Nestlé's Food*, however, contain only about half the normal amount.

There is much difference of opinion among physiologists as to the essentials of a proper artificial infant's food, but we submit these analyses for the information and guidance of physicians and others who may wish to make use of one or the other of these foods in their practice. It is quite likely that the physician or specialist in searching for a diet which will satisfy the peculiar needs of infants deprived of their natural food will find sometimes one of these foods and sometimes

* Food and the Principles of Dietetics, Robt. Hutchinson, M.D., 1906.

another of very different composition best adapted to a particular case and this table with the preceding discussion will be of assistance in making a selection.

TABLE XVI:—COMPOSITION OF FEEDING MIXTURES, PREPARED ACCORDING TO DIRECTIONS FOR INFANTS 3 MOS. OLD.

Infant Food.	Grams per 100 cc.			
	Protein.	Fat.	Carbo-hydrates.	Ash.
A. D. S. Malted Milk	1.69	0.81	8.46	0.34
Allenburys' Milk Food No. 1	1.56	2.17	10.61	0.63
" " " " No. 2	1.53	2.24	10.73	0.58
Benger's Food	2.10	1.75	4.14	0.36
Borden's Malted Milk	1.88	0.88	8.44	0.42
Carnrick's Lacto-Preparata	0.62	0.07	3.55	0.15
" " " " Soluble Food	1.19	0.10	8.00	0.13
Cereal Milk	1.51	0.49	10.69	0.33
Cereo Barley Flour	2.42	3.40	6.63	0.35
" " " " Oat Flour	2.50	3.57	6.37	0.39
" " " " Wheat Flour	2.33	3.37	6.82	0.31
Eskay's Albumenized Food	2.16	1.77	4.77	0.40
Horlick's Malted Milk	1.99	1.08	9.42	0.53
Imperial Granum	2.10	1.78	3.58	0.35
Justfood	2.63	2.47	6.65	0.49
Lactated Food	2.11	1.86	3.73	0.38
Meadow Malted Milk	1.83	0.66	9.34	0.42
Mellazea	2.05	3.40	7.00	0.32
Mellin's Food	2.42	1.93	5.55	0.38
Nestlé's Food	0.75	0.36	4.84	0.09
Peptogenic Milk Powder	1.66	2.04	5.01	0.34
Ridge's Food	2.09	1.75	4.06	0.36
Wampole's Milk Food	1.78	1.02	15.30	0.93
Mother's Milk	1.00	2.90	6.70	0.20

It is necessary however to call attention to claims made by three of these foods. *Carnrick's Lacto-Preparata* claims to be "the nearest approach to mother's milk that can ever be produced and remain permanent"; *Lacnut* claims that its "composition is nearly identical with that of mother's milk"; and *Nestlé's Food* claims that it "in its composition shows a close resemblance to mother's milk." The following summary of the analyses of these three preparations shows that if the manufacturers' claims are correct human milk in Jersey City, Battle Creek and in Vevey, Switzerland, must be an exceedingly variable product.

	Carnrick's Lacto-Preparata.	Lacnut.	Nestlé's Food.
Fat	1.60	31.30	5.70
Ash	3.38	2.10	1.45
Protein	13.63	22.19	11.94
Carbohydrates	78.46	39.51	77.08
Starch	none	2.31	20.25

Table XVI has been prepared to show the actual composition of the food mixtures in terms of grams per 100 cc.

EFFECT OF PRESCRIBED METHOD OF PREPARATION ON THE STARCH OF THE FOODS.

In the following experiments of course those brands containing little or no starch were not included. Twelve of the brands were prepared strictly according to the formulas and directions for infants three months old, except that in the *Cereo* foods the mixtures were not strained. The amount of food recommended was determined in grams and the volume of liquid (water or milk, or both) estimated in cubic centimeters. Four grams of material were then used for the test, the volume of liquid being made proportional.

After preparing the ration the mixture was centrifuged and soluble materials removed by decantation, this operation being repeated three times; no other washing was made. The residue was then treated with malt extract and starch determined in the usual way. It must be recognized that the residual starch in all cases is cooked starch, possessing therefore some advantages over raw starch from the standpoint of digestibility.

There was no actual digestion or conversion of starch to sugars except where enzymes were incorporated in the food (*Benger's Food*) or were mixed with the food at the time of preparation (*Cereo* foods). The action in the other cases must have been due to that of boiling water on starch, rendering it partly soluble or colloidal. The action of any amylase in the milk must have been insignificant since the time consumed in preparation was not great in any case, and usually the milk was boiled. The acidity of the milk likewise would probably not cause any considerable conversion of starch in the time employed.

Attention has already been called to the presence of amylase in *Cereo*. *Benger's Food* likewise contained amylase, together with an esterase and a protease, all enzymes normal to pancreatic

extract which this food is claimed to contain. The effect of these enzymes in the food is clearly apparent from the following table:

	Starch in Original. %	Starch after Preparation. %	Starch Converted. %
<i>Prepared with water only.</i>			
Carnrick's Soluble Food	25.99	22.87	12
Nestlé's Food	20.25	16.92	16
<i>Prepared with water and milk.</i>			
Eskay's Albumenized Food	31.95	23.64	26
Imperial Granum	72.79	41.67	43
Ridge's Food	70.93	44.84	37
Benger's Food	57.66	5.71	90
Lactated Food	47.93	40.49	16
Allenburys' Malted Food No. 3	60.92	27.76	54
<i>Prepared with water, milk and Cereo.</i>			
Cereo Gruel Flour, Oat	56.31	7.20	87
Cereo Gruel Flour, Wheat	67.61	1.18	98
Cereo Gruel Flour, Barley	58.39	12.14	79
Mellazea	74.36	5.15	93

In the four *Cereo* preparations and *Benger's Food* from 79 to 98 per cent of the starch was converted into soluble carbohydrates. In the other brands the starch conversion was relatively small, in *Carnrick's Soluble Food* 12 per cent, in *Nestlé's Food* and in *Lactated Food* 16 per cent, in *Eskay's Albumenized Food* 26 per cent, in *Ridge's Food* 37 per cent, in *Imperial Granum* 43 per cent and in *Allenburys' Malted Food No. 3* 54 per cent. In fairness to this last named food it should be said that it is not recommended by the manufacturer for infants under six months.

Twenty-five samples were examined for the Dairy and Food Commissioner.

The present standard for maple syrup requires that it shall contain not more than 35 per cent of water. This is a maximum standard and any excess over that amount is considered as adulteration. The following eleven samples, containing from 35.30 to 37.95 per cent of water, were thus adulterated:

10045, 10215, 10213, 10212, 10047, 10208, 10216, 10048, 10206, 10211 and 10214. With the exception of this excessive dilution these were of good quality.

TABLE XVII.—

‡ Made from granulated and maple sugars.

§ Made from maple and granulated sugars.

10043 and 10042 were properly labeled compounds of cane and maple syrups, the former containing an excess of water; neither sample contained more than 10 per cent of maple syrup.

MAPLE SYRUP.

Volume.		In Original Material.								In Water-free Material.								
Claimed.	Found.	Solids.		Water.		Ash.		*Alka- linity. of Ash.		Lead No. (Winton).		Ash.		*Alka- linity. of Ash.		Lead No. (Winton).		
fl. oz.	fl. oz.	Total.	Soluble.	Insoluble.	Soluble.	Insoluble.	Soluble.	Insoluble.	Soluble.	Insoluble.	Soluble.	Insoluble.	Soluble.	Insoluble.	Soluble.	Insoluble.	Lead No. (Winton).	Malic Acid.
16	14.7	65.50	34.50	0.50	0.26	0.24	39	31	1.41	0.31	0.76	0.39	0.37	60	47	2.15	0.47	
15	15.9	65.50	34.50	0.43	0.24	0.19	34	28	1.28	0.29	0.66	0.37	0.29	52	43	1.95	0.44	
6	5.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
..	..	66.90	33.10	0.49	0.31	0.18	48	34	1.16	0.24	0.73	0.46	0.27	72	51	1.73	0.36	
..	+19.3	64.70	35.30	0.51	0.23	0.28	34	80	1.48	...	0.79	0.36	0.43	53	124	2.27	...	
..	..	63.00	37.00	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	+22	63.90	36.10	0.54	0.36	0.18	44	58	1.28	...	0.85	0.56	0.29	69	91	2.00	...	
..	20.9	64.35	35.65	0.51	0.32	0.19	46	50	1.19	...	0.79	0.50	0.29	71	78	1.85	...	
..	13.2	65.15	34.85	0.48	0.28	0.20	40	46	1.20	0.30	0.74	0.43	0.31	61	71	1.84	0.46	
7	6.9	63.55	36.45	0.45	0.27	0.18	31	59	1.29	...	0.71	0.43	0.28	49	93	2.03	...	
15	15.3	64.30	35.70	0.64	0.35	0.29	48	76	1.47	...	1.00	0.55	0.45	75	118	2.29	...	
..	19.1	65.00	35.00	0.56	0.37	0.19	46	48	1.63	0.31	0.86	0.57	0.29	71	74	2.52	0.48	
6.5	6.5	64.20	35.80	0.07	0.04	0.03	8	8	0.10	...	0.11	0.06	0.05	12	12	0.16	...	
16	..	65.90	34.10	0.45	0.28	0.17	35	55	0.86	0.06	0.68	0.42	0.26	53	83	1.31	0.09	
8	8.4	66.50	33.50	0.49	0.31	0.18	48	46	1.19	0.29	0.74	0.47	0.27	72	69	1.79	0.44	
..	14.6	63.90	36.10	0.52	0.38	0.14	46	44	1.54	...	0.81	0.59	0.22	72	69	2.41	...	
..	6.5	62.90	37.10	0.20	0.16	0.04	24	22	0.81	...	0.32	0.25	0.07	38	35	1.29	...	
16	15.9	62.50	37.50	0.53	0.29	0.24	41	71	1.46	...	0.85	0.47	0.38	66	114	2.34	...	
7	6.9	66.95	33.05	0.07	0.06	0.01	14	6	0.09	...	0.10	0.09	0.01	21	9	0.13	...	
..	..	67.50	32.50	0.62	0.43	0.19	46	40	1.02	0.06	0.92	0.64	0.28	68	59	1.51	0.09	
16	15.9	62.05	37.95	0.44	0.25	0.19	42	46	1.19	...	0.71	0.40	0.31	68	74	1.92	...	
..	..	65.00	35.00	0.47	0.27	0.20	33	61	1.16	0.29	0.72	0.42	0.30	51	94	1.78	0.45	
..	..	64.05	35.95	0.16	0.12	0.04	20	18	0.22	...	0.25	0.19	0.06	31	28	0.34	...	
..	..	64.70	35.30	0.44	0.28	0.16	38	48	1.45	...	0.68	0.43	0.25	59	74	2.25	...	
..	..	63.90	36.10	0.52	0.30	0.22	42	54	1.33	...	0.81	0.47	0.34	66	85	2.08	...	

* cc. $\frac{n}{10}$ acid per 100 gms.

† Avoirdupois oz.

10209 was a properly labeled compound maple and cane syrup, containing an excess of water; it contained somewhat more than 50 per cent of maple syrup.

10205 contained cane sugar and an excess of water.

10046 and 10210 we pass, although their low malic acid percentages suggest the presence of cane sugar.

To summarize, 8 samples were genuine, 2 were doubtful, 3 were labeled compounds, 1 was adulterated with water and cane sugar, and 11 were adulterated with water.

Six samples did not come to us in the original containers and we cannot say whether or not they bore the required statement of weight or volume. Samples 10212, 10204, 10217, 10216 and 10209 did not bear the statement required by law. Of the brands bearing a statement of volume only 10200 showed any serious discrepancy; 16 fluid ounces were claimed in this brand but only 14.7 were supplied.

NOODLES.

The following definitions and standards have been adopted recently by the Joint Committee on Definitions and Standards:

"Noodles, egg noodles, are dried alimentary pastes made from wheat flour and egg. They contain not less than five per cent by weight of the solids of whole, sound egg exclusive of the shell."

TABLE XVIII:—

Station No.	Brand.
3536	Babyhead Pure Egg Noodles, Medium. Auger Baking Co., New York
3544	Republic Egg Noodles, Medium, Extra Quality. Austin, Nichols & Co., New York
5485	Golden Egg Brand Noodles, contain egg. Cleveland Macaroni Co., Cleveland, Ohio
3535	Egg Noodles, Medium. Freihofer Baking Co., Philadelphia, Pa.
4457	Pure Egg Noodles, Fine. A. Goodman & Son, New York
4469	A. & P. Brand Egg Noodles, Medium. Great Atl. & Pac. Tea Co., Jersey City, N. J.
5181	Warner's Noodles, Cream of the Wheat. The Hotaling-Warner Co., Syracuse, N. Y.
5179	Pure Gold Medal Egg Noodles, Brood. Maas Baking Co., New York
3545	Superior Quality Mohican Fine Noodles. The Mohican Stores
3546	Fine Egg Noodles. C. F. Mueller Co., Jersey City, N. J.
5100	In bulk. Said to be Mueller's
5180	In bulk. Marked "Zarega's, New York, Artificially colored"

* When packed.

† No artificial color in any sample except 5180, where Naphthol Yellow S was used.

NOODLES.

"Plain noodles, water noodles, are dried alimentary pastes made from wheat flour without egg, or with less than five per cent by weight of the solids of whole, sound egg exclusive of the shell."

The five per cent of egg of the above standard is equivalent to about one and one-half eggs per pound of flour.

In the past noodles have been very commonly artificially colored, the main purpose having been to conceal a deficiency, or even a complete absence, of eggs, and this abuse has grown so prevalent that the better manufacturers have united in protesting against this practice. It will be seen from the above definition that this product when sold as "noodles" without any other qualification means "egg noodles," and this interpretation is recognized by the trade.

Twelve samples were analyzed, ten bought in package form, and two in bulk. All of the package samples were sold as egg noodles except 5181 and 3545, which were offered simply as "noodles." The samples show the usual wide variations in composition, partly due to the flour and partly to the amount of egg used. Ash ranged from 0.67 to 2.50 per cent, ether extract

NOODLES.†

Net Weight.	Price.			Water.	Ash.	Protein (N x 6.25).	Fiber.	Nitrogen-free Extract.	Ether Extract.	Lecithin Phosphoric Acid.
	Claimed.	Found.	Per Package.	Per Pound.						
oz. 8	oz. 7.2	cts. 10	cts. 22	10.58	0.71	15.81	0.21	70.55	2.14	0.0314
16	18.1	15	13	10.86	2.07	12.94	0.17	72.03	1.93	0.0352
7	7.5	10	21	7.76	2.50	14.19	0.20	73.16	2.19	0.0449
8	8.4	10	19	10.54	0.67	12.88	0.19	73.83	1.89	0.0373
8	8.1	12	24	10.85	1.69	15.00	0.18	68.70	3.58	0.0564
8	7.7	10	21	10.57	2.10	13.00	0.23	71.22	2.88	0.0355
*7	6.3	10	25	8.36	0.80	13.88	0.25	75.69	1.02	0.0237
*3.5	4.1	5	20	8.46	1.00	14.19	0.30	73.01	3.04	0.0624
*7	6.8	9	21	10.98	0.65	14.56	0.15	72.15	1.51	0.0309
8	7.7	10	21	10.56	1.02	14.00	0.14	71.47	2.81	0.0470
8	8.2	5	10	9.34	0.88	13.56	0.03	74.98	1.21	0.0386
8	7.3	5	11	8.63	1.65	13.81	0.18	75.32	0.41	0.0281

from 0.41 to 3.58 per cent, and lecithin phosphoric acid, as determined by Juckenack's method, from 0.0237 to 0.0624.

Without attempting to judge these brands too critically, it is apparent from our analyses that **5180** contains no egg, and that **5181** and **3545** contain little, if any. The other brands appear to contain from about one to one and one-half eggs per pound of flour.

5180 was the only brand containing artificial color, and it was so labeled.

As is usual with this class of foods there is a tendency towards short-weight in the package goods, ranging from 4 to 10 per cent.

OYSTERS.

A series of samples of shucked, canned oysters from the stock of a prominent Connecticut oyster grower were examined as to their water and salt content. The oysters represented regular stock, and samples of one quart each were taken from five-gallon cans packed ready for shipment. The oysters after shucking had been drained through a coarse sieve, washed with fresh water without "paddling" or "aeration," and were not allowed to stay in contact with the fresh water much over five minutes. In addition to these, two samples were examined which had been aerated somewhat by paddling.

The following results were secured, using essentially the methods employed by the Bureau of Chemistry. A sample of shucked oysters bought in a retail market is included for comparison.

The first eight samples in the table are two lots of four taken on different days and probably represent oysters from different localities. The differences in the amount of ash and salt, in both the oysters and the liquor, in the two groups are striking. In these eight samples the amount of free liquor was small, ranging from 5.7 to 8.2 per cent, and all the samples showed satisfactory amounts of oyster solids, ranging from 17.87 to 18.77 per cent. The two "aerated" samples showed quite clearly the effect of this treatment, the free liquor increasing and the oyster solids decreasing over one per cent. These oysters had been only moderately aerated, and if the process had been more

prolonged the absorption of water by the oysters would have been greatly increased.

TABLE XIX.—SHUCKED OYSTERS.

No.	Drained			In Oysters.			In Liquor.		
	Oysters. gms.	Liquor. gms.	Liquor. %	Solids. %	Ash. %	Salt. %	Solids. %	Ash. %	Salt. %
<i>Not aerated.</i>									
5564	985	88	8.2	17.87	1.91	0.38	3.94	1.16	0.69
5565	993	85	7.9	18.31	1.74	0.38	4.14	1.32	0.86
5566	968	85	8.1	18.24	1.62	0.38	4.08	1.21	0.84
5567	1010	81	7.4	17.89	1.57	0.35	3.41	1.08	0.74
5568	944	57	5.7	18.38	1.36	0.31	4.29	0.79	0.46
5569	1021	62	5.7	18.77	1.36	0.26	4.34	0.68	0.38
5570	983	79	7.4	18.70	1.43	0.28	4.31	0.79	0.45
5571	1000	66	6.2	17.94	1.26	0.23	3.58	0.69	0.40
<i>Av.</i>	988	75	7.1	18.26	1.53	0.43	4.01	0.97	0.60
<i>Aerated.</i>									
5572	876	82	8.6	16.74	...	...	2.89	...	...
5573	964	99	9.3	17.32	...	...	3.24	...	...
<i>Av.</i>	920	90	8.9	17.03	...	...	3.07	...	...
<i>Retail sample.</i>									
5490	644	350	35.2	11.77	0.84	0.07	1.66	0.39	0.21

The analysis of the retail sample clearly shows the possibility of abuses in the retail shucked oyster trade. The free liquor amounted to over 35 per cent, and the oyster solids to only 11.77 per cent. The low amounts of salt in both the oysters and the liquor indicates either soaking or excessive washing with fresh water.

RICE.

5557. *Comet Rice Natural Brown.* Seaboard Rice Milling Co., Galveston, Tex.

5556. *Comet Unkoted Rice Head Rice.* "No glucose, no talc." Seaboard Rice Milling Co., Galveston, Tex.

	5557	5556
Water	10.22	11.00
Ash	1.08	0.40
Protein (N x 6.25)	9.00	9.19
Fiber	0.53	0.20
Nitrogen-free extract	77.03	78.85
Ether extract	2.14	0.36
Acid-insoluble ash	0.04	0.004

The second sample is a "polished" rice, but does not contain the usual glucose and talc. Its analysis, however, shows very clearly the effect of polishing on the food value of rice. The ether extract (fat) has been reduced from 2.14 to 0.36 per cent, and the ash from 1.08 to 0.40 per cent. The polishing, in this instance at least, has had little effect on the protein content.

SODA WATER SYRUPS.

Two hundred and nine samples were examined for the Dairy and Food Commissioner, of which 183 were tested for preservatives, saccharin, and artificial color and flavor; 26 were tested only for saccharin, 2 of which contained this artificial sweetener.

The following tabulation shows the results of these tests. The lemon syrups were not tested for added citric acid, nor the vanilla syrups for coumarin. The chocolate syrups were examined for iron oxide and similar mineral coloring matters with negative results.

The results show that of the 183 samples only 74 were not adulterated. If the chocolate and vanilla syrups, which are

TABLE XX:—SODA WATER SYRUPS.

Flavor.	No. of Samples.	Not Found Adulterated.	Legally Labeled Compounds.	Adulterated with					
				Saccharin.	Color.	Benzoc Acid.	Benzoc Acid and Color.	Benzoc Acid, Color and Flavor.	Color and Flavor.
Cherry	12	I	I	I	3	3	3	..	..
Chocolate and Cocoa ..	29	26	I	I	..	I	..	..	..
*Lemon	28	13	3	4	I	6	I	..	..
Mint	5	..	..	..	4	..	I	..	..
Orange	23	4	3	..	7	4	5	..	..
Peach	I	I	..	..	..	..	..	..	..
Pineapple	2	2	..	..	..	..	..	..	..
Raspberry	29	6	4	..	I	II	6	..	I
Strawberry	36	5	5	I	6	3	II	I	4
†Vanilla	18	16	..	2	..	..	..	..	..
Totals	183	74	17	9	22	28	27	I	5

* Not tested for added citric acid.

† Not tested for coumarin.

seldom adulterated, are omitted from the totals, we find only 32 of 136 samples, or 24 per cent, were free from benzoic acid, saccharin, artificial color or artificial flavor. Soda water syrup continues to be one of the most frequently adulterated of our food products. In 17 instances the consumer had warning of the inferior quality of the syrup by the posting of placards in the store, but it is a question whether many consumers are wise enough to allow this warning to interfere with their purchase.

Summarizing the results we find 74 samples not to be adulterated, 70 contained artificial color, 71 benzoic acid, 9 saccharin and 6 artificial flavor. Salicylic acid was found in none of the samples.

MISCELLANEOUS FOODS.

5537. *Nuttose*. Kellogg Food Co., Battle Creek, Mich. Price 20 cents per can of 8 oz.

5538. *Protose Vegetable Meat*. Kellogg Food Co., Battle Creek, Mich. Price 20 cents per can of 7.7 oz.

5540. *Protose Vegetable Meat, Potted*. Kellogg Food Co., Battle Creek, Mich. Price 30 cents per can of 15.6 oz.

5539. *Protose Vegetable Meat, Roast*. Kellogg Food Co., Battle Creek, Mich. Price 30 cents per can of 16.8 oz.

5547. *Cocoanut Sticks*. Battle Creek Sanitarium Food Co., Battle Creek, Mich. Price 20 cents per package of 15.2 oz.

5294. *Nu-Food Health Flour, 15% Gluten*. Smith and Ashton, Rochester, N. Y. Price \$1.25 per bag of 11.6 lbs. (12.25 lbs. claimed.)

5468. *Wheat-A-Laxa Whole Wheat Flour*. Washburn-Crosby Co., Minneapolis, Minn. Price 25 cents per bag of 3 lbs.

6832. *Dairy Maid Brand Milk Hominy*. Marshall Canning Co., Marshalltown, Ia.

	5537	5538	5540	5539	5547	5294	5468	6832
Water	57.25	60.60	56.60	57.45	6.47	8.88	10.58	83.72
Ash	2.30	1.75	2.65	2.18	1.90	0.95	1.90	0.53
Protein (N x 6.25) ..	16.94	21.94	18.06	23.94	10.06	20.56	14.81	2.54
Fiber	0.85	0.40	0.58	0.45	0.40	0.38	2.13	0.03
Nitrogen-free extract ..	0.71	8.26	8.78	7.98	73.17	66.95	68.37	12.31
Ether extract	21.95	7.05	13.33	8.00	8.00	2.28	2.21	0.87
Starch .....	.....	.....	.....	.....	.....	60.02	.....	.....

6832 claims to be made from "Pure White Flint Corn and Fresh Sweet Milk." Analysis of the free liquid indicated the

claim as to the use of milk was correct, the following data being secured:—Solids 7.12, fat 2.10, refraction of fat 49.5 @ 25° C., casein 1.79 per cent.

II. DRUG PRODUCTS.

ASPIRIN TABLETS.

Samples of these tablets were collected by the Dairy and Food Commissioner from 54 druggists. In each case twelve tablets were sent to this laboratory, each of which was weighed, and six of them then ground and the composite sample analyzed.

The content of aspirin ranged from 2.26 to 5.22 grains per tablet. Excluding five samples notably deficient, the tablets averaged 4.82 grains of aspirin. Eight samples contained from 4.61 to 4.75 grains, 35 from 4.76 to 4.99 grains and 6 over 5 grains per tablet.

The individual tablets in the same sample showed wide variations in weight. In sample 10058 the druggist dispensed tablets of two distinct sizes in the same purchase, the weights ranging from 5.7 to 7.7 grains. Excluding this sample the tablets in the different lots showed variations of from 0.2 to 1.2 grains, with an average variation of 0.5 grain.

The chief excipient used in all samples was starch; in four samples a substance (probably talc) insoluble in dilute hydrochloric acid was present; in one sample calcium sulphate was present in quantity. In only four samples were more than traces of free salicylic acid present.

The following five samples showed too wide variations from the amount of aspirin guaranteed to be present:

9967. Sold by West Side Pharmacy, Ansonia. Only 45.2 per cent of strength claimed.

9043. Sold by Kaufmann's Pharmacy, Hartford. Only 78.6 per cent of strength claimed.

9800. Sold by S. Kossoff, Hartford. Only 47.4 per cent of strength claimed; contained much calcium sulphate.

10017. Sold by Joseph J. Dupre, Putnam. Only 83.0 per cent of strength claimed.

10088. Sold by (dealer's name not given), So. Norwalk. Only 78.4 per cent of strength claimed.

TABLE XXI:—ASPIRIN TABLETS, 5 GR.

No.	Place of Purchase.	Weight of Tablets.		Aspirin.		Free Salicylic Acid.	Starch.
		Range.	Average.	Per Cent.	Per Tablet.		
9967	Ansonia	mgms.	mgms.	grs.	grs.	Trace	Yes
10132	Bethel	360.0-387.0	374.1	38.76	2.26	None	*
10108	Bridgeport	427.6-454.9	439.7	73.64	4.98	Trace	*
10109	"	424.2-448.8	436.3	75.76	5.05	"	"
10112	"	410.0-449.0	430.6	74.20	4.93	None	"
10120	"	345.0-400.3	378.3	84.28	4.83	"	"
10123	"	359.7-394.4	376.1	83.16	4.82	Trace	"
10033	Bristol	349.5-380.0	365.7	87.82	4.96	"	"
10037	"	412.3-429.6	421.5	76.30	4.97	"	"
10127	Danbury	353.3-396.5	382.1	83.16	4.95	"	"
10127	"	371.3-447.4	390.6	81.70	5.02	None	"
10130	"	350.4-366.6	358.6	83.30	4.61	Trace	*
10012	Danielson	363.1-389.3	376.0	86.50	4.99	None	*
10005	Darien	376.8-408.8	391.6	77.14	4.68	Trace	"
9985	East Derby	411.0-437.0	426.7	75.06	4.94	"	"
10078	Greenwich	432.5-477.1	457.1	69.42	4.80	None	"
10058	Groton	366.5-496.8	415.8	77.08	4.71	Trace	"
9936	Guilford	383.0-410.0	394.2	79.16	4.83	None	"
9038	Hartford	415.0-433.5	423.9	75.28	4.96	"	Yes
9043	"	368.5-398.0	381.9	65.26	3.93	Trace	"
9045	"	375.5-386.7	382.5	80.60	4.77	Yes	†Yes
9800	"	369.8-404.0	386.9	89.42	2.37	"	"
9963	Meriden	408.7-434.5	417.7	76.20	4.93	"	"
10144	Middletown	422.4-447.5	434.0	71.20	4.81	Trace	"
10145	"	420.7-432.5	428.9	74.44	4.94	"	"
9988	Naugatuck	447.5-485.1	461.2	70.92	4.98	"	"
9950	New Haven	321.0-370.0	357.0	90.58	4.94	"	"
9998	"	417.2-458.0	430.9	70.76	4.71	"	"
10054	"	365.0-383.7	370.9	81.30	4.66	"	"
10135	"	346.4-391.0	369.1	83.16	4.78	None	"
10070	New London	355.7-397.4	379.3	80.20	4.68	Trace	"
10065	Norwich	370.5-422.8	385.0	82.22	4.83	"	"
10096	Norwalk	357.8-387.6	376.9	81.74	4.77	"	"
10098	"	376.5-402.5	391.4	83.96	5.11	"	"
10099	"	406.3-431.0	419.6	77.24	5.02	"	"
10136	Norwich	413.5-432.7	422.4	74.54	4.82	"	"
10015	Putnam	388.0-402.7	395.6	79.18	4.64	"	"
10017	"	391.0-454.2	435.0	63.08	4.15	"	"
10028	Rockville	366.3-399.2	379.2	83.62	4.86	None	"
9973	Shelton	419.0-443.7	436.6	73.40	4.95	Trace	"
10088	So. Norwalk	359.5-401.0	384.8	65.64	3.92	"	"
10089	"	368.5-398.9	384.0	82.10	4.91	"	"
10092	"	364.5-403.9	380.1	82.96	4.99	None	"
10080	Stamford	345.8-383.5	362.6	87.70	4.90	"	"
10084	"	391.3-441.9	411.6	77.78	4.98	"	"
10086	"	434.1-466.0	448.4	71.38	4.92	"	"
10003	Torrington	413.5-428.5	420.7	74.60	4.85	Trace	"
10004	"	346.7-379.0	365.2	86.82	4.94	"	"
10008	"	433.0-456.5	443.7	71.28	4.87	"	"
9954	Wallingford	425.5-444.0	434.2	75.22	5.01	Yes	"
9983	Waterbury	375.7-407.0	393.4	76.26	4.62	"	"
10020	Willimantic	422.0-450.7	433.0	73.68	4.88	Trace	"
10022	"	546.4-571.4	556.9	66.84	5.22	"	"
10025	"	361.3-391.1	382.2	80.70	4.77	"	"
10149	Winsted	450.6-487.3	457.6	69.00	4.89	"	"

* Material present, insoluble in dilute HCl (probably talc).

† Much calcium sulphate present.

SPIRIT OF CAMPHOR.

(Spiritus Camphorae.)

The U. S. Pharmacopoeia requires that spirit of camphor shall contain 100 grams of camphor in 1000 cc. of alcohol.

Forty-three samples from druggists were examined for the Dairy and Food Commissioner. Three contained abnormally high amounts of camphor, viz., 22.75, 16.56 and 15.00 per cent, respectively. Six samples were more than ten per cent deficient in camphor. The other 35 samples ranged from 9.00 to 11.33 per cent, with an average of 9.49 per cent.

The following is a summary of the results:—

6 samples from	6.3	to	8.6	per cent
17	"	"	9.0	to 9.5
10	"	"	9.51	to 10.0
8	"	"	10.01	to 11.3
3	"	"	over	15.0

The notably deficient samples were the following:—

No.	Sold by.	Alcohol by Volume. %	Camphor. %
9046	Pigeon Bros., Hartford	87.86	8.00
9935	J. H. Monroe, Guilford	88.14	7.75
9984	Picarelli Pharmacy, Waterbury	85.73	8.55
10008	J. H. Bezner, New Haven	88.80	6.33
10052	Alling's Drug Store, New Haven	72.33	7.12
10093	So. Norwalk	85.29	8.39

SYRUP OF FERROUS IODIDE.

(Syrupus Ferri Iodidi.)

The U. S. Pharmacopoeia defines this preparation as "a syrupy liquid containing about 5 per cent by weight of ferrous iodide, or about 6.74 gm. in 100 cc."

Among other requirements of the U. S. P. are that it is "a transparent pale green liquid," of "specific gravity, about 1.349 at 25° C., and that it shall contain no free iodine."

The twenty-nine samples examined for the Dairy and Food Commissioner contained from 3.58 to 6.96 per cent of ferrous iodide, or from 4.73 to 9.58 gms. per 100 cc. No free iodine was found in any sample. The color ranged from pale green through yellow to brown; in two samples there was turbidity and in one considerable sediment.

The specific gravity ranged from 1.2862 to 1.3763, the lower gravities indicating the use of insufficient sugar in preparing the syrups.

The following is a summary of the results as regards ferrous iodide:

2 samples contained from	3.5	to	4.0	per cent
2	"	"	4.1	to 4.3
13	"	"	4.5	to 5.0
12	"	"	over	5.0

Ignoring discrepancies as regards specific gravity and color, the following samples were notably deficient in ferrous iodide:

No.	Sold by.	Ferrous iodide. %
9968	West Side Pharmacy, Ansonia	3.79
10077	Finch's Pharmacy, Greenwich	4.30
10066	G. G. Engler, Norwich	4.10
10010	G. E. Dresser, Putnam	3.58

TABLE XXII:—SYRUP OF FERROUS IODIDE.*

No.	Place of Sale.	Spec. Grav. @ 25° C.	Ferrous Iodide.		Color.
			Per Cent.	Grams per 100 cc.	
9968	Ansonia	1.3307	3.79	5.04	Pale greenish
9941	Branford	1.3027	5.12	6.98	Greenish yellow
10117	Bridgeport	1.3293	4.61	6.13	Yellowish green
10032	Bristol	1.3226	4.51	5.96	Pale greenish
10125	Danbury	1.3443	4.61	6.20	Yellowish green
10013	Danielson	1.3206	4.61	6.09	"
10077	Greenwich	1.2899	4.30	5.55	Very pale green
9039	Hartford	1.3610	5.19	7.06	Yellowish green
9044	"	1.3300	5.07	6.74	Pale green
9811	"	1.3590	5.02	6.82	"
9958	Meriden	1.3577	4.71	6.39	Greenish yellow
10139	Middletown	1.3763	6.96	9.58	Greenish
10057	Mystic	1.3668	4.80	6.56	Pale green
9989	Naugatuck	1.3112	4.81	6.31	"
9951	New Haven	1.2862	4.61	5.93	"
9994	"	1.3760	5.32	7.32	"
10050	"	1.3435	4.51	6.06	Yellowish green
10063	New London	1.3360	5.22	6.97	Pale green
10097	Norwalk	1.3043	4.71	6.43	"
10066	Norwich	1.3220	4.10	5.42	" (sediment)
10010	Putnam	1.3203	3.58	4.73	Yellow
10016	"	1.3366	4.92	6.58	"
10029	Rockville	1.3466	4.51	6.06	Very pale green (turbid)
9975	Shelton	1.3517	4.92	6.65	Brown
10091	So. Norwalk	1.3333	5.02	6.69	Greenish yellow (turbid)
10087	Stamford	1.3430	5.63	7.56	Yellowish green
9979	Waterbury	1.3747	5.02	6.90	Pale greenish
10021	Willimantic	1.3486	5.12	6.90	"
10146	Winsted	1.3219	5.02	6.64	Yellowish green

* No free iodine in any sample.

TABLE XXXIII.—CHLORINATED LIME.

No.	Brand.	Weight.	Claimed.		Found.	Available Chlorine.	Pct. Cl. S. P.	Strength.
			Cl. S. P.	Cl. S. P.				
9939	Acme Chloride Lime, High Test.	A. Mendelson's Sons, Albany, N. Y.	.....	.....	5.0	5.3	119.0	119.0
10083	"	"	"	"	...	2.2	89.1	89.1
10119	*	"	"	"	2.7	27.46	91.5	91.5
9961	*	"	"	"	2.2	14.46	48.2	48.2
10007	*	"	"	"	2.1	24.21	80.7	80.7
10131a	*	"	"	"	4.1	0.02	0.1	0.1
10039	A. D. S. Pure Chloride Lime.	American Drug Syndicate, New York City	.....	.....	3.9	0.02	0.1	0.1
9977	"	"	"	"	2.7	0.23	0.8	0.8
9949	Black Diamond Pure Chloride of Lime.	Archibald & Lewis Co., New York City	.....	.....	2.7	0.26	0.9	0.9
9956	"	"	"	"	14.3	Trace	0.0	0.0
9974	"	"	"	"	14.3	14.6	111.7	110.3
10062	"	"	"	"	14.5	33.10	110.3	110.3
10140	*	"	"	"	7.24	24.1	23.3	23.3
10131b	*	"	"	"	14.9	7.00	72.9	72.9
					2.2	21.87	78.5	78.5
					2.6	23.56	72.5	72.5
					2.3	21.75	72.5	72.5
					2.3	22.07	73.6	73.6
					2.5	20.80	69.3	69.3
					2.4	21.21	70.7	70.7
					2.6	8.24	27.5	27.5
					2.5	8.02	26.7	26.7
					...	Trace	0.0	0.0
					...	Trace	0.0	0.0
					...	Trace	0.0	0.0

* Patent rotating cover for sifting purposes.

† "Technical use."

CHLORINATED LIME.

(Calx Chlorinata.)

Chlorinated lime, "bleaching powder," of the U. S. P., should contain "not less than 30 per cent of available chlorine. . . . It should be kept in well-closed vessels in a cool and dry place."

This product has a wide use in medicine, both for local application and for general use as a disinfectant. The U. S. Dispensatory recognizes its value in the following words, which it italicizes for emphasis: "For the destruction of disease germs in urine, fecal discharges, sputa, etc., a saturated solution of bleaching powder appears to be in all respects the best disinfectant known."

With this strong recommendation in mind, because of which and similar recommendations the laity put great dependence on the disinfecting powers of this material, it is obvious that it is most important that it shall contain the stipulated amount of its active ingredient. It is easily conceivable that most serious effects might follow the use of chlorinated lime of deficient strength, especially of products, like one-third of our samples, which contain only traces of available chlorine.

Chlorinated lime deteriorates quickly, especially in containers which are not tightly closed, so that when a deficient sample is found it is difficult to place the responsibility. The original material as it came from the manufacturer might be of inferior quality, the sample might represent stock kept too long on the druggists' shelves, or the deterioration might be due to an improper kind of container. Whatever the cause of the inferiority the consumer would have placed dependence on a product that could not secure the desired results. Nine of the samples were packed in cans with a patent rotating cover, which rendered the package far from air-tight. Doubtless this form of cover is used for the convenience of the consumer, but the manufacturer should know that, except when intended for immediate use, such a container causes speedy deterioration of the product. The druggist likewise should know that chlorinated lime packed in this way, and kept on his shelves for an indefinite time, must be inferior, and should not be dispensed.

Of the 25 samples examined for the Dairy and Food Commissioner, only 3 were of full strength, while 2 others were slightly

deficient; 7 samples were from 69 to 81 per cent U. S. P. strength, 5 from 23 to 48 per cent, and 8 contained only traces of available chlorine. The deficiencies were confined to no individual brand. Three samples of the *Acme* brand were of standard strength or passable, 1 was 81 per cent U. S. P., another 40 per cent, and 5 contained only traces of available chlorine; all but the first three were packed in cans with the patent covers. Two samples of the *A. D. S.* brand were of full strength; the other two were 23 and 24 per cent U. S. P.; although these last two were labeled "Technical Use" it is questionable whether such a widely used disinfectant as chlorinated lime, and one on which so much dependence is placed at critical times, should be sold of less than standard strength under any conditions whatever. None of the eleven samples of the *Black Diamond* brand was of full strength; 6 ranged from 69 to 79 per cent U. S. P., 2 were 27 and 28 per cent, while 3, with patent covers, contained only traces of available chlorine.

Surely the druggist owes it to the consumer to purchase this useful disinfectant only from reliable firms, who pack it in a way which tends to preserve its valuable properties; stock long kept on the shelf he should not dispense at all.

SOLUTION OF MAGNESIUM CITRATE.

(*Liquor Magnesii Citratis.*)

The U. S. P. formula for this much used preparation yields a product which contains, in 100 cc. of the solution, 1.60 gms. magnesium oxide, 0.33 gm. potassium oxide, 9.28 gms. total citric acid and 3.24 gms. free citric acid.

Sixty-three samples were analyzed for the Dairy and Food Commissioner. In nearly every case two bottles of the preparation from each druggist were analyzed in order to forestall any criticism based on the variability of the product. The samples showed a wide range in composition. They contained from 1.87 to 11.00 gms. total and from 0.60 to 6.02 gms. free citric acid per 100 cc., from 0.59 to 1.95 gms. magnesium oxide and from a trace to 0.41 gm. potassium oxide. All but five of the solutions were clear, these showing a slight turbidity. In 35 samples there was no sediment; in 25 the amount of sediment was slight, while in 3 it was considerable.

This solution is liable to deteriorate in appearance on keeping for even a short time, losing its clear, bright appearance, and a precipitate of potassium bicarbonate frequently settling out. Furthermore, from its composition it is a particularly favorable medium for bacterial and fungus growth. For these reasons, as directed in the U. S. P., "This preparation should be freshly made when wanted." Storage cannot reduce the magnesia and potash in it, but long keeping results in loss of acidity and carbonic acid gas, with an accompanying precipitation of potassium bicarbonate, which seriously affects its appearance, if not its efficiency.

Allowing a variation of ten per cent from the U. S. P. standard, that is, 8.35 total and 2.92 free citric acid, 1.44 magnesia and 0.30 gm. potash per 100 cc., the following table summarizes our analyses:

- 10 samples within 10 per cent U. S. P.
- 7 samples low in free citric acid.
- 2 samples low in magnesia.
- 11 samples low in total and free citric acid.
- 8 samples low in total citric acid and magnesia.
- 17 samples low in total and free citric acid and magnesia.
- 4 samples low in total and free citric acid and potash.
- 2 samples low in total citric acid, magnesia and potash.
- 2 samples low in all four ingredients.

That is, only 10 samples were entirely satisfactory, while 44 were deficient in total citric acid, 41 in free citric acid, 31 in magnesia and 8 in potash.

In certain instances a formula differing from that of the U. S. P. was given on the label, and in others the preparation was stated to be "Not U. S. P.," although the official name of the preparation was used; in 24 samples the word "effervesing" was used in the brand name, apparently redundantly. The statement on the label of the formula used, while possibly technically complying with the rather loose requirements of the law, is of little benefit to the consumer as he is generally in complete ignorance of what the correct formula should be.

Sample 10036, labeled "Effervesing Solution Aperient Magnesia blended with Lemon" was sold to the inspector on a request for "Solution of Magnesium Citrate." It contained magnesium sulphate (Epsom salt).

TABLE XXIV:—SOLUTION OF
(Grams per
100 cc.)

No.	Manufacturer.	Citric Acid.						Character of Sediment.
		Volume of Bottle, cc.	Total.	Free.	Magnesium Oxide.	Potassium Oxide.	Appearance of Solution.	
9993	Apothecaries Hall Co., Waterbury	335	4.06	1.26	0.71	0.35	Clear	None
10103	¹ Blanding & Blanding, Providence, R. I.	340	4.06	1.30	0.71	0.33	"	Considerable
10079	² The Boswell Drug Co., Greenwich	325	5.60	0.70	1.33	Trace	"	"
10102	Bronson & Pelcher Drug Co., New Haven	335	5.46	0.60	1.38	"	"	Slight
10014	³ Corey Klein Co., Worcester, Mass.	315	6.37	2.35	1.06	0.35	"	"
9937	Frank F. Dowden, Guilford	315	6.51	2.35	1.09	0.37	"	"
10122	A. Duka, Bridgeport	350	8.83	2.21	1.83	0.30	"	Slight
9943	Fair Haven Drug Shop, New Haven	345	8.61	2.03	1.86	0.31	"	"
10137	Lerou's Pharmacies, Norwich	350	7.35	3.85	1.01	0.30	"	None
10036	⁴ Madden's Drug Store, Bristol	360	4.20	1.40	0.81	0.37	"	"
10053	Morris Pharmacy, New Haven	315	9.88	3.19	1.95	0.30	"	Slight
9965	W. W. Mosher, West Meriden	315	7.70	1.93	1.54	0.24	"	"
10005	E. F. Nolan, Torrington	300	7.84	2.03	1.60	0.19	"	"
10134	J. A. Notkin, New Haven	335	6.65	4.02	0.72	0.29	"	None
10113	Park Pharmacy, Bridgeport	350	3.29	0.74	0.61	0.33	"	"
9982	Pharmacie Francaise, Waterbury	350	3.15	0.74	0.59	0.31	"	"
10069	Geo. M. Rathbone, Norwich	345	2.05	0.63	*0.95	0.31	"	"
10115	Riker Drug Store, Bridgeport	345	1.87	0.49	†0.96	0.31	"	Slight
10075	Riker & Hegeman Co., Hartford	370	7.91	4.76	0.78	0.30	Sl. turbid	Slight
9945	" " " New Haven	330	10.08	6.02	0.98	0.35	Clear	None
10085	" " " Stamford	325	4.20	0.80	0.88	0.37	"	"
9978	" " " Waterbury	335	5.95	0.77	0.90	0.36	"	"
		320	7.14	3.61	0.98	0.38	"	"
		320	7.56	3.82	0.99	0.38	"	"
		325	5.95	1.54	1.21	0.39	"	"
		320	6.09	1.65	1.18	0.32	"	"
		335	6.30	0.84	1.49	0.35	"	"
		330	5.39	0.67	1.37	0.37	"	Slight
		285	8.68	2.94	1.55	0.40	"	"
		320	9.11	3.33	1.61	0.36	"	None
		315	8.82	2.84	1.69	0.29	"	"
		330	8.96	2.94	1.67	0.24	"	Trace
		330	9.18	2.66	1.69	0.35	"	"
		350	9.04	2.73	1.70	0.33	"	None
		355	9.94	3.64	1.79	0.34	"	"
		350	10.16	3.71	1.87	0.34	"	"
		345	8.05	2.61	1.55	0.34	"	"
		345	9.76	2.55	1.56	0.36	"	Slight
		340	9.10	2.91	1.75	0.34	"	"
		345	9.25	2.94	1.78	0.34	"	"
		340	6.58	1.19	1.64	0.35	"	"
		330	6.72	1.12	1.68	0.37	"	"

¹ "Formula: magnesia carb. 12.2 grs., citric acid 24.6 grs., sodii bicarb. 3 grs., sugar 43 grs., oil lemon to flavor, distilled water to make one ounce."

² "Made of pure citric acid and carbonate of magnesia."

³ Not U. S. P. Each fluidounce contains alcohol 0.25%, benzoic acid 1-5 grs."

⁴ "Blended with lemon, contains sodium benzoate 1-10%."

MAGNESIUM CITRATE.

100 cc.)

Volume of Bottle, cc.	Citric Acid.		Magnesium Oxide.	Potassium Oxide.	Appearance of Solution.	Character of Sediment.
	Total.	Free.				
335	4.06	1.26	0.71	0.35	Clear	None
340	4.06	1.30	0.71	0.33	"	Considerable
325	5.60	0.70	1.33	Trace	"	"
335	5.46	0.60	1.38	"	"	Slight
335	6.37	2.35	1.06	0.35	"	"
315	6.51	2.35	1.09	0.37	"	"
350	8.83	2.21	1.83	0.30	"	"
345	8.61	2.03	1.86	0.31	"	"
350	7.35	3.85	1.01	0.30	"	None
360	4.20	1.40	0.81	0.37	"	"
315	9.88	3.19	1.95	0.30	"	Slight
315	7.70	1.93	1.54	0.24	"	"
300	7.84	2.03	1.60	0.19	"	"
335	6.65	4.02	0.72	0.29	"	None
350	3.29	0.74	0.61	0.33	"	"
350	3.15	0.74	0.59	0.31	"	"
345	2.05	0.63	*0.95	0.31	"	"
345	1.87	0.49	†0.96	0.31	"	"
370	7.91	4.76	0.78	0.30	Sl. turbid	Slight
330	10.08	6.02	0.98	0.35	Clear	None
325	4.20	0.80	0.88	0.37	"	"
335	5.95	0.77	0.90	0.36	"	"
320	7.14	3.61	0.98	0.38	"	"
320	7.56	3.82	0.99	0.38	"	"
325	5.95	1.54	1.21	0.39	"	"
320	6.09	1.65	1.18	0.32	"	"
335	6.30	0.84	1.49	0.35	"	"
330	5.39	0.67	1.37	0.37	"	Slight
285	8.68	2.94	1.55	0.40	"	"
320	9.11	3.33	1.61	0.36	"	"
315	8.82	2.84	1.69	0.29	"	None
330	8.96	2.94	1.67	0.24	"	"
330	9.18	2.66	1.69	0.35	"	Trace
350	9.04	2.73	1.70	0.33	"	"
355	9.94	3.64	1.79	0.34	"	None
350	10.16	3.71	1.87	0.34	"	"
345	8.05	2.61	1.55	0.34	"	"
345	9.76	2.55	1.56	0.36	"	Slight
340	9.10	2.91	1.75	0.34	"	"
345	9.25	2.94	1.78	0.34	"	"
340	6.58	1.19	1.64	0.35	"	"
330	6.72	1.12	1.68	0.37	"	"

* 1.30% SO₃; Epsom salt present.

† 1.54% SO₃; Epsom salt present.

TABLE XXIV:—SOLUTION OF
(Grams per

No.	Manufacturer.	100 cc.)					
		Citric Acid.		Magnesium Oxide.		Potassium Oxide.		Character of Sediment.
Volume of Bottle, cc.	Total.	Free.	Magnesium Oxide.	Potassium Oxide.	Appearance of Solution.		
10110	Ruell's Drug Store, Bridgeport	8.47	3.01	1.47	0.34	Clear	None
10061	Sayle's Prescription Pharmacy, New London	9.11	3.12	1.53	0.33	"	"
10142	The Sisson Drug Co., Hartford	7.84	2.03	1.60	0.37	Sl. turbid	Slight
10030	" " " "	7.84	1.93	1.61	0.37	Clear	None
10126	D. F. Stevens, Danbury	7.35	3.50	1.10	0.31	"	"
10090	Stillson-Powell Corporation, So. Norwalk	7.56	3.50	1.09	0.33	"	"
10001	^a The Talcott Co., Hartford. (Wegman Brand.)	7.42	3.43	1.06	0.31	"	"
9048	G. H. Talcott & Co., Hartford. (Wegman Brand.)	7.77	3.50	1.07	0.32	"	"
9969	Edward T. Vance, Ansonia	8.62	1.79	1.83	0.41	"	"
9962	^b Whitman Chemical Co., Boston	8.06	1.68	1.79	0.48	"	"
9948	Wooster Pharmacy, New Haven	9.53	3.08	1.77	0.33	"	Slight
		9.46	3.01	1.80	0.34	"	"
		6.27	1.68	1.22	0.33	"	None
		6.16	1.72	1.23	0.33	"	"
		6.34	1.85	1.20	0.35	"	Slight
		8.33	2.06	1.60	0.38	Sl. turbid	Considerable
		8.47	2.80	1.68	0.31	Clear	None
		8.12	3.59	1.31	0.38	"	Slight
		11.00	3.99	1.26	0.31	"	None
		7.56	1.82	1.59	0.32	"	"
		8.96	1.76	1.56	0.34	"	Slight

The station also inspected this preparation in 1912, when only 4 of 24 samples were of satisfactory quality. This year's inspection shows practically no improvement over the first inspection, and suggests that the leniency then shown the offending druggists was ill advised. The results indicate that as a rule this solution is very carelessly prepared by druggists, especially with respect to the citric acid and magnesia, and that in a number of instances the druggists dispense stock not freshly prepared as is required by the U. S. P. The duplicate samples, representing purchases made at the same time, in many cases further emphasize this carelessness and disregard of pharmacopoeial requirements.

The solution is supposed to be dispensed in 12 oz. (360 cc.)

^a"12 fluidounces containing magnesia carb. 180 grs., citric acid 400 grs., syrup 2 oz., extract lemon, bicarb. potash, water."

^b"Not U. S. P."

MAGNESIUM CITRATE.

100 cc.)

Volume of Bottle, cc.	Total.	Free.	Magnesium Oxide.	Potassium Oxide.	Appearance of Solution.	Character of Sediment.
325	8.47	3.01	1.47	0.34	Clear	None
345	9.11	3.12	1.53	0.33	"	"
325	7.84	2.03	1.60	0.37	Sl. turbid	Slight
325	7.84	1.93	1.61	0.37	Clear	None
375	7.35	3.50	1.10	0.31	"	"
350	7.56	3.50	1.09	0.33	"	"
350	7.42	3.43	1.06	0.31	"	"
350	7.77	3.50	1.07	0.32	"	"
315	8.62	1.79	1.83	0.41	"	"
325	8.06	1.68	1.79	0.48	"	"
360	9.53	3.08	1.77	0.33	"	Slight
355	9.46	3.01	1.80	0.34	"	"
355	6.27	1.68	1.22	0.33	"	None
360	6.16	1.72	1.23	0.33	"	"
...	6.34	1.85	1.20	0.35	"	Slight
325	8.33	2.06	1.60	0.38	Sl. turbid	Considerable
370	8.47	2.80	1.68	0.31	Clear	None
360	8.12	3.59	1.31	0.38	"	Slight
345	11.00	3.99	1.26	0.31	"	None
365	7.56	1.82	1.59	0.32	"	"
365	8.96	1.76	1.56	0.34	"	Slight

portions, which amount constitutes the official dose. The quantity dispensed by our druggists ranged from 285 to 370 cc., or from 9.5 to 12.2 oz. Nine samples equaled or exceeded the required amount, 20 were less than one-half ounce short, 14 were short from one-half to one ounce, 17 from one to one and one-half ounces, and 2 from two to two and one-half ounces.

MERCURY OINTMENTS.

The mercury ointments of the U. S. P. are often liable to be confused. Although our inspector was instructed to purchase "Mercurial Ointment," which is the official name of the strong ointment, this product was supplied to him in no instance. Two druggists sold products labeled "Mercurial Ointment" which

were in reality "Blue Ointment"; while five druggists supplied "Ointment Ammoniated Mercury," the latter, however, being properly labeled.

The necessity for both the strong and dilute ointments has often been questioned. At any rate confusion certainly exists in the minds of many druggists as to the true significance of the names of the three mercury ointments carrying approximately 50, 33.5 and 10 per cent of the metal.

The first two samples in our table are of full strength for "Blue Ointment," but they were sold and labeled as "Mercurial Ointment," and must therefore be considered as substandard. The five samples labeled "Ointment Ammoniated Mercury" more than satisfied the requirement of 10 per cent of metallic mercury.

Mercury ointments are of course dangerous poisons, and yet only three of the seven samples bore a poison label. The sellers of samples 9041, 9944, 9964 and 9980 gave the purchaser no warning as to the poisonous nature of the product. This carelessness on the part of certain druggists in dispensing poisons we have repeatedly noted in former reports.

TABLE XXV:—MERCURY OINTMENT.

No.	Dealer.	Metallic Mercury.	Per Cent U. S. P. Strength.
9041	Sold as "Mercurial Ointment." S. J. Rickman, Hartford	33.67	68.7
9047	*Stoughton Pharmacies, Hartford	33.20	67.8
9944	Sold as "Ointment Ammoniated Mercury." Fair Haven Drug Shop, New Haven	10.69	106.9
9964	Meriden House Drug Store, Meriden	10.15	101.5
9980	Waterbury	10.41	104.1
9999	Colburn's York Pharmacy, New Haven	10.37	103.7
10067	Lee & Osgood, Norwich	10.37	103.7

* "Merck's U. S. P., 33½%" written on the label.

MINERAL OIL.

(*Liquid Petrolatum.*)

The U. S. P. VIII defines this product as

"A mixture of hydrocarbons, chiefly of the methane series, obtained by distilling off most of the lighter and more volatile portions from petroleum, and purifying the liquid residue."

"A colorless, or very slightly yellowish, oily, transparent liquid, without odor or taste, but giving off, when heated, a faint odor of petroleum."

"Sp. gr. about 0.870 to 0.940 @ 25° C."

According to the proofs of the U. S. P. IX, the definition and gravity of this product are to be changed as follows (*Jour. Amer. Pharm. Assoc.*, 2, 1913, 1400):

"A transparent liquid, free from fluorescence, without odor or taste, and giving off when heated not more than a faint odor of petroleum. Spec. grav. 0.845 to 0.940."

The new definition is more stringent as regards color and fluorescence and more lenient respecting gravity.

Liquid Petrolatum as an internal remedy dates back to 1872, and at that time it was exploited "as a cure for coughs, colds, consumption, and a number of other diseases and conditions." It is now known that it is not absorbed from the alimentary tract, and therefore has no food value and has no value as a remedy for consumption and similar wasting diseases.

The chief uses of this product at present are externally as a vehicle for oil sprays and as a base for ointments and salves, and internally for the treatment of constipation (intestinal stasis). As far as is known it exerts no deleterious effect even when used internally.

During the last few years especial attention has been drawn to the product as a remedy for chronic constipation, its value for this purpose having been demonstrated by Lane and Carrel. These authorities cautioned, however, especially against the lighter oils used in spraying mixtures.

Liquid Petrolatum of the highest quality in the past has been produced almost exclusively in Russia. The great European war, however, has closed that source of supply, and most of the product now on the market is of American origin. Usually the American product has not been so free from color and fluores-

cence as that produced in Russia, and generally is of lower gravity.

Because of the unsettled trade conditions, and because of the suggested changes in the new Pharmacopoeia, the product now sold in this country should be judged with some leniency. Nevertheless, the sale of American as Russian oil is dishonest.

Of the 50 samples examined by us, all of which were purchased in October and November, 1915, 14 were sold under proprietary names, 8 were sold as Russian oil, and 28 were sold without any suggestion as to their origin, and were presumably American oils.

A description of the proprietary samples follows:—

5503. *Liquid Albolene*, McKesson & Robbins, New York. "A Pure Paraffin Oil Refined for Medicinal Use." Price 60 cents for 15.2 fl. oz.

6791. *Blamcoline (Liquid)*, Lehn & Fink, New York. "Refined Mineral Oil." Price one dollar for 15.5 fl. oz.

6768. *Calol Liquid Petrolatum Heavy*, Standard Oil Co. (Cal.), San Francisco, Cal. "A pure, heavy, hydrocarbon oil." Price 57 cents for 15.7 fl. oz.

6781. *Colonol Paraffin Oil, Russian Mineral Oil*, Hindle's Drug Stores, Bridgeport. "A pure white hydrocarbon oil of the proper sp. gr. for internal administration." Price 40 cents for 7.6 fl. oz.

5525. *Glymol*, Angier Chemical Co., Boston, Mass. "An Unalterable Hydro-Carbon Oil." Price (wholesale) 40 cents for 16.4 fl. oz.

6767 and 5505. *Interol*, Van Horn & Sawtell, New York. "A particularly fine quality of mineral oil." Price 75 cents for 15.8 and 15.6 fl. oz.

6762. *Moovie Oil*, The Lee & Osgood Co., Norwich, Conn. Price 50 cents for 15.7 fl. oz.

5493. *Nujol*, Standard Oil Co., (N. J.), Bayonne, N. J. "A Pure White Mineral Oil." Price 68 cents for 15.0 fl. oz.

5511. *Solox Mineral Oil*, Solox Chemical Co., New York. "A First Quality American Hydrocarbon Mineral Oil." Price 60 cents for 13.4 fl. oz.

5514. *Terraline, Petrolatum Purificatum Plain*, The Hillside Chemical Co., Newburgh, N. Y. "Indicated in Phthisis, Coughs, Colds, Asthma, La Grippe, Hoarseness and all diseases of the Throat and Lungs, and for General Debility. Free from taste and odor and easily digested. Preferable to Cod Liver Oil." Price 75 cents for 10.5 fl. oz.

5504. *Usoline Oil*, Oil Products Co., New York. "The Original Russian White Mineral Oil." Price 37 cents for 15.0 fl. oz.

5496. *White Liquid Vaseline*, Chesbrough Mfg. Co., New York. "A Pure Hydrocarbon Mineral Oil." Price 25 cents for 4 fl. oz.

6792. *White Mineral Oil*, Eimer & Amend, New York. Price one dollar for 15.3 fl. oz.

TABLE XXVI.—MINERAL OIL (LIQUID PETROLATUM).

Station No.	Brand, or Place of Purchase.	Spec. Grav. @ 25° C.	Color.	Fluorescence.	Sulphuric Acid Test.	
					Color.	Transparency.
<i>Proprietary Preparations.</i>						
5503	Albolene, Liquid	0.834	None	Slight	Straw	Yes
6791	Blancoline, Liquid	0.855	Straw	None	Black	No
6768	Calol	0.888	None	"	Slight	Yes
6781	Colonol	0.853	"	Strong	Black	No
5525	Glymol	0.860	"	Yes	Light brown	Yes
6767	Interol	0.846	¹ "	None	Slight	"
5505	"	0.847	"	"	Yellow	"
6762	Moovie Oil	0.847	"	"	Straw	"
5493	Nujol	0.846	"	"	Brown	"
5511	Solox	0.849	"	Slight	Dark brown	No
5514	Terraline	0.876	Brown	?	Black	Yes
5504	Usoline	0.850	None	Slight	Brown	No
5496	White Liquid Vaseline	0.852	"	Yes	Black	Yes
6792	White Mineral Oil	0.849	"	None	Dark brown	Yes
<i>Sold as Russian Mineral Oil.</i>						
6780	Bridgeport	0.880	Yellowish	Slight	Light brown	Yes
5521	Hartford	0.876	None	None	Yellow	"
5523	New Britain	0.849	"	Slight	Brown	"
5507	New Haven	0.858	"	Yes	"	"
6790	New London	0.850	² "	None	Light brown	"
6782	Stamford	0.875	"	Slight	Dark brown	"
6771	Waterbury	0.877	"	None	Yellow	"
6772	"	0.864	"	Slight	Black	No
<i>Sold as Mineral Oil.</i>						
6775	Bridgeport	0.836	"	None	None	Yes
6776	"	0.837	"	None	"	"
6777	"	0.862	Yellowish	Slight	Brown	"
6778	"	0.836	None	None	Yellow	"
6779	"	0.849	"	"	"	"
5516	Hartford	0.853	"	Yes	Black	No
5517	"	0.860	Yellowish	³ None	Yellow	Yes
5518	"	0.848	"	"	"	"
5519	"	0.851	None	Yes	Black	No
5520	"	0.853	"	"	"	"
5522	New Britain	0.882	⁴ "	Slight	Brown	Yes
5524	"	0.850	"	None	Yellow	"
5495	New Haven	0.847	"	"	None	"
5506	"	0.846	"	"	"	"
5508	"	0.850	"	Yes	Yellow	"
5512	"	0.836	"	None	None	"
5513	"	0.840	⁵ Yellow	"	"	"
6788	New London	0.864	None	Yes	Black	No
6789	"	0.845	"	None	Light brown	Yes
6763	Norwich	0.847	"	None	"	"
6764	"	0.850	"	Yes	Brown	"
6765	"	0.854	"	"	Black	No
6783	Stamford	0.850	"	"	"	"
6784	"	0.849	"	Slight	"	"
6769	Waterbury	0.864	⁶ "	Yes	"	"
6770	"	0.851	"	"	"	"
6773	"	0.834	"	None	None	Yes
6774	"	0.851	"	Slight	Brown	"

¹ Contained considerable sediment.

² Contained some water.
³ Phenolic odor and taste.

⁴ Nutty odor and taste.
⁵ Contained water and dirt.
⁶ Kerosene odor and taste.

The proposed gravity limits of the U. S. P. IX, 0.845 to 0.940, are so wide as to include practically all available paraffin oils without regard to their origin. The average specific gravity of our 50 samples was 0.853, ranging from 0.834 to 0.888. Six of the samples were lower than the new U. S. P. minimum. None of the oils approaches the maximum limit of the U. S. P. The ten samples sold as Russian oil ranged from 0.850 to 0.880, average 0.863, compared with the others ranging from 0.834 to 0.888, average 0.851.

None of the samples was acid to litmus, none gave a precipitate with sulphuric acid after saponification, and none gave acrid vapors or appreciable residue when heated on platinum foil. Except in the three cases noted in the table the samples were odorless and tasteless; 5517 had a distinct phenolic taste and odor. All the samples were colorless except six, which ranged from a light yellow to brown; 5514 was of a deep brown color and totally unlike any of the other samples in appearance. Strong fluorescence was shown by 14 samples, slight by 11 and none by 25. In the test for readily carbonizable organic impurities 14 samples exceeded "a deeper tint than brown."

Only 15 of the 50 samples complied with the U. S. P. standard in all respects.

The samples bought in bulk were uniformly of a volume of 4 oz., and cost from 15 to 35 cents, with an average of 23.4 cents. The proprietary preparations, usually sold in short-pint bottles, cost from 37 cents to one dollar, average 69 cents, for 15.4 oz. Even making allowance for the relatively lower price of larger sized samples, the unusual result is shown of the proprietary preparations being on the whole rather cheaper than the drugists' samples, which made no claims for special excellence. The fact remains, however, that the proprietary samples ranged in price from 37 cents to one dollar for practically the same amount, certainly a wide range in price.

5493, *Nujol*, and 5504, *Usoline*, contained only 15 fl. oz., 16 being claimed.

THERAPEUTIC CLAIMS.

The therapeutic claims made for the proprietary preparations are just except in the case of *Terraline*. On the label of this brand we are told that it is "Indicated in Phthisis, Coughs, Colds,

Asthma, La Grippe, Hoarseness and all diseases of the Throat and Lungs, and for General Debility," and that it is "Preferable to Cod Liver Oil." The claims as to phthisis, general debility, etc., are false and dangerous and worthy only of a disreputable "patent" medicine. Cod liver oil is a valuable nutrient, *Terraline* has no nutrient value whatever.

PROPRIETARY MEDICINES.

The work reported last year with this class of preparations aroused so much interest and there has been such a demand for our 1914 report that the investigation was continued this year, our attention, as before, being directed chiefly towards medicines widely advertised in the newspapers of this state.

A special study was made of phenolphthalein preparations. The usefulness of this drug as a laxative, and in general its harmlessness, have given it a wide popularity in recent years. In consequence we find on the market a large number of preparations, in which phenolphthalein is the chief active ingredient, sold under fanciful names at greatly increased prices. The greatly advanced price of this drug noted at the present time has no relation to our samples, as most of them were purchased in October, 1914, too early for the market to feel the effect of the European war.

From the standpoint of composition the proprietary remedies show considerable improvement, that is, the presence of dangerous and habit-forming drugs (other than alcohol) is becoming less frequent. Of the 49 samples examined this year only 10 contained dangerous drugs other than alcohol:—

1 acetanilide	1 fusel oil
1 acephenetidine	3 lead acetate
1 arsenic	1 silver nitrate
1 bromides	1 strychnine

The claims on the labels and in the literature accompanying the medicines, though far from perfect, likewise show an improvement. This is largely due to the Sherley amendment of the Federal Food and Drug Act which prohibits false and fraudulent therapeutic claims. The newspaper advertising of many of these preparations, however, is still viciously bad. That

the day of honest advertising is fast approaching is obvious to any close observer, and no agency is hastening that day so much as the false and dangerous advertisements of patent nostrums.

A classified list of the brands examined follows:—

<i>Colds</i>	Phenaloin Tablets
Grove's Laxative Bromo-Quinine	Rexall Orderlies
Hill's Cascara-Bromide-Quinine	Veracolate
<i>Hair and Scalp</i>	Problin
Am-O-Tone	Laxaphen
Barbo Compound	<i>Stomach and Bowels</i>
Cactico Hair Tonic	Adler-i-ka
Farr's Gray Hair Restorer	Bad-Em Salz
Hay's Hair Health	Bisurated Magnesia
Q-Ban Hair Color Restorer	Caldwell's Syrup Pepsin
<i>Obesity</i>	Mother Gray's Sweet Powders for Children
Fatoff	Regulin
Louisenbad Reduction Salt	<i>Tonics</i>
Oil of Korein Capsules	Cuticura Resolvent
<i>Rheumatism and Kidneys</i>	Manola
Neutronne Prescription 99	Vin Mariani
Solvax	Wincarnis
Toris Compound	<i>Miscellaneous</i>
Uricsol	Cutex
Var-ne-sis	En-Ar-Co Oil
<i>Skin and Complexion</i>	Gets-It
Clearola	Miles' Restorative Nervine
Flowers of Oxzoin	Modene
Gloriol Glowene	Mu-Col
Rose-Kayloin	Musterole
<i>Phenolphthalein Preparations</i>	Odo-Ro-No
Phenolax Wafers	Optona
Purgen	Mosso's Oil of Salt
Partola	
Prunoids	

REMEDIES FOR COLDS.

GROVE'S LAXATIVE BROMO-QUININE.

4534. *Laxative Bromo-Quinine* (E. W. Grove, Inventor), Paris Medicine Co., St. Louis, Mo. "Each tablet contains 2 grs. phenacetine." Price 19 cents for 24 tablets weighing 104.8 grs.

Grayish-brown tablets with the odor of aloes on powdering, and with a bitter, pungent taste.

REMEDIES FOR COLDS.

Alcohol-soluble matter	75.64	Starch	21.60
Acetphenetidine	46.90	Aloes, resins	present
Caffeine	4.02	Carbonates	small amount
Cinchona alkaloids, anhydr.	8.78		
Ash	6.13	Chlorides, sulphates, phosphates, lime, magnesia, iron, alumina	traces
Ash, insol. in HCl	4.43		
Potassium oxide	0.48		
Sodium oxide	0.52	Phenolphthalein	none
Bromine	0.46		

The active ingredients of the tablets are acetphenetidine, aloes, cinchona alkaloids, caffeine and bromides, each tablet containing about 2.1 grs. acetphenetidine (phenacetine), 0.18 gr. caffeine, 0.4 gr. cinchona alkaloids, and 0.03 gr. bromide calculated as potassium bromide, with aloes.

In the company's circular the claim is made that *Laxative Bromo-Quinine* "relieves a cold in the head in the shortest possible time." In the newspaper advertising, where the honesty of therapeutic claims is not required by law, we are told that "it cures a cold in one day."

HILL'S CASCARA-BROMIDE-QUININE.

4513. *Hill's Cascara-Bromide-Quinine*, W. H. Hill Co., Detroit, Mich. "1.5 grs. acetanilide to a tablet." Price 25 cents for 25 tablets weighing 123.5 grs.

Yellow-brown tablets with a bitter taste.

Alcohol-soluble matter	42.03	Potassium oxide	1.93
Acetanilide	28.32	Sodium oxide	0.32
Cinchona alkaloids, anhydr.	3.60	Magnesium oxide	0.28
Ash	19.85	Bromine	0.82
Ash, insol. in HCl	2.66	Starch	27.72
Calcium oxide	5.34	Cascara, resins	present
Sulphuric anhydride	7.70	Caffeine, phenolphthalein ..	none

The active ingredients of the tablets are acetanilide, cascara, bromides and cinchona alkaloids, each tablet containing about 1.4 grs. acetanilide, 0.20 gr. cinchona alkaloids, and 0.06 gr. bromides, calculated as potassium bromide, with cascara. Calcium sulphate, starch and talc are used as excipients.

In the company's literature the claim is made "will relieve a cold in 24 hours." In the newspaper advertisements, where at present truth is not required by law, the claim becomes more blatant, and we read: "Cures a cold in 24 hours, cures la-grippe

in three days." "Entirely harmless." "Contains no poisonous chemicals." "Always cures." Each of these claims is false.

REMEDIES FOR THE HAIR AND SCALP.

AM-O-TONE.

4711. *Am-O-Tone*, Dry Shampoo, The Am-O-Tone Co., Windsor, Can. Price 67 cents for 3.74 oz.

A cream-colored, perfumed powder.

Loss @ 100° C.	19.77	Acid-insol.-matter (talc) ..	7.20
Boric acid	59.90	Sodium	present
Starch	3.55	Perfume	present

The material consists of about 90 per cent crystalline borax, 7 per cent talc and 3.5 per cent starch.

A quarter-pound of borax can be bought almost anywhere for 2 or 3 cents, one-twentieth to one-thirtieth the price asked for it when sold under the proprietary name of *Am-O-Tone*.

BARBO COMPOUND.

4524. *Barbo Compound*, for Making a Hair Remedy, Barbo Mfg. Co., Kansas City, Mo. "Gradually darkens faded gray hair." "For external use only." Price 50 cents for 5.75 gms.

A pale-yellow powder without a pronounced odor.

Loss @ 100° C.	1.43	Calcium oxide	10.45
Free sulphur	22.68	Chlorine	14.84
Lead	14.56	Acetates	present
Sulphuric anhydride	12.93	Potassium oxide	none
Sodium oxide	14.77		

The hypothetical composition of the compound, based on the above analytical data, is approximately 23 per cent anhydrous lead acetate, 23 sulphur, 23 sodium sulphate (Glauber's salt), 21 calcium chloride, 3 sodium chloride and 7 per cent water and undetermined. This analysis agrees with those made by the Indiana and North Dakota departments as to ingredients but not as regards proportions. Evidently the mixture is carelessly compounded. The constituent of *Barbo Compound* which gives it the power to darken gray hair is lead acetate, a well-known poison, and dangerous to use.

Appeals to the vanity of women on the part of nostrum manufacturers are common; such appeals as the following, addressed to men, are less frequent:

"The wisdom of concealing gray hair is of no less importance to the man, because anything that robs man of the appearance of youthful vigor is a menace to his success in the business world. With few exceptions none of the big industrial corporations will employ a man for an important position whose hair is tinged with gray. The bid of the commercial world is for youth, because it indicates vigor of mind and body, and the presence of gray hair is a sign that youth is fading and age gaining its mastery."

The person who wishes to ruin his hair can hardly adopt a more certain means of doing so than to use a preparation containing lead acetate.

CACTICO HAIR TONIC.

5515. *Cactico Hair Tonic*, Mrs. Gervaise Graham, Chicago, Ill. "Alcohol 6%." "Promotes the Growth of Hair." Price one dollar for 6.7 oz.

A yellowish liquid with the odor of oil of rose.

Spec. grav. @ 15.6° C.	1.0123
Alcohol by volume	5.50
Non-volatile solids	6.65 gms. per 100 cc.
Glycerine	6.09 " " "
Ash	0.25 " " "
Boric acid	0.33 " " "
Capsicum, oil of rose	present
Sodium, boron	present
Alkaloids	sl. trace
Salicylates, resorcin, cantharidine, quinine, pilocarpine	none

This tonic is simply a dilute alcohol-glycerine-water solution of borax, containing a little capsicum and oil of rose. The solids, other than glycerine, amount to only 0.56 gm. per 100 cc. and most of that is ordinary borax.

Mrs. Graham's confidence in the efficiency of a small amount of borax and a trace of capsicum is shown in the following:

"For many years I have had my Hair Tonic on the market with excellent results, and I am prepared, after various experiments, to say that a more potent hair tonic, in my opinion, does not exist. I have in Cactico Hair Tonic a tested compound that will stimulate the growth of hair on any scalp where the hair follicles are not dead."

As the cause of baldness is the death of the hair follicles, the speciousness of the above claim is apparent.

On February 25, 1909, a consignment of *Cactico Hair Grower* (now renamed *Cactico Hair Tonic*), having been seized by the U. S. Government on the charge of misbranding because of such false claims as "will produce hair on bald heads," and "stops falling of the hair," Mrs. Graham entered a plea of guilty and was fined \$50 and costs (Not. of Judg. 715).

FARR'S GRAY HAIR RESTORER.

4526. *Farr's Gray Hair Restorer*, No. 1, The Brookline Chemical Co., Boston, Mass. "Contains no lead or sulphur," "Absolutely harmless," "Free from sediment." Price one dollar per 6 fl. oz.

A colorless solution with an ammoniacal odor.

It contained 0.518 gm. of metallic silver, equivalent to 0.816 gm. of silver nitrate, per 100 cc.; 0.369 gm. of ammonia and 0.87 gm. of solids per 100 cc. It contained no lead, sulphur, mercury, glycerine, alcohol, resorcin, pilocarpine, salicylic acid or boric acid.

The material is a dilute ammoniacal solution of silver nitrate. The silver nitrate of course acts as a dye, the silver being reduced on contact with the organic matter of the hair. It would seem that such a powerful caustic must be injurious to the hair, and yet we are assured by the manufactuer that the preparation is "absolutely harmless."

HAY'S HAIR HEALTH.

4525. *Hay's Hair Health*, Philo Hay Specialties Co., Newark, N. J. "For external use only." Price 50 cents for 3.3 fl. oz.

A colorless liquid, containing a yellow precipitate, and with the odor of oil of bay.

Glycerine	9.23	Alcohol, resorcin, pilocarpine
Free sulphur	1.80	pine, salicylic acid, boric acid
Lead acetate	1.78	..... none
Organic matter (possibly sage)	0.10	

This is simply one of the familiar glycerine-water solutions of lead acetate, with considerable free sulphur. The use of any preparation, even externally, containing such a dangerous poison as lead acetate is unsafe.

Q-BAN HAIR COLOR RESTORER.

5510. *Q-Ban Hair Color Restorer*, Hessig-Ellis Drug Co., Memphis, Tenn. "10% alcohol." "A Hair Dressing producing Soft Luxuriant Hair." Price 50 cents for 6 fl. oz.

A whitish-yellow liquid, with considerable sediment, and with the odor of oil of rose geranium.

Alcohol by volume	10.46
Solids	16.39 gms. per 100 cc.
Glycerine	11.56 " " "
Free sulphur	3.08 " " "
Lead oxide	0.99 " " "
= lead acetate	1.68 " " "
Acetates	present
Oil of rose geranium.....	present
Salicylates, resorcin, alkaloids	none

This is a perfumed alcohol-glycerine solution of 1.68 gms. per 100 cc. of lead acetate, containing 3.08 gms. of free sulphur in suspension. It is simply one of the many familiar lead acetate-sulphur preparations, and its use is by no means free from danger.

The company's specific claim that it "produces soft luxuriant hair" is considerably weakened by the following reservation also quoted from its literature:

"If you follow directions and the treatment that we recommend, it will in some cases recover the bald spots. This we do not positively assert or guarantee, but that it will restore the color we do guarantee."

REMEDIES FOR OBESITY.

FATOFF.

4698. *Fatoff Obesity Cream*, M. S. Borden Co., New York. Advertised price on the label \$1.50; our sample was secured at a cut-rate drug store for 79 cents, the sample weighing 8.82 oz.

A whitish-yellow semisolid mass, with the odor of oil of bitter almonds or nitrobenzol.

Loss @ 100° C.	86.75
Non-volatile solids	13.25
Ash	2.79
Sodium oxide	1.66
Free alkali (in 10 gms.) =	0.2 cc. N/50 acid

Solids sol. in abs. alcohol	13.14
Solids insol. in abs. alcohol	0.11
Nitrobenzol	present
Ether extract	none

The preparation is simply a sodium soap, containing about 86.75 per cent water, with a small amount of nitrobenzol, and with a slightly alkaline reaction.

The label claims that

"Fatoff Cream tends to remove fat from any part of the body, invigorates the system and improves the circulation." "A preparation which tends to dissolve fat. A purely hygienic compound of superlative excellence, which contains nothing harmful or poisonous." "This is the only application known to man, by which in a few weeks a large abdomen or any part of the body afflicted with fat may be reduced to a normal size." "One of the charms of the cure is the possibility of removing fat from any part of the body you desire without affecting the adjacent portions. You can take away the double chin, reduce an enlarged waist or over-prominent abdomen or bust, the unsightly lump on the back of the neck, or any portions where an overabundance of flesh has settled, without detracting from the other parts which are just about right." "While using *Fatoff* no drugs, no dieting, nor exercise is necessary."

With the above analysis in mind comment on these claims is superfluous.

The sample analyzed was marked one pint, or $1\frac{1}{4}$ lbs.; it actually weighed slightly over one-half pound. The price stated on the carton was \$1.50, but as noted above we bought it for 79 cents, even that being a fairly remunerative price for 1.16 oz. of dry soap.

LOUISENBAD REDUCTION SALT.

4699. *Louisenbad Reduction Salt*, Karl Landshut, Importer, Chicago, Ill. Price one dollar for 14.6 oz.

An odorless, white, crystalline product.

Loss @ 100° C.	0.10	Potassium oxide	17.85
Chlorine	19.93	Sulphuric anhydride	34.18
Sodium oxide	31.84		

That is, it contains 60.70 per cent anhydrous sodium sulphate (Glauber's salt), 10.59 per cent sodium chloride (common salt), and 28.44 per cent potassium chloride. That a combination of these well-known salts used in the bath would be in any way effec-

tive as a remedy for obesity taxes one's credulity to the limit. If these salts did possess the qualities claimed for them any druggist could supply equivalent amounts for about five cents instead of the dollar charged by this manufacturer.

And yet the following claims are made for the compound:

"Reduces fat without medicine, drugs or exercising. You need not be fat; you need not dose with drugs (which are liable to throw your digestion out of order); you need not starve yourself; you need not consume valuable time and tire yourself with the exertion and monotony of physical exercises; you need not inconvenience yourself in any way, only use *Louisenbad Reduction Salt* (for the bath)."

OIL OF KOREIN CAPSULES.

10733. *Oil of Korein Capsules*, Korein Company, Binghamton, N. Y. "Highly recommended . . . for the Safe and Speedy Reduction of Superfluous Fat." Price one dollar for 40 capsules weighing 18.56 gms., or 7.16 grs. per capsule.

Gelatin capsules colored red, containing a pale yellow oil with the odor of sassafras and with an aromatic taste. Average weight of capsules 7.16 grs., weight of covering 3.50 grs., weight of contents 3.66 grs., volume of contents from 0.25 to 0.30 cc.

The spec. grav. of the oil was 0.959 @ 20° C., the oil being partly soluble in 95 per cent and in absolute alcohol. It was optically active, 0.2851 gm. dissolved in 20 cc. of absolute alcohol giving a rotation of +0.2° V. in a 200 mm. tube. The portion insoluble in alcohol was not saponified by alcoholic potash. Heated on platinum foil the oil ignited without appreciable residue. No iodine was present and there was no coloration with ferric chloride. Loss @ 100° C. 39.61 per cent. The non-volatile residue had a refractive index @ 20° of 1.4732, and was not saponified by alcoholic potash; it was unaffected by acetic acid anhydride. Concentrated nitric acid gave a color with the original oil followed by the formation of a resinous compound, and the separation of unchanged oil. Concentrated sulphuric acid containing sulphuric anhydride destroyed the oil partially, leaving a clear, unchanged residue.

The above data point to the conclusion that the preparation is a combination of a volatile oil and a non-volatile hydrocarbon oil. The volatile oil is largely or wholly oil of sassafras, recognized by its strong odor and aromatic taste, optical activity, volatility, reaction with nitric acid and its alcohol solubility. The non-volatile oil is a hydrocarbon oil of the nature of paraffin

oil, recognized by its stability towards reagents, its index of refraction, and its alcohol insolubility. The mixture, therefore, essentially consists of about 40 per cent of oil of sassafras and 60 per cent of paraffin oil.

The prescribed dose is 4 capsules per day, yielding about 1 cc. of total oil, or 0.6 cc. of paraffin oil. The usual dose of paraffin oil is 4 cc., and some patients require as much as 60 cc. It is apparent, therefore, that the daily dosage supplied by *Oil of Korein Capsules* is only one-seventh of the minimum official dose, scarcely enough to have any effect whatever. The 40 capsules contain 24 cc. of paraffin oil, for which a price of one dollar is asked, whereas paraffin oil (liquid petrolatum) can be purchased at drug stores under its own name for 15 to 25 cents per 4 oz. (120 cc.), or for one-twentieth to one-thirtieth the price.

REMEDIES FOR RHEUMATISM AND KIDNEY DISEASES.

NEUTRONE PRESCRIPTION 99.

4692. *Neutrone Prescription 99*, for Rheumatism, The Relief Laboratory, Newburgh, N. Y. "Alcohol not in excess of 20%." Price one dollar for 8.2 fl. oz.

A clear dark-brown liquid with a sweet, bitter, and alkaline after-taste.

Spec. grav. @ 15.6° C.	1.0955
Alcohol by volume	15.20
Solids	27.27 gms. per 100 cc.
Glycerine	3.58 " " "
Reducing sugars, as dextrose	14.06 " " "
Salicylic acid	4.79 " " "
= sodium salicylate	5.55 " " "
Ash (chiefly Na_2CO_3 and KI)	3.96 " " "
Sodium oxide	1.10 " " "
Potassium oxide	0.63 " " "
Iodine	1.58 " " "
= potassium iodide	2.07 " " "
Colchicine	present
Emodin	present

The material is an alcohol-glycerine-water solution of syrup, containing per 100 cc. 5.55 gms. of sodium salicylate and 2.07

gms. of potassium iodide, with extract of colchicine and an emodin-bearing drug.

That the manufacturers are not overconfident as to the curative powers of *Neutrone* is shown by the following extracts from their literature:

"Remember rheumatism is a deeply rooted disease. It takes a long time to develop and you cannot get rid of it in a day, so don't make the mistake of stopping treatment too soon even though your rheumatic pains have disappeared. After taking *Neutrone Prescription 99* for a short time and experiencing its benefits, do not jump to the conclusion that your rheumatism is cured because the pain has stopped, the chances are that in reality the fight against your rheumatism is just turning in your favor unless your case is a mild one. If you stop treatment too soon you may suffer a return of your rheumatism because it has not been thoroughly driven from your system. . . . Furthermore, if yours is a severe, chronic case of rheumatism, be content to wait a little while for results—your patience will be rewarded. Bear in mind what a stubborn ailment rheumatism is and how its poisons permeate the system and you will realize that in a longstanding case of chronic rheumatism it takes time to accomplish material benefits. Your case may be so severe as to require three or six or even more bottles of *Neutrone Prescription 99*."

In other words if your rheumatism is not cured it is not the fault of the remedy, but because you have not taken enough of it; as long as you continue to pay your dollar for a half pint of the medicine there still is hope.

SOLVAX.

5509. *Solvax*, Booth's Hyomei Co., Buffalo, N. Y. "A Treatment for Affections Arising from Disorders of the Kidneys and Bladder, etc." Price 50 cents for 50 pills, weighing 22.51 gms., or 6.95 grs. per pill.

Pills coated with sugar, calcium carbonate and gum, and colored with a red dye. Pill mass (3.46 grs.) rather soft, green, with a terpene-like taste, and a balsamic odor similar to oil of juniper.

Ash, total	36.12	Methylene blue, approxi-
Ash, insol. in HCl (talc) ..	7.29	mately
Sucrose	17.39	18.60
Invert sugar	trace	Total nitrogen
Calcium oxide	18.36	3.00
Carbonates	present	Hexamethylene tetramine.. present
		Oil of juniper
		present
		Potassium acetate, nitrates none

The pills consist essentially of methylene blue, hexamethylene tetramine, oil of juniper and talc, coated with sugar and calcium carbonate, and colored red.

TORIS COMPOUND.

4710. *Toris Compound*, Globe Pharmaceutical Co., Chicago, Ill. Price 50 cents for 0.88 oz.
A whitish, granular powder.

Loss @ 100° C.	0.20	Nitric nitrogen	2.10
Reducing sugars, as invert	0.68	= potassium nitrate ..	16.07
Sucrose	67.88	Salicylic acid	12.78
Potassium oxide	7.49	= sodium salicylate ..	14.82
		Sodium	present

The compound consists, therefore, of 67.88 per cent cane sugar, 16.07 per cent potassium nitrate (salmeter) and 14.82 per cent sodium salicylate, with small amounts of invert sugar and volatile matter.

"This formula although apparently simple is well known all over the nation, even in the remotest sections, for its quick and satisfactory effects in controlling rheumatism."

This preparation is one of the prescription fakes, in which well-known drugs are claimed to be endowed with unusual remedial powers, where used with another less familiar drug purporting to be a standard article. In this case, for instance, the famous rheumatism remedy is composed of

Toris Compound	1 oz.
Syrup Sarsaparilla Comp.	1 oz.
Pure Whiskey	8 oz.

The last of these two ingredients are of course well-known, but the first, *Toris Compound*, is sold only by the one manufacturer and has no official standing whatever.

Sodium salicylate is recognized as a valuable drug in the treatment of rheumatism. The same cannot be said for potassium nitrate. The U. S. Dispensatory says

"At one time potassium nitrate was used in very large doses in acute rheumatism, but the practice has passed out of vogue. It is essential always to give the remedy very freely diluted, if at all, and thus avoid its irritant influence upon the gastro-intestinal tract."

The therapeutically useful ingredient in *Toris Compound*, therefore, is the sodium salicylate alone, the current price of which is 45 cents per pound. In this preparation 50 cents is charged for 0.9 oz. of a mixture, only about one-seventh of which is sodium salicylate. It is hard to conceive of a more expensive way to purchase this useful drug.

URICOSOL.

4536. *Uricosol*, Uricosol Chemical Co., Boston, Mass. "Alcohol not over 0.5%." "Rheumatic Remedy, Uric Acid Solvent, Kidney and Liver Stimulant." Price 97 cents for 8 fl. oz.

A brown, syrupy liquid with the odor of orange peel, and with a salty, acid, and persistently bitter taste.

Spec. grav. @ 15.6° C.	1.3138	Lithium	0.18
Alcohol by volume	0.16	Citric acid	8.32
Glycerine	15.63	Nitric nitrogen	0.10
Ash	19.46	Bitter principle, probably	
Sodium oxide	8.51	gentian	present
Phosphoric anhydride	9.74	Salicylates, sucrose, alka-	
Potassium oxide	0.32	loids, hexamethylene tetra-	
Sulphuric anhydride	0.12	mine	none

The preparation is essentially a glycerine-water solution of sodium phosphate with traces of lithium, sodium nitrate and sulphate, acidified with citric acid, and containing a bitter principle, probably gentian.

Sodium phosphate is a mild purgative but can scarcely be said to be "efficacious in all the uric acid diseases including all forms of rheumatism, gout, eczema, asthma and in a large proportion of liver and kidney complaints."

VAR-NE-SIS.

4522. *Var-ne-sis*, The Var-ne-sis Co., Lynn, Mass. "A Vegetable Remedy for Stomach and Rheumatism. Guaranteed Strictly Vegetable." "18% alcohol." Price one dollar for 14.4 fl. oz.

A brown liquid, with some brown sediment, and with a bitter taste.

Spec. grav. @ 15.6° C.	0.9896	Reducing sugars, as dextrose	0.86
Alcohol by volume	13.62	Capsicum, emodin	present
Non-volatile solids	1.81	Glycerine, alkaloids, sali-	
Ash	0.16	cyclic acid	none

The preparation is an alcoholic solution, containing less than one per cent of vegetable drug extracts, chiefly derived from emodin-yielding drugs and capsicum.

Dr. Varney, the sponsor for this "positive stomach and rheumatic remedy," tells us in his literature how his heart, back, head, and whole body ached, how his brain was weary and how he tossed through many a restless night until "a merciful Providence led me to this remedy made of pure roots and herbs, nature's own simples combined with the most perfect combination of roots and herbs ever put together."

"Var-ne-sis has cured, and is today curing hundreds." "All forms of Rheumatism Yield to Var-ne-sis." "Var-ne-sis makes the stomach sound." "Var-ne-sis stimulates, purifies and enriches the blood and soothes the nerves." "Hundreds have been cured, why not you?"

Although on one page of his circular Dr. Varney tells us relief from his terrible rheumatism "came after a few doses," on another page he advises us that rheumatism requires from three to twelve bottles; "in some cases it may require a little longer to produce the desired effect." "Where the disease is of many years' standing there may be no apparent results until from seven to twelve weeks, but in all cases the treatment must be followed consistently to produce the desired result." It is apparent, therefore, according to the good doctor, that if the remedy does not cure, the fault lies with the patient, not the medicine. All the patient has to do is to keep up his faith, which will doubtless be stimulated by the alcohol in the medicine, and continue to pay one dollar per short pint for a remedy containing only a trace of medicament other than alcohol.

REMEDIES FOR THE SKIN AND COMPLEXION.

CLEAROLA.

4712. *Clearola*. Geo. W. Carpenter, East Jaffrey, N. H. "For the removal of Pimples, Blackheads, Blotches and all Eruptions of the Skin." Price 39 cents for 0.44 oz.

A light-yellow powder.

Soluble in carbon bisulphide (sulphur)	99.58
Total ash	0.04
Ash of carbon bisulphide-insoluble	0.28

The preparation is simply sublimed sulphur (flowers of sulphur).

Sublimed sulphur is a specific for scabies (itch) and has distinct therapeutic value. It can be bought, however, at any drug store for ten cents or less per pound; in *Clearola* it costs \$14.18 per pound.

FLOWERS OF OXZOIN.

4715. *Flowers of Oxzoin*, To-Kalon Mfg. Co., Syracuse, N. Y. "Absolutely free from pearl white or bismuth in any form. It contains no poisonous ingredients." Price 39 cents for 2 fl. oz.

A colorless liquid, with a heavy pink-white sediment, and having the odor of oil of rose.

Alcohol	none
Non-volatile solids	41.24 gms. per 100 cc.
Glycerine	22.84 " " "
Zinc oxide	18.21 " " "
Ash	18.36 " " "
Cochineal	present

The preparation consists essentially of 18.21 gms. of zinc oxide per 100 cc., suspended in water and glycerine, perfumed with oil of rose and colored with cochineal. The cochineal appeared to be in combination with the zinc oxide, as the filtered liquid was colorless.

Flowers of Oxzoin comes with the recommendation of Mlle. Meta "to-day the most able and widely known Beauty Specialist in the world. . . . Her own marvelous preservation of youth and beauty is a living testimonial to the efficacy of her teachings." Mlle. Meta recommends her *Milk of Roses*, which is compounded from *Flowers of Oxzoin*, *Tincture of Benzoin*, *Rose Water* and *To-Kalon Perfume*, as "an invaluable dressing for all cases of rash, irritation, ringworm, salt rheum," etc., and "the indescribable torture, the awful intolerable itching of eczema, the most dreaded of all skin diseases, are almost immediately allayed

by a liberal application of *Milk of Roses*." *Milk of Roses*, or *Flowers of Oxzoin* will relieve the above diseases to the same extent as ordinary zinc oxide, no more, no less, only zinc oxide can be bought at retail for 15 cents per pound, while *Flowers of Oxzoin*, less than one-fifth of which is zinc oxide, costs 39 cents for only two ounces.

GLORIOL GLOWENE.

4701. *Gloriol Glowene*, The Lesslie Co., Dayton, O. Price 25 cents for 1.7 oz.

A yellowish-brown pasty material slightly perfumed.

Loss @ 100° C.	66.90	Insol. in absolute alcohol ..	0.53
Non-volatile solids	33.10	Sodium, salicylates, phenols	none
Ash	6.94	Free caustic alkali	none
Potassium oxide	4.59		
Sol. in absolute alcohol (soap)	32.51		

The preparation is nothing more than a slightly scented soft soap, consisting of about two-thirds water. The current price of green soap (soft soap) quoted in *The Druggists Circular* is 13 cents per pound, quite different from the \$2.25 per pound asked for *Gloriol Glowene*.

ROSE-KAYLOIN.

4714. *Rose-Kayloin Compound*, for Unguentine Mixtures, The Blackburn Products Co., Dayton, O. Price 50 cents for 0.43 oz.

A pink powder, with the odor of oil of rose, and colored with a fluorescent dye.

Loss @ 100° C.	0.81	Sulphuric anhydride	0.29
Sulphur	81.40	Sulphites	present
Potassium oxide	8.48	Calcium oxide	trace
Sodium oxide	0.77	Carbon dioxide	present

The compound consists essentially of sulphur and potassium carbonate, with small amounts of sodium carbonate and sulphur compounds.

"*Rose-Kayloin* is especially preferred to meet the public demand for a remedy for Acne, Pimples, Blackheads, Boils, Ulcers, Cuban Itch, Common Itch and other Skin Diseases. It eliminates skin troubles, soothes the itching and heals the sores."

Although sulphur and potassium carbonate serve a useful purpose in the treatment of cutaneous affections, it is difficult to see why the consumer should buy these very common drugs at the rate of over \$18 per pound, simply because they are called *Rose-Kayloin*.

PHENOLPHTHALEIN PREPARATIONS.*

The usefulness of phenolphthalein as a remedy in chronic constipation is well recognized. As a result of the popularity of this relatively new laxative we find certain pharmaceutical houses and a number of proprietary medicine manufacturers offering to the public preparations bearing fanciful names, in which phenolphthalein is often the only active ingredient, for which extravagant prices are asked. We have examined a number of such preparations this year, and while in this examination we have devised no new methods, we have modified certain well-known methods and the analytical details are given herewith as of probable interest to the analyst.

The preparations fell into three general classes:

1. Tablets; mixtures of phenolphthalein with excipients (lactose, sucrose, or both, starch, talc, etc.), with traces of flavoring agents and essential oils (such as peppermint, cinnamon, cassia, etc.).
2. Tablets and pills: mixtures of phenolphthalein with other cathartic drugs, or with compounds of a non-cathartic nature, together with excipients, etc.
3. Liquid preparations: phenolphthalein suspended in a sucrose syrup, flavored with cacao and vanilla, and containing salicylic acid as a preservative.

It is obvious that these various mixtures offer quite diverse problems to the analyst, and the following experimental data may be of interest.

Simple Preparations.

Various solvents, such as ethyl alcohol, acetone, etc., have been proposed for the extraction of phenolphthalein.

Extraction with acetone. A mixture of 2.5 gms. of phenolphthalein and 7.5 gms. of lactose was prepared by trituration. 0.5 gm. of this mixture was extracted on a 5.5 cm. filter with successive portion of acetone to a volume of about 50 cc.; further extraction gave no coloration with NaOH. The excess of solvent was distilled off and the residue of about 100 cc. transferred to a tared beaker with acetone, evaporated and the residue dried at 100° C.

* Credit for the analytical work herewith reported is due to C. B. Morison.

Phenolphthalein Taken. gm.	Weight of Residue. gm.	Apparent Error. gm.	Apparent Error- Blank in Acetone.* gm.	Recovery Per Cent.
.1250	.1316	+.0066	.0050	104.00
.1250	.1334	+.0084	.0068	105.44
.1250	.1267	+.0017	.0001	100.08
.1250	.1277	+.0027	.0011	100.88

The above apparent error was not due to the solubility of the lactose in acetone, as 0.5 gm. of lactose treated with 50 cc. of acetone yielded a residue of only .0017 gm., which minus the correction for acetone, .0016 gm., amounted to but .0001 gm.

The above procedure (extraction with solvent on filter paper) is similar to methods employed by Emery in the extraction of synthetics from headache powders (See Kebler, *The Tablet Industry, Jour. Amer. Pharm. Asso.*, June, July, August, 1914).

Solution in alkali, and extraction with ethyl ether from an acidified solution. 0.5 gm. of the mixture used above was transferred to a 100 cc. separatory funnel, 10 cc. of 2N KOH added, and the funnel shaken vigorously to effect solution of the powder. The solution was diluted with water to about 25 cc., acidified strongly with HCl and extracted with successive portions of 15, 10, 10, 10 cc. of ethyl ether. The ether extracts were combined in another separatory and washed free from acid with water. The ethereal solution was then passed through a dry filter into a tared beaker, the solvent evaporated and the residue dried at 100° C. Phenolphthalein after this treatment appears first as a transparent resinous film which gradually becomes white on heating at 100°.

Phenolphthalein Taken. gm.	Weight of Residue. gm.	Error. gm.	Recovery. %
.1250	.1253	.0003	100.24
.1250	.1252	.0002	100.16

Application of above Methods to Proprietary Preparations.

Phenolax. The tablets were declared to contain 1 gr. of phenolphthalein with aromatics and milk sugar to make 5 grs. The average weight of the tablets was 4.76 grs., and according to the claim should contain 20 per cent phenolphthalein. The tablets were finely ground and the following results obtained on 0.5 gm. portions.

Weight Taken. gm.	†Weight of Residue. gm.	Phenolphthalein. Per Cent.	Grs. per Tablet.
<i>Extraction with acetone.</i>			
.5000	.1079	21.58	1.03
.5000	.1074	21.48	1.02
<i>Extraction with ether.</i>			
.5000	.1021	20.42	0.97
.5000	.1029	20.58	0.98
.5000	.1024	20.48	0.98
.5000	.1026	20.52	0.98

* 50 cc. of the acetone gave a residue of .0016 gm.

† The residues were slightly colored.

Extraction with absolute alcohol in a similar manner with the same amounts of material gave residues of .1475 and .1457 gm., or 29.50 and 29.14 per cent; the residues contained considerable sugar and coloring matter. (See Kebler, *The Tablet Industry, Jour. Amer. Pharm. Asso.*, June, July, August, 1914).

Extraction with chloroform gave very unsatisfactory results. After using from 160 to 165 cc. of the solvent further washings still gave a strong coloration with NaOH.

Note. The results from the alcohol extraction of *Phenolax* show that the alcohol removes sugar to an extent undesirable for this class of preparations where the residue is to be weighed directly as phenolphthalein. The extraction from an acid solution with ether after dissolving the substance in an alkali yields better results, as the residue is but slightly contaminated. This procedure possesses the advantage of extracting completely all the phenolphthalein which may be occluded by the carbohydrate material present. In the extraction of complex preparations, where starch, dextrin, gums, etc., have been used as excipients, the possibility of loss by occlusion is obvious.

Purgen. Average weight of tablets 3.72 grs.; amount of phenolphthalein not declared.

Weight Taken. gm.	Weight of Residue. gm.	Phenolphthalein. Per Cent.	Grs. per Tablet.
.5000	.2053	41.06	1.53
.5000	.2083	41.66	1.55
.5000	.2040	40.80	1.52
.5000	.2066	41.32	1.54

Partola. Average weight of tablets 14.9 grs.; amount of phenolphthalein not declared.

Weight Taken. gm.	Weight of Residue. gm.	Phenolphthalein. Per Cent.	Grs. per Tablet.
.5000	.0886	17.72	2.64
.5000	.0867	17.34	2.59

Complex Preparations.

Determination of phenolphthalein in this class of preparations is more difficult than in the foregoing class. Simple extraction with solvents and subsequent direct weighing of the residue yields high results. In these complex mixtures the phenolphthalein may be extracted by a suitable solvent and the resulting residue converted into an iodine derivative with reasonably satisfactory results. The determination of phenolphthalein as its tetrailodine derivative was proposed by Kollo (*Apoth. Ztg.* 24, 1909, 283; *abst. in Analyst*, 34, 1909, 442). The abstract in the *Analyst* is incomplete, lacking certain important details of manipulation, and the original paper was inaccessible to us. Tetraiodo phenolphthalein was first described by Classen and Löb (*Ber. deuts. chem. Gesell.*, 28, 1895, 1603). It occurs in commerce under the name *Nosophen*.

A solution of 10 gms. iodine and 15 gms. potassium iodide in 200 cc. of water was used. A weighed amount of phenolphthalein was dissolved

in about 100 cc. of 2N NaOH and the solution diluted to about 25 cc. The alkaline solution was then treated with an excess of the iodine solution, from 7 to 8 cc., added slowly drop by drop, and allowed to stand at room temperature for about two hours. The iodinized solution was then strongly acidified with HCl and cooled, the precipitate allowed to settle and then collected on a tared Gooch crucible, washed with cold water and dried at 100° C. Practically the same weights of precipitate were obtained when the solution was allowed to stand overnight before acidifying. (It is important to wash free from acid and excess of iodine.)

The following results were obtained using 0.1 gm. of phenolphthalein, and employing the factor .3871.

Weight of Ppt. gm.	Phenolphthalein. Equivalent. gm.	Recovered. %
.2550	.09871	98.71
.2550	.09871	98.71
.2568	.09941	99.41
.2566	.09933	99.33
.2515	.09736	97.36
.2502	.09685	96.85

The following results were obtained using 0.2 gm. of phenolphthalein in the same manner, but doubling the amount of iodine solution used.

.4803	.18592	92.96
.4947	.19149	95.75
.4928	.19076	95.38
.4775	.18484	92.42

Application of above Methods to Proprietary Preparations.

Prunoids. Average weight of tablets 8.15 grs.; 1.5 grs. of phenolphthalein per tablet declared.

Weight Taken. gm.	Weight of Residue. gm.	Phenolphthalein. Per Cent.	Grs. per Tablet.
Extraction with acetone.			
.5000	.1082	21.64	1.76
.5000	.1105	22.10	1.80
Extraction with ether (from acetone residue).			
.5000	.1024	20.48	1.67
.5000	.1025	20.50	1.67

Results with Iodine Method.

Weight Taken. gm.	Weight of Ppt. gm.	Weight. gm.	Phenolphthalein. Per Cent.	Grs. per Tablet.
.5000	.2210	.08555	17.11	1.39
.5000	.2202	.08528	17.06	1.39

The residues from acetone and ether were contaminated with coloring matter and extractives. The ether residues were dissolved in 2N NaOH.

filtered, and the alkaline solution precipitated with iodine as outlined above.

Phenaloin Tablets. Average weight of tablets 2.58 grs.; amount of phenolphthalein not declared.

Weight Taken. gm.	Weight of Residue. gm.	Phenolphthalein. Per Cent.	Grs. per Tablet.
Extraction with acetone.			
.5000	.1574	31.48	0.81
.5000	.1598	31.96	0.82
Extraction with ether (from acetone residue).			
.5000	.1032	20.46	0.53
.5000	.1046	20.92	0.54

The residue from acetone was yellow with a strong odor of aloes and with a bitter taste; that from ether was slightly yellow, but not as badly contaminated as when acetone was used.

Results with Iodine Method.*

Weight Taken. gm.	Weight of Ppt. gm.	Weight. gm.	Phenolphthalein. Per Cent.	Grs. per Tablet.
.5000	.2221	.08597	17.19	0.44
.5000	.2220	.08594	17.19	0.44

Rexall Orderlies. Average weight of tablets 9.0 grs.; amount of phenolphthalein not declared.

Weight Taken. gm.	Weight of Residue. gm.	Phenolphthalein. Per Cent.	Grs. per Tablet.
Extraction with acetone.			
.5000	.1226	24.52	2.21
.5000	.1229	24.58	2.21
Extraction with ether (from acetone residue).			
.5000	.1174	23.48	2.11
.5000	.1170	23.40	2.11

Results with Iodine Method.

Weight Taken. gm.	Weight of Ppt. gm.	Weight. gm.	Phenolphthalein. Per Cent.	Grs. per Tablet.
.5000	.2511	.09720	19.44	1.75
.5000	.2510	.09716	19.43	1.75

Veracolote. Average weight of tablets 5.62 grs.; amount of phenolphthalein not declared.

* The yellow residue from the acetone extraction was dissolved in 2N NaOH, acidified and extracted with ether. The iodine compound was prepared from this residue.

Weight Taken. gm.	Weight of Residue. gm.	Phenolphthalein. Per Cent.	Grs. per Tablet.
Extraction with acetone.			
.5000	.0632	12.64	0.71
.5000	.0616	12.32	0.69

Results with Iodine Method.

Weight Taken. gm.	Weight of Ppt. gm.	Weight. gm.	Phenolphthalein. Per Cent.	Grs. per Tablet.
.5000	.1560	.0604	12.08	0.68
.5000	.1552	.0601	12.02	0.68

Problin. Average weight of pills 3.1 grs.; salicylic acid, acid sodium oleate, phenolphthalein and menthol declared.

2.1626 gms. of the pills were treated with water in a glass mortar and thoroughly disintegrated. The solution was then diluted to about 175 cc. and allowed to stand overnight. The insoluble matter did not settle completely, the supernatant liquid remaining turbid. The solution was finally cleared by centrifuging, the clear liquid filtered through a tared paper and the precipitate washed with water until the filtrate and washings amounted to 300 cc., and dried at 100° C. The above water-insoluble residue treated with acetone yielded as follows

Insol. Residue Representing gm.	Weight. gm.	Phenolphthalein. Per Cent.
2.1626	.1026	4.74
2.1713	.1029	4.74

The residue from the first of the above determinations was subjected to the iodine method and a precipitate of .2563 gm., equal to .0992 gm. of phenolphthalein, or 4.59 per cent, was obtained.

Phenolphthalein is slightly soluble in water, according to McCoy .00318 gm. per 100 cc. (*Amer. Chem. Jour.*, 21, 1904, 503), and according to Zotier .0092 gm. per 100 cc. (*Bul. Soc. Chem.*, 7, 1910, 993). Assuming the average of these two figures as being the correct value, the loss of phenolphthalein due to solution in the 300 cc. of water used as in the above method would be .0186 gm., increasing our yield to .1178, or 5.45 per cent.

An attempt to extract phenolphthalein from the original material with acetone and determine the iodine compound was unsuccessful as the acetone extracted a dark-brown fatty compound, which absorbed iodine, formed a precipitate before acidification and prevented the precipitation of the iodo compound.

Kellogg's Sanitone Wafers. Average weight of wafers 12.78 grs.; amount of phenolphthalein not declared. Chromium sulphate and a vegetable drug were found to be present.

Weight Taken. gm.	Weight of Residue. gm.	Phenolphthalein. Per Cent.	Grs. per Tablet.
Extraction with acetone.			
.5000	.0111	2.22	0.28
.5000	.0117	2.34	0.30
Extraction with ether (from acetone residue).			
.5000	.0110	2.20	0.28
.5000	.0114	2.28	0.29

Results with Iodine Method.

Weight Taken. gm.	Weight of Ppt. gm.	Weight. gm.	Phenolphthalein. Per Cent.	Grs. per Tablet.
.5000	.0176	.0068	1.36	0.17
.5000	.0186	.0072	1.44	0.18

Liquid Preparations.

Laxaphen. This was claimed to contain phenolphthalein 8 grs., salicylic acid 3/5 gr. to the fl. oz., incorporated in a chocolate base.

Salicylic acid was separated by steam distillation, and the residue evaporated and extracted with 95 per cent alcohol. The alcohol was evaporated and the residue dissolved in 2N NaOH, acidified, and shaken out with ether. The residue, which was contaminated with fat, was redissolved in 2N NaOH and filtered through glass wool, the filtrate being treated with iodine and the phenolphthalein compound precipitated and weighed as follows:

Weight Taken. gm.	Weight of Ppt. gm.	Weight. gm.	Phenolphthalein. Per Cent.
20.0	.6643	.2572	1.29
20.0	.6577	.2546	1.27

To check the above, 10 gms. of the original preparation were evaporated on sand in a porcelain casserole and the residue extracted with alcohol. The alcoholic solution was evaporated and treated with iodine (after treating with KOH, acidifying and extracting with ether), and yielded .3489 gm. of precipitate, equal to .1350 gm. of phenolphthalein, or 1.35 per cent.

PHENOLAX WAFERS.

4529. Phenolax Wafers, The Upjohn Co., Kalamazoo, Mich. "Each wafer contains phenolphthalein 1 gr., aromatics, sugar, q. s. ad 5 grs." Price 35 cents for 102 tablets weighing 31.48 gms., or 4.76 grs. per tablet.

Pink tablets with the odor of cassia or cinnamon.

Loss @ 100° C.	0.64	Reducing sugars total, as dextrose,	70.40
Ash	6.07	Phenolphthalein	20.58
Ash, insol. in HCl	3.45	Starch, color, oil of cassia	
Reducing sugars before inv., as dextrose	2.12	or cinnamon	present

These tablets contain 0.98 gr. phenolphthalein per tablet, with 3.35 grs. sugars, and 0.43 gr. starch, talc and aromatics.

PURGEN.

4528. *Purgen*, D. Bayer, Budapest, Hung. (Dist. by Lehn and Fink, New York.) Price \$1.10 for 100 tablets weighing 24.05 gms., or 3.72 grs. per tablet.

Pink tablets with the odor of vanilla.

Loss @ 100° C.	0.94	Reducing sugars total, as dextrose	40.08
Ash	4.71	Phenolphthalein	41.66
Ash, insol. in HCl	4.64	Vanilla flavor, starch, color present	
Reducing sugars before inv., as dextrose	17.84		

These tablets contain 1.55 gr. phenolphthalein per tablet, 1.49 gr. sugars, and 0.68 gr. talc, starch, color and vanilla flavor.

PARTOLA.

5039. *Partola*, Partola Mfg. Co., New York. "The Ideal Peppermint Laxative Candy. Good for Baby, Good for All, a Pleasure to Eat. Best for You. Laxative Blood Purifier and Effective." Price 10 cents for 6 tablets weighing 5.8 gms., or 14.9 grs. per tablet.

Pink tablets with the odor and taste of peppermint.

Loss @ 100° C.	1.45	Reducing sugars total, as dextrose	69.76
Ash	5.83	Phenolphthalein	17.72
Ash, insol. in HCl	5.19	Starch, color, oil of pepper-	
Reducing sugars before inv., as dextrose	trace	mint	present

The tablets contain 2.64 grs. phenolphthalein per tablet, 10.39 grs. sugars, and 1.86 grs. starch, talc, color and oil of peppermint.

PRUNOIDS.

4533. *Prunoids*, Sultan Drug Co., St. Louis, Mo. "An Ideal Laxative, Purgative and Intestinal Tonic." "Are made of

phenolphthalein 1.5 grs. in each, cascara sagrada, de-emeticized ipecac and prunes." Price 50 cents for 36 tablets weighing 18.99 gms., or 8.15 grs. per tablet.

Brown tablets with a sweet, slightly bitter, aromatic taste.

Loss @ 100° C.	2.71	Phenolphthalein	17.11
Ash	8.20	Cascara, probably in ...small amt.	
Ash, insol. in HCl	1.28	*De-emeticized ipecac ..	?
Reducing sugars before inv., as dextrose	9.88	*Alkaloids	none
Reducing sugars total, as dextrose	39.12	Prunes, probably in ...small amt.	

Prunes have considerable popular favor as a mild natural laxative food, and the manufacturer of *Prunoids* capitalizes this popularity of prunes in the name of his product. The quantity of prunes in *Prunoids* must indeed be small, the amount of cascara is trifling, and the therapeutic effect of any de-emeticized ipecac present cannot be important. The chief active medicament of *Prunoids*, therefore, is phenolphthalein.

PHENALOIN TABLETS.

4517. *Phenaloin Tablets (Wood's)*, Wood's Pharmacy, New Haven. "A Chocolate Coated Tablet for the Treatment of Constipation." Price 25 cents for 40 tablets weighing 6.697 gms., or 2.50 grs. per tablet.

Brown, chocolate-coated sugar tablets with the bitter taste of aloes.

* 1 gm. of material was extracted with alcohol and after evaporation of the solvent the residue treated with N sulphuric acid and filtered. The filtrate was made alkaline with ammonia and shaken out with ether. The residue from ether was taken up with N sulphuric acid and tested for alkaloids with negative results. If ipecac is present it is so practically freed of its alkaloids. The following check test for alkaloids was also made. About 2 gms. were triturated with sodium bicarbonate and extracted with a mixture of amyl alcohol, 1, chloroform, 1, and ether, 3 volumes. The solvent was drawn off and extracted with N sulphuric acid, the acid solution made alkaline with ammonia, and extracted with ether-chloroform. The residue after evaporation gave no reaction for alkaloids.

Loss @ 100° C.	3.12	Reducing sugars total, as	
Ash	21.37	dextrose	28.16
Ash, insol. in HCl	17.34	Phenolphthalein	17.19
Reducing sugars before inv, as dextrose	trace	Aloin	present
		Alkaloids	none

The tablets contain 0.44 gr. phenolphthalein per tablet, 0.73 gr. sugars, 0.45 gr. talc, and about 0.96 gr. aloin and chocolate coloring.

This preparation must not be confused with *Phenaloin*, made by the Norwich Pharmacal Co., Norwich, N. Y., which according to the label contains aloin 1-4 grain, strychnine sulphate 1-80 gr., extr. belladonna leaves 1-12 gr., phenolphthalein 1-2 gr., and ipecac 1-15 gr. per pill.

REXALL ORDERLIES.

4518. *Rexall Orderlies*, United Drug Co., Boston, Mass. "A gentle-acting, pleasant and effective laxative." Price 25 cents for 36 tablets weighing 20.96 gms., or 9 grs. per tablet.

Brown tablets with a vanilla-like odor.

Loss @ 100° C.	0.60	Phenolphthalein	19.44
Ash	7.95	Oxymethylanthraquinones ..	none
Ash, insol. in HCl	5.73	Alkaloids	none
Reducing sugars before inv, as dextrose	trace	Cacao powder, vanilla flavor	present
Reducing sugars total, as dextrose	6.64		

The tablets contain 1.75 grs. phenolphthalein per tablet, 5.46 grs. sugars, 0.51 gr. talc, and 1.28 grs. cacao powder flavored with vanilla.

VERACOLATE.

4531. *Veracolate*, The Marcy Co., Boston, Mass. "Rich in cholates." Price one dollar for 100 tablets weighing 36.39 gms., or 5.62 grs. per tablet.

Red, sugar-coated compressed tablets with a peppery taste.

Loss @ 100° C.	4.09	Reducing sugars before inv, as dextrose	trace
Ash (CaO 13.09, MgO 0.87, Na, K, and trace Fe) ...	28.07	Reducing sugars total, as dextrose	27.64
Carbonates	present		

Phenolphthalein	12.08	*Bile acids	present
Oxymethylanthraquinones ...	present	Starch, vegetable tissues ...	small
Cascara, probably	present	amts.	
Capsicum	considerable	Alkaloids	none

These tablets contain 0.68 gr. phenolphthalein per tablet, with cascara, capsicum, bile acids and excipients (calcium carbonate and sugars).

PROBILIN.

4530. *Probilin*, W. Bauermeister (Schering and Glatz, New York, Agents). "A combination of salicylic acid with acid sodium oleate to which sufficient phenolphthalein and menthol have been added to mildly stimulate the gastro-intestinal tract and insure tolerance." Price \$1.50 for 60 pills weighing 11.95 gms., or 3.1 gr. per pill.

Black, graphite-covered pills with a strong odor of menthol, and with a mentholic, soapy taste.

Loss @ 100° C.	9.68	Phenolphthalein	5.48
Ash	15.88	‡Salicylic acid	5.82
Ash, insol. in HCl	1.86	Vegetable drug	28.70
Iron and alumina phosphate	3.05	†Sodium oleate	present
Calcium oxide	1.18	Menthol, carbonates	present
Sodium oxide	6.11	Oxymethylanthraquinones ..	none
Potassium oxide	0.60	Alkaloids	none
Magnesium oxide	trace	Biliary products	?

* The residue from alcoholic or aqueous extracts of *Veracolate* has the odor of preparations of sodium glycocholate and taurocholate, the odor being strong and persistent. A test for bile acids was made as follows: An aqueous extract of the pill mass was shaken with ether to remove phenolphthalein, coloring matter, etc., the ethereal extract being rejected. The aqueous solution was then treated with basic lead acetate, the white precipitate removed by filtration and decomposed with strong soda solution. The alkaline solution was evaporated and extracted with alcohol, and after evaporation of the latter the residue was tested for bile acids by the Pettenkofer test, using a few drops of furfural solution (1-1000) instead of cane sugar (Mylius and Udransky modification). The reaction was strong and the color persistent.

† An attempt was made to determine oleic acid quantitatively but the residue obtained appeared to be very impure. This residue, however, gave the elaidic acid reaction on treatment with nitrosyl sulphuric acid (Mulliken and Scudder), absorbed bromine and iodine readily, and a barium salt prepared from it had the properties of barium oleate.

‡ The lead precipitate insoluble in ether, obtained in the oleic acid separation, was suspended in water and the lead precipitated by hydrogen

The preparation contains 5.48 per cent phenolphthalein, 5.82 per cent salicylic acid, with sodium oleate, menthol, excipients, and 28.70 per cent of an unidentified vegetable drug.

LAXAPHEN.

4535. *Laxaphen*, Parke, Davis and Co., Detroit, Mich. "Each fl. oz. contains phenolphthalein 8 grs., salicylic acid 3.5 gr., in a palatable chocolate base." Price 35 cents for 4 fl. oz.

A brown syrup with the taste of chocolate and vanilla.

Spec. gr. @ 15.6° C.	1.2381	Phenolphthalein	1.35
Solids	55.00	Salicylic acid	0.077
Ash	0.19	Ether extract	2.98
Reducing sugars before inv., as dextrose	2.82	Alcohol extract	2.44
Reducing sugars total, as dextrose	34.20	Cacao solids, vanilla	present

The preparation contains about 7.74 grs. phenolphthalein and 0.44 gr. salicylic acid per fl. oz., with sugar, cacao solids and vanilla flavor.

REMEDIES FOR THE STOMACH AND BOWELS.

ADLER-I-KA.

4516. *Adler-i-ka Treatment*, The Adlerika Co., St. Paul, Minn. "For Bowel and Stomach Diseases." "Composed of twelve medicinal substances. Contains no opium or other narcotics." Price 93 cents for 11.8 fl. oz.

A brown liquid, with some brown sediment, with an aromatic odor, and with a bitter, salty taste.

Spec. grav. @ 15.6° C.	1.1704	Ash	15.21
Alcohol by volume	1.08	Magnesium oxide	5.06
Non-volatile solids	22.68	Sulphuric anhydride	9.97
Glycerine	2.69	Salicylic acid	0.13
Reducing sugars	0.26	Aloes, saccharin	present
Other vegetable extractives	4.52	Alkaloids	none

sulphide. The lead sulphide was removed by filtration and the filtrate extracted with ether. The solvent was evaporated at room temperature spontaneously and the residue dried in vacuo over sulphuric acid. The residue thus obtained was white and crystalline, gave a violet color with ferric chloride, and the odor of methyl salicylate when heated with sulphuric acid and methyl alcohol; its melting point was 159° C.

It is interesting to note that both the oleic acid and the salicylic acid residues showed a slight contamination with phenolphthalein.

While aloes, and possibly some other vegetable drugs, are present to the extent of 4.5 per cent, the 15 per cent of anhydrous magnesium sulphate (Epsom salts) is probably the most active constituent.

The manufacturers of *Adler-i-ka* are very conservative in their claims on the label. Their correspondence with druggists and their advertisements in the local papers, however, show the false pretenses under which the remedy is sold, "The company in a leaflet that it sends around to druggists frankly admits that it is not the people who *have* appendicitis that might be expected to buy this worthless and potentially dangerous fraud, but those who *think* they have it." (*Nostrums and Quackery*, 582.) Furthermore although the remedy has been "made famous by curing appendicitis," a preparation containing 15 per cent of Epsom salts and considerable aloes might involve great danger to a sufferer from appendicitis. And yet prominent druggists in our different communities are willing to lend their names and influence to the exploitation of this dangerous fraud.

BAD-EM SALZ.

4519. *Bad-Em Salz*, The American Laboratories, Philadelphia, Pa. "An incomparable remedy for Diseases of Stomach, Intestines, Liver, Kidneys and Bladder." Price 50 cents for 8.7 oz.

An odorless, white, crystalline powder with an alkaline taste.

Loss @ 100° C.	8.10	Sulphuric anhydride	22.16
Chlorine	7.97	Tartaric acid	7.54
Sodium oxide	38.18	Potassium and calcium ...	traces
Carbon dioxide	19.45	Magnesia	none

The above data indicate that the preparation is a mixture of sodium chloride, sodium sulphate, sodium carbonates and tartaric acid.

The baths at Ems have a wide reputation for their efficiency in certain physical disorders. The manufacturers of this preparation attempt to give by the brand name the false impression that these salts have some close connection with this famous Ems "Bad." In fact the label states that "this powder reproduces the medical properties of the great European springs, famous for centuries for the cure of diseases of the stomach, intestines, liver,

kidneys and bladder." The Federal government, however, has successfully maintained a charge of misbranding against this preparation in this connection, and the name has been changed to *Bad-Ex Salts*.

Although consisting only of common well-known salts we are assured by the manufacturers that their preparation is a remedy for Dyspepsia, Gastritis, Catarrh of the Stomach, Vomiting, Heartburn, Nervous Affections of the Stomach, Intestinal Indigestion, Diarrhoea, Constipation, Hemorrhoids, Biliaryness, Torpid Liver, Jaundice, Gall Stones, Inflammation of the Kidneys, Gravel, Catarrh of the Bladder, Diseases of Women, Skin Diseases, Gout, Rheumatism, Uric Acid, Obesity, Diabetes, and "Unusual Diseases," "the kind that you yourself and even the doctor are not sure of."

The label claims a net weight of 11 oz., but we find only 8.7 oz.

BISURATED MAGNESIA.

4704. *Bisurated Magnesia*, International Druggists' and Chemists' Laboratories, Paris, New York, London. "An Antacid, especially prepared for dyspepsia, indigestion and digestive disorders arising from hyper-acidity of the stomach. Corrects heartburn, distress after eating, bad sour breath; relieves belching, gas, bloating, headaches, dizziness and similar disorders attendant upon hyper-acidity." Price 50 cents for 0.7 oz.

An odorless white powder.

Loss @ 100° C.	10.75	Bismuth oxide	1.49
Magnesium oxide	51.90	Sulphuric anhydride	0.41
Calcium oxide	6.30	Carbon dioxide	20.40
Sodium oxide	10.79	Potassium oxide	trace

From the above the following hypothetical composition of the mixture may be calculated:

Loss @ 100° C.	10.75	Calcium carbonate	11.24
Bismuth subcarbonate		Magnesium carbonate	10.87
(Bi ₂ O ₃ CO ₃ H ₂ O)	1.69	Magnesium sulphate	0.62
Sodium bicarbonate	18.43	Magnesium oxide	46.49

No doubt these alkaline salts would have a tendency to correct hyper-acidity. All of the drugs the compound contains are cheap

except the bismuth salt, and the amounts supplied in the 0.7 oz. of material are worth in the retail market not over one cent.

CALDWELL'S SYRUP PEPSIN.

5500. *Dr. W. B. Caldwell's Syrup Pepsin and Herb Laxative Compound*, Pepsin Syrup Co., Monticello, Ill. "Alcohol 8.5%." Price 50 cents for 5.7 fl. oz.

A brown syrup with the taste and odor of senna, peppermint and cloves or cinnamon.

Spec. grav. @ 15.6° C.	1.1993
Alcohol by volume	8.16
Solids	54.83 gms. per 100 cc.
Ash	0.43 " " "
Sucrose	49.45 " " "
Invert sugar	1.42 " " "
Salicylic acid	0.12 " " "
Organic matter, non-sugars	3.53 " " "
Senna	present
Oil of peppermint	present
Oil of cinnamon or cloves	present
Pepsin, if any	very slight
Phenolphthalein, glycerine	none

This is an alcoholic sugar solution containing senna and a small amount of salicylate, and flavored with oil of peppermint and aromatics. Pepsin, if any, is present in an inappreciable amount.

The company in its circular tells us

"Having made the science of vegetation a study for many years, discovering and isolating proximate principles of plant drugs containing the most valuable properties and most wholesome substances that may be used to promote human health, separating the inert material with which they are combined, we offer to the world the most convenient, agreeable and acceptable laxative, delicate and effective, having a pleasant flavor, adapted for children, a mild action and soothing effect."

There is no question as to the efficacy of this compound as a laxative but the company's study of "the science of vegetation" apparently stopped with senna, a drug whose value was recognized by the Arabians as early as the ninth century. If pepsin ever was present in the compound, its power as a digestive had been completely lost in the sample which we have analyzed.

MOTHER GRAY'S SWEET POWDERS FOR CHILDREN.

4697. *Mother Gray's Sweet Powders for Children.* Allen S. Olmsted, Le Roy, N. Y. Price 25 cents for 14 powders weighing 8.71 gms., or 9.6 grs. per powder.

Powders with a sweet, licorice taste.

Loss @ 100° C.	1.00	Sulphur	3.18
Ash	1.88	Water-extract	91.38
Reducing sugars before inv, as dextrose	1.96	Licorice powder	present
Reducing sugars total, as dextrose	90.48	Senna	small
			amt.
		Phenolphthalein	none

This preparation is quite similar to the *Compound Licorice Powder* of the U. S. P. as to ingredients, but the proportions are very different. The U. S. P. product contains 50 per cent sugar, 23.6 licorice powder, 18 powdered senna, 8 sulphur, and 0.4 per cent oil of fennel, while in *Mother Gray's* preparation all of the active therapeutic agents are reduced in quantity and sugar, which is their least desirable ingredient for children suffering from stomach or bowel troubles, is increased from 50 to over 90 per cent.

REGULIN.

4514. *Regulin*, The Reinschild Chemical Co., New York. Price 50 cents for 1.62 oz.

A coarsely-shredded substance of a brownish color.

Water	12.35	Cascara	present
Ash	3.95	Agar-agar	present
Galactan	19.53		

The material is agar-agar colored by an aqueous infusion of cascara. The value of agar-agar in the treatment of constipation is well recognized. Cascara also is a drug of known alternative properties, but its use here in connection with agar-agar would appear to be unnecessary and open to the objection stated by the manufacturers themselves that "all laxatives and cathartics impose a tax on the already affected intestinal tract." The really useful ingredient in *Regulin* is the agar-agar, which ordinarily costs about 70 or 80 cents per pound, while in this preparation it costs about five dollars. The use of agar-agar can hardly be called a "New Treatment for Constipation," nor

TONICS.

can cascara be considered "a Harmless Vegetable Addition to Daily Food."

MINERAL OIL PREPARATIONS.

For the analysis of proprietary preparations of liquid petrolatum see page 359.

TONICS.

CUTICURA RESOLVENT.

5494. *Cuticura Resolvent*, Potter Drug and Chemical Corporation, Boston, Mass. "Alcohol 20%." "A gentle alterative tonic, digestive and aperient." Price 39 cents for 6.3 fl. oz.

A dark-brown liquid with an alcoholic aromatic odor, and a sweet, slightly-bitter after-taste.

Spec. grav. @ 15.6° C.	1.0594
Alcohol by volume	18.85
Solids	21.81 gms. per 100 cc.
Sucrose	5.54 " " "
Invert sugar	12.55 " " "
Ash	0.81 " " "
Potassium oxide	0.22 " " "
Iodine	0.58 " " "
= potassium iodide	0.76 " " "
Sodium oxide	0.03 " " "
Yellow coloring matter, extracted by ether	large amount
Alkaloids	slight trace
Glycerine, emodin	none
Strychnine, quinine, morphine, cocaine	none

The *Resolvent* is an alcoholic, syrupy liquid containing 0.76 gm. of potassium iodide and 2.91 gms. of unidentified vegetable extractives per 100 cc. In composition it is not unlike ordinary *Compound Extract of Sarsaparilla*.

MANOLA.

4706. *Manola*, The Manola Co., St. Louis, Mo. "Alcohol 18%." Price one dollar for 19.3 fl. oz.

A brown, turbid liquid with an aromatic odor, like cinnamon, and a vinous taste.

Spec. grav. @ 15.6° C.	1.0389
Alcohol by volume	17.35
Non-volatile solids	17.96 gms. per 100 cc.
Glycerine	2.09 " " "
Reducing sugars, as dextrose	11.77 " " "
Ash	0.28 " " "
Potassium oxide	0.11 " " "
Phosphoric anhydride	0.076 " " "
Nitrogen	0.04 " " "
Cinchona alkaloids	0.0042 " " "
Strychnine	present
Arsenic	trace
Calcium, magnesium, iron, sodium	traces

The label makes the following claim:

"Each 0.5 oz. contains 1 min. each of tr. echinacea, tr. cinchona and phos. acid dilute U. S. P., and 0.5 min. each of Fowler's solution and tr. nux vomica U. S. P. and also the tissue phosphates of Ca, K, Na, Fe, Mg, etc., aromatics, with a nutritious palatable base."

In such a complex preparation as this it is impossible to state the exact proportions in which the numerous ingredients are present. We identified all the claimed ingredients except tincture of echinacea, for which we could find no reliable test. Cinchona alkaloids, phosphoric acid, arsenic (probably due to Fowler's solution) and strychnine (probably due to tincture of nux vomica) were found to be present. Our analysis agrees very closely with one made by the *Journal of the American Medical Association* in 1910, except that we find only 0.28 gm. of ash where the *Journal* found 0.96 gm. Apparently the amount of "tissue phosphates" has been somewhat reduced.

Manola is recommended as "a Powerful Reconstructive Tonic and Alterative, Blood Maker and Tissue Builder."

Manola is indicated wherever Cod Liver Oil would be used. It is especially efficient in Phthisis Pulmonalis on account of its reconstructive and nutritive elements, lessens the muco-purulent expectoration, and arrests night sweats."

Manola is a boon to nursing mothers increasing the quantity and quality of their milk."

Manola possesses a wonderful power as a prompt and reliable restorative in those cases of general and nervous debility peculiar to married women."

"The ideal tonic and reconstructive in all conditions, from the deficient development of childhood to the exhaustion and debility of old age."

"*Manola* embodies the five tissue or cell phosphates in the same relative proportions in which these phosphates are represented in the cells which make up the human organism. . . . They are divided into several groups: *The Cell Constructants*, Calcium Phosphate, Magnesium Phosphate. *The Oxidizing Agent*, Ferrum Phosphate. *The Nutritive Stimulant*, Sodium Phosphate. *The Vitalizing Constituent*, Potassium Phosphate."

The above claims are so palpably false that they need no refutation. The last claim for the cell phosphates, however, might be imposing were it true and were it not for the stubborn facts of our analysis. We found but 0.28 gm. of ash per 100 cc., which would include all the phosphates (only 0.076 gm. of phosphoric acid per 100 cc.), and while a small amount of potash was present, 12.5 cc. of the medicine did not yield enough of either lime, magnesia ("Cell Constructants"), soda ("Nutritive Stimulant") or iron ("Oxidizing Agent") to weigh. The "tissue phosphates" may be desirable ingredients in a medicine, but *Manola* is sadly deficient in them.

VIN MARIANI.

5498. *Vin Mariani à la Coca du Pérou*, Mariani and Co., Paris and New York. "Alcohol 17%; free from cocaine." Price 90 cents for 16.7 fl. oz.

A wine with the taste of extract of coca leaves.

Spec. grav. @ 15.6° C.	1.0143
Alcohol by volume	16.25
Extract	8.90 gms. per 100 cc.
Ash (containing soda, potash, carbonates and phosphates)	0.23 " " "
Glycerine	0.42 " " "
Sucrose	0.10 " " "
Invert sugar	6.60 " " "
Total acidity, as tartaric	0.495 " " "
Volatile acidity, as acetic	0.072 " " "
Salicylates, benzoates, saccharin, cocaine and other alkaloids	none

The analysis indicates this is a mixture of Bordeaux wine and an alcoholic extract of decocainized coca leaves, with the addition of 6 to 7 per cent of sugar.

"It is pronounced serviceable in anaemia, debility, indigestion, bronchitis, la grippe, vocal weakness, continued fevers, nervous troubles,

malaria, overstrain, melancholia, heart affections, mental and muscular weakness, diseases of the aged, and in protracted convalescence it is employed successfully."

Vin Mariana has simply the tonic properties of ordinary red wine, and, since the cocaine which it formerly contained is now eliminated, its "bracing" effect is probably due to its 16 per cent of alcohol and to nothing else.

WINCARNIS.

4703. *Wincarnis*, Coleman and Co., Norwich, Eng. "Alcohol 18.5%." Made from choice wine, Liebig's extract of meat and extract of malt." Price \$1.65 for 25.3 fl. oz.

A clear brown liquid with the odor and taste of port wine.

Spec. grav. @ 15.6° C.	1.0408
Alcohol by volume	19.61
Solids	16.33 gms. per 100 cc.
Ash	0.42 " " "
Glycerine	0.49 " " "
Reducing sugars	13.04 " " "
Nitrogen	0.084 " " "
Iron	slight trace
Salicylates, benzoates, alkaloids ...	none

This preparation appears to be a wine to which has been added malt extract and a small amount of meat extract. The amount of the latter is extremely small, as Leibig's extract contains 9.41 per cent of nitrogen, and the total nitrogen in *Wincarnis* amounts to but 0.08 per cent, certainly insufficient to have any appreciable tonic effect.

MISCELLANEOUS REMEDIES.

CUTEX.

4713. *Cutex*, The Special Products Co., New York. "An Ideal Cuticle Remover." Price 25 cents for 0.5 oz., with a stick for application and a small amount of absorbent cotton.

A colorless solution with a faint odor of oil of rose.

Ash	2.35 gms. per 100 cc.
Potassium oxide	1.34 " " "
Sodium oxide	0.16 " " "
Glycerine	12.24 " " "

Carbon dioxide	very small amount
Oxalic acid	none
Oil of rose	present
Suspended gelatinous matter, chiefly silica and aluminum	small amount
Reaction	strongly alkaline

Cutex is a water-glycerine solution of 1.50 per cent caustic alkali, perfumed with oil of rose. The normal price of caustic potash is 15 cents per pound, which quantity would make 30 liters of a preparation of the same causticity as *Cutex*, which sells for 25 cents per half ounce.

EN-AR-CO OIL.

4705. *En-Ar-Co Oil* (formerly known as *The Wonderful Japanese Oil*), National Remedy Co., New York. "Alcohol 5%." Price 50 cents for 2 fl. oz.

A dark-brown liquid with a strong odor of fusel oil.

Fractional Distillation.			
Spec. grav. @ 15.6° C...	0.8545		
Alcohol by volume	3.60	From	85°-90°.... 6.0
Non-volatile solids	0.85 gm. per 100 cc.	"	90°-100°.... 7.6
Ash	0.002 " " "	"	100°-120°.... 22.4
Capsicum	present	"	120°-130°.... 35.2
Fusel oil	present	"	130°-140°.... 17.4
Oil of eucalyptus	present	Oily residue	11.4

This preparation is essentially fusel oil (about 85%), tincture of capsicum and oil of eucalyptus.

The manufacturer tells us that *En-Ar-Co Oil* is

"A medicine that is equally valuable for man, beast or fowl, is something outside the general run, and should attract the attention of all classes accordingly." . . . "We do not claim it to be infallible, or to cure everything, but we do believe that it comes nearer to accomplishing all this than any other known remedy; for proof of this read list of diseases printed hereon, which it relieves, and the testimonials published here and elsewhere."

The list of diseases referred to includes among others asthma, cholera morbus, fever sores, gout, headache, snake bites, rheumatism and the itch in human beings, "All diseases common to horses, cattle, fowl, etc.," and "is also excellent for making hens lay."

Fusel oil is an exceedingly dangerous poison, and should not be sold without a poison label. This remedy, however, is not alone recommended for external use; but also for internal medication, "for persons under six years of age five drops, over six years eight to ten drops." In spite of its dangerous character we are assured that

"It is just as necessary to keep a bottle of *En-Ar-Co Oil* in the house as to have a bottle of glue, ink, or any other article which may be required at any moment."

GETS-IT.

4523. *Gets-It.* E. Lawrence and Co., Chicago, Ill. "Each ounce contains alcohol 20%, ether 61%." "For Corns, Callouses, Warts and Bruises, Allays Inflammation, Stops Pain at Once." Price 25 cents for 6.5 cc., about one-third of which in our sample had probably been lost by evaporation, although the seal was unbroken.

On account of this partial loss of material by evaporation only qualitative tests were made. The preparation was a brown liquid of ethereal odor, and left a transparent film on evaporation. The presence of alcohol, ether and collodion was demonstrated, as well as a large amount of salicylic acid; no *Cannabis indica* was detected.

Gets-It is simply a collodion preparation of salicylic acid, quite similar to the *Corn Collodion* of the U. S. Dispensatory, except for the omission of *Cannabis indica*.

DR. MILES' RESTORATIVE NERVINE.

5499. *Dr. Miles' Restorative Nervine.* Dr. Miles Medical Co.'s Laboratory, Elkhart, Ind. "Non-alcoholic." Price one dollar for 8.7 fl. oz.

A dark-brown, syrupy liquid, with an aromatic odor, and a sweet, saline taste.

Spec. grav. @ 15.6° C.	1.3350
Alcohol	none
Ash	16.51 gms. per 100 cc.
Potassium oxide	3.46 " " "
Sodium oxide	2.40 " " "
Bromine	12.74 " " "
Ammonia (NH ₄)	0.183 " " "

Sucrose	46.30 gms. per 100 cc.
Invert sugar	6.14 " " "
Benzoic acid	0.04 " " "
Glycerine	none
Alkaloids, antipyrine, emodin	none
Aromatic volatile oil	slight amount

The preparation is a heavy syrup containing about 17 per cent of bromides, chiefly potassium and sodium, with a smaller amount of ammonium bromide; a small amount of benzoic acid is also present.

We are told by the manufacturers that "all of Dr. Miles' Remedies are Safe," and yet the dosage of this *Nervine*, with its 17 per cent of bromides, for children fourteen years old is one teaspoonful three times a day. The long-continued use of bromides is not without danger.

MODENE.

4527. *Modene*, for Removing Objectionable Hair, Modene Mfg. Co., Cincinnati, O. Price one dollar per oz.

A pale yellow powder with a slight odor of hydrogen sulphide.

Ash	97.78	Sodium oxide, water-sol.	0.14
Ash, insol. in HCl	85.38	Sulphur, total	2.40
Barium	10.30	" water-sol.	1.59
Potassium oxide, water-sol.	0.07	" free	none

The preparation appears to be essentially a mixture of about 13 per cent of barium sulphide with 85 per cent of siliceous material. (A small amount of calcium sulphide may also be present.) We are told by the manufacturers that it is "the only preparation known to science that will remove objectionable hair without the slightest injury or discoloration to the most delicate skin," and that it "is of recent scientific discovery."

Barium sulphide, the active ingredient of this product, may be bought at retail for 20 cents per pound; in *Modene* one dollar is asked for about one-eighth of an ounce.

MU-COL.

4693. *Mu-Col*, for Cleansing Mucous Membranes, The Mu-Col Company, Buffalo, N. Y. Price 25 cents for 2.4 oz.

A white powder with an aromatic odor.

Boric acid	32.85	Thymol, oil of wintergreen,
Chlorine	28.56	and possibly menthol and
Sodium	present	eucalyptol present

The material consists of 47.12 per cent sodium chloride (common salt) and 50.62 per cent borax ($Na_2B_4O_7 \cdot 10 H_2O$) with small amounts of thymol, oil of wintergreen, and possibly menthol and eucalyptol. Whatever virtues the remedy possesses undoubtedly lie chiefly in the two common drugs, table salt and borax, which make up nearly 98 per cent of the mixture.

MUSTEROLE.

4696. *Musterole*, The Musterole Co., Cleveland, O. Price 25 cents for 0.78 oz.

An ointment with the odor of mustard oil and menthol.

Loss @ 100° C.	10.83	Menthol present
Fatty base, by difference ..	89.17	Camphor prob.
Mustard oil	1.67	present
Ash	0.02	

As a counter-irritant perhaps *Musterole* has a place among "home remedies." When it is advertised, however, as it is in our local papers, with the claim that it "prevents pneumonia," it of course enters the fraudulent class.

Odo-Ro-No.

4700. *Odo-Ro-No*. Odorono Co., Cincinnati, O. "External use only." Price 25 cents for 1.1 fl. oz.

A red liquid with an aromatic odor.

Aluminum oxide	7.95	gms. per 100 cc.
Chlorine	13.90	" " "
Sodium oxide	0.40	" " "
Sulphuric anhydride	0.19	" " "
Reaction	acid	
Borates, nitrates, salicylates, resorcin ..	none	
Aromatics, color	present	

The material consists essentially of 37.58 gms. aluminum chloride ($Al_2Cl_6 \cdot 12 H_2O$), 0.72 gm. sodium chloride and 0.19 gm. sulphuric anhydride per 100 cc., with water, aromatics and color.

The free acid in this preparation, and the probability of the production of further free acid from the breaking down of the aluminum chloride militate against the safe use of *Odo-Ro-No*.

OPTONA.

4702. *Optona*, for the Eyes, Optona Co., Rochester, N. Y. Price one dollar for 37 white compressed tablets weighing 0.4 oz.

Loss @ 100° C.	19.21	Chlorides trace
Loss on ignition	38.35	Sulphates, phosphates, ni-
Boric acid	84.56	trates, alkaloids none
Sodium oxide	13.99	Reaction alkaline
Carbon dioxide	3.51	

From the above data *Optona* appears to be a mixture of about 37.50 per cent of borax ($Na_2B_4O_7$), 38.50 per cent of boric acid and 7 per cent of sodium bicarbonate, with water of crystallization. Surely a simple preparation to buy at the rate of one dollar for 0.4 oz., and yet the manufacturers tell us that the first reason for offering *Optona* in tablet form is "because this enables us to give *Optona* users more for their money. It would be impossible for us to make two quarts of this liquid solution, bottle it and offer it at the price we now sell *Optona*."

Mosso's OIL OF SALT.

5674a. *Mosso's Oil of Salt*, C. A. Mosso, Chicago, Ill.

A yellow, oily liquid with an odor resembling turpentine. It had a spec. grav. of 0.9254 @ 15.6° C., and a butyro-refractometer reading of 80.1 @ 25°. It began to distill at about 160°, but this point was very indefinite as the distillation temperature rose very quickly and the liquid decomposed giving off an acrolein-like odor. Under these conditions fractional distillation was difficult, and the distillation was stopped at 300°. The residue was heavy, viscid, of a dark-brown color, and with a fishy odor. The distillate was of a lower gravity, with a fishy odor and refracted at 67.0° at 25°. Tests for phenol derivatives in the original compound and in the distillate were negative; 5 cc. were ignited and gave a residue of 0.0003 gm., equivalent to 0.006 gm. of ash per 100 cc. This gave a faint opalescence when dissolved in water and treated with silver nitrate. The compound contained not more than a trace of chlorides.

The Halphen test for cotton seed oil was negative, and the Hanus number was 150.0. On saponifying with potash, and extracting with ether, a small amount of unsaponifiable matter was found with the odor of oil of sassafras. The saponification

residue was acidified and the fatty acids separated; these were liquid at room temperature and resembled fatty acids of the oleic acid series.

Oil of Salt is probably a mixture of volatile terpene compounds and fixed oils of the linseed and marine oil types, and contains but a trace of chlorides.

That this material varies in composition from time to time is shown by the following analysis given in the *Jour. Amer. Med. Asso.* Aug. 14, 1915, 640:—

"A mixture consisting of about two-thirds linseed oil with one-third of a mixture of essential oils, including turpentine, camphor and sassafras, containing total chlorides equivalent to 0.52 per cent HCl, one-third of which is present as free HCl."

We find distinct evidence of a marine oil, only a trace of chlorides and no free HCl.

This preparation is especially exploited among manufacturers as a "First Aid" for injured workmen. It would be an ignorant factory superintendent indeed who would believe that such a mixture as the above could produce the results claimed for *Oil of Salt*:—

"Our Compound promptly relieves pain, stops flow of blood, prevents infection; Causes Wounds to Heal Very Rapidly in all cases of Cuts, Burns, Bruises," etc. "Hayfever, Rheumatism, Neuralgia, Skin Troubles such as Salt-rheum, Eczema, Pimples, etc. Piles of all kinds, Indigestion, Diarrhoea, Nervousness, Female Weakness and prostatic troubles; all of which can be restored to perfect order by the use of Mosso's Oil of Salt."

The manufacturer reveals his ignorance of pathology when he tells us that diabetes is "commonly called Bright's disease."

The preparation is also exploited under the name "First Aid Treatment," and sold by the Pan-Albert Laboratories, Chicago.

TINCTURE OF VANILLA.

(*Tinctura Vanillae.*)

Twenty-seven samples from the stock of druggists were examined for the Dairy and Food Commissioner. Twenty-three of these were genuine tincture of vanilla, containing from 0.11 to 0.36 gm. of vanilla per 100 cc. Two samples were legally labeled compounds.

The two following samples were misbranded:—

9940. "*Ext. Vanilla Compound*," Hoadley and Hutchinson, Branford. It contained 0.50 gm. of vanillin and 0.0312 gm. of coumarin per 100 cc., and was artificially colored, 85 per cent of the color being insoluble in amyl alcohol.

10059. "*Compound Extract of Vanilla*," Taylor's Pharmacy, New London. It contained 0.41 gm. of vanillin and 0.0608 gm. of coumarin per 100 cc.

BAR WHISKEY.

Owing to the lax governmental rulings as to what is whiskey, almost any alcoholic beverage may be sold under that name provided it contains from 45 to 50 per cent of alcohol derived from grain. The use of caramel to give alcohol an appearance of age is tolerated, and as a consequence much of our "four-year-old" whiskey is a made-over-night concoction of water, grain alcohol, caramel, prune juice and beading oil. The peculiar aroma and flavor for which whiskey is valued, and which is developed only by the slow maturing of the whiskey over a long period of time are, according to governmental interpretation, no longer essential characters of true whiskey.

It has been suggested that the sudden evil effect of certain bar whiskies on the users indicated that some harmful ingredient other than alcohol might be present, such as wood alcohol, ether or chloral hydrate. The present examination was undertaken, therefore, to determine the alcoholic content of bar whiskey, and the presence or absence of these foreign poisons. In the present state of official opinion it appeared futile to indulge in the niceties of a real whiskey analysis.

One hundred and twenty-three samples were analyzed, in most cases representing the cheapest grades of whiskey sold in our larger cities. In 15 of the samples wood alcohol was suspected from the differences between the actual and theoretical readings of the distillates as shown by the immersion refractometer. The most careful tests, however, failed to demonstrate the presence of wood alcohol in any case, other than possibly mere traces. Likewise neither ether nor chloral was found in any of the samples.

TABLE XXVII:—ANALYSES OF BAR WHISKEY.

Station No.	Dealer.	Price Paid for 8 oz. Requested.	Quantity Delivered.	Alcohol by Volume.	Solids.	Color Insoluble in Amyl Alcohol.					
							cts.	oz.	%	%	%
<i>New Haven.</i>											
4768	Josef Adler, 467 State St.	20	8	45.72	.395	30.5					
4789	" " " " "	15	8	39.24	.095	80.5					
4759	The Arlington, 152 Meadow St.	25	8	45.67	.100	7.3					
4755	The M. J. Beck Co., 398 Grand Ave.	15	8	39.83	.370	72.9					
4760	" " " " " Grand Ave. & Jefferson St.	15	8	39.84	.313	64.2					
4770	" " " " " 562 Grand Ave.	15	8	43.73	.195	65.4					
4783	" " " " " 144 Congress Ave.	20	8	46.01	.140	8.6					
4786	" " " " " 800 Grand Ave.	25	8	47.07	.614	41.6					
4798	" " " " " East St. & Grand Ave.	20	8	46.03	.232	43.7					
4802	Jos. Blake, Carlisle St. & Union Ave.	25	8	45.78	.667	63.4					
4806	B. Bohan, 46 Putnam St.	25	8	31.72	21.470	68.0					
4771	T. E. Cahill, 133 Dixwell Ave. (Harper)	25	8	46.41	.312	59.5					
4767	Michele Cappetta, 40 Olive St.	25	8	45.52	.335	65.6					
4795	Cedar Hill Café, 1146 State St.	25	8	35.95	.243	77.6					
4782	Congress Ave. Café, 250 Congress Ave. (Lalley's Jockey Club)	25	8	43.57	.541	70.1					
4807	James Cotiero (?), 128 Commerce St.	25	8	45.10	.390	56.8					
4811	G. S. D'Annielo, 21 Collis St.	25	8	44.68	.277	68.8					
4792	C. Defelice, 79 Oak St. (Old Bronson)	25	8	45.84	.195	74.6					
4804	Alfonso De Maio, 52 Fair St.	25	8	44.41	.819	49.6					
4793	Doolittle Inn, 327 State St.	25	8	42.96	.445	73.8					
4778	Durant Hotel, 160 State St.	25	8	45.58	.158	5.0					
4766	Joseph A. Frye, 121 Broadway	25	8	41.99	.520	56.9					
4761	Giuseppe's Café, Water & Warren Sts.	25	8	34.09	.120	97.6					
4785	Grenon Bros., 116 Crown St.	25	8	45.80	.151	6.0					
4774	Hotel Carrollton, 674 Chapel St.	25	8	43.55	.222	70.7					
4757	Hotel Davenport, Orange & Court Sts.	40	8	43.51	.115	32.8					
4756	Hotel Freeman, 179 Meadow St.	25	8	45.71	.815	71.1					
4793	Hotel Oneco, 14 Church St.	25	8	44.56	.230	71.8					
4784	L. P. Ihne, Orange & Crown Sts.	25	8	45.58	.445	58.9					
4810	Imperial Café, 12 St. John St.	25	8	44.86	.281	52.9					
4776	Fred. Jacob, 113 Water St. (Old Standard)	25	8	46.42	.755	72.6					
4772	J. J. Johnson, 636 Congress Ave.	25	8	46.84	.129	6.2					
4791	Mrs. John Kechan, 164 Franklin St.	25	8	42.91	.670	57.3					
4762	James Kelley, 172 Ashmun St.	25	8	42.53	.105	72.1					
4779	Maiorino Bros., 46 Fair St.	15	8	31.93	.098	78.1					
4781	" " 173 Wooster St.	30	8	43.46	.471	83.2					
4803	Marble Café, 38 St. John St.	25	8	45.88	.470	43.0					
4799	A. Maresco, 193 Hamilton St. (Royal XXXX)	25	8	40.01	.197	66.0					
4769	McCarthy, 316 East St.	25	8	42.69	.290	76.2					
4753	Peter McDermott, 294 Ashmun St.	25	8	45.33	.408	68.7					
4805	M. F. McNerney, 93 Cedar St.	25	8	33.28	.293	60.3					
4797	Victor Mettling, 1280 State St.	25	8	46.45	.528	65.8					
4765	¹ Chas. W. Motley, Jr., 153 Dixwell Ave.	25	7	45.26	.617	66.9					
4794	John Nolan, 256 Wallace St.	25	8	43.33	.134	7.0					

¹ Our 8 oz. bottle kept and 7 oz. given in exchange.

TABLE XXVII:—ANALYSES OF BAR WHISKEY.—Continued.

Station No.	Dealer.	Price Paid for 8 oz. Requested.	Quantity Delivered.	Alcohol by Volume.	Solids.	Color Insoluble in Amyl Alcohol.					
							cts.	oz.	%	%	%
<i>Hartford.</i>											
4752	Thomas Nolan, 443 Grand Ave.	25	8	45.64	.720	74.3					
4751	— Ochenkowski, 770 Grand Ave.	25	8	44.08	.985	75.1					
4809	Joe Ornato, 31 Green St.	25	8	52.61	.171	4.8					
4777	Oxford Hotel, 132 State St.	25	8	44.71	.454	68.8					
4788	Max Price, 123 Oak St.	15	8	42.13	.118	87.5					
4750	² J. Quint Co., 835 Grand Ave.	20	7	45.73	.395	47.0					
4775	Hugh J. Reynolds, 152 Crown St.	25	8	45.63	.931	19.2					
4790	Peter Reynolds, 1362 State St.	25	8	46.51	.781	74.8					
4780	B. Ruggiero, 709 Congress Ave.	25	8	36.93	.131	95.2					
4754	R. Salimeno, 34 Olive St.	25	8	40.47	.095	63.7					
4787	H. Salzmann, 53 Congress Ave.	15	8	37.36	.123	67.0					
4764	Jacob Strauss, 27 George St. (Cabinet)	15	8	38.37	.090	76.5					
4773	— Reserve)	20	8	45.44	.130	73.2					
4758	Herman Taylor, 35 Broadway	25	8	43.89	.871	68.9					
4796	Vanacore & Mocci, 194 Wallace St.	25	8	27.38	.771	80.6					
4808	M. Weadlick, 166 Bridge St.	25	8	21.91	12.750	79.2					
4812	Wooster Café, Wooster & East Sts.	25	8	45.01	.282	71.0					
<i>Norwich.</i>											
4813	³ J. Bronerwine, 205 Windsor St.	15	7	30.84	.156	79.7					
4817	— Coppelli, 406 Front St.	15	7	42.97	.158	8.4					
4823	⁴ A. C. Gallucci, 466 Front St.	15	7	37.34	.167	64.1					
4816	⁵ Julian Glowack, 16 Sheldon St.	25	7	46.35	.240	75.3					
4821	Hartford Distillery Co., 83 Windsor St.	15	8	40.19	.113	77.1					
4824	⁶ Ed. Kacprzinski, 161 State St.	15	7	29.83	.088	77.5					
4814	⁷ Michael Kolar, 1180 Main St. (Old Cabinet)	25	7	44.82	.342	58.7					
4818	⁸ People's Café, 283 Front St.	15	7	36.94	.137	73.4					
4822	M. S. Sczawinski, 53 Sheldon St.	25	8	45.05	.243	75.1					
4815	⁹ G. Stovola, 290 Front St.	15	7	37.76	.159	74.4					
4820	¹⁰ Synott Bros., 522 Main St. (Sherwood)	25	7	39.84	.398	73.3					
4819	M. Yellin, 177 Windsor St.	25	8	47.96	.364	46.8					
4826	¹¹ Henry Allard, 29 No. Main St.	25	7	39.89	.123	71.3					
4828	D. J. Driscoll, 157 No. Main St.	25	8	45.49	.144	55.6					
4825	H. Jackel & Co., Water & Market Sts.	25	8	45.16	.180	16.3					
4831	C. Karpenia, 95 Water St.	25	8	44.79	.112	61.8					
4827	Larwiere Bros., 62 Water St.	25	8	45.75	.157	5.7					
4833	Levine Bros., 8 No. Thames St.	25	8	50.31	.160	4.8					
4830	Lurie & Bendett, 152 W. Main St.	25	8	52.28	.149	4.4					
4834	F. Pedace & Co., 9 Bath St.	25	8	44.42	.162	36.1					
4832	A. Schauken, 43 W. Main St.	15	8	39.06	.116	66.5					
4829	J. Stein, 93 W. Main St.	15	8	37.54	.147	81.7					
4836	Tomaino Bros., 174 W. Main St.	25	8	45.52	.420	79.1					
4835	L. Wunderlich & Co., 21 Bath St. (Old Empire Straight)	25	8	46.28	.432	46.6					

² No statement of volume; contained 7 oz.³ "7 oz." blown in bottle.⁴ Full $\frac{1}{2}$ pt. blown in bottle; handstamped "7 oz."⁵ Labeled "This bottle contains 7 oz."

TABLE XXVII.—ANALYSES OF BAR WHISKEY—Concluded.

Station No.	Dealer.	Price Paid for 8 oz. Requested.	Quantity Delivered.	Alcohol by Volume.	Solids.	Color Insoluble in Amyl Alcohol.
<i>New London.</i>						
4847	R. Centinella & Co., 79 Main St.	15	8	34.81	.187	66.2
4839	Michael Doyle, 99 Bradley St.	25	8	49.07	.112	6.0
4848	Phil. Dufresne, 15 Bradley St.	25	8	46.34	.549	23.8
4844	Max R. Einhorn, 23 Bradley St.	15	8	35.02	.254	87.8
4843	J. Hoff (?), Water & Atlantic Sts. (Paul Jones)	25	8	44.50	.180	87.6
4846	Edward Keefe, 489 Bank St.	25	8	39.34	.763	66.6
4838	Thos. J. Kehr, 247 Bank St.	25	8	41.43	.220	71.7
4842	A. Leverone, 15 Golden St.	15	8	35.03	.102	20.0
4837	Samuel Levin & Co., 268 Main St.	25	8	45.77	.356	76.2
4841	M. L. Siegel, John & Potter Sts. (Chimney Corner)	25	8	46.26	.263	33.8
4840	Paul Smilgin, 113 Bradley St.	25	8	52.85	.150	3.6
4845	The Soltz Co., 131 Bradley St. (Oakland Maryland Rye)	15	8	35.11	.131	82.7
<i>Waterbury.</i>						
5150	Kyran Brophy, 30 Scoville St.	15	8	35.56	.156	84.7
5152	Andrew Byron, 709 Bank St.	25	8	45.24	.438	74.6
5145	Gallabro & Co., 627 So. Main St.	25	8	42.93	.385	72.3
5148	M. Gartz, 2 Sperry St.	25	8	45.73	.206	79.1
5147	Hennessey & Foody, 457 W. Main St.	25	8	45.17	.093	73.6
5144	Nicolo Jacaruso, 606 Bank St.	25	8	45.08	.098	66.3
5151	Kardac & Kaliszewski, 395 So. Main St.	25	8	40.39	.110	67.5
5141	Joseph Kudirka, 883 Bank St.	25	8	48.88	.769	74.3
5146	Leonardo Lo Russo, 38 Scoville St.	15	7	34.92	.148	53.7
5149	Rocco Mancini, 64 Canal St.	25	8	46.59	.883	65.1
5143	Orlando Bros., 38 Union St. (Old Polk) ...	25	8	44.03	.668	54.4
5139	Ike Pasternak, 213 So. Main St.	15	7	42.04	.158	67.0
5142	Perillio Bros., 313 Bank St.	25	8	35.35	.160	66.6
5140	V. Vallerio, 116 Meadow St.	25	8	36.95	.576	84.6
<i>Bridgeport.</i>						
5153	⁸ Jacob Cohen, 758 Pembroke St.	15	7	37.38	.205	68.8
5159	Klematis & Giedratis, 84 Hamilton St.	25	8	38.22	.109	62.0
5156	J. Losanov, 800 Pembroke St. (Royal XXXX)	25	8	40.02	.250	74.8
5160	Ignac Malulewic, 633 Pembroke St.	25	8	45.98	.766	74.8
5163	Julius Nussenfield, 559 Water St.	15	8	36.70	.124	75.2
5162	Jack Reich, 591 Water St.	15	8	37.76	.077	61.7
5155	Edward Rink, 791 E. Main St.	8		41.74	.172	81.3
5158	² B. Sachs, 541 Water St. (Monogram) ...	15	7	40.10	.106	79.4
5154	J. Schine, 701 Pembroke St.	15	8	42.63	.293	83.4
5164	Robt. J. Veit, 777 E. Main St.	25	8	45.63	.924	53.4
5167	Leonard Verrillo, 26 Reiley St.	15	8	34.29	.139	67.4
5161	⁸ John Weldon, Water St. & Golden Hill ...	25	7	38.26	.127	62.1

⁸Labeled "Contents 7 oz."⁷"Guaranteed full $\frac{1}{2}$ pint" blown in flask; contained less than 7 oz.⁸"Guaranteed flask" blown in flask; contained less than 7 oz.

Apparently the commonest means employed by the compounders and dealers to cheapen their whiskey is the addition of water. From the standpoint of temperance this practice perhaps may not be without its advantages, but the commercial fraud is none the less real. A liquor dealer has a right to expect whiskey of full alcoholic strength from the compounding, and even the sot is entitled to expect that his "poison" as served over the bar is of full strength and potency. Leaving the question of morality entirely out of the question, the bar keeper has no more right to sell a compound containing 25 per cent of alcohol when whiskey is ordered than the dairyman to sell watered milk for the genuine article.

ALCOHOL CONTENT.

The following is a summary of the alcoholic strength of the whiskies examined:—

4	contained	over	50 per cent
46	"	from	45-50 "
36	"	"	40-45 "
26	"	"	35-40 "
8	"	"	30-35 "
2	"	"	25-30 "
1	"	"	20-25 "

That is, only 50 of the 123 samples were of full alcoholic strength, while 3 contained less than 30 per cent. The range was from 21.91 to 52.85 per cent. One hundred and eight of the samples contained between 35 and 50 per cent of alcohol.

SOLIDS.

With the most liberal interpretation a good whiskey should not contain over 0.5 per cent of non-volatile solids. Our samples showed the following percentages:—

97	with	solids	from	0.08-0.50	per cent
24	"	"	"	0.51-0.99	"
I	"	"	of	12.75	"
I	"	"	"	21.47	"

The extremely high solids in 4806 and 4808 were due almost entirely to added sugar or syrup; 4806 contained 18.90 per cent sucrose and 2.41 per cent invert sugar, 4808 10.18 and 2.05 per cent, respectively. In 4780 the solids had a distinct peppery taste.

In most of the samples containing over 0.5 per cent of solids, the residue on evaporation had a distinct sweetish taste, indicating the presence of sugar or glycerine. It is worthy of note that in 22 samples the solids showed a slight astringency, suggesting the possibility that at least this number of our samples may have been in an oak cask long enough to extract some of the tannin; these same 22 samples likewise contained from 42.1 to 52.9 per cent of alcohol and were probably the closest approach to genuine whiskies of any of the brands examined.

ADDED COLOR.

Freshly distilled whiskey is colorless and the amber color associated with genuine whiskey is a result of long storage in charred casks. In factitious whiskey, however, this appearance of age is simulated by the addition of caramel, prune juice or other coloring matter. The color of genuine whiskey is almost completely soluble in amyl alcohol, while caramel shows only a slight solubility in that reagent. Accordingly a high insolubility of the color in amyl alcohol indicates the presence of artificial color. The following tabulation shows a summary of our data on this point:—

13 with under 10 per cent insoluble color				
3	10-20	"	"	"
1	20-30	"	"	"
4	30-40	"	"	"
7	40-50	"	"	"
11	50-60	"	"	"
30	60-70	"	"	"
40	70-80	"	"	"
14	80-98	"	"	"

That is, 110 of the 123 samples may be considered as having derived their color from some other source than a charred whiskey cask. It is of interest to note that the thirteen samples showing from 3.6 to 8.6 per cent of insoluble color contain from 43.0 to 52.6 per cent of alcohol and only from 0.100 to 0.171 per cent of solids.

On the generous assumption that a genuine whiskey is one showing from 45 to 50 per cent of grain alcohol, not over 0.5 per cent of non-volatile solids, and not over 10 per cent of color insoluble in amyl alcohol, only 13 of our samples can be considered to be above suspicion as to their purity.

LOCAL CONDITIONS.

The following tabulation shows the maximum and minimum percentages found in the samples taken in the various cities. Too definite conclusions should not be drawn from these data, but it is noticeable that none of the 26 samples of cheap bar whiskey taken in Waterbury and Bridgeport was free from added color, and only one in Hartford.

City.	No. of Sam- ples.	No. Genu- ine.	Alcohol.		Solids.		Insol. Color.	
			Max.	Min.	Max.	Min.	Max.	Min.
New Haven	61	7	52.61	21.91	21.47	0.09	97.6	4.8
Hartford	12	1	47.96	29.83	0.40	0.09	79.7	8.4
Norwich	12	3	52.28	37.54	0.43	0.11	81.7	5.7
New London	12	2	52.85	34.81	0.76	0.10	87.8	3.6
Waterbury	14	0	46.59	34.92	0.88	0.09	84.7	53.7
Bridgeport	12	0	45.98	34.29	0.92	0.08	83.4	53.4

NET VOLUME OF WHISKEY.

Our agent was provided with half-pint flasks for his purchases, and in many instances this flask was retained by the dealer and a flask already filled substituted for it. In a number of cases the dealer saved an ounce of whiskey by this exchange. In 17 instances our agent received only 7 ounces when 8 ounces were requested and paid for. In 10 of these the whiskey contained from 29.8 to 39.9 per cent of alcohol, so that the dealer not only sold short volume but diluted whiskey as well. The dealers in Hartford were the chief offenders, 9 out of 12 selling the agent 7 ounces when 8 ounces were called for. These facts have been reported to the state police for action.

The following samples require special notice in this connection:—

4765. Asked for 8 oz.; our 8 oz. bottle kept and a 7 oz. bottle given the agent.

4750 and 5158. No statement of contents on bottle; asked for 8 oz., received 7 oz.

4813, 4817, 4823, 4816, 4824, 4818, 4820, 5139 and 5153. Asked for 8 oz.; received bottle with "7 oz." blown in.

4814. "Full $\frac{1}{2}$ pt." blown in bottle; handstamped "7 oz.;" asked for 8 oz., received 7 oz.

4815 and 4826. Labeled "7 oz."

5146. "Guaranteed full $\frac{1}{2}$ pt." blown in bottle; contained less than 7 oz.

5161. "Guaranteed flask" blown in bottle; no volume stated, contained less than 7 oz.

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

Thirteen hundred and seven samples were examined for the Dairy and Food Commissioner. Certain of these, such as cheese, maple syrup, soda water syrups and various drug products, have already been discussed. A brief summary of the remaining samples follows. Of the total number examined 761 were not found to be adulterated, 24 were legally labeled compounds, and 522 were adulterated, misbranded or below standard.

Bread. A sample of *Ward's Tip Top Bread* contained 0.06 per cent of sulphuric anhydride, not much greater than is usually found in bread.

Butter and Butter Substitutes. Of 189 samples examined 132 were genuine butter, 34 renovated butter and 23 oleomargarine.

Cheese. In addition to the 86 samples reported on page 269, another sample, suspected of having caused sickness, was examined with negative results.

Cider. Of 25 samples tested 8 contained salicylates, 5 benzoates alone and 2 benzoates with saccharin; only 10 of these samples were free from preservatives.

Confectionery. Two samples of chocolate candies contained alcohol, 1.09 and 1.47 per cent, respectively, in the liquid portion of the candy.

Horse Radish. Two samples were examined microscopically for the presence of ground turnip; none was present.

Maple Sugar. The single sample was not adulterated.

Maple Syrup. Twenty-five samples were analyzed (see page 339.)

Milk. Three hundred and eighty-four samples were analyzed. Of these 182 conformed to the legal standards, while 88 were deficient only in solids-not-fat. Ninety-one were below standard in solids, 66 in fat and 176 in solids-not-fat, 202 samples failing to meet the legal requirements in one or more particulars. Thirteen samples were skimmed, 29 watered and 6 both skimmed and watered.

The skimmed milks were taken in Woodstock, West Hartford, Chaplin, Lebanon, Ellington, North Branford, Rocky Hill and Groton; the watered milks, in Bloomfield, Killingly, Stamford, Shelton, Orange, West Hartford, Coventry, Ellington, Somers,

Columbia, Stafford Springs and Manchester; the milks which were both skimmed and watered, in Griswold and Stafford Springs.

Rye Meal. The sample examined contained oat hulls.

Sausage. Sixty-three samples were examined. Of these two were decomposed when received, and 8 contained from 1.35 to 6.46 per cent of starch; sulphites were present only in traces and no boron compounds were detected.

Soda Water Syrups. Two hundred and nine samples were examined (see page 344).

Temperance Drinks. The 63 samples tested were examined chiefly for saccharin. In 19 samples saccharin was present, in 6 instances accompanied with artificial color. Two samples were legally labeled compounds, while 11 contained undeclared artificial color, and one benzoates and color. One sample of strawberry soda contained acid magenta, an unpermitted coal-tar color.

Aspirin Tablets. Fifty-four samples were examined (see page 346).

Spirit of Camphor. Forty-four samples were examined (see page 348).

Chlorinated Lime. Twenty-five samples were examined (see page 351).

Syrup of Ferrous Iodide. Twenty-nine samples were examined (see page 348).

Hydrogen Peroxide. The sample tested contained 2.98 per cent of absolute hydrogen peroxide.

Tincture of Iodine. The sample tested contained no wood alcohol.

Solution of Magnesium Citrate. Sixty-three samples were analyzed (see page 352).

Mercurial Ointments. Seven samples were examined (see page 357).

Proprietary Medicines. A partial analysis of *Fowler's Asthma Cure* (William Fowler, New Haven) showed 14.98 per cent of ethyl alcohol; a small amount of unidentified alkaloid was present, not *Cannabis indica*. The preparation was misbranded "a positive and sure cure for asthma in any form." A sample of *Oil of Korein Capsules* were also examined, the details being given on page 371.

Tincture of Vanilla. Twenty-seven samples were analyzed (see page 404).

Turpentine. The sample examined contained about 40 per cent of mineral oil.

Extract of Witch Hazel. The sample contained 14.48 per cent of ethyl alcohol; no wood alcohol or formaldehyde was present.

MISCELLANEOUS MATERIALS SENT BY PRIVATE INDIVIDUALS.

Butter. Of the 13 samples tested 4 were genuine butter, 1 renovated butter and 8 oleomargarine.

Celery Roots. The sample was analyzed to determine its availability in the diabetic diet. It showed the following composition:—

Water	89.00	Starch	0.09
Ash	1.24	Reducing sugars before inv.	
Fiber	1.18	as dextrose	0.74
Protein	1.96	Reducing sugars total, as	
Nitrogen-free extract	6.27	dextrose	1.39
Ether extract	0.35		

Cheese. Two samples suspected of having caused sickness were tested with negative results. One of the chemists ate an ounce of one sample with no ill effects. The cheese was fed to three rats, which had been starved for 48 hours before feeding it. The rats showed no bad effects after eating 31, 40 and 55 grams, respectively, in three days, and two of the three rats gained weight on the diet.

Cider. The sample contained 2.34 per cent of alcohol by volume.

Cinnamon. The sample contained 10.70 per cent of alcohol extract and 3.98 per cent of ash, and under the microscope showed no adulteration.

Confectionery. The sample contained 5.97 per cent of paraffin.

Cream. Twenty-seven samples were analyzed; these ranged from 13.5 to 53.5 per cent of fat, all but four meeting the legal standard of 16 per cent. Thirteen samples sold as heavy cream ranged from 29.0 to 53.5 per cent, only 7 exceeding 40 per cent.

Flour. A sample of *Ballard's Self-Rising Flour* was suspected of having caused illness. It contained 3.98 per cent of ash, con-

sisting chiefly of sodium, lime, phosphates and chlorides, none in excessive amount for this sort of flour; no heavy metal was detected.

Honey. The two samples analyzed were not adulterated.

Human Milk. Five samples were analyzed as follows:—

Solids	13.26	13.13	12.38	....	....
Fat	4.20	3.80	3.10	4.50	3.00
Protein	2.05	1.56	....	1.15	....
Lactose	6.61	7.55	....	....	....
Ash	0.40	0.22	....	....	....

Ice Cream. The one sample contained 11.5 per cent of fat.

Malted Milk. Three samples suspected of containing poison were tested with negative results.

Maple Syrup. The single sample was not adulterated.

Meat. Two samples suspected of containing poisonous ingredients were tested with negative results.

Milk. Of the 40 samples examined 27 were of standard quality. One sample was watered, one both skimmed and watered, and 11 were below standard in one or more particulars.

Milk Powder. A sample of skim milk powder contained 32.53 per cent of casein and 0.65 per cent of fat.

Oats. The sample contained 0.0036 per cent of sulphur dioxide; the oats were of poor quality, somewhat musty, and showed no germinating power whatever.

Oleo Color. The color consisted of an oil solution of annatto, with possibly a trace of turmeric.

Olive Oil. The four samples tested were not adulterated.

Peanut Butter. The two samples analyzed were not adulterated; they showed

Protein	28.94	29.06
Fat	47.52	48.25

Salt. The sample was suspected of containing poison; none was found, only the usual impurities of ordinary table salt being present.

Tea. The sample contained 6.26 per cent of ash; no Prussian blue or indigo was present.

Vinegar. Of the 70 samples examined 37 satisfied the legal standards for acidity and solids. Fifteen samples were low in

acidity, 11 in solids and 7 in both acidity and solids. Most of the samples were farmers' vinegar and the deficiencies generally were due to incomplete acetification.

Water. A sample of spring water suspected of containing poison showed no heavy metals or alkaloids; a small amount of flowers of sulphur was found as a sediment.

Wine. A sample of Zinfandel wine contained 12.70 per cent of alcohol by volume and 0.20 gm. of reducing sugars per 100 cc.

Aspirin. Two samples of 5 gr. tablets showed 3.84 and 4.98 grs. per tablet, respectively; the former contained free salicylic acid and starch.

Auto-Laks. A partial analysis showed the preparation to consist essentially of about 25 per cent of phenolphthalein in a chocolate base.

Beeswax. The three samples tested showed no adulteration, two being of somewhat superior quality to the third, as indicated by their complete solubility in chloroform and their melting point of 62° C.; the third sample melted at 68° C.

Methylene Blue. The two samples were intended for use in treating contagious abortion in cattle, and were examined for impurities; both samples were found to be the pure dye.

Phosphoric Acid Paste. The sample contained 5 parts per million of arsenic trioxide.

Soap. A sample of liquid soap consisted of a white solid and an olive-green liquid. The solid was of the nature of a wax or paraffin, while the liquid was a solution of soap containing no free alkali.

Stock Medicines. The two samples examined were phenolic products of complex composition.

Whiskey. Three samples were examined. One contained 22.65 per cent of alcohol by volume with considerable black pepper; the other two contained 38.55 and 46.74 per cent of alcohol by volume. No wood alcohol or chloral hydrate was present.

Wool Fat. A sample of *Corona Wool Fat* was tested for salicylates, benzoates, borates, nitrates, phenols and creosote with negative results.

Police Cases. Thirty-nine samples were examined in connection with the police crusade against the sale of habit-forming drugs in New Haven. Fifteen samples were morphine sulphate, 3 cocaine hydrochloride, 1 heroin, 1 strychnine sulphate, 4 gum

opium, 7 "yen shi" (partially burned gum opium), 1 a mixture of menthol and opium, 1 roach paste, 1 a bromide preparation for impotency, while 5 samples were milk sugar or other inert drugs.

Poisoning Cases. A sample of vinegar contained 8.93 grs. of corrosive sublimate in 6 fl. oz.; a sample of cooked peas sent at the same time contained no heavy metals. A sample of tablets contained 6.94 grs. of corrosive sublimate per tablet. One sample each of milk and cracked corn contained no metallic poison. An apple, sent by a farmer seven of whose cows had been killed, contained a large amount of arsenic. A sample of candy contained methylene blue, which had been introduced apparently to scare the victim rather than to injure her. A duck and the contents of the stomach of a heifer, thought to have been poisoned, were tested for arsenic and alkaloids with negative results.

Westerly Poisoning (?) Cases. During July, 1915, an epidemic of food poisoning occurred at Westerly, R. I., and in an adjacent township in this state. It is estimated that sixty persons were made seriously ill, four of whom died. The cause of the poisoning seemed to be traced to pies purchased from a certain Westerly bakery. Samples of the various food products used at the bakery were sent to this laboratory; these included cocoanut custard pie, dough, flour, shredded cocoanut, shortening, sugar, nutmeg and vinegar, together with samples of disinfectant and insect powder found on the premises. The disinfectant was of a phenolic character and the insect powder a pyrethrum powder; both of these preparations were shown conclusively to have no connection with the sickness. The food samples were tested for heavy metals and alkaloids with negative results. The stomach contents of one of the victims was also sent to us and in this we found formaldehyde and bismuth; the first of these, we found later, was introduced by the sample having been sent to us carelessly in an embalming fluid bottle; it was stated that bismuth had been administered to the deceased by his physician. No metallic or alkaloidal poison was found in any of the samples. The examination for ptomaines was beyond the facilities of this laboratory and our connection with the case ceased at this point.

It is of interest, however, to note that Bernstein and Fish, in reporting these cases in the *Jour. Amer. Med. Assn.*, Jany. 15, 1916, came to the conclusion that the poisoning was due to the

Bacillus paratyphosus B, that the vehicle of infection was pie, and that the presence of a "disease carrier" in the community had probably been established.

TABLE XXVIII.—SUMMARY OF RESULTS OF EXAMINATION OF FOOD AND DRUG PRODUCTS, 1915.

	Not Found Adulterated.	Adulterated or below Standard.	Compound.	Total Number Examined.
<i>Sampled by Station.</i>				
Cereal Breakfast Foods	11	3	..	14
Cocoa and Chocolate	2	1	2	5
Hygienic Coffee	1	4	..	5
Coffee Substitutes	3	..	..	3
Diabetic Foods	9	..	..	9
Fig Preparations	4	..	..	4
Flavoring Extracts	82	13	26	121
Canned Fruits	..	..	..	303
Graham Flour	7	1	2	10
Infant Foods	..	..	..	27
Noodles	9	3	..	12
Oysters	10	1	..	11
Rice	2	..	..	2
Miscellaneous Foods	8	..	..	8
Mineral Oil	15	35	..	50
Proprietary Medicines	..	..	..	49
Whiskey	10	113	..	123
Total	173	174	30	756

	Not Found Adulterated.	Adulterated or below Standard.	Compound.	Total Number Examined.
<i>Sampled by Dairy Commissioner.</i>				
Bread	1	..	..	1
Butter	132	57	..	189
Cheese	83	3	1	87
Cider	10	15	..	25
Confectionery	..	2	..	2
Horse Radish	2	..	..	2
Maple Sugar	1	..	..	1
Maple Syrup	11	12	2	25
Milk	182	202*	..	384
Rye Meal	..	1	..	1

* Including 88 below standard in solids-not-fat only.

	Not Found Adulterated.	Adulterated or below Standard.	Compound.	Total Number Examined.
Sausage	53	10	..	63
Soda Water Syrups	98	94	17	209
Temperance Drinks	30	31	2	63
Aspirin Tablets	49	5	..	54
Spirit of Camphor	38	6	..	44
Syrup of Ferrous Iodide	25	4	..	29
Hydrogen Peroxide	1	..	..	1
Tincture of Iodine	1	..	..	1
Chlorinated Lime	5	20	..	25
Solution of Magnesium Citrate	10	53	..	63
Mercurial Ointments	5	2	..	7
Proprietary Medicines	..	2	..	2
Tincture of Vanilla	23	2	2	27
Turpentine	..	1	..	1
Extract of Witch Hazel	1	..	..	1
Total	761	522	24	1,307
Samples by Private Individuals	147	110	..	257
Total from all sources	1,081	806	54	2,220

PART VI.

Report of the Botanist for 1915.

G. P. CLINTON.

NOTES ON PLANT DISEASES OF CONNECTICUT.

G. P. CLINTON.

We have not previously reported on the plant diseases found either in 1914 or 1915 in this state, so we will consider in this article those found in both these years. We will first mention briefly the common troubles that have been previously noted in our reports, and then consider more in detail those that are reported for the first time.

DISEASES, ETC., PREVIOUSLY REPORTED.

Weather, 1914. The winter of 1913-14, following a long mild autumn, was rather severe as a whole on perennial out of door plants. A severe ice storm in December did considerable injury to both fruit and shade trees because of the great weight of the ice supported by some of them during a high wind. Mr. G. A. Drew, writing of this injury in southwestern Connecticut, in *Tree Talk* (1915:9. Feb.) said: "From the shade trees the tops were literally stripped, the oaks, hickories and elms apparently suffering just as much as the softer wooded trees. Moreover, the forest trees seemed to suffer about as much as the individual ornamental or specimen trees in the open."

Two cold spells, one in January and another in February, without much snow on the ground, also caused considerable winter injury to trees, especially fruit trees, which has continued to show up to the present time. The peach blossom buds were rather severely injured in many orchards.

The spring started early, but in the end was not more advanced than usual. The summer and fall as a whole were of the warmer, drier type, not especially favorable to the development of fungous

troubles, September being especially dry. Killing frosts occurred the last of that month.

Diseases, 1914. The following diseases were called to our attention by correspondents during the season, or were noted by us as especially injurious:

Fire blight of apple was reported a number of times; there was considerable scab of apples on susceptible varieties, and also some sooty blotch. Peach leaf curl was unusually prevalent and scab not uncommon. Black knot on cherries and plums was sent to us for identification several times; there was one complaint of anthracnose of cherry, and of downy mildew of grape. Orange rust and fire blight of quince were also reported a few times.

There were a number of reports of injury by potato scab, and Rhizoctonia on the tubers was also common. A few cases of injury by black leg were seen. Tip burn of the vines caused the most trouble, altho near the end of the season there were a few reports of injury by late blight. The anthracnose of bean, rust of asparagus, club root of cabbage, and Phoma rot of Rutabaga were also troubles complained of.

Besides the ice injury and the winter injury to bark, wood and buds of fruit trees, there was complaint of winter injury to the roots of grapes, paeonies, and a few other plants. The white pine blight, due to the severe winter, was also unusually prevalent.

Weather, 1915. The winter of 1914-15 was not so severe as to cause any serious injury of plants, as shown by the very profuse blossoming of peaches in May. The spring was rather cool and dry, and not especially forward. The summer from the middle of June to the middle of August was unusually cool and wet, being an exception in this respect to the rather dry, warm summers for several years past. The cool, wet weather put back plant growth considerably and produced rather unusual troubles, so that crops as a whole did rather poorly, especially muskmelons, late potatoes and tobacco. Warmer and drier weather in late summer and a long fall, due to very late killing frosts, partially compensated for the earlier unfavorable weather.

Diseases, 1915. On the whole the weather conditions favored fungous troubles more than for several years past. Those troubles especially injurious were as follows:

Fire blight and sooty blotch of apple were prevalent, but scab, because of unfavorable spring conditions, was less conspicuous

than the year previous. Leaf curl of peach was common, and in certain unsprayed orchards scab was so injurious on Albertas as to seriously affect their selling value. Brown rot did much injury to the early varieties of peaches, but this in itself did not cause serious financial loss, as over-production and poor quality had made the price so low that some growers left part of the crop to rot rather than market it. The bacterial spot of peach was more conspicuous than for several years. There was some complaint of the anthracnose of cherry, the downy and powdery mildews of grape and the black rot of grape. Some raspberries showed signs of disease, possibly due to winter injury.

The white pine blight also showed again this year, and a leaf spot of Catalpa was reported twice. The sycamore anthracnose was more common than usual. Leaf scorch of maple was also reported a number of times.

The currant rust, *Cronartium ribicola*, was reported on black currants from Canaan by the Massachusetts inspectors, and on red currants from Meriden by Spaulding of the U. S. Department of Agriculture. As this fungus is connected with the white pine blister rust, brought some years ago into this state on stock imported from Europe, this indicated that there were still infected pines in the state, though none had been seen since the last inspection of plantations in 1910. The presence of the rust on one or more of its hosts in Massachusetts, Connecticut, and some other states in 1915 was considered such a menace that the Government threatened to place a quarantine on white pines and currants in the nurseries of these states. This was finally delayed pending a thorough inspection of the pine plantations and nurseries in 1916, to determine the present distribution and amount of the blister rust.

On market garden and special farm crops there were several serious fungous troubles. Root rot of tobacco caused considerable injury to plants in the fields, altho just how much of the poor tobacco crop is to be credited to this and how much to adverse weather conditions in mid-summer is a matter upon which there is some diversity of opinion.

Bacterial spot of beans (see mention elsewhere) was an unusual trouble, and anthracnose of the same host was quite severe. The effect of weather conditions on the development of this latter trouble is shown in Plate XVII e, where seedlings grown from

diseased beans (d) developed more or less injury according to whether they were grown under moist or dry conditions. The chief means of combating this trouble seems to be the selection for seed purposes of only those beans that are in pods absolutely free from any signs of anthracnose, and seed should be selected and planted by itself each year as a source of seed for the general crop the next year.

Other important diseases were the mosaic of cucumber and the storage rot of onions, both of which are mentioned elsewhere in this report. "Blast" of seed onions was another serious trouble that caused a loss of one-half to two-thirds of the seed crop. This trouble is still under investigation as to its cause. Late blight of potatoes for the first time in several years caused considerable injury to late potato vines, and in certain fields serious rotting of the tubers. Black leg of potatoes was more common than usual, and there were a few cases of tip burn. Other troubles noted as more prominent than usual were leaf spot of beets and mangels, black rot of cruciferous plants, leaf spot and downy mildew of lettuce, blight of melons, leaf blight of corn, leaf spot of tomatoes, and late leaf blight of celery. Plate XVIII d shows the latter trouble developing in the leaf stalks of celery, spoiling it for market.

A fungus, not of the parasitic type, but yet of considerable economic importance, which was called to our attention in February, was the dry rot, mention of which was made in our Report for 1906, p. 336, as causing injury to woodwork in the basement of a church at Stony Creek. This time the fungus, *Merulius lacrymans*, was found in the factory of the Singer Manufacturing Company of Bridgeport. Complaint of it was made by George M. Eames, as follows:

"We desire to ascertain the cause of a peculiar condition which has arisen under circumstances as follows: On opening up some packing cases containing finished sewing machines, which have lain for a matter of six weeks or two months on a maple floor laid on top of a brick floor with an air space between, we found the inside of the boxes very handsomely decorated with fungi, and the fungi had also climbed around and across the arm and bed of the machines. This would not surprise us if it were in a damp cellar, but it is in a regular working room where the temperature is always dry and warm and the light good, and it seems to have occurred only in one spot in a room 75 feet wide and 350 feet long. This situation is not only interesting, but important for us to ascertain the

cause, and we would like to have someone come here and consult with us in the premises."

A visit to the factory showed several of the boxes and the enclosed heads of the sewing machines like those shown in the illustration, Plate XXIV. A considerable number of boxes had stood close together in a pile on the floor. Those showing the fungus had covered a spot about four feet in diameter on the floor which was decayed by the fungus, and apparently the moist air spaces offered by the close placing of the boxes had favored its development upon and into the boxes. The fungus evidently came from the flooring, as the boxes were made of new kiln-dried material and the flooring a short distance away some time before had been replaced on account of rot evidently caused by this fungus. Apparently not all of the fungus had been removed, and the piling of the boxes over an infected part of the floor had favored a rapid and vigorous development above the floor. The fungus had formed a very conspicuous and thick growth, covering the wood of the infected boxes, also the iron of the inclosed machines and the sample cloth attached, and had become slightly tinted as the first step in forming its fruiting stage.

DISEASES NOT PREVIOUSLY REPORTED.

Besides the troubles already mentioned, there were others of more or less economic importance that had not been previously listed from this state. Some of these, however, were only old troubles on new hosts. The following notes, arranged alphabetically by hosts, are upon these new diseases.

ALFALFA, *Medicago sativa*.

White Spot. Plate XVII c. This obscure alfalfa trouble was first called to our attention by Farm Bureau Agent Manchester of Litchfield County, who sent specimens collected at Chapinville early in May, 1915. As shown by the illustration the injury occurs on the leaves as numerous small white spots, usually of an irregular oval or more elongated shape, which are most frequently seen at the upper marginal parts. These spots are generally confined to scattered plants in the field. The disease appears early and is usually rather general on the infected plants,

but does not seem to spread to others, so it is not a very important or injurious trouble.

We find the same thing on alfalfa at our Mount Carmel farm, and it appears to be a widespread trouble. Stewart *et al.* (Geneva, N. Y. Agr. Exp. Sta. Bull. 305:402. 1908) were, as far as we know, the first to give a brief description of it. They were not sure as to the cause, but thought it might be a physiological trouble. We understand that it occurs on alfalfa in Wisconsin, and investigators there have some reason for considering it the work of thrips. Recently Crabill (Phytopath. 6:91-3. Fe. 1916) reported that in Virginia this trouble is associated with a fungous crown-rot of the roots and that a similar injury can be produced by mutilating the crown. Such roots as we have examined have shown more or less of a rotting of the tissues in spots near the crown, as if starting from the dead stubs left when the alfalfa is cut. Presumably fungi might enter there and work down somewhat into the crown, or winter injury might be partially responsible, especially in killing the stubs.

Yellow Top. With this trouble the leaves usually show a yellowish band of varying width at the upper end and sides. It has also been reported by Stewart (*loc. cit.*) To us the trouble seems to be physiological, and due to either frost or drought injury. It often shows in spots in the field.

APPLE, *Pyrus Malus*.

In our previous reports we have briefly described various rots of apples caused by *Glomerella rufomaculans* (Bitter Rot), *Sphaeropsis Malorum* (Black Rot), *Penicillium expansum*, reported as *Penicillium glaucum* (Blue-Mold Rot), and *Monilia cinerea* (Brown Rot). During the past few years our assistant, Mr. Stoddard, has been making a special study of all rots of apples. As a result of his studies and our own there have been observed a number of other species of fungi that are primarily or secondarily responsible for rotting of apples, chiefly in storage. A brief mention of these follows.

ALTERNARIA ROT, *Alternaria* sp. We first obtained this fungus some years ago from apples showing a speck rot developing rather abundantly over the fruit, and it has been isolated since then several times from similarly specked apples, but it is likely

to be crowded out later by the more aggressive black-rot fungus. It has also been found causing large rotten areas either on the side or blossom end of the apple. Morse and Lewis (Me. Agr. Exp. Sta. Bull. 185:365. 1910) of Maine and Cook and Martin (Phytopath. 3:119. 1913. *Ibid.* 4:102-5. 1914) of New Jersey, have reported *Alternaria* rots of the fruit. The latter recognize two types, called by Cook (N. J. Agr. Exp. Sta. Circ. 44:11-12) Blossom End Rot and Jonathan Spot Rot. There has been some difference of opinion as to whether the Jonathan Fruit Spot was due to an *Alternaria* attack or was a physiological trouble, in most cases following removal of apples from cold storage. Scott and Roberts (U. S. Dept. Agr. Bur. Pl. Ind. Circ. 112:11-16. 1913) hold the latter view. Norton (Phytopath. 3:99-100. 1913) reports that similar injury can be produced by the fumes of formalin and ammonia. Cook and Martin seem to think that there may be both a physiological and an *Alternaria* Jonathan Fruit Spot.

FUSARIUM ROT, *Fusarium* sp. Mr. Stoddard has obtained a *Fusarium* a number of times from stored apples showing a general or core rot. When kept under moist conditions the rotten area is likely to become coated over with a vigorous development of the white mycelium, with more or less development of pink spores, thus distinguishing this from other rots. Lewis (Me. Agr. Exp. Sta. Bull. 219:257. 1913) of Maine reports two species of *Fusarium* isolated from apples in that state, *F. pirinum* and *F. helianthi*. We have not definitely determined our species, but since it is questionable whether the numerous so-called *Fusarium* species are all real species or merely physiological strains, the selection of a specific name is largely a matter of personal opinion.

GRAY-MOLD ROT, *Botrytis vulgaris* Fr. Plate XVII a. Fruit rot caused by a *Botrytis* has been found occasionally on apple, pear, peach, quince and strawberries in this state. It occurs on the summer varieties of apple, and Mr. Stoddard has obtained it a number of times from stored apples. It causes a general rot of the fruit, and the reproductive stage appears in time as a grayish growth of clustered fruiting threads bearing at their tips bunches of spores, as shown imperfectly in the illustration. It seems to be the same species that occurs on various herbaceous greenhouse plants when kept under unfavorable conditions of

moisture. The fungus (said by some authors to be the same as *B. cinerea*) has not been particularly studied with reference to its various hosts or its exact identity, but as it is as much a saprophyte as a parasite, and has the same general appearance in cultures from the various hosts, presumably there is but one species represented by the hosts-mentioned here, and this is probably only the conidial stage of the ascomycete *Sclerotinia Fuckeliana*, altho this mature stage has not been seen by us.

SOFT ROT, *Rhizopus nigricans* Ehrn. This was found once on summer varieties causing a soft rot of the fruit. In time a vigorous growth of the black fruiting threads overruns the outside. Presumably it occurs more frequently than is indicated by our single collection.

VOLUTELLA ROT, *Volutella fructi* S. & H. Plate XVII b. This rot was first called to our attention in 1913, by Professor Osmun of Amherst, who sent us apples (see illustration) from Simsbury from which the fungus was isolated. Mr. Stoddard has also isolated it from one or two other collections. The fungus causes a general rot of the apple, with its fruiting stage showing as small erumpent pustules much like those of black rot, but under the hand lens they show the characteristic setae of Volutella.

CABBAGE, *Brassica oleracea*.

GRAY-MOLD FUNGUS, *Botrytis vulgaris* Fr. Plate XVIII a. This fungus, which we have reported (see Apple) on various fruits and greenhouse plants, was found by Mr. Stoddard causing a decay of stored cabbage. A vigorous development of the gray fruiting stage appeared on the outside, as shown in the illustration. Some years ago Professor Graves of Yale separated a somewhat similar fungus from decaying stored cabbage, which he gave us under the name of *Sclerotinia*, probably *S. Fuckeliana*.

CARNATION, *Dianthus Caryophyllus*.

White Tip. Plate XVIII b. We have given this name to a trouble that was first called to our attention on the Enchantress carnation in the greenhouses of W. H. Burr at Westport in December, 1914. The injury, as indicated by the name, shows on the partially unrolled tips, which assume a white or creamy color for a distance of an inch or so inward. Occasionally

similarly colored spots were seen across the leaves a short distance below the tips. No signs of fungus or insect attack showed on these spots. Presumably they appeared rather suddenly; at least they did not seem to increase much in number after their first appearance. This would indicate a physiological rather than a fungous trouble.

The fact that the injury occurred at or near the tips, and on young leaves, points toward a gas rather than a spray injury, and so far as we know, in the case under consideration no injurious spray was used on the plants. Apparently the trouble was due to the fumes of sulphur, or possibly of tobacco, used as a fungicide or an insecticide. We have seen the trouble rarely in other greenhouses, and the only explanation seems to be the one given. The fact that the injury takes place at the tips of the leaves is probably due to their more tender condition, and that it occurs on certain plants rather than on all, to the amount of moisture present on the affected ones at the time of injury. Certain varieties seem much more susceptible than others, and apparently the Enchantress is one of the most susceptible.

CELERY, *Apium graveolens*.

Bunched Roots. Plate XVIII c. Occasionally we have seen celery that after transplanting remained small or became stunted during the season, owing to the lack of sufficient fertilizer in the soil, or of sufficient cultivation to enable the plants to make use of it in a normal growth. In the fall of 1914 we had called to our attention two celery fields, one in Hamden and one in East Haven, where a somewhat similar trouble seemed to be due to excessive fertilization or to improper fertilization, perhaps in part to the character of the season or to the soil in which the celery was transplanted. The plants remained stunted, due to the fact that the roots did not make a normal growth, appearing as if "pot bound," as shown in the illustration. While these roots were massed together and had a reddish, diseased appearance, no signs of a fungous or bacterial cause could be found. Apparently fertilizer burn was responsible. In one field the worst spots showed a red color of the soil, due to the development of an unusual amount of a red unicellular alga, indicating an unusual condition of the soil solutions.

CUCUMBER, *Cucumis sativus*.

Mosaic or *White Pickle*. Plate XIX a-b. This trouble was first noticed by us in this state in 1914, on cucumbers grown by Mr. Hayes for experimental purposes at the Mount Carmel Station farm. The crop was practically ruined by it about the time it came into full bearing. Not much attention was paid to it that year on account of other work. An application of lime to certain plots, however, failed to show any favorable results. In 1915 the disease was even more severe, ruining some of the cucumber seed crops near Milford, where it was mistaken for blight by some of the growers. Specimens were sent to us from other states, and from the reports it seems to have been unusually prevalent and injurious in the northern states east of the Mississippi River. It is apparently the same disease reported some years ago by Selby from Ohio on greenhouse cucumbers.

The most characteristic appearance of the disease and its greatest injury is shown on the fruits. These have a mottled appearance with lighter and darker green areas, the lighter green often fading into white, hence the name "white pickle." The tissues beneath the darker green areas grow more normally and rapidly, due to the greater amount of chlorophyll present, and this causes an irregular knobbing of the fruit, as shown in the illustration. On the leaves the disease shows as mottled areas of light and dark green color, giving a mosaic effect somewhat similar to that of calico of tobacco. This uneven distribution of the chlorophyll sometimes causes irregular growth, resulting in crumpling of the leaves. The disease, however, does not always show prominently on the leaves. As a whole, the vines are more or less stunted.

The writer has made no special study of this disease, but at the recent meeting of the American Phytopathological Society at Columbus, papers were presented by Gilbert, Doolittle and Jagger (see *Phytopath.* 6:143-51. Ap. 1916) which show that the disease is contagious, and can be inoculated into healthy plants by rubbing them with bruised diseased tissues or by injection of the infected juice, the same as with calico of tobacco. Their experiments proved likewise that it could be carried from plant to plant by lice. This disease, however, does not seem to be exactly the same as calico of tobacco, since the writer (Rept.

1914, p. 413 (26)) failed to infect cucumber plants with the juice of calicoed tobacco plants. The chlorosis trouble on muskmelon reported previously by us (Rept. 1907-8, p. 865) is very similar to this, but we were not sure that that disease was infectious. We noticed this year that some muskmelon vines near the infected cucumbers showed slight indications of a similar disease on certain of the young melons, but we saw no mottling of the leaves. The disease did not become at all prominent on these vines.

As this disease is contagious, and can be carried by lice, it is important that the vines be watched carefully early in the season and all infected vines pulled up and carried from the field, being especially careful not to drop off lice from the diseased onto the healthy vines. Neither should the healthy vines be touched after handling diseased ones, without first washing the hands. We cannot but believe that the type of season is an important factor in this disease, because of its sudden and general appearance the past wet year and the presence of other unusual chlorosis troubles, especially that on the soy bean reported elsewhere.

GRAPE, *Vitis* sp.

GRAY-MOLD FUNGUS, *Sclerotinia Fuckeliana* (deBy.) Fckl. Plate XIX c. We have previously reported the conidial stage of this fungus, *Botrytis cinerea*, as causing a rotting of greenhouse grapes. Mr. Zappe, while inspecting imported grape cuttings from Hungary in March, 1914, brought to our attention the sclerotial stage of this fungus (see illustration), which we had not seen before. These sclerotia are small, flattened, oval bodies about one-sixteenth to one-eighth of an inch long, adhering closely to the bark. It is from these that the mature, or sclerotinal stage, is said to develop, altho as yet we have not observed it in this state. From the sclerotia, however, Mr. Stoddard obtained in cultures the *Botrytis* and sclerotial stages.

KALE, *Brassica oleracea* f. *acephala*.

BLACK ROT, *Pseudomonas campestris* (Pam.) Smith. Plate XIX d-e. We reported this bacterial disease on cabbage, of which kale is merely a horticultural variety, in our Report for 1911-12, p. 345. It is characterized by the black discoloration it produces

in the veins of the yellowed leaves, and on kale by the blackening and decaying of the stems, as shown by the illustrations. It was found in 1915, late in October, at Mr. Burr's farm at Greens Farms, and evidently had spread to the kale from some nearby infected cabbage. The moist season was favorable for its development.

MANGEL, *Beta vulgaris*.

LEAF BLIGHT, *Cercospora beticola* Sacc. This disease has been reported here previously on beet and chard, which, with the mangel, are merely varieties of the same species. It produces small brownish or later whitish spots with a distinct purplish border, scattered over the surface of the leaves. These spots are usually subcircular and only a few millimeters in diameter, but when numerous they may run together somewhat. Badly infected leaves turn yellowish and die prematurely. Last year was favorable for its vigorous development late in the fall.

Townsend, of the U. S. Department of Agriculture, has published in Farmers' Bulletin No. 618 an account of this fungus as a disease of the sugar beet. Concerning its control, he writes:—"Leaf spot may be controlled on a commercial scale and in a practical and inexpensive manner by a carefully planned and thoroughly executed system of crop rotation, or by deep fall plowing. The best results are obtained by combining these two methods." He also found that the trouble could be controlled by thoro spraying with Bordeaux mixture, and that the proper disposition of beet tops and stable manure are important aids in its control.

CROWN GALL, *Pseudomonas tumefaciens* (Sm. & Towns.) Stev. Plate XX a. In October, 1915, on the Bedford farm at Greens Farms, where the Station had some experiments with mangels, the writer found the specimen shown in the illustration, in which a large gall-like growth had made its appearance on the side of the mangel just above the surface of the ground. No doubt injury to the beet during cultivation had allowed entrance for the bacterial germs that are responsible for the crown gall. The gall has a structure very similar to that of the main root, being an enlargement due to rapid multiplication of the cells caused by the stimulus of the organism. In time the surface becomes more roughened and distorted, and decay may follow.

Townsend (U. S. Dept. Agr. Bull. 203. 1915) has recently published an account of crown gall on sugar beets, and some of his illustrations show specimens with a single large gall, like that shown here. Cooke (Fungoid Pests of Cultivated Plants, p. 245) described some years ago a similar gall observed on beet roots in England. He assigns *Edomyces leproides* Trab., the canker fungus, as the cause, but he failed to find any signs of this fungus present. As Milburn (Fungoid Diseases of Farm and Garden Crops, p. 107) also illustrates and describes a similar trouble of mangels from England, which Bessey suggests as crown gall, there seems to be little doubt of their identity with the trouble described here.

This trouble, according to Townsend, is likely to increase on land where beets and mangels are grown year after year. When proper rotation of crops is practised, however, the disease does not usually cause much injury.

Root Rot, *?Pythium deBaryanum* Hesse. Plate XX b. During the summer of 1915 there was called to the writer's attention a root rot of mangels at the farm of R. F. Beecher of Centerville. Pressure of work prevented an examination of the field until late in September, just after the mangels had been dug. At that time, however, specimens of the diseased roots were found among those harvested and others left in the field as worthless. Apparently the trouble was then at a standstill, since the decayed parts of the roots were very sharply marked off from the healthy, and there was no indication of recent infection of the healthy tissues. A peculiarity of the rot (see illustration) was that it never started at the crown, and usually the part of the root above ground was perfectly healthy even when the part beneath was almost entirely rotted off. Some plants were found which indicated that while the rot was severe, it did not injure the growing crown of leaves as much as one would expect, since plenty of living leaves were found on the badly-rotted roots. A wilting and yellowing of the leaves was noticeable during the growing season, it was said, by which the badly-injured plants could be detected.

Some roots were found that indicated that the trouble started on the side rootlets beneath the ground, and entering the tap root, rotted away the part below so that it was easily broken off when the mangel was pulled from the ground. The rot no

doubt progressed upward more slowly, but did not seem to develop very far on the root above the ground. Evidently unusual conditions of moisture were responsible for the starting and continuing of the rot. The past midsummer was very moist, and the land was rather low, so that moisture conditions there at that time were rather favorable for the development of the rot. In the drier fall weather the rot was evidently largely checked even on the infected plants. According to the owner, this same field developed rot badly some years previously.

An examination of the tubers showed in the rotted portions a great variety of low forms of animal life and saprophytic fungi, but no very suspicious species that might account for the trouble. In a few mangels, however, where a slight water-soaked area showed between the perfectly healthy and the rotted tissues, microscopic sections revealed the presence, between the cells, of very distinctive mycelial threads of a fungus that undoubtedly was responsible for the rot. With some difficulty, pure cultures of a phycomycetous fungus were finally obtained from such regions. When the mangels were kept in the laboratory under unusually moist conditions, these water-soaked areas became more pronounced, and cultures of the fungus were then more easily obtained. Grown in test tubes of oatmeal agar, this fungus usually produced a matted submerged surface growth (this may have been due to bacterial impurities), though cultures were finally obtained with an abundant white fluffy aerial growth. All cultures failed to produce a fruiting stage of any kind. However, when a small amount of the mycelium, with the medium, was placed in water in a Van Tieghem cell, oospores with one or more antheridia were readily produced, which seemed to agree well with descriptions of the oospores of *Pythium deBaryanum*.

So far as the writer could determine, the fungus agreed better with *Pythium deBaryanum* than with any other fungus, although there were some things in our imperfect study of it that made us hesitate to name it unquestionably as that species. Unfortunately our assistant let the cultures go too long before renewing, so it was lost before we had a chance to compare it with cultures of *Pythium deBaryanum* obtained from the U. S. Department of Agriculture. The statement of Edson, however (Journ. Agr. Res. 4:160. 1915) regarding the growth of

Pythium deBaryanum in artificial cultures, seems to agree fairly well with the results we obtained with our fungus. He says:—"It grows especially well, with long-continued vitality, upon string-bean agar. The sexual fruiting bodies are quite common in Petrie-dish cultures upon this medium, but are rarely met with in tube cultures. The asexual conidia, as well as oospores, are formed abundantly when the fungus is grown in water upon sugar beet seedlings in Petrie dishes. * * * Germination by zoospores was not observed, but no special effort was made to induce this type of development."

The only other fungi which seem likely to have caused this root rot are *Aphanomyces laevis* deBy. or *Rheosporangium aphanidermatus* Eds. The former has been described by Barrett (Phytopath. 2:96. 1912 Abstr.) as causing a root rot of radishes, but we have seen no description of its cultural characteristics, though so far as we can determine from the specific description, it does not agree so well with our fungus as *Pythium deBaryanum*. The second fungus was recently described by Edson (Journ. Agr. Res. 4:279-91. Jl. 1915) as the cause of a dampening off and a side root disease of sugar beets, which are very closely related to mangels. Edson describes and figures this fungus in detail and states that "in the general character of the disease produced in seedlings and in its appearance in cultures, the organism resembles *Pythium deBaryanum* so closely as to be readily confused with it, except in the asexual fruiting stage." This fungus was at first mistaken by him for *Aphanomyces laevis*. The fact, however, that in water it readily produces a "presporangium," which gives rise to a zoosporangium with zoospores, seems to preclude our fungus from belonging to it, since we saw no signs of such an asexual stage, or of zoospores of any kind in the water cultures in Van Tieghem cells.

While several authors have described *Pythium deBaryanum* as a cause of dampening off and of fibrous root rot of *Beta vulgaris*, we have seen no description of its causing a root rot of the tap root such as we mention here. Edson, who has made a special study of the sugar beet diseases in this country, mentions no such injury, but possibly suggests it in the following statement:—"The fungus was found to be capable of attacking the beet after it was five or six weeks old. Peters' statement

that it is able to infect the side roots during the entire vegetative period is probably correct. When the tap root is once attacked by *Pythium deBaryanum*, the ultimate death of the plant seems to be assured."

MAPLE, NORWAY, *Acer platanoides*.

ANTHRACNOSE, *Gleosporium* sp. Plate XX c. This disease was first called to our attention by Mr. Bartlett of Stamford, who sent us specimens of leaves collected in August, 1914, on the Bedford estate at Greens Farms. These leaves showed no signs of the fruiting stage, and at first seemed to indicate not a fungous, but a physiological trouble due to injury from some cause at the base of the petiole. Specimens collected by Dr. Britton the last of September at the same place, however, showed the fruiting stage of a *Gleosporium*, which was obtained in cultures by Mr. Stoddard.

The peculiarity of the disease is that the injury is confined to a very narrow band running each side of the principal midribs and their large veins. In general, the trouble seemed to start, or at least show most prominently, at the juncture of the midribs at the base of the leaf. From there it appeared to spread up the midribs, though not infrequently the diseased areas were confined to isolated places scattered along them. This may have been due to the restriction of the injury in places to the bundles, while further on it spread out into the parenchyma. So far as could be seen, the veins running off from these ribs always showed the injury first at their juncture with them, and the diseased band was usually widest there. Apparently it progressed from these outward, so that in some cases all of the midribs and their principal veins were injured practically their entire length. The injured tissues were of a reddish-brown color, in rather sharp contrast to the normal green of the rest of the leaf. Under a lens this reddish area was usually seen to be bordered by a faint yellowish, semi-pellucid line. Where the injury to the veins was extensive, the parenchyma tissue between the veins finally lost its green color, turning yellowish, as in maturing leaves, and such leaves were shed prematurely.

While the evidence as a whole seems to point to the *Gleosporium* as the cause of the trouble, since it was also found on

the fruit, we are not quite sure of its identity. In appearance the trouble approaches nearest to the anthracnose disease of the sycamore, *Gleosporium nervisequum*, which is not infrequently found here on sycamore leaves. In this case, while the injury usually develops along the veins, it is apt to show more in spots, often isolated, running out into the parenchyma, and rarely if ever is confined to such narrow elongated lines. Some botanists have reported the sycamore anthracnose as occurring on maples and oaks, and one would be inclined to consider this the same, were it not for the fact that the spores obtained from these maple leaves were smaller ($5-8 \times 2-3\mu$) than those examined from the sycamore ($9-13 \times 3.5-5.5\mu$). Curiously enough, the culture we now have on hand, said to have been isolated from these maple leaves, has spores agreeing in size with those from the sycamore. As there is a bare possibility that the culture has been mislabeled, we cannot claim them to be identical.

Besides *G. nervisequum*, Saccardo gives at least eight other species on *Acer*, but none of these, according to the descriptions, seems to produce an injury similar to that described here, although several of them have spores of approximately the same size, and others have the same host.

Bartlett (Tree Talk 2²:25. N. 1914) gives a brief description of this disease, and reports its occurrence on Long Island. Further study, especially with cultures and inoculation tests, is needed to prove the exact relationships and identity of the *Gleosporium* supposed to be its cause. It is barely possible that it is merely an unusual form of attack of *G. saccharini* or some other described species with similar spores.

ONION, *Allium Cepa*.

FUSARIUM ROT, *Fusarium* sp. Plate XX d. In 1915 onions rotted badly after storage. In some instances the growers lost from one-half to three-quarters of the crop. While the *Botrytis* previously reported was partly responsible for the rot, there were cases where a *Fusarium* fungus was the chief cause, producing a wetter rot than the former. This fungus is not so apt to fruit on the exposed surface and around the neck of the onion as the *Botrytis*, but seems to work down between the layers, often rotting one or more so that the inside easily slips

out of the outer healthy layers. The wet summer season was apparently the chief factor in the development of this trouble and no doubt most of the bulbs went into storage already infected though showing little or no sign of decay at the time. Selby of Ohio (Ohio. Agr. Exp. Sta. Bull. 214:416) has reported a storage rot of onions caused by *Fusarium* sp. which seems to be connected with injury by *Fusarium* (p. 413) in the field.

RUST, *Puccinia Porri* (Sow.) Wint. This fungus was found by the writer on specimens labeled Egyptian perennial onion (which, so far as we can learn, is a horticultural variety of *Allium Cepa*) in Blakeslee's botanical garden at Storrs in July, 1914. Only the uredo stage showed at that time, and specimens sent the first of October by Mr. Shultz, in charge of the garden, also failed to show any other stage. This makes it rather difficult to positively identify the fungus, as there have been a number of rusts reported on *Allium* in Europe. As we (Conn. Agr. Exp. Sta. Rept. 1909-10:726) have previously reported *Puccinia Porri* from this state on chives, and as these uredo specimens seem to agree with those of that species somewhat better than with those of *P. Alliorum*, reported in this country on wild species of *Allium* from the West, we have referred it to the former species, which frequently occurs on cultivated species of *Allium* in Europe. Dr. Arthur, to whom specimens were sent, also agreed with this determination.

The uredo sori occur as small, scattered or somewhat clustered subcircular to lanceolate pustules, protected by the epidermis, which, cracking lengthwise, exposes the dusty, orange-yellow spore masses. The spores are yellowish to light brown, moderately thin-walled and provided with several germ-pores, minutely and often obscurely verruculate, broadly oblong or oval to ovate or subspherical in shape, and chiefly 24-30 μ in length.

PALM, *Phoenix* sp.

FALSE SMUT, *Graphiola Phoenicis* (Moug.) Poit. This fungus occurs on palms in greenhouses, and is not uncommon in tropical regions, especially on the date palm. It was collected here by Inspector Zappe on specimens imported from Ghent, Belgium, by J. N. Champion of New Haven in May, 1914. The fungus, which was originally considered a smut, shows as small black

cup-shaped receptacles, light colored where rupturing on top, and elevated above the surface of the leaf about 0.5 mm. When abundant, it causes some injury to the leaves. Stone and Smith briefly describe and figure this in the Mass. Agr. Exp. Sta. Rept. for 1897, p. 67.

PEACH, *Prunus Persica*.

GRAY-MOLD ROT, *Botrytis vulgaris* Fr. This fungus has appeared during the last few years in our young peach orchard at Mount Carmel, causing a rot of the fruit, especially that on the lower branches and on the ground. As yet it has not caused serious injury, but on the other hand, it has been almost as common so far as the brown rot. See Apple, p. 427.

STRIPPED BUDS. Plate XXII a. An unusual injury, due to snow and ice, occurred on some of our nursery peach trees in the winter of 1913-14. The seedlings had been budded rather late the previous summer with yellowish buds, and so had in many cases made a rather tender and weak growth to go into the winter. They were so situated that they became rather deeply buried in the snow. When examined in April, they showed the condition indicated in the illustration. Many of the buds had been torn back for two or three inches and were hanging down at the end of a strip of bark. The snow had evidently frozen around the buds, and later, when settling down, had stripped back the buds because of the tender bark, much as if one had slashed them with a knife. The injury was greatest on the most tender trees and those in the lowest part of the rows, where the snow had banked the highest. The buds high above the snow had escaped injury. Although no complaint of such injury has ever been received, it is liable to occur in any nursery to some extent.

PEAR, *Pyrus communis*.

BLUE-MOLD ROT, *Penicillium expansum* Lk. Plate XXII d shows this rot on pear. The specimen was obtained from pears kept in storage for a short time in October, 1915, by Mr. Sears of Elmwood. It forms a general rot of the fruit, and in time the characteristic blue-green fruiting pustules appear, breaking out abundantly on the surface. This rot is not uncommon on

both apples and pears in storage, although we have not reported it before on the latter host.

GRAY-MOLD ROT, *Botrytis vulgaris* Fr. This rot was found at the same place as the preceding, on recently stored pears. See Apple, p. 427.

POPLAR, *Populus* spp.

Rusts on poplars and willows have been found on both cultivated and wild species in this state, and are not uncommon on certain of the latter. While several species of *Melampsora* on these hosts are now recognized in North America, their macroscopic appearance is much the same. The II or uredinial stage shows as small, dusty, yellowish, powdery pustules, breaking out more or less abundantly, usually on the under surface of the leaves, during the early summer. Later, these are followed by the III, or telial stage, which develops its sori as somewhat larger, waxy, orange-red areas firmly imbedded in the leaf tissues. The I or aecial stage occurs as a Caeoma on certain alternate hosts, varying with the different species.

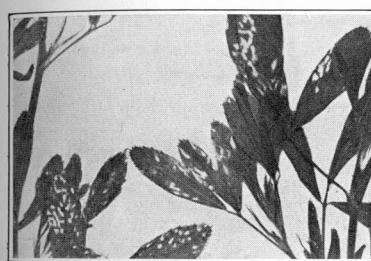
Burrill, in his *Uredineae of Illinois*, published in 1885, recognized only one species of *Melampsora* on *Salix* and another on *Populus*. Arthur, in his *Uredinales of North America*, published in 1907, describes two species on *Populus* and four on *Salix*, distinguished chiefly by their uredinial spores, but, like Burrill, lists only one species on each of these host-genera for the Eastern United States, both of which are said to have their aecial stage as a Caeoma on *Larix*. Recently, however, at Arthur's suggestion, Ludwig (*Phytopath.* 5:279. O. 1915) has made a further study of herbarium material and, profiting by the infection experiments of Fraser (showing the relationship of the hemlock Caeoma to a *Melampsora* on *Populus grandidentata*), has distinguished besides the species recognized by Burrill and Arthur a new one, which he calls *Melampsora Abietis-canadensis* (Farl.) Ludw. In Switzerland, Fischer (*Die Uredineen der Schweiz*: 478-506. 1904) described thirteen species on *Salix* and six on *Populus*, differing in part by their aecial stages occurring on such widely differing host-genera as *Larix*, *Allium*, *Galanthus*, *Orchis*, *Euonymus*, *Saxifraga*, *Ribes*, *Pinus*, *Corydalis* and *Mercurialis*. A recent examination of Connecticut herbarium specimens, before seeing



a. Gray-mold Rot, p. 427.



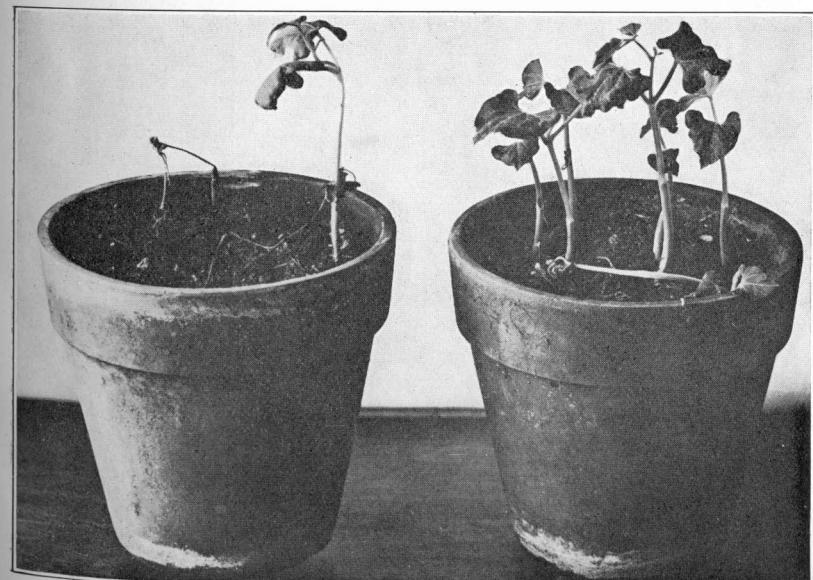
b. Volutella Rot, p. 428.



c. White Spot, p. 425.

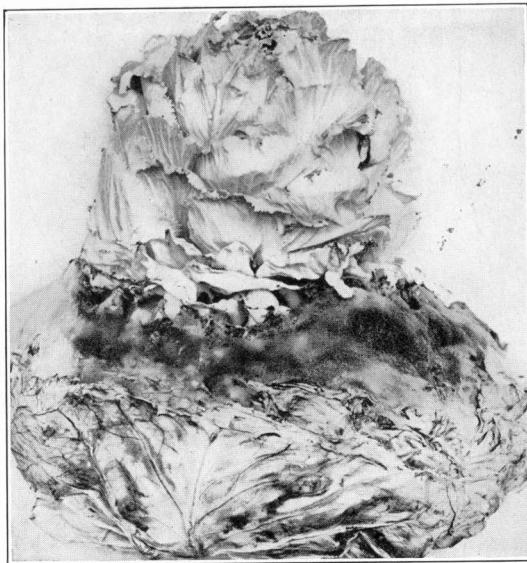


d. Anthracnose, p. 423.



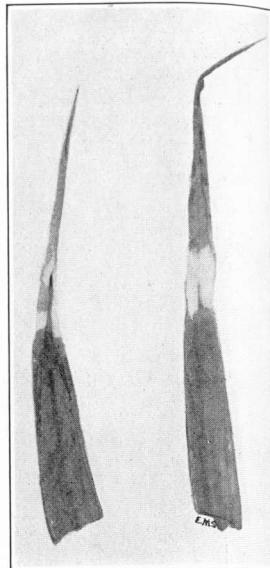
e. Seedlings from Anthracnose Beans kept under moist and dry conditions.

CABBAGE.



a. Gray-mold Fungus, p. 428.

CARNATION.



b. White Tip, p. 428.

CELERY.

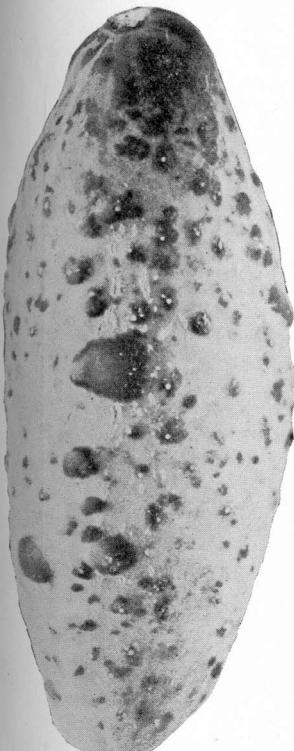


c. Bunched Roots, p. 429.

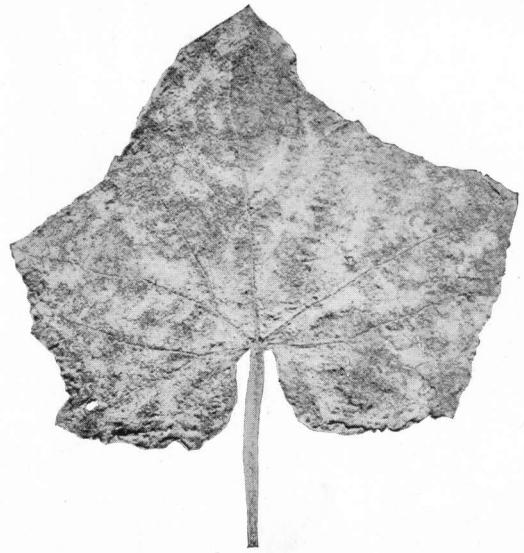


d. Late Leaf Blight, p. 424.

CUCUMBER.



a. White Pickle, p. 430.



b. Mosaic, p. 430.

KALE.



d-e. Black Rot on Leaf and Stem, p. 431.

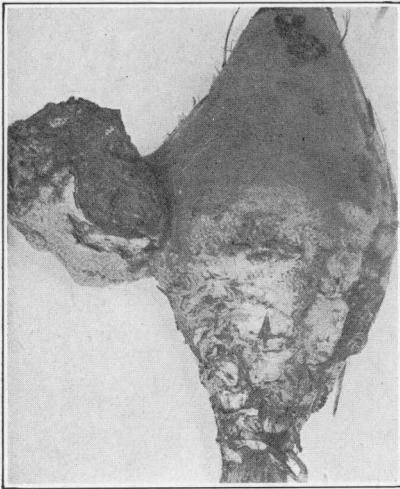


c. Gray Mold, p. 431.

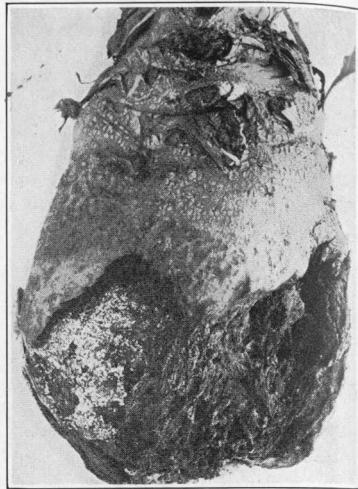


PLATE XX.

MANGEL.



a. Crown Gall, p. 432.



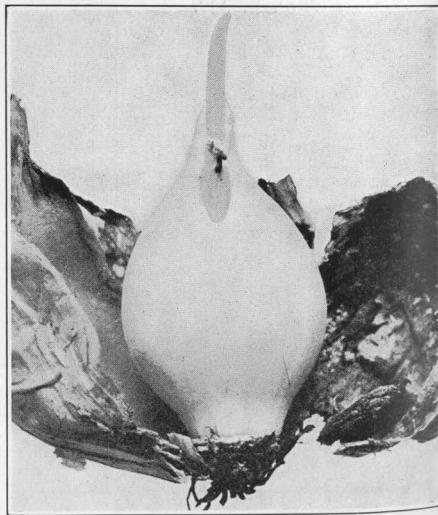
b. Root Rot, p. 433.

MAPLE.



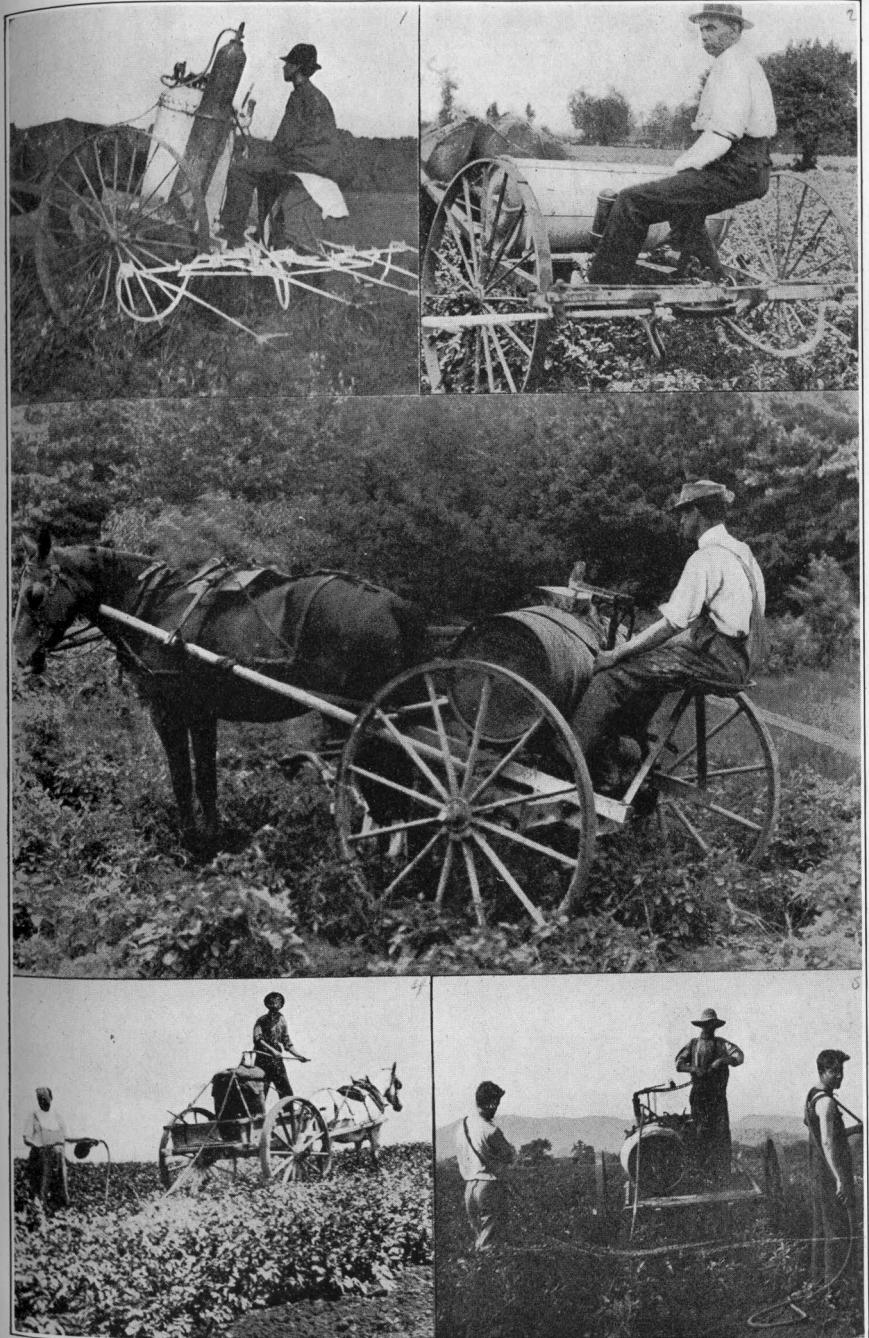
c. Anthracnose, p. 436.

ONION.



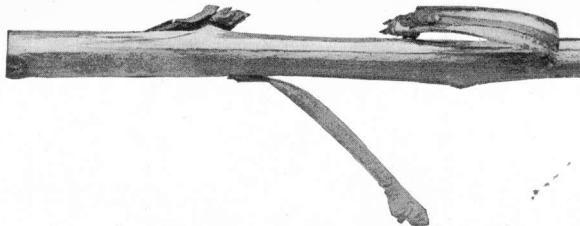
d. Fusarium Rot, p. 437.

DISEASES OF MANGEL, MAPLE AND ONION.



Types of Sprayers used in Experiments, p. 470.

POTATO SPRAYING.



a. Stripped Buds, p. 439.



b. Potato Spraying Experiment, p. 487.

POTATO.



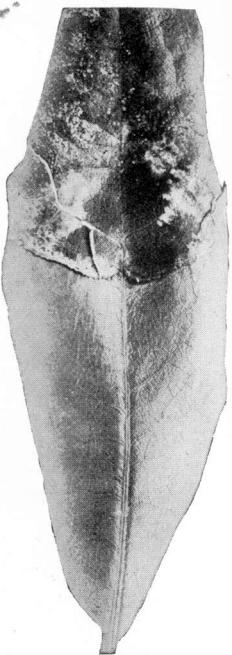
c. Powdery Scab, p. 463.

PEAR.



d. Blue Mold, p. 439.

TRROUBLES OF PEACH, POTATO, PEAR AND RHODODENDRON.

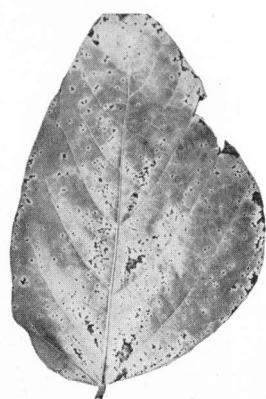


e. Anthracnose, p. 443.

SOY BEAN.



a. Crinkling Chlorosis, p. 446.



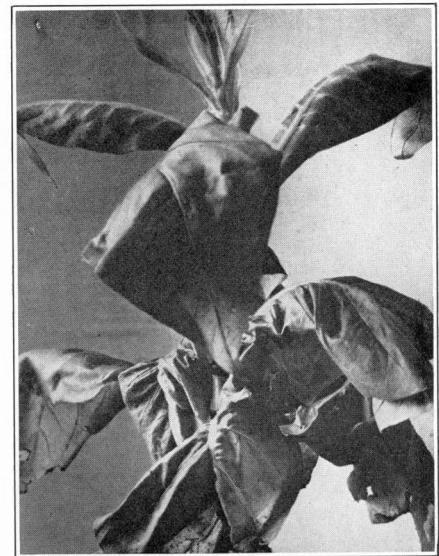
b. Bacterial Leaf-Spot, p. 444.

SNAPDRAGON.



c. Rust, p. 443.

TOBACCO.



d. Lightning Injury, p. 448.

TRROUBLES OF SOY BEAN, SNAPDRAGON AND TOBACCO.

rarer here than the form on the cones and twigs, described by Arthur as *Peridermium fructigenum*, and has much smaller sori. Both forms seem to be common in Canada, and the spores of the two are similar, so that the smaller size of the sori on the leaves is probably due merely to the different part of the host attacked.

Ever since finding the Cæoma on hemlock cones, we have tried to trace its telial stage, but could never get any clues from other rusts appearing in the vicinity of infected hemlocks. We therefore attempted to infect a large number of plants noticed growing beneath or near infected hemlocks, but without success. These included such host-genera as *Mitchella*, *Pyrola*, *Stellaria*, *Chimaphila*, *Gaylussacia*, *Vaccinium*, *Rubus*, *Azalea*, *Kalmia*, and *Betula*. Fraser's success in connecting it with the *Melampsora* on *Populus grandidentata* clears up the mystery, as we did not try this species. We did, however, try unsuccessfully, as did Fraser, to infect *Populus deltoides*. In view of the fact that Ludwig reports this as one of the hosts of this species in Indiana, the meaning of these failures is not clear.

The uredinial spores of this species are considerably smaller and more subspherical than those of the preceding species, and are without very evident smooth spots. We have made no careful examination of the telia of either species. So far as we can determine from the uredinial stage, which in some cases is not abundant, most of our Connecticut collections belong to this species, and include one or more specimens on the following hosts:—*Populus balsamifera*, *P. grandidentata*, *P. heterophylla*, *P. tremuloides*. Besides these, Ludwig also gives *P. candicans* as a Connecticut host.

POTATO, *Solanum tuberosum*.

POWDERY SCAB, *Spongospora subterranea* (Wallr.) Johns. Plate XXII c. This disease has been found here so far only on imported seed potatoes. See special article in this Report.

PRIVET, *Ligustrum* sp.

CROWN GALL, *Pseudomonas tumefaciens* (Sm. & Towns) Stev. Privet is a host not before reported for the crown gall

in this state. It was found by Inspector Davis on stock imported by Barnes Brothers Nursery Co. from Angers, France, in April, 1915.

QUINCE, *Cydonia vulgaris*.

GRAY-MOLD ROT, *Botrytis vulgaris* Fr. The gray-mold fungus has been isolated from a decaying quince. See note under Apple.

RHODODENDRON, *Rhododendron* sp.

ANTHACNOSE, *Pestalozzia Guepini* Desm. Plate XXII e. This fungus was found three times during 1915 by Mr. Lowry, of the entomological department, while inspecting imported plants at New Haven, Greenwich, and Stamford, these plants having been received in one case from France and in the other two cases from Holland. Large, dead, brown to reddish-brown areas developed at the tip or sides of the infected leaves, and on these the fruiting stage showed on either surface as minute black pustules beneath the epidermis. From these pustules the spores are exuded on the surface.

RUTABAGA, *Brassica campestris*.

CLUB Root, *Plasmodiophora Brassicae* Wor. We have previously reported this disease on the common white turnip, but not on the yellow, or Swedish turnip. In 1914 we found it in our experimental garden on the latter, though not nearly so common as on white turnip.

SNAPDRAGON, *Antirrhinum majus*.

RUST, *Puccinia Antirrhini* Diet. & Holw. Plate XXIII c. This fungus was first collected in this state by Mr. Zappe, of the entomological department, while inspecting plants at the greenhouse of Brooks Brothers, at Westbrook, in November, 1915. Apparently the rust was not doing much damage there, or at least it was not nearly as prominent at that time as the anthracnose fungus which we have previously reported on this host. The specimens brought to the writer showed only the uredinial stage. This stage forms small, roundish, reddish-brown pustules, or sori, usually circularly grouped, on the under side of the leaf, causing the tissues above to become yellowish.

On the stem the sori are clustered irregularly, and are often more elongated. The sorus is at first protected by the epidermis, which breaks away, disclosing a rather firmly agglutinated spore mass much like a telial sorus. The spores on the stem seem to retain their pedicels more firmly than those on the leaves, and are as a rule more elongated, being subspherical to oval instead of chiefly subspherical.

This fungus was originally described by Dietel (*Hedwigia* 36:298) in 1897, from specimens showing both the stages on this same host collected by Blasdale at Berkeley, California, and it has since been collected elsewhere in that state. In the Atlantic States it does not seem to have been collected very frequently, so its importance here as a parasite of this host is yet somewhat doubtful. Peltier and Rees (*Phytopath.* 4:400. D. 1914), however, reported finding it in 1913 and 1914 in the vicinity of Chicago, Illinois, where it was doing considerable damage. They also reported it from Indiana and Ohio.

SOY BEAN, *Glycine hispida*.

BACTERIAL LEAF-SPOT, *Bacillus* sp. Plate XXIII b. A bacterial disease was found on the Soy bean leaves at the Station farm at Mount Carmel in August, 1915, apparently identical with a somewhat similar appearing bacterial leaf-spot on Lima and wax beans (Round Point Kidney) nearby, though no cultural studies were made to prove their exact identity. Sturgis (Rept. 1898:262) years previously had reported a bacterial disease from this state on Lima beans, and the writer (Rept. 1903:307. *Ibid.* 1904:316) had listed similar troubles on both the common and Lima bean. As observed by both of us, the spots on the Lima beans are light brown, with a dark red-brown or purplish border, subcircular, 1-5 mm. in diameter, sometimes coalescing into larger areas, but not apt to be numerous. Sturgis found similar spots on the pods, and the writer observed what seemed to be the same trouble on the cotyledons of germinating seeds, which indicates how it carries over winter.

The specimens on wax bean collected in 1915 have spots that are reddish-brown, angular, smaller (usually 1-2 mm.), but generally very numerous and coalescing into large areas

covering most of the leaf surface. On the other hand, our earlier collections on similar beans usually show a few large spots that by growth have involved most of the leaf tissues. Possibly the size of the spots depends somewhat on the number of infections that have taken place on the same leaf. When moist, these spots have a pellucid or water-soaked appearance.

On the Soy bean the spots (see illustration: less than natural size) vary somewhat, but are generally dark reddish-brown and about 1-2 mm. in diameter, with a somewhat angular outline. Sometimes irregular spots several millimeters in diameter occur, which probably result from the merging of numerous small spots. Very often a yellowing of the tissues outside the spot is seen. Occasionally under a lens the spots show the bundles darker than the parenchyma. The spots are generally well scattered over the leaf blade, but in some cases they occur in areas along the border, as if a general invasion had taken place there. As is the case with the other hosts, the invaded tissues sometimes fall out. The disease was noticed on the following varieties of Soy bean: Medium Yellow, Wilson, Manhattan, Quebec 92, Quebec 537, and Ito San, being especially bad on the last-named variety.

Both Sturgis and the writer considered the bacterial spots previously reported on the Lima and string bean the same as that described by Smith as *Pseudomonas Phaseoli*. Von Oven, according to Stevens, has described a bacterial disease (*Pseudomonas leguminiperdus* (V. Oven) Stev.) on peas and other legumes, but we have not seen a description of this. We have seen no detailed description of a bacterial spot of Soy bean. Smith does not give *Glycine* as a host of his *P. Phaseoli*, although he mentions Lima and bush beans as hosts (U. S. Dept. Agr. Div. Veg. Phys. & Path. Bull. 28:149), and later (Ann. Mo. Bot. Gard. 2:381. 1915) gives *Vigna* (to which genus the cow pea belongs) but not *Glycine*, as one of several leguminous genera upon which bacterial diseases have been found. Earlier, however, in his "Bacteria in Relation to Plant Diseases" (Vol. II:69), he merely mentioned a leaf spot of Soy bean. The only other references we have been able to find are short ones by Heald in *Science* (1906:624), where under the title of "New or Little Known Plant Diseases in Nebraska" he mentions Bacterial Blight as serious on Soy beans used as an orchard cover

crop (as were ours), and in the Nebraska Ann. Rept. (19:41, 71, 1906), where he names this as *Bacillus* sp. and gives a short description of its appearance on the leaves, which agrees with what we found on Soy beans here. He does not seem to have made further studies of it.

We believe that the disease collected in 1915 on wax, Lima and Soy beans is the same thing, and presumably *Pseudomonas Phaseoli*, yet because of the small spots as contrasted with the general invasion previously noted on the common bean, and the fact that this species has not to our knowledge yet been reported on Soy bean, we list it here merely provisionally as *Bacillus* sp. as given by Heald, expecting later to determine its exact identity.

Chlorosis and Crinkling. Plate XXIII a. The same year, Soy beans at the Mount Carmel Station farm showed an unusual trouble or troubles which took the form of a yellowish mottling of the leaves, usually accompanied by an irregular wrinkling or puckering of the parenchyma tissues. The former we have called chlorosis, and the latter crinkling. The chlorosis trouble was much like the ordinary chlorosis of plants in appearance, showing as yellowish to yellowish-green irregular areas scattered in the parenchyma between the normally green tissues. This sometimes occurred on certain leaves on plants which had no other peculiarity, but more frequently it was associated with the crinkling trouble. This latter showed wrinkles which were a deep green, while the intervening smooth tissues were a yellowish-green, though not apt to be so yellow as where chlorosis alone showed. Whether these were distinct, or variations of the same trouble, was not determined. Neither were experiments conducted to determine whether they were infectious.

The crinkling chlorosis (see illustration) was in some respects much like the infectious mosaic trouble found on cucumbers, mentioned elsewhere in this report. The crinkling on some of the leaves was very marked, and was most conspicuous in the vicinity of the midrib or larger veins, often showing as a series of small wrinkles on either side of the midrib or veins. This unevenness of development of the parenchymatous tissues was evidently due to the greater amount of chlorophyll in these spots, which caused a more rapid growth of the tissues there, with the pockets or folds always forming with the concavity on the lower side of the leaf. The crinkling chlorosis was found on

the following varieties: Medium Green, Wilson, Swan, Kentucky, Wing's Mikado, and Hollybrook, being especially abundant and prominent on the last-named variety. On the Hollybrook, O'Kute, Wilson, Ito San, and Manhattan, specimens were also obtained that showed only the chlorosis. Whether or not the wet season was partially or wholly responsible for the unusual development of the trouble probably depends on whether or not it is infectious. We have seen no mention of similar trouble on this host, although we have previously reported chlorosis troubles on both string and Lima beans (Rept. 1907-8:859).

SPINACH, *Spinacia oleracea*.

DOWNY MILDEW, *Peronospora effusa* (Grev.) Raben. Although we have looked for this fungus during the past ten years, we did not succeed in finding it until last October. We discovered it then on the W. G. Griswold farm at Wethersfield, on the variety of spinach known as Viroflay, and shortly afterward at the Morgan farm at Cheshire on the Goliath variety. At neither place was the fungus abundant, and apparently it was present only as a result of the favorably moist season. This seems to indicate that this disease is not liable to be very troublesome so far north, tho Reed and others have found it doing considerable damage further south.

This fungus causes indefinite yellow spots, usually of conspicuous size, showing prominently on the upper side of the leaf, while it more or less covers the under surface with a mat of the dirty-white or violet-gray fruiting stage. The winter or oospore stage was not produced within the tissues so far as we could determine from the specimens examined. Magnus, however, found that the mycelium winters over in the late-infected leaves of the spinach. This fungus occurs in the United States also on several of the wild species belonging to the same family, especially on species of *Chenopodium*, Lamb's Quarters being a common host. Thus far we have found it only once on *Chenopodium* in this state.

Yellow Leaf. In November, 1915, specimens of spinach were received from S. S. Mills of Stratford, who wished to know what was the matter with his plants, as this trouble was common in his field. An examination of these and other specimens sent later showed that no particular insect or fungus was

responsible for the trouble, although on the leaves of a few of the plants the anthracnose fungus, *Colletotrichum Spinaciae* Ell. & Hals., was found. The roots seemed to be healthy. The trouble consisted chiefly of a yellowing of the leaves, either a few or all on a plant, in the latter case presenting the appearance of a golden or aurea variety. This yellowing caused somewhat premature death. Usually, when fresh, the yellowed portion showed a thickening of the tissues, which was also manifested by increased turgor when the leaves were wet. Cross sections under the microscope revealed no fungus mycelium, but the cells and intercellular spaces were enlarged.

The character of the disease and the unusually wet summer indicated that it was probably due to unfavorable seasonal conditions possibly complicated with unfavorable soil conditions. Harter (Va. Truck Exp. Sta. Bull. 4:61. Au. 1910) describes, under the term of malnutrition, a trouble of spinach quite similar, at least, to that mentioned here. He seemed to think that it was the result of unfavorable soil (acid land and excessive use of fertilizers) and seasonal conditions, but in regard to the latter, very dry rather than wet seasons were given as the responsible factor. No doubt excess in either direction might produce somewhat similar effects.

SYRINGA, *Philadelphus* sp.

CROWN GALL, *Pseudomonas tumefaciens* (Sm. & Towns.) Stev. A single specimen of this was found on this new host, imported from Orleans, France, at Burr's Nursery, Manchester, by Inspector Lowry, in January, 1915.

TOBACCO, *Nicotiana Tabacum*.

Lightning Injury. Plate XXIII d. In July, 1914, Mr. P. H. Woodford, of Avon, wrote that he had a disease of tobacco which he would like to have the Station investigate. He said:—"I have a new disease in my tobacco. It has affected a patch about one rod in diameter. A plant will have one leaf shrivel up and soon another on the same side of the plant; then the whole top will wilt and die. It seems to affect the pith of the plant." Mr. Stoddard visited the place and obtained specimens for study, and also made photographs, one of which is shown

in the illustration. No definite explanation of the cause of the trouble was obtained, however, from this investigation, except that it might possibly be a bacterial disease, as cultures were obtained from the injured tissues, and the stem showed blackened longitudinal folds something after the manner of a bacterial canker previously reported by us.

Later, when reading an account by Jones and Gilbert (Phytopath. 5:94-101. Ap. 1915) of somewhat similar injury to potato and cotton plants by lightning, both Mr. Stoddard and the writer came to the conclusion that this was the probable explanation of the trouble. On writing to Mr. Woodford to this effect, he replied:—"I think your diagnosis of this case is probably correct. Mr. Floyd of the Granby Tobacco Corporation told me that it was the effect of lightning. After you were here the disease did not spread, and some of the plants affected improved and lived through the season but did not amount to much for tobacco. * * * Lightning is not very likely to strike in that vicinity, but I have known it to do so. There was a small thunder storm a week or so before I noticed the plants affected, but I did not think that the lightning struck so near me or that it struck in that direction from my house."

TURNIP, *Brassica Rapa*.

BACTERIAL SOFT-ROT, *Bacillus carotovorus* Jones. In the Station Report for 1914, p. 25, we gave a brief description of this soft rot, which is found most frequently in the roots or underground stems of various market plants. The turnip was not included in this list, although it has been reported elsewhere as having the same trouble. Last year Mr. Huber of the Station staff called our attention to its occurrence on white turnips at the Station farm. Undoubtedly the moist season favored its development, especially where the roots had been injured.

WHITE PINE, *Pinus Strobus*.

Fertilizer Burn. In the summer of 1914 the Northeastern Forestry Company had a scorch type of injury appearing suddenly on certain beds of their one-year-old white pines. This developed after some fertilizer had been scattered over the beds one morning, those beds showing the burn where the fertilizer

was applied before the dew had evaporated, while other beds similarly fertilized later in the day escaped without injury. The fertilizer was ground bone, which one would not expect to cause injury under ordinary conditions. The injury was different from that described below, in that the tips rather than the base of the leaves first showed it. In some cases the *Rhizoctonia* fungus seemed to spread where this fertilizer was present, and may have caused some of the injury, but on most of the leaves no sign of it could be found.

RHIZOCTONIA BLIGHT, *Corticium vagum* var. *Solani* Burt (*Rhizoctonia Solani* Kuhn). We have previously reported (Rept. 1912:348) the *Rhizoctonia* stage of this fungus causing dampening off of various coniferous plants. In August, 1914, the Northeastern Forestry Company requested the writer to examine a lot of two-year white pines in their nurseries, whose leaves were dying from some unknown cause. An examination of the plants showed the roots to be perfectly healthy. The mycelium of this *Rhizoctonia* was found, however, running up from the ground on the stems and developing without injury to the host until it reached the base of the young leaves, where it infected and killed the tender tissues for a short distance. As a result of this basal injury, the leaves eventually died, finally turning a reddish-brown. They sometimes died from the tip downward. In some cases all of the leaves above the original point of infection died as a result of the invasion of the stem from the infected leaves. Spraying with Bordeaux gave beneficial results, as it afforded protection to the exposed tissues in this case. This type of injury is new to us on this host, but is somewhat similar to that caused by the same fungus when it runs up potato stems and produces canker spots, usually beneath the ground.

WILLOW, *Salix* spp.

LARCH-WILLOW RUST, *Melampsora Bigelowii* Thüm. Rust on various species of *Salix* has been collected a number of times in the past, but we have not reported it before, since all our collections were on wild hosts. Last year it was found on certain species of basket willow grown at our Mount Carmel farm for experimental purposes. Although several species or varieties grew here together, only one showed signs of the rust,

thus suggesting differences in susceptibility to infection, or possibly indicating that different host-species might have different species of rust attacking them. Hedcock also (Mycol. 4:147. My. 1912) has reported rust as causing injury to basket willows grown at Washington for experimental purposes.

We are not sure of the identity of our Mount Carmel specimen, as its uredinal sori, spores and paraphyses seemed to differ somewhat from those of our other collections, but it is placed here until further information is gained concerning its possible aecial stage. The other collections seemed certainly to belong under this species, and to have for their aecial stage the Caeoma on *Larix*, which has been collected twice in this state on *Larix laricina*, once in June, 1910, at Norfolk, with infected willow leaves just beneath the infected larch trees, and again in June, 1913, at West Willington, with infected willows in the vicinity. See Poplar, p. 440.

DISEASES OF PLANTS CAUSED BY NEMATODES.

G. P. CLINTON.

General. Nematodes, or as they are more popularly called, "eel worms," are low, often semi-microscopic, forms of animal life belonging with the true worms to the class known as *Vermes*. Usually they are characterized, at least in some stage, by a long slender body with tapering ends. Some forms live in decaying vegetable or animal matter, while others are true parasites. Examples are furnished by the eel worm of vinegar, the horse-hair worm, the trichina of pork and the root-knot nematodes parasitic on various plants.

While the investigation of these animals naturally belongs to the zoologist, American botanists have paid considerable attention to those forms which are parasitic on plants, because the problems here are botanical in so far as they relate to the effect of the nematodes on the host plants. It is not the purpose of this article to deal with these animals from a zoological point of view, but merely to call attention briefly and in a general way to two species that have been found in Connecticut, noting the plants upon which they have been found here and the injury caused. The reader who wishes a more comprehensive or a zoological account of the nematodes is referred to the article by Cobb (3) on "Parasites of Stock," published by the Department of Agriculture of New South Wales in 1898, or his more recent article (5) on "Nematodes and Their Relationships," in the United States Department of Agriculture Yearbook for 1914.

ROOT-KNOT NEMATODE, *Heterodera radicicola* (Greef) Müll.

Distribution. This nematode is widely distributed in the United States, and occurs on the roots of a great variety of herbs and trees, both cultivated and wild. It is in the Southern States, however, that it causes the most serious damage. Neal (12), then of Florida, in a bulletin of the United States Department of Agriculture published in 1889, was one of the first in this country to give details concerning the injury caused by this species, which he named provisionally as *Anguillula arenaria*. He also made various experiments with reference to its control. In this same year there also appeared a bulletin of the Alabama

Station by Atkinson (1), giving details of the life history, etc., of the same species, which he determined as *Heterodera radicicola* (Greef) Müll., under which name it has since been generally recognized.

In 1897 Selby (16) noted injury caused by this nematode to greenhouse plants in Ohio, and in 1898 Stone and Smith (19) published a bulletin of the Massachusetts Experiment Station dealing with its life history, its injury in Massachusetts, especially as a greenhouse pest, and methods for its control. One of the most complete accounts of the nematode is given in the Bureau of Plant Industry bulletin by Bessey (2), treating of its life history, hosts, literature, etc., and methods of control based on experimental work in Florida. Recently McClintock (10) has published a bulletin giving experiments in its control on ginseng in Michigan.

Injury. The special characteristic of this nematode is that it inhabits the living roots of various plants and by its presence causes a multiplication of the parenchymatous cells of the cortex in its vicinity, giving rise to small swellings or gall-like structures much like those of the club foot of cruciferous plants. This stimulation of tissue formation, however, is succeeded by early death and decay of the tissues, with the liberation of the parasites into the soil for new infections. The root injury frequently results in the yellowing of the foliage, with more or less stunted growth, or premature death, depending upon the severity of the attack. Infected roots of parsnip and snapdragon are shown in Plate XXV a-b.

While in the South this nematode causes considerable injury to a great variety of plants, in the North its hosts seem to be more limited in number, and the injury less. In fact, it is here chiefly a pest of greenhouse plants, or those grown in hot beds, cold frames or protected places.

Hosts in Connecticut. We do not know when this trouble was first noted in Connecticut, tho Sturgis (20) reported it in 1893 as serious on asters, and listed a number of other hosts on which it occurred in New England. Later Jenkins and Britton (7) reported it as bad on tomatoes in certain soils in the Station greenhouse. It has also been seen by the writer in greenhouses on the roots of roses and violets, and occasionally it has been sent in for identification on other cultivated plants. At the Elm

City Nursery it has recently been found on *Pachysandra terminalis*. The writer in 1915 found a few specimens of parsnip, *Pastinaca sativa*, at Farnham's market garden in Westville, showing the trouble (see Plate XXV a). Mr. Lowry, while doing inspection work about the state, has obtained specimens on *Genista jasminoides* from the Lewis greenhouse at Ridgefield, and on snapdragon, *Antirrhinum majus* (see Plate XXV b), from the Pierson greenhouses at Cromwell, where on both hosts it was doing more or less injury. Mr. Shepard of the Station has brought us specimens on ginseng, *Panax quinquefolium*, from Mount Carmel, and states that the nematode does considerable harm in his seedbeds. No doubt there are many other hosts, especially among greenhouse plants, upon which it occasionally occurs in this state.

Effect of Winter. One reason why the nematode does not cause more trouble in the North is that it does not readily winter over out of doors in unprotected places, this preventing its culminative development in infected fields. That it can winter over here, especially in protected places, there is little doubt. Mr. Shepard brought the writer specimens of ginseng in early May showing its presence. These were out of door plants, but mulched during the winter. Byars, of the United States Department of Agriculture, who is making a study of this phase of the subject, writes that he has found it wintering over out of doors in protected places as far north as Boston.

Remedies. Numerous remedies have been tried for the prevention of this trouble. Where it is feasible, a change of soil in the greenhouse or hot beds is desirable; or the soil may be left out of doors over the winter and the nematodes largely destroyed by freezing. Thoro drying out of the soil for several months in the summer is helpful. Steam sterilization of the soil (10, 19) is one of the most effective measures. Chemical treatments have not proved very effective, tho some benefit results from the treatment of the soil with formalin (10) or carbon bisulphide (2).

Other species. Besides the root-gall nematodes mentioned here there are other parasitic species found on various parts of their hosts. *Tylenchus devastatrix* Kühn (14, p. 78) is one of the more important of these. Ritzema-Bos (13) has described two species on strawberries from England that are sometimes serious pests. Cobb (4) has recently published an account of one, parasitic

on the roots of Citrus trees, that causes considerable injury in California, and has been found in Florida and in other countries. He thinks this species, *Tylenchulus semipenetrans*, to be limited to Citrus as a host. Most of the species parasitic on plants seem to belong to the genera *Heterodera*, *Tylenchus* or *Aphelenchus*.

LEAF-BLIGHT NEMATODE, *Aphelenchus olesistus* Ritzema-Bos.

Cause. A very different type of injury from that of the root-knot is caused by a nematode occurring as a parasite in the leaves of certain plants, and which because of the appearance of the injury, somewhat similar to that caused by bacteria, we have called here the leaf-blight nematode. Apparently not so much has been published concerning this trouble. It was first called to our attention in November, 1914, by a letter and specimens sent to the Station by Mr. John Coombs, the Hartford florist. He wrote as follows:

"By parcel post I am sending you to-day some leaves taken from a lot of five hundred Begonia Cincinnati which show some disease that is a mystery to me. Can you identify it and give any means of prevention or cure? The leaves turn brown in spots which soon spread, affecting the whole leaf, causing it in a short time to wither and drop off, and spreading from leaf to leaf, ruining the entire plant. I saw a very few cases of it last year, but this year it is very prevalent and, unless I can check it in some way, will ruin my entire stock."

A microscopical examination of the diseased tissues of these leaves showed the presence always of slender nematodes, *Aphelenchus olesistus*, which without question were the cause of the injury, as similar injury by them has been reported previously both in Europe and in this country, not only to begonias but to a great variety of plants. The Cincinnati begonia is especially subject to the disease, being badly injured when other varieties show little or no injury. In 1915, in the Sokol greenhouses at Westville, we again found this variety suffering greatly from this trouble, and there was also some injury to the variety Gloire de Chatelaine. The disease has also been reported from the Pierson greenhouses at Cromwell, and no doubt is quite general in the greenhouses of the state, especially where the Cincinnati variety is grown.

Method of Infection, etc. An examination of the leaf structure of the Cincinnati begonia shows that it is especially adapted as a home for this nematode because of the ease with which it can pass thru the stomates to the large intercellular cavities above, which serve as a convenient and protected place where the eggs can be laid. The stomates are confined to the lower surface of the leaves, and usually two or three are grouped together under the large air chambers which under a lens show as small white areas dotting the surface.

The air chambers of the infected tissues, when examined microscopically, were usually found to contain the nematodes or their eggs (Plate XXVI B-D). Thru the epidermis the eggs (chiefly 15-18 μ by 50-60 μ) could be seen more or less abundantly around the cells lining the air chamber. Sometimes only one or two eggs were seen, but as high as a dozen have been counted in some chambers. Upon hatching, the young larvae can easily pass out thru the stomates and form new colonies elsewhere on the leaf. The mature larvae are also found more or less in the intercellular spaces further within the leaf in the spongy parenchyma, but are apparently prevented from a general invasion of the tissues by the reticulations of the larger veins, which cut off connection with the intercellular spaces of the adjoining areas. Thus the nematodes usually invade new tissues by passing out thru the stomates when the leaves are wet and entering the leaf in a new spot thru the underlying stomates.

Ritzema-Bos (14) held that the nematodes did not gain entrance into the leaf tissues thru the stomates, but worked up thru the tissues of the stem from the soil. Other investigators, as Klebahn (8) and Marcinowski (9), held that they passed into the leaves thru the stomates. Our investigations proved this to be so without a doubt. For instance, the size of the openings between the guard cells of stomates is usually sufficient to admit the passage of even mature nematodes, which we found to be 12-15 μ in diameter by 550-800 μ in length (see Plate XXVI B, E). Again, their passage thru the stomates could readily be proved by taking fresh leaves and placing a few drops of water over the infected area both on the upper and lower surface. Examination of the water in a few minutes always showed nematodes in it on the lower surface, where the stomates are situated, but not on the upper surface, where they are absent. By watch-

ing the stomates of a wet leaf with a microscope of low power we were even able on one occasion to see a nematode emerge thru a stomate into the water.

Infection of two different and less susceptible varieties of begonias was easily accomplished by placing drops of water containing the nematodes on the under surface of the leaves. Infection was also obtained by tying infected leaves of a plant to those of a healthy one, placing the lower surfaces together and keeping them moist for a time. Spots began to show in about ten days, and were conspicuous in two weeks. Microscopic examination later showed the presence of the nematodes and their eggs in the injured tissues.

No root-galls were found on the infected begonias, and we were unable by placing badly infected leaves in the soil to infect seedlings of buckwheat, onions, oats or rye grown in this soil, tho these plants are said to be subject to injury by another species. We were also unable to find the nematodes in the stems of the infected begonias. Infection seemed to be limited to entrance thru the stomates. Of course infection might take place by leaves in contact with infected soil or by the nematodes going up the outside of the stem to the leaves.

Hosts. At the several greenhouses where we have found or heard of this begonia disease, similar injury has also been found on certain species of ferns. We have not noticed it on any other plants, tho many other species have been reported as injured in Europe, and some few others in this country. In our Report for 1907 (p. 349) we reported, with an illustration, a leaf scorch of the Farleyense fern from the Pierson greenhouses that resembles very much the appearance of this nematode leaf blight on certain of the infected ferns. A recent examination of the dried herbarium specimens, however, failed to show the presence of nematodes in the tissues, so apparently a similar appearance may be caused by other agents. We have heard of complaints elsewhere in New England of this nematode causing injury to ferns, etc. On different hosts the appearance and amount of injury is somewhat different, apparently depending in part on the leaf structure, the size and abundance of the stomates, the delicacy of the tissues, etc., and the ability of the nematodes to pass freely thru the intercellular spaces to various parts of

the leaf. The following are the hosts upon which we have noticed the trouble, with notes on their appearance:

On the Cincinnati begonia (Plates XXV d, XXVI A) the injury showed as numerous small, at first indistinct, discolorations limited by the small veinlets, but in time merging and causing a large conspicuous reddish-brown spot or spots, as shown in the illustration, so that finally the whole leaf may become so badly injured as to wither and drop off. Sometimes the infection showed as elongated streaks along the main veins, where the nematodes could pass for some distance thru the intercellular spaces unhindered by the juncture of secondary veins. Sometimes small isolated spots occurred in the perfectly green tissues. The species Gloire de Chatelaine usually had single large areas at the base of the blade, following up the veins and out into the tissues, and showed extended dead areas at the margin of the leaf.

On *Asplenium nidus-avis* the injury was quite conspicuous, as it caused a continuous dark brown area from the base of the leaf up the midrib and spreading out into the parenchyma to the margin, killing the entire area as it progressed upward. The small ribs joining the midrib apparently did not cut off the upward progress of the nematodes. Tho they did not seem to be nearly as numerous in the tissues as in the begonia, their action was apparently very severe, as if some poisonous excretion was carried by the sap for some distance thru the tissues.

On *Pteris serrulata aristata* (Plate XXV c) there were very marked reddish-brown bands reaching out from the midrib to the border, limited sidewise by the small parallel cross veins. Sometimes these bands were broad, occupying several parallel spaces, and sometimes narrow, with intervening healthy green bands, giving a striped effect. A somewhat similar appearance showed on *Pteris Wimsetti*, and less so on *Pteris tremula*, where the spots were more irregular and less banded, due to difference in the shape of the pinnae and their venation.

Remedies. As to preventive or remedial treatments for this trouble, it is desirable in the first place to isolate any diseased plants from the healthy, in order to check the spread of the trouble. It may also help to pick off the worst infected leaves and burn them. The rubbish from infected plants and the soil

in which they have grown should not be mixed with soil to be used subsequently for potting purposes. Care in watering the plants, using as little water as possible directly on the foliage, should have some influence in lessening infection, since it is quite evident that the nematodes come out on the surface of the leaves when wet and thereby gain access to new areas in the leaf or are dropped with the water onto other leaves.

The fact that the nematodes are likely to come out on the wet leaf surface suggests their partial control by spraying the plants, especially the under surface, with such irritant solutions as soap and water, etc. What effect Bordeaux mixture would have on them we do not know, but it is possible that they would dislike coming to the surface of leaves coated with this mixture. Marcinowski (9) found that immersing infected ferns five minutes in water at 50° C. (122° Fahr.) did not injure the plants, but helped to destroy the nematodes. Molz (11) states that the nematodes can be killed by immersing infected chrysanthemums for ten minutes in water at a temperature of 43° C. (110° Fahr.). He also recommends steam sterilization of the soil as a preventive measure.

Historical. Smith (17) of England, in 1890, was apparently one of the first to note a nematode disease of begonia similar to that described here. He writes: "A correspondent has forwarded leaves of begonias badly discolored and diseased. The mischief has been caused by colonies of minute eel worms living and breeding between the two membranes of the leaf. * * * Although nematodes are a frequent cause of disease in plants, we cannot remember any former record of their occurrence in begonias, neither can we remember seeing any results identical with the one here described."

In 1891, Klebahn (8) of Germany described a somewhat similar injury that he had known for some time on *Asplenium* ferns. He concluded that the trouble was caused by an undetermined species of *Aphelenchus*.

Ritzema-Bos (14) seems to have been the first to determine the species of nematode responsible for these leaf troubles. In 1893 he received specimens of diseased begonias from England and of ferns from Germany, and his investigations led him to the conclusion that the troubles were caused by the same nematode, which he described as a new species, *Aphelenchus olesistus*.

In 1891 the last mentioned investigator had already described the two species of nematodes which caused the diseases of strawberries we have previously mentioned. Marcinowski, in 1908, in studying nematode leaf diseases came to the conclusion that these strawberry diseases were not caused by two different nematodes, but that one of these was merely the immature stage of the other. Infection experiments and a comparison of the mature nematodes also led her to conclude that the strawberry nematode and that of the begonia and fern were the same species. She chose for its name one of the names given by Ritzema-Bos to the strawberry nematode, namely *Aphelenchus Ormerodis*.

Since this trouble was first mentioned by Smith a great variety of plants (Marcinowski gives nearly fifty) have been listed from Europe as having similar injury caused by nematodes. Some authors have used for these the name *Aphelenchus olesistus*, given by Ritzema-Bos to the begonia disease, and some have used the name selected by Marcinowski, *A. Ormerodis*, as being the proper one. Schwartz (15), one of the later writers, uses the name *A. olesistus* for the disease of begonias and ferns, describes the violet trouble as a new variety (*longicollis*) of this, and the chrysanthemum trouble as caused by a new species, *Aphelenchus Ritzema-Bosi*. Ritzema-Bos considered that *A. olesistus* did not cause distortion of its hosts, while the species on strawberry often produces a cauliflower-like head. While it is quite probable that the strawberry disease and that of the begonia are caused by the same nematode, we prefer for the present to use the name *Aphelenchus olesistus* as limited by Ritzema-Bos to the nematodes of the begonia, fern, etc., in which no distortion of the tissues occurs.

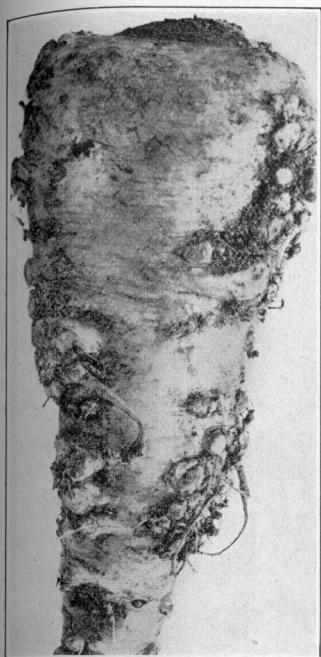
In America only two or three botanists have published references to leaf spot diseases of begonia, etc., attributed to nematodes. Halsted (6) of New Jersey figured and described as early as 1892 a nematode leaf disease of begonia, pelargonium, salvia, etc., which was apparently the same as ours. Stewart (18), of New York, also mentioned in 1910 a nematode leaf disease of begonias, but, like Halsted, did not identify the nematode, tho he mentions the similar disease in England caused by *Aphelenchus olesistus*. No doubt other references to such troubles on ferns, etc., have been published in floral magazines.

LITERATURE.

The following articles on nematodes include only those referred to in the preceding discussion. The literature of the subject is extensive, many additional references being given by the authors listed here.

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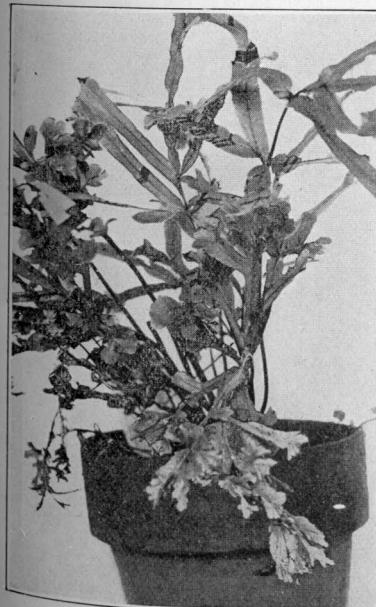


a. On Parsnip, p. 454.

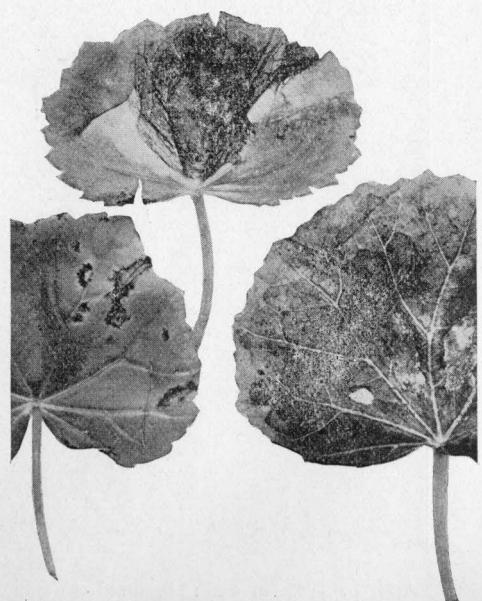


b. On Snapdragon, p. 454.

LEAF INJURIES.



c. Of Fern, p. 458.



d. Of Begonia, p. 458.

In the United States the fungus was first reported by Morse (7) in July, 1913, occurring on potatoes grown in sterilized soil in pots in a greenhouse from tubers received from Massachusetts and Nebraska. Nothing was known about the occurrence of the fungus in either of these states. Later Morse (8) published a general account of the disease. Shortly after the first announcement by Morse, Melhus (4) reported finding the powdery scab on potatoes grown at Presque Isle, Maine, and later he (5) reported the disease not uncommon in Aroostook County, Maine, especially in the northern half. Quite recently the United States Department of Agriculture (1) reported its distribution in the United States as follows:—Northern Maine; Clinton and Franklin Counties, New York; northeastern Minnesota, Carlton, Lake and St. Louis Counties; Washington; Oregon; and a limited area in northern Florida. Although infected potatoes have been planted elsewhere, so far as known the disease has never established itself at these places. Melhus and Rosenbaum (6) have shown that it can infect other hosts beside the potato, since they found it on the roots of six other species of *Solanum* and on the tomato.

Description. This fungus presents in general two types of injury. The ordinary form, called the powdery scab, somewhat resembles our common potato scab in that the scabby spots are superficial, but can be distinguished from the latter by the deeper and more powdery, olive-brown (darker when wet) pustules, which are generally smaller and more nearly circular in outline, and somewhat protected at the margins by the ruptured skin of the tuber. (See plate showing this form.) The other type is known as the canker form, which involves the tissues more deeply and sometimes causes distortion of the tuber. When the powder from one of the pustules is examined under the microscope, it is found to consist of numerous, definite, subspherical or more elongated masses of small thin-walled cells bound firmly together, but having interstices like those of a sponge. These are the reproductive or spore bodies.

Injury. Where powdery scab becomes established it may, according to various investigators, cause considerable injury, especially in low, wet fields. On the whole, however, it seems to be a trouble of northern regions. So locality, soil conditions and climate are all important factors in its development. Con-

cerning injury by it in Ireland, Pethybridge (12) says:—"This disease was extremely prevalent in the Clifden plots in 1912, its attacks being favored by the wetness of the season. They were particularly disastrous on those portions of the land which for special purposes have now been cropped for four successive seasons with potatoes, the cankerous form of the disease being extremely common. In one or two plots nearly two-thirds of the total crop were practically ruined by it, while the general average loss in the plots on the old land due to it would be about one-third of the crop."

Government Quarantine. After its discovery in Canada, and in view of its possible introduction into the United States, a temporary quarantine (9), prohibiting the importation of potatoes from countries having the powdery scab, was established in December, 1913. On its discovery in Maine and New York, a domestic quarantine (9) was laid, in the fall of 1914, on the shipping of infected potatoes from these two states, and regulations were made concerning inspection of potatoes allowed to be shipped. According to Beattie (2) while this quarantine was in effect the entire crop of the infected region was inspected, and 27,600 cars were allowed shipment, this work requiring as many as 132 inspectors at one time.

Connecticut Inspection. As a result of the discovery of the powdery scab in Maine and the possibility of its introduction from there on seed potatoes into this state, or its occurrence here already, the writer with his assistants, Messrs. Stoddard and Graham, at the suggestion of Mr. Orton, of the Federal Horticultural Board, and with financial aid from the Board, undertook a preliminary inspection of the seed potatoes to be planted in this state in the spring of 1914. The arrangements were not made until the first part of May, so that the time was too limited for a very extensive examination, as many farmers had already begun to plant their potatoes. To facilitate the work, an automobile was hired, and potatoes on farms in various parts of the state were examined during the two weeks from May 12th to 25th. Usually one man was left at a farm while the others were taken to farms near by, and when all had finished they were carried on to the next stop. A certain amount of potatoes of each variety was carefully examined, and any suspicious tubers were taken for subsequent microscopic examination. Records were

kept of the varieties, the sources of the seed, the amount to be planted, its condition as regards disease, and whether or not it had been previously inspected.

Results of Inspection. Altogether, potatoes from 130 farms were thus examined, and out of this number the powdery scab was found at only three places, as follows:—(1) At A. N. Farnham's in Westville, on May 13th, in examining a one hundred bushel lot of Irish Cobblers purchased from S. D. Woodruff, from New York but Maine-grown, the writer found a few scabby tubers that upon microscopic examination proved to be infected with the powdery scab. The tags on the bags did not say whether or not these potatoes had been inspected. These potatoes were all treated with formalin before planting. (2) At Andrew Ure's, Highwood, on the same date, the writer also found a couple of Irish Cobblers that on microscopic examination showed the powdery scab. It was not certain whether these were home- or Maine-grown, but they probably came from the same source as those at Farnham's. (3) The third lot was found at the farm of Charles T. Short, Newtown, and consisted of a barrel of Early Bovee purchased of Peter Henderson and grown in Maine. These were advertised as inspected seed, but there was no inspection tag on the barrel. This lot was very badly scabbed, and microscopic examination showed most of it to be the powdery scab. At least half of the tubers showed this scab, some of them badly, of which the one shown in plate XXII c is a fair sample. The scabby potatoes were selected and used by us for experimental purposes, and the others treated with formalin and sulphur before planting.

So far as was shown by the data obtained, 64 of the lots examined were home-grown seed, and 65 were seed grown outside of the state. Of the latter at least 17 had been inspected. The data as to the varieties showed that Green Mountain is the variety most generally grown here. The numbers of each variety inspected were as follows:—Green Mountain, 70; Irish Cobbler, 11; Early Rose, 8; New Queen, 5; Gold Coin, 3; Delaware, 2; and one each of Beauty of Hebron, Long Island Wonder, Early Six Weeks, State of Maine, Carmen, Carmen No. 1, Carmen No. 3, Burpee's Extra Early, Burbank, White Mountain, Bethel Beauty, Early Bovee, Snow, Noxall, Red Bliss, White Bliss, and World's Wonder. On account of the

poor yields of the previous few years, due largely to drought, it was found that many growers were cutting down their acreage and some omitting the crop altogether. None of the farmers offered any objection to the examination of the potatoes when our purpose was stated.

Experiments. This inspection seemed to indicate that the disease might already be established in the state, or that there was danger of its being introduced in imported seed. In that case, it was desirable to find means for combating it. Pethybridge (10) had shown that the seed could be fairly well disinfected by treatment with formalin, 1-600, for three hours, or by rolling the wet tubers in flowers of sulphur. Accordingly the infected Early Bovee tubers from the Short farm were divided into three lots and treated as follows: (1) No treatment; (2) Soaked 1½ hours in formalin of strength 1 to 240; (3) Same as 2, but after soaking, thoroughly dusted with fine sulphur. These potatoes were then cut so that every piece had a powdery scab spot on it. They were planted on well-drained land on the Station farm at Mount Carmel, each lot in two rows of about two hundred and thirty feet in length and between young peach trees, so that the exact location would be known in later years. The potatoes were dug on October 2d, and carefully examined for scab of any kind, though little was present. *No powdery scab was surely found even upon microscopic examination.* The results of the experiment as regards ordinary scab were as follows:—

Treatment.	Total Wt. of Tubers.		Free from Scab.		Somewhat Scabbed		Badly Scabbed.	
	lbs.	lbs.	%	lbs.	%	lbs.	%	
No. 1. No treatment	418	350½	83.9	65.	15.6	2.5	0.6	
No. 2. Formalin	388	360	92.8	26.5	6.8	1.5	0.4	
No. 3. Formalin and Sulphur ...	461½	432	93.6	28.	6.1	1.5	0.3	

These results were so surprising, especially in that no powdery scab appeared on the untreated seed, that other experiments were made in 1915 on the supposition that the soil might have become infected and that at least some powdery scab would develop on the tubers planted where the untreated ones had been the year previous. Through the kindness of Melhus, of the United States Department of Agriculture, badly powdery-scabbed potatoes from Presque Isle, Maine, were received and

planted on a fourth space while on the three spaces used in 1914 there were planted potatoes free from powdery scab and treated with formalin. The treatments were as follows: (1) Seed free from powdery scab and treated with formalin was planted where No. 1 (untreated powdery scab) was planted in 1914; (2) Same as No. 1, but planted where No. 2 (powdery scab tubers treated with formalin) was planted in 1914; (3) Same as No. 1, but planted where No. 3 (powdery scab tubers treated with formalin and sulphur) was planted in 1914; (4) Powdery scab potatoes from Presque Isle, untreated, planted on new space.

The potatoes were dug and examined on September 29th, but here again, while they showed ordinary scab more than the previous year, as the mid-season had been quite wet, *there was found absolutely no powdery scab* even after careful microscopic examination of all suspicious tubers. The details of the results as regards ordinary scab are as follows:—

	Total No. of Tubers.	Free from Scab.	Badly Scabbed.	Somewhat Scabbed.	Little Scabbed.	Total Scabbed.	Per Cent.
No. 1.	1602	1113	75	219	195	489	30½
No. 2.	1679	1170	65	170	274	509	30¾
No. 3.	1649	1323	36	147	143	326	19¾
No. 4.	1842	1721	23	59	39	121	6½

Conclusions. Powdery scab of potatoes is not likely to prove a serious disease of potatoes in Connecticut. In fact so far as known, it does not occur here and is not likely to become established. If it ever does occur here, it is likely to be restricted to wet, poorly drained fields. The United States Department of Agriculture has shown that it is largely a question of soil infection, and climatic conditions such as exist in our northern districts, since the disease is confined largely to our northern states; and while soil shipped from Connecticut developed a certain amount of powdery scab when planted with infected tubers in Maine, it did not in our experiments here. As a result of the investigations made, the Federal Horticultural Board has lifted the domestic quarantine (2) on potatoes from the infected districts in Maine and New York, as well as that (1) on foreign potatoes for this disease.

Literature. The following references include only those mentioned in the preceding discussion, and by no means cover all the literature on the subject:

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POTATO SPRAYING EXPERIMENTS,
THIRD REPORT.

G. P. CLINTON.

In the Station's Reports for 1904, pp. 368-84, and for 1909-10, pp. 739-52, we have published the results of experiments from 1902 to 1909 in spraying potatoes, and in this article we give those obtained since then, together with a general consideration of the results for the entire period of fourteen years during which experiments were carried on in every year except 1905. These experiments had three main objects in view; namely, (1) to determine the value of Bordeaux mixture as a fungicide in wet seasons and its effect on the vines in dry seasons when little or no injury from fungi results; (2) to compare the effect of ridged versus level culture in preventing rot of the tubers, etc.; (3) to determine the value of other fungicides as compared with Bordeaux mixture. We will discuss the results under these three main heads.

SPRAYING EXPERIMENTS WITH BORDEAUX MIXTURE
FROM 1902-1915.

Weather Conditions. In the vicinity of New Haven where these experiments were conducted, and no doubt in Connecticut as a whole, the blight of potatoes, *Phytophthora infestans*, rarely appears before the middle of July even in the most favorable seasons, and in seasons not so favorable it may not show until late August or September, or even not at all. The conditions that stimulate its development are frequent rains during July and August, or more especially cool, muggy, or cloudy weather during these months, with sufficient showers to keep the vegetation from drying off rapidly. If after the blight has started there comes a wet or foggy period of some days' duration, it spreads very rapidly; but, on the other hand, if bright, dry weather follows, little development takes place.

The early blight, *Alternaria Solani*, as indicated by the name, develops somewhat earlier than the late blight, and wet weather in June and July favors its development. On the whole, how-

ever, this blight never causes the injury to the vines that the late blight does.

Tip burn is a physiological, not a fungus, trouble, and is due to excessive loss of moisture from the foliage beyond that supplied by the roots, causing the leaves to die from the tip and margins inward. This trouble is often confused with the late blight, but the trained eye can distinguish the latter by the faint whitish growth of the fungus on the under side of the leaves between the dead and living tissues. Tip burn is a serious trouble here, especially in very dry seasons, and is developed under opposite conditions from those of late blight, though it sometimes also occurs in moist seasons when there are sudden changes from wet to bright, hot days.

The weather and blight conditions during the years of the experiments were as follows: In 1902 July and August were unusually cool, and wet, or foggy, so that blight started early in July, and before the end of the month many fields were dead, and by the middle of August practically all of them. There was considerable rot of the tubers. So far as blighted vines were concerned, this was by far the worst of any of the years reported here. Also 1903 was a wet year, favorable for blight, but not as much so as the preceding, so that the disease was not seen before the first week in August. From then on the disease gradually spread until a rainy period the last of August caused the vines to go down rapidly. The decrease in yield caused by the premature death of the vines was not as great as the previous year, but the longer period of gradual spread allowed a better chance for tuber infection, with a resulting greater loss from rot. In 1904 the weather in July and August was warmer and drier than in either of the two years previous, so the blight did not start until after the first of August, and did not do much damage to the foliage until September. The moist weather in September and October, however, favored the general infection of the tubers from the infected vines, so that the rot was even more serious than in the previous years.

The years 1906 to 1914 had on the whole dry periods during July to September that did not favor any extensive development of the blight in the fields in which our experiments were conducted. In fact, in some of these years we failed to find any blight at all on the foliage (1907, 1908, 1911, 1913, 1914), and

in others only a little blight was found, not enough to cause any damage. In 1910 a little more developed, but not enough to seriously injure the foliage, and only enough to cause a small amount of rot in the tubers. In these dry years, however, the vines suffered considerably from tip burn, especially in 1908, 1911, 1913, 1914, which killed the vines so prematurely that the yields were exceptionally small.

In 1915 the wet, cold weather of June and July caused the blight to develop and kill most of the late potatoes by the end of August, and there was serious rot in certain places, the worst since 1904. Some injury was caused to vines and tubers at Greens Farms, but at our Mount Carmel farm there was neither blight of the vines nor rot of the tubers, though the vines were killed prematurely, as were some others in similar high, well-drained situations, by a type of tip burn.

Out of the thirteen years, therefore, there were four (1902, 1903, 1904, 1915) in which blight caused considerable injury, one (1910) in which a little injury resulted, chiefly from rotting of the tubers, and eight (1906-1909, 1911-1914) in which blight was entirely absent or so inconspicuous as to cause no injury in the fields under consideration.

Conditions of Experiments. The tests in 1902-04 were conducted on private land not under the control of the Station except as to spraying. The other tests were made at the Station farms at Centerville and Mount Carmel, and one at Greens Farms. In all cases the land was fairly well taken care of as regards fertilization and cultivation, though the land at Centerville and at Mount Carmel was at first run down or not adapted to growing potatoes, so that fair yields were impossible. Furthermore, the dry seasons of 1907-14 seriously cut down the yields for most of these years. The experiments were not undertaken, however, with the idea of trying for large yields, but entirely for studying the effect of spraying. Some of the yields will seem very small to successful growers, and no doubt are when compared with crops that are occasionally harvested here; but considering the object of the experiments, the dry character of the seasons, the run down condition of the land, and the fact that the average potato yield for the state year after year is not far from 100 bushels per acre, the yields are not so low

as they seem at first sight. Green Mountain was the variety largely used, and practically the only one on the Station land.

The treatment of the sprayed and unsprayed plots was the same except for the spraying, and the land used was as nearly uniform as possible. No doubt some of the differences in yield may be due to the unevenness of the land, but in the long run this should affect the sprayed and unsprayed the same. To eliminate this factor as much as possible in determining the yields, test strips of one hundred feet in length were taken in each, parallel and as near together as possible, and usually from several different parts of the plots, depending upon their size. The numbers of these test strips are indicated in each case in the tables, where their combined average yields only are given. Their separate yields, however, usually indicated the same general results, thus serving as additional checks.

In our earlier experiments, in 1902-04, we did not determine the results of the yields as firsts and seconds, but as very large, large, medium, etc. In rearranging these to correspond with the later data obtained only as yields of firsts and seconds (size only considered) no doubt they do not show as relatively large a percentage of firsts as they should in most cases. However, as both sprayed and unsprayed plots were computed on the same basis each year, this makes little difference, as the results of different years should not be compared with each other because of difference in location, weather conditions, etc.

On the sprayed plots home-made Bordeaux mixture of the 4-4-50 strength was always used. The number of treatments varied from one to four, three being given on the average. The time of spraying varied somewhat, but as a rule the first was given about the middle of July and the last at the end of August. With a few exceptions (Table I, Exp. Nos. 4, 6, 9, 11, 20) these sprayings were thoroughly done by hand so that the spray usually coated the vines until they died in the fall. In a few cases, where the spraying was not done often enough to fully protect the vines, the foliage became partially infected and thereby favored the development of rot in the tubers. Our experience shows that with more thorough or frequent treatment this could have been largely avoided. This emphasizes the necessity of thoroughly protecting the foliage in blight years from the last

TABLE I.—AVERAGE RESULTS OF SPRAYING

Year.	Grower, Locality, etc.	Treatment.	No. Exp.	Times Sprayed.	No. of 100 ft. Tests.
1902	Ogden, Centerville. Late potatoes	Sprayed	1	3	5
		Unsprayed	2	..	5
1903	Farnham, Westville. No. 4 sprayed imperfectly, dug early before rot started	Sprayed	3	4	4
		Sprayed	4	3	2
		Unsprayed	5	..	4
1903	Ogden, Centerville. Imper. sprayed. Rye plowed under developed rot	Sprayed	6	3	2
		Unsprayed	7	..	2
1904	Farnham, Westville. Early potatoes, dug early. No blight developed	Sprayed	8	2	4
		Sprayed	9	1	4
		Unsprayed	10	..	4
1904	Farnham, Westville. Late potatoes planted late ..	Sprayed	11	4	2
		Unsprayed	12	..	2
1904	Clinton, Whitneyville. Early and late garden potatoes	Sprayed	13	2	1
		Unsprayed	14	..	1
1906	Station farm, Centerville. Ridging vs. level expers. ...	Sprayed	15	3	4
		Unsprayed	16	..	4
1907	Station farm, Centerville. Ridging vs. level expers. ...	Sprayed	17	3	4
		Unsprayed	18	..	4
1907	Station farm, Centerville. East's exper. with late potatoes	Sprayed	19	3	1
		Sprayed	20	2	1
		Unsprayed	21	..	1
1908	Station farm, Centerville. East's experiments	Sprayed	22	3	6
		Unsprayed	23	..	6
1908	Station farm, Centerville. Ridging vs. level expers. ...	Sprayed	24	3	4
		Unsprayed	25	..	4
1909	Station farm, Centerville. Ridging vs. level expers. ...	Sprayed	26	3	4
		Unsprayed	27	..	4
1910	Station farm, Centerville. Ridging vs. level expers. ...	Sprayed	28	4	41.6
		Unsprayed	29	..	26
1911	Station farm, Centerville. Ridging vs. level expers. ...	Sprayed	30	4	72.8
		Unsprayed	31	..	72.8

WITH BORDEAUX FROM 1902 TO 1915.

	Aver. Wt. Tubers, 100 ft.			Aver. Rates per Acre.				Gain per Acre.	
	Firsts. lbs.	Seconds. lbs.	Total. lbs.	Firsts. bu.	Seconds. bu.	Total. bu.	Rotten Tubers.	Bushels.	Per Cent.
1902	47 21	32 16	79 37	114 51	77 39	191 90	58 145	101 ...	112 ...
1903	25 33 5	66 50 46	91 83 51	60 80 12	160 201 111	220 290 123	1,815 2,900 3,920	97 78 ...	79 63 ...
1903	2 $\frac{1}{4}$ $\frac{1}{2}$	26 $20\frac{1}{2}$	28 $\frac{1}{4}$ 21	5 1	63 50	68 51	17,351 8,712	17 ...	33 ...
1904	5 $\frac{1}{2}$ 4 6	108 $\frac{1}{2}$ 101 95	114 105 101	13 10 14	263 244 230	276 254 244	72 72 ...	32 10 ...	13 4 ...
1904	2 $1\frac{1}{4}$	34 20	36 $21\frac{1}{4}$	5 3	82 48	87 51	26,862 3,194	36 ...	69 ...
1904	10 $\frac{1}{2}$ 8	85 $\frac{1}{2}$ 71	96 79	25 19	207 172	232 191	1,452 3,339	41 ...	21 ...
1906	45 29	17 16	62 45	109 70	41 39	150 109	145 871	41 ...	38 ...
1907	7 5	19 16	26 21	17 12	46 39	63 51	...	12 ...	24 ...
1907	19 $\frac{1}{4}$ 14 $\frac{1}{2}$ 9 $\frac{1}{2}$	15 $\frac{1}{4}$ 13 $\frac{1}{4}$ 13 $\frac{3}{4}$	34 $\frac{1}{2}$ 27 $\frac{3}{4}$ 23 $\frac{1}{4}$	47 35 23	37 32 33	84 67 56	...	28 11 ...	50 20 ...
1908	19 $\frac{1}{2}$ 14	19 $\frac{1}{2}$ 15	39 29	47 34	47 36	94 70	...	24 ...	34 ...
1908	21 17	18 16	39 33	51 41	43 39	94 80	...	14 ...	18 ...
1909	23 13	29 21	52 34	56 31	70 51	126 82	...	44 ...	54 ...
1910	70 57 $\frac{1}{2}$	13 12	83 69 $\frac{1}{2}$	170 139	31 29	201 168	25 222	33 ...	20 ...
1911	32 $\frac{1}{2}$ 23	15 $\frac{1}{2}$ 15	48 38	79 56	37 36	116 92	12 12	24 ...	26 ...

TABLE I.—AVERAGE RESULTS OF SPRAYING

Year.	Grower, Locality, etc.	Treatment.	No. Exp.	Times Sprayed.	No. of 100 ft. Tests.
1912	Station farm, Mt. Carmel.				
	Ridging vs. level expers.	Sprayed	32	4	20
		Unsprayed	33	..	16
1913	Station farm, Mt. Carmel.				
	Ridging vs. level expers.	Sprayed	34	3	16
		Unsprayed	35	..	16
1914	Station farm, Mt. Carmel.				
	Ridging vs. level expers.	Sprayed	36	3	24
		Unsprayed	37	..	16
1915	Station farm, Mt. Carmel.				
	Ridging vs. level expers.	Sprayed	38	4	20
		Unsprayed	39	..	20
1915	Bedford, Greens Farms.				
	Late potatoes	Sprayed	40	4	34
		Unsprayed	41	..	18

of June until the end of the season. In all cases both sprayed and unsprayed plots received the same treatment with an insecticide, in the earlier years with Paris green and in the later with lead arsenate, so such differences as are manifested between the Bordeaux sprayed and the unsprayed are not due to insect injury, except possibly the slight effect the Bordeaux may have had in lessening injury from the flea beetle in some years.

Results of Experiments. The results on the plots sprayed with Bordeaux as compared with those unsprayed are given in Table I. These figures give the results of all the different experiments each year as determined from the average of the 100 foot tests. From 1906 to 1915 they indicate average results obtained in experiments involving both ridged and level culture in both the sprayed and unsprayed plots. As an acre potato field, 16 by 10 rods, with rows running lengthwise, and three feet apart, can contain 145.2 lengths of 100 feet, the yield in bushels per acre for each experiment has been obtained by multiplying the average yield of its 100 foot tests by 145.2 and dividing by 60, the number of pounds in a bushel.

WITH BORDEAUX FROM 1902 TO 1915.

	Aver. Wt. Tubers, 100 ft.			Aver. Rates per Acre.			Gain per Acre.		
	Firsts, lbs.	Seconds, lbs.	Total, lbs.	Firsts, bu.	Seconds, bu.	Total, bu.	Rotten Tubers,	Bushels,	Per Cent.
1902	53	21	74	128	51	179	29	58	48
	34½	15½	50	83	38	121	18	...	...
1903	63	10	73	152	24	176	...	32	22
	50	9½	59½	121	23	144	...	...	...
1904	66	18	84	160	43	203	...	34	20
	51	19	70	123	46	169	9	...	...
1905	52½	16	68½	127	39	166	...	19	13
	44	17	61	106	41	147	37	...	...
1906	66½	17½	84	161	42	203	77	50	33
	47	16	63	114	39	153	944	...	...

Remembering that the spraying was imperfectly done in some cases and that in others only one or two sprayings were made, the results are striking in the absolute uniformity they show in favor of the sprayed plots. In not a single case in the 22 spraying tests during the thirteen years did the unsprayed plot give a yield equal to the corresponding sprayed plot. This is more remarkable when we consider that in five of these years we failed entirely to find any signs of the late blight fungus on even the unsprayed vines, and that in only four of the thirteen years did it cause any considerable injury in the field! As the early blight did not appreciably harm the vines during these nine years, it can be safely stated, as has been noted previously by others, that outside of its fungicidal value Bordeaux mixture has a beneficial action on the potato vine, as shown by the increased yield. This increased yield is correlated with and apparently directly due to the greater length of life of the sprayed vines. At least the sprayed vines in dry seasons have always remained green longer on the average than the unsprayed vines, the difference being more noticeable some years than

others. When this difference was most pronounced the yield was correspondingly greater. Perhaps on the average a difference of one or two weeks was shown, though it is impossible to determine it accurately, as the vines die unevenly in both the sprayed and unsprayed plots.

This greater length of life in the sprayed vines in seasons free from blights has been attributed by us to a lessening or delaying of the tip burn trouble which is so injurious to potatoes in very dry seasons. Apparently the earlier and the more thoroughly the vines are sprayed the better the results obtained. The 4-4-50 Bordeaux also has given better results than the 1-1-50 in a few comparative tests, and the Bordeaux as a whole was better than the less sedimentary sprays, as lime-sulphur, etc. These facts previously led us to the conclusion that the favorable results thus obtained were due to the sediment from the spray on the leaves lessening the loss of moisture in dry seasons and thereby lessening tip burn.

Recent experiments by Duggar and Cooley have shown that certain plants, including potatoes, sprayed with Bordeaux mixture or with certain other substances, really transpire more water than do the unsprayed plants. At first glance this seems contradictory to our theory. These experiments, however, were with potted plants and therefore not under typical field conditions, and they were made at a time of year (May) when tip burn conditions were not a factor in the experiment. May they not then merely explain in part the reason of the increased yield of the sprayed plants, since increased transpiration, if not excessive, is in a sense a measure of the increased chemical activities of the plant? This would still admit of our theory that the sediment on the leaves is a partial protection against sudden and irreparable loss of water during the dry seasons when tip burn occurs, or those occasional wet seasons when it appears because of sudden changes from moist to bright hot weather. For there is no denying the fact that spraying does lessen injury from tip burn and in this way helps to increase the yield. This check to excessive evaporation at a time when it would prove fatal might be due in part, as we suggested, to the mechanical clogging of the stomates and the extra protection to the epidermis, and in part to the reduction of the intensity of sunlight and thereby of the temperature of the leaf and its excessive trans-

piration in the heat of the day; on the other hand, this coating might by its protection lessen heat radiation at night, thus on the whole securing a greater but a more uniform transpiration and consequent chemical activity. The following statement of Barnes (Text Book Botany 1:330) may serve to illuminate the point made:—

"The temperature of the plant itself tends normally to equal that of the air, since its extended surface permits quick gain or loss of heat toward equilibrium. A rise of temperature in the air, therefore, is quickly followed by a rise of temperature in the plant, and (even with no change in the relative humidity of the air) by increased evaporation. But the temperature of the plant depends also upon the energy absorbed by the green pigment in diffuse light or direct sunlight. In diffuse light the greater part of this energy is used in food making, and only a small portion exerts a heating effect. But in sunlight two-thirds to three-fourths of that absorbed is free to heat the tissues, and as soon as that begins, evaporation is thereby much accelerated."

Sprayed leaf surfaces certainly are not subject to such excessive sunlight on a bright hot day as those uncoated with a film, especially if this film is of a color, such as the blue coating of Bordeaux, that tends to absorb the chemical rather than the heat rays of the light, therefore they should not be so subject to excessive loss of water as the unsprayed.

Returning to a consideration of the actual results of spraying, we find that while the sprayed plants uniformly gave an increased yield, this varied greatly in the different experiments. The increase ranged all the way from 10 bushels to 101 bushels per acre, or from 4 per cent. to 112 per cent. The greatest increased yields were obtained during 1902-04, when the blight did the most injury, but only in those fields where the spraying was most thoroughly done.

We estimate that where several acres are sprayed with home-made Bordeaux it costs, including labor and materials, about ten dollars per acre. This is higher than some estimate, but we believe it costs fully that amount on the average for thorough work. Of course this is based on a cost of copper sulphate at six to eight cents per pound, and not at twenty-four cents, the present war price. Sixty-five cents per bushel seems to be a fair estimate of the price one would have received on the average for both firsts and seconds during the past fourteen years. This means that it would take 16 bushels increase on

the average to pay for the cost of spraying. Of the twenty-two experiments reported in Table I, only four failed to give this increase. Even in drought years, on the average, the spraying has much more than paid for itself, giving an increase of 29 bushels (Exp. Nos. 15-38). The average increase for all the spraying experiments is about 38 bushels, and deducting 16 bushels as cost, this allows a net gain of 22 bushels, or about \$15.00 per acre. The greatest gain (Exp. No. 1) at this rate was about \$55.00 per acre. These gains do not take into consideration the extra cost of digging, marketing, etc., which would reduce them somewhat. Upon the whole, the experiments show that just as it is a wise policy to give attention to selection of good seed, thorough fertilization and cultivation, it is equally wise to add thorough spraying to these as one of the necessary operations in the most successful potato culture.

RIDGED VERSUS LEVEL CULTURE, WITH AND WITHOUT BORDEAUX.

It is well known that the late blight produces an infection of the tubers as well as the foliage, and this tuber infection comes about by spores from the foliage being washed down into the soil. These infected tubers open the way for secondary bacterial infection, which is the cause of the ill-smelling soft rot. Seasonal conditions that tend to develop the blight gradually over a long period favor greater infection of the tubers than if the blight appears only at the end of the season or even appears early and suddenly blights all the vines. Years ago it was advocated in England and some other European countries that the tubers be protected by ridging up the ground and burying them deeper; and especially if the vines were leaned so that the spores were washed into the trenches, fewer spores or their zoospores would eventually reach the tubers and less rot would therefore result.

As a result of a considerable development of rot in potatoes during the years 1902 to 1905, we began in 1906 comparative experiments with ridged and level culture on both sprayed and unsprayed potatoes to determine the effect, if any, of the former cultural method in lessening the rot. These experiments have been conducted every year since, or ten years altogether. The results of the first four years were reported in the Station Report for 1909-10, p. 743.

The method of treatment of the plots each year was exactly the same except for the planting and cultivation, and as part of each was sprayed we have two ways of comparing the ridged with the level culture each year. With the ridged potatoes the seed pieces were planted on the average five to six inches deep, while with the level, only three to four inches. The cultivation of both was the same until about the first of July, when the deeper planted half was gradually ridged up as high as possible with wings attached to the cultivator during the next two or three cultivations, the center of the ridged rows being cultivated at this time and later whenever the level half was cultivated. This method gave the ridged rows the advantage of level cultivation early in the season, and both had the same number of cultivations, averaging about one a week.

Unfortunately for the experiment, not once during the ten years did any very serious rot develop on either the ridged or level cultivated potatoes. This was largely because these years were not blight years, but also because during the last four years the potatoes were grown on high, well drained land, where rot was not so likely to develop, as shown by its absence in 1915, when it developed considerably elsewhere. So, after ten years of experimenting, we are still without any very extensive data to show the value of ridging in preventing rot. An examination of Table II, however, shows that what little rot did appear was always greater in the level than in the ridged plots. The year 1910 was the only one of the six in which a noticeable amount of rot developed, and the evidence here was clearly in favor of the ridging lessening the rot both in the sprayed and unsprayed plots, as no rotten tubers were found as compared with 44 in the sprayed and 504 in the unsprayed level plots, per acre. In two other unsprayed plots in the same field, not reported in the table, we found at the rate of 17 rotten tubers per acre in the ridged as against 973 in the level. The evidence then, as far as it goes, shows that the deeper planting and ridging have at least some influence in lessening rot.

Aside from the question of rot, the method of ridging and deep planting shows advantages over that of the level and shallower planting. In the first place, the ridging of the vines keeps them off the ground more, and so allows a better circulation of air through them, with consequent quicker drying off

TABLE II.—RIDGING VS. LEVEL CULTURE, WITH AND WITHOUT BORDEAUX MIXTURE.

Year.	Cultivation.	Spraying.	No. of Sprayings.	No. of 100 ft. Tests.	Aver. Yields per Acre.				Rank of Yield for Year
					Firsts. bu.	Seconds. bu.	Total. bu.	Rotten tubers.	
1910	Ridged	Sprayed	4	18.2	182	21	203	...	1
		Unsprayed ..	..	15.6	154	21	175	...	3
	Level	Average ....	..	...	168	21	189	...	1
		Sprayed	4	23.4	158	42	200	44	2
1911	Ridged	Unsprayed ..	..	10.4	125	36	161	504	4
		Average ....	..	...	141½	39	180½	274	2
	Level	Sprayed	4	36.4	82	33	115	...	2
		Unsprayed ..	..	36.4	65	33	98	8	3
1912	Ridged	Average ....	..	...	73½	33	106½	4	1
		Sprayed	4	36.4	75	43	118	...	1
	Level	Unsprayed ..	..	36.4	48	39	87	16	4
		Average ....	..	...	61½	41	102½	8	2
1913	Ridged	Sprayed	4	10	127	57	184	44	1
		Unsprayed ..	..	8	81	33	114	...	4
	Level	Average ....	..	...	104	45	151	22	2
		Sprayed	4	10	131	44	175	14	2
1914	Ridged	Unsprayed ..	..	8	85	43	128	36	3
		Average ....	..	...	108	43½	151½	25	1
	Level	Sprayed	3	8	153	20	173	...	2
		Unsprayed ..	..	8	114	28	142	...	4
1915	Ridged	Average ....	..	...	133½	24	157½	...	2
		Sprayed	3	8	153	27	180	...	1
	Level	Unsprayed ..	..	8	126	19	145	...	3
		Average ....	..	...	139½	23	162½	...	1
1915	Ridged	Sprayed	3	12	161	38	199	...	2
		Unsprayed ..	..	8	138	38	176	...	3
	Level	Average ....	..	...	149½	38	187½	...	2
		Sprayed	3	12	159	50	209	...	1
1915	Ridged	Unsprayed ..	..	8	110	61	171	18	4
		Average ....	..	...	134½	55½	190	9	1
	Level	Sprayed	4	10	129	41	170	...	1
		Unsprayed ..	..	10	117	33	150	...	3
1915	Ridged	Average ....	..	...	123	37	160	...	2
		Sprayed	4	10	125	38	163	...	2
	Level	Unsprayed ..	..	10	98	47	145	73	4
		Average ....	..	...	111½	42½	154	37	2

of the foliage, thereby lessening opportunity for rapid blight infection. Also, this method allows the spray cart to be more easily driven through the rows without running over the vines, and permits a more general distribution of the spray on the vines. In the third place, the deeper planting and ridging prevents tubers from being formed so superficially that they

are exposed to the sun and so become green or sun-burned, a not uncommon occurrence with potatoes in level culture if not planted deeply.

Aside from the blight, level culture has been advocated by certain investigators as possessing considerable advantage over ridged culture because of supposed greater yield, due in part to better conservation of soil moisture, especially in dry seasons. In our experiments we have aimed to preserve as much as possible the supposed advantages of level culture. Inasmuch as most of these years have been unusually dry, it is of interest to see if the level culture has possessed any particular value over the ridged. If it did, this might more than offset any occasional lessening of rot. In the experiments previously reported (1906-09) the level culture gave better yields three out of four years. However, this increase was quite small, amounting to only 6 per cent on the average, or 12 bushels per acre yield of 200 bushels. During the last six years, in the tests reported here, the results, obtained more in detail, show on the whole more in favor of the ridged rather than the level, though they run close together. The chief advantage seems to be that the ridged gave a better percentage of firsts both in the sprayed and unsprayed plots. A summary of these points made from Table II is given below. Taking everything into consideration, ridging would seem to be preferable to level culture as a general practice in this state.

CONDENSED DATA OF SIX YEARS TEST WITH RIDGED VS. LEVEL CULTURE.

	Ridged.	Level.
No. years aver. for both sprayed and unspr. was best	3	3
No. times sprayed gave best total yield	3	3
No. times unsprayed gave best total yield	4	2
No. times 1sts, each, of sprayed and unspr. were best	8*	3*
No. times 2ds, each, of sprayed and unspr. were best	3	9
Aver. total bu. per acre, both sprayed and unspr.	158½	157
Aver. total bu. per acre, sprayed	174	174
Aver. total bu. per acre, unsprayed	142½	140
Aver. total bu. per acre, sprayed, 1sts	139	133½
Aver. total bu. per acre, sprayed, 2ds	35	40½
Aver. total bu. per acre, unsprayed, 1sts	111½	99
Aver. total bu. per acre, unsprayed, 2ds	31	41
Aver. total bu. per acre, both sprayed and unspr., 1sts	125½	116½
Aver. total bu. per acre, both sprayed and unspr., 2ds	33	40½

* One tie not counted.

year there was a fair increase in yield, and the other two years not enough difference one way or the other to indicate any benefit.

Miscellaneous Sprays. In 1907 and 1908 we tried, at the suggestion of the Dow Chemical Company, the use of Sodium Benzoate on potatoes. They claimed this had fungicidal value and might be used with weak Bordeaux, making it as effective as the strong. We used, as advocated by them, one-half pound in 1-1-50 Bordeaux. Of course its real fungicidal value was not tested in these dry years, but its practical value under such conditions was not any greater than the weak Bordeaux alone. In fact, there was one year a very slight increase over the check, and the next year an even greater decrease, while the 4-4-50 Bordeaux gave good results both years.

Sulfocide, 1-200, was tried in 1910, with absolutely no advantage over the check either in keeping the vines alive longer or in increasing the yield. Indeed, the yield was slightly smaller, and there was possibly a slight injury to the foliage. Niagara Lime-sulphur, 1-50, used the same year, gave similar unsatisfactory results. Home-made Bordeaux and, to a less extent, Pyrox, gave fair yield increases in adjacent rows in the same field.

Lieberam's Secret Treatment. In 1906 Mr. August Lieberam of Deep River appeared before the State Board of Agriculture and requested payment for a secret potato blight treatment that he proposed to reveal to them. He was referred to the writer, with the assurance that if his method possessed decided merit his request would receive consideration. Mr. Lieberam revealed his method to the writer, who tried it out in 1906 and 1907. In neither of these years, however, did the blight develop in the experimental plants, either the treated or the checks. This makes it impossible to state definitely that the treatment has no merit, but from our acquaintance with its nature and our experience these two years, also from an examination of some potatoes similarly treated by Mr. Lieberam the past season, we confidently believe that it has little or no merit so far as preventing blight of the vines is concerned. Whether or not it will lessen rot of the tubers is not quite so certain, for there is a possibility that, under certain conditions, it might have this effect, not so much by preventing blight of the tubers as by lessening the soft

bacterial rot that generally follows such infection. While this treatment may or may not have an influence on blight, the experiments certainly show that the yields under ordinary conditions are decreased rather than increased, since in all five of the experiments the treated plots gave a decidedly lower yield than the check, or untreated plots, and this decreased yield was not accidental, but apparently directly due to the treatment. The effect of this treatment on the vines is shown by comparison in Plate XXII b. The first row received three treatments with dust Bordeaux; the second, three with liquid home-made Bordeaux; the third, no treatment; the fourth, Lieberam's secret treatment.

SUMMARY OF RESULTS AND CONCLUSIONS.

(1) Experiments with home-made 4-4-50 Bordeaux mixture uniformly gave higher yields than the unsprayed parts of the potato fields during the thirteen years the tests were carried on, the increase ranging from 10 to 101 bushels, or an average increase of 38 bushels per acre.

(2) The Bordeaux not only gave increased yields by controlling blight, but also gave an increase in dry years, when there was no trouble of this sort, by lessening injury from tip burn, and also possibly by its stimulating effect, as shown by an average increase of 29 bushels per acre during these blight-free years.

(3) The increased yields in all but four of the twenty-two tests more than paid for the extra cost of spraying, and the average increase was considerably above this cost, which, estimated at \$10.00 per acre, gave a net gain of about \$15.00 per acre.

(4) Ridged versus level culture experiments with both sprayed and unsprayed vines indicate that the ridging and deeper planting help to lessen rot of the tubers in blight seasons.

(5) Aside from this advantage, ridging permits of better spraying and easier access to do it.

(6) Ridging potatoes also gave on an average as high total yields as the level culture, and a higher yield of firsts; also they were not subject to sunburn.

(7) The increases in yield obtained in experiments with some of the other fungicides tried in no case equaled those obtained with home-made Bordeaux.

CUTTING OUT CHESTNUT BLIGHTED TIMBER.*

E. M. STODDARD, *Asst. Botanist*,
A. E. MOSS, *Asst. Forester*.

This experiment was undertaken in the State forest at Portland to determine whether the spread of the chestnut blight within the limits of a woodlot or small forest area could be retarded or checked by the removal each year of all infected trees, and if so, whether such work was economically possible. The plan followed was to select certain areas in the forest, amounting to about 130 acres, and on them to count, mark and remove every winter all infected chestnut trees. In other "check" areas on adjoining land, amounting to 190 acres, the infected trees were counted and marked, but not removed. By this means the progress of the disease in successive years could be determined under the two conditions of cutting out and letting go, assuming that the distribution and number of the trees were comparable in the two cases.

DESCRIPTION OF PLOTS.

The forest conditions were typical of the forests of Connecticut, consisting of various-aged cut-over stands and reverting old fields. The species varied from a hardwoods mixture to pure chestnut on the best sites, pure oak on the ridges, and pure maple in the swamps. The original purchase was by "lots," and these have been used as the plots in this experiment.

The cut-out plots on state land are designated by letters in the text and on the accompanying map, while the check plots on private land are represented by numerals.

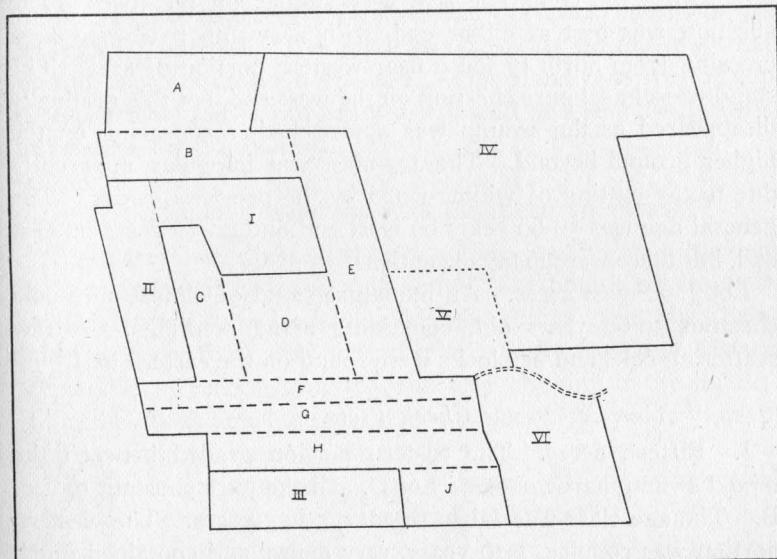
Cut-Out Plots.

Lot A. Twenty acres. Irregular age classes due to some portions having been culled while other portions were clear cut, consisting of chestnut, more or less shaded and in rather poor

* This experiment was started by the former state forester, S. N. Spring, and the botanist. It has been continued under the direction of the latter and the present state forester. As Messrs. Stoddard and Moss have been largely responsible for the work done, they have been requested to write up the results of the experiment.

condition, with much suppressed material left at the time of cutting, and a great deal of slash on the ground at the present time. The older age classes prevail toward the east, while the younger are found in the southwest part of the area.

Lot B. Twelve acres. There are two distinct age classes, 11-20 year scarlet oak to the west and 40-60 year chestnut to the east. The chestnut was in poor condition, being over-mature. In the chestnut coppice a noticeable percentage of trees were dying without signs of disease.



Lot C. Sixteen acres. The greater portion was coppice, 11-20 years, in which probably 75 per cent was oak, the remainder being chestnut, with percentage of oak increasing toward the north. Fairly good growing conditions prevailed, but with a tendency to crowding. North end of area was 30-40 year chestnut and oak, which had been thinned and suppressed, and from which cord-wood had been removed.

Lot D. Twenty acres. This is largely a stony swamp, with yellow birch and maple as predominant species. Chestnut and oak appear along the west and northeast sides of the tract. The age was probably 40-50 years, and the stand has been somewhat thinned in places.

Lot E. Seventeen acres. The entire area was clear cut fifteen or twenty years ago. The southern portion was more or less swampy, with much inferior growth coming in and very little chestnut. To the north the conditions improved, with more or less dense coppice of chestnut and oak, and a dense laurel undergrowth. The north end approached old field conditions, with open turf areas and exposed ledges. The chestnut in this section of the lot was not in a vigorous growing condition.

Lots F., G. and H., a total of 39 acres, may be described as one lot because the conditions are very similar on the three. The chestnut was best at either end, with a swamp hardwood area crossing from north to south near western portion of area. The stand was almost pure chestnut on the west end, but this gradually disappeared as the swamp was approached, reappearing on the higher ground beyond. The age class was irregular, apparently due to the cutting of winter wood by the previous owner. The general age was 50-60 years on west end and 20-30 years on east end, but there were many exceptions.

Lot J. Seven acres. An immature stand of almost pure pole chestnut 50-60 years old, containing many seedlings. A few scattering oaks and hemlocks were found on the eastern half.

Check Plots.

I. Fifteen acres. The eastern portion graded between the mixed swamp hardwoods of Lot D. and the pure chestnut of Lot B. The age class was fairly regular, 50-75 years. The western portion was coppice, 1-10 years, very dense, and contained much oak, with chestnut more or less in groups. The growing conditions were not suitable for chestnut in this portion of the lot.

II. Fifteen acres. The north end was a 40-60 year stand of chestnut and oak, the percentage of oak increasing on the hilltop. To the south there were two classes,—1-20 year clear cut, with open coppice, and 50-60 year poles. The percentage of chestnut was much greater in this plot.

III. Fourteen acres. This region was similar to H. and J., with swamp to the west, grading into pure chestnut on the east. Age classes were also irregular, but tended to be 1-20 years, with dense coppice, on the west, and 50-60 years on the east, with much pure chestnut of pole size.

IV. One hundred and fifteen acres. This large area contained many very diverse conditions. As a whole, the area was one of old field birch and cedar, developing into more or less uniform chestnut stands, especially to the north and east. Very irregular cuttings have been made on this area.

V. Thirteen acres. This area was largely swamp, but the southeast portion was chestnut 50-70 years old, with a large percentage of seedlings. The stand was relatively poor form, but good forest conditions prevailed.

VI. Eighteen acres. More or less uniform conditions prevailed on this tract. The age was 1-10 years on the south half and 11-20 years on the north half. This stand consisted of coppice chestnut, fairly uniformly distributed and sufficiently dense to produce rapid growth.

INSPECTION AND REMOVAL OF INFECTED TREES.

These areas were inspected by two men, running strips through them approximately three rods wide. The blighted trees to be removed from state land were blazed with an axe, care being taken to make them easy to find later. Tally was kept of trees so marked, no record being made of total chestnut in the stand.

On the check areas the marking was done with yellow lumberman's crayon, which was found to be very satisfactory, the marks being visible for 2-3 years in most cases. Otherwise the work was done the same as on the experimental areas.

The trees marked on the state land were cut and all material removed during the winter months. Merchantable wood was sold and the rest was gathered and burned as brush in a suitable opening during the winter.

In describing the inspection we propose to take up the work by years and by plots, using to designate the latter the numbers and letters found on the accompanying map. The work of inspection was done by W. O. Filley, R. L. Stevenson, A. E. Moss and E. M. Stoddard, and the work of removal was supervised by J. C. Reeves, warden of the forest.

First Inspection.

The first inspection was made in November, 1911, and March, 1912, 27 days being required to complete the work, which con-

sisted in locating the boundary lines of the plots, laying out the work, counting and marking diseased trees. The following notes on the different plots represent their condition at the beginning of the experiment.

Plot A. On this plot 63 diseased trees were found, of which the greater number were young sprouts.

Plot B. One hundred and two infected trees were found, mostly in small stuff scattered over the area, with perhaps the least on the east end.

Plot C. A total of 64 blighted trees was found, 10 of which were large trees and the remainder smaller trees and sprouts. The blight was found most often on the south side of the trees, a condition which might indicate that the disease had followed a winter injury. Many of the small trees were in an unhealthy condition, but did not show any apparent signs of blight.

Plot D. This plot showed 14 trees infected with the blight, most of which were on the drier portions of the lot, there being none in the swampy part of the piece.

Plot E. This lot had 76 blighted trees, all of which were sprouts four inches or less in diameter. Disease was very scarce in and near a swamp on the east end of the lot. No particular side of the tree seemed to be attacked.

Plots F and G. Owing to the similarity of these two plots they will be considered collectively, the two having 59 blighted trees, mostly in the drier portions of the lot. Many trees in the swamp appeared to have suffered severely from winter injury, but diseased trees were exceedingly scarce.

Plot H. In the sprout growth on either end of this lot were most of the 26 infected trees, very few occurring in the larger growth.

Plot J. Twenty-nine infected trees were found on this plot, most of them on the higher ground.

Check Plot I. On this plot were 36 blighted trees, the larger number being on the east side, which was dry and rocky.

Check Plot II. On this plot 41 trees had been attacked by blight, the larger number on the east end, which was largely small sprouts.

Check Plot III. Scattered throughout the piece were 46 diseased trees.

Check Plot IV. This plot was a large area with a variety of conditions and sizes of trees, 423 of which were infected. The greater part of these were in a small area near the northeast corner of the lot, where the disease had probably been present for about ten years, as near as could be determined by the age of the sprouts grown since the death of many of the trees.

Check Plot V. A considerable part of this plot was swamp containing no chestnut, and consequently was not inspected; but on the slope at the south side were found 22 infected trees.

Check Plot VI. This plot consisted of recently cut-over land coming into sprouts, of which 76 were diseased, and older sprout growth, of which 58 were diseased.

Second Inspection.

The second inspection was made in 1912 during October and November. The details of the work were identical with the previous year, and the stand of timber was the same except for a small thinning in Plot H, which removed diseased trees. The notes concerning the prevalence and location of the disease in 1911 apply equally well to the condition found in each plot in 1912. The number of infected trees by plots follows, and it will be noted that as the infected trees were not removed on the check plots, the counts for them for this and succeeding years include trees counted previously.

Cut-out Plots.		Check Plots.	
	Number of Blighted Trees.		Number of Blighted Trees.
Plot A	102	Plot I	55
B	64	II	101
C	{ 57 sprouts	III	60
	{ 10 larger trees	IV	699
D	23	V	39
E	117	VI	{ 100 sprouts
F }	109		{ 103 larger trees
G }		Total	1,157
H }			
J	9		
Total	491		

Plots F, G and H were combined on this and subsequent inspections, as they were adjoining and similar, thus facilitating the work of inspection.

Third Inspection.

The inspection for 1913 was made October 23d to November 6th inclusive. The work was carried out as formerly on the same plots. All plots showed a marked increase over previous years, and, as formerly, the sprout growth was attacked more severely, although this inspection showed that the disease was attacking the larger trees more than formerly. High or low land seemed to show no difference in the prevalence of the blight. The number of blighted trees in the respective plots follows.

Cut-out Plots.		Check Plots.	
	Number of Blighted Trees.		Number of Blighted Trees.
Plot A	339	Plot I	492
B	219	II	231
C	15 larger trees	III	1,941
D	202 sprouts	IV	417 large trees
E	43	V	603 small "
F	195	VI	
G	422	Total	3,684
H			
J	65		
Total	1,500		

Check Plots I and II, also V and VI, were inspected as one plot in 1913, in order to get the work done in shorter time.

Fourth Inspection.

In 1914 the inspection was made from November 9th to 30th inclusive, and was conducted in every respect as the previous work had been. The diseased trees were found in moist and dry areas in equal proportion, and also large and small stuff showed practically an equal amount of infection. It was estimated at this inspection that about two-thirds of the total stand of chestnut was infected. The trees cut after the 1913 inspection had not been entirely removed, but it is doubted if this fact appreciably influenced the results. Tabulated results of this inspection follow.

Cut-out Plots.		Check Plots.	
	Number of Blighted Trees.		Number of Blighted Trees.
Plot A	1,028	Plot I	1,865
B	1,325	II	1,865
C	800	III	800
D	200	IV	7,575
E	1,375	V	3,925
F	1,159	VI	
H		Total	14,165
J	197		
Total	6,084		

The trees marked in 1914 were not removed, as it was decided to discontinue the work at that time.

In November, 1915, a hasty survey of the whole area was made in which no accurate counts were made; however, it was very evident that the disease was still progressing, although possibly not as rapidly as between 1913 and 1914.

SUMMARY.

In the following table is shown the count of infected trees by years, giving totals in cut-out plots and in check plots, also cost of inspection, cutting and removal, and receipts for product. In estimating the cost of inspection, \$2.50 per day per man is allowed for two men working.

As is shown by the table, the total cost of inspection, cutting and removal was \$741.25, while the total receipts were \$52.23, giving a net loss of \$689.02. The small amount received for product is due to the large percentage of small sprouts, which had to be burned as brush.

Cut-out Plots.		1911	1912	1913	1914	Totals.
Plot A	63	102	339	1,028	1,532	
B	102	64	219	1,325	1,710	
C	64	67	217	800	1,148	
D	14	23	43	200	280	
E	76	117	195	1,375	1,763	
*F, G, H	112	109	422	1,159	1,802	
J	29	9	65	197	300	
Check Plots.						
Plot *I, II	77	79	336	1,373	1,865	
III	46	14	171	569	800	
IV	423	276	1,242	5,634	7,575	
*V, VI	156	86	778	2,905	3,925	

Total number of trees infected on cut-out plots 8,535
" " " " on check plots 14,165

Cost of inspection	\$110.00	\$30.00	\$ 70.00	\$106.00	\$316.00
Cost of Cutting and Removal	193.26	90.12	141.87	†	425.25
Amount received for Product	35.23	3.72	13.28	†	52.23

* Plots inspected together to facilitate the work.

† Not cut and removed in 1914.

N. B. Counts in checks for 1912-13-14 represent new infections for those years, as counts for previous years have been subtracted from those of succeeding years.

CONCLUSIONS.

Study of the table shows that the number of infected trees increased year by year, and very rapidly in 1913 and 1914. The total number of infected trees for the check plots the last year was noticeably greater than for the cut-out plots, yet the proportional increase, as estimated by comparison of the number of infected trees in each the first year, was about the same, namely, twenty and nineteen times as many respectively. Whether the greater total for the check plots at the end of the experiment was due to the greater number of diseased trees to begin with, or to differences in soil conditions, density of stand, or total number of trees involved, cannot be determined. In any case it is fair to conclude that

- (1) In Connecticut, the cutting and removal from woodlots of trees infected with chestnut blight (*Endothia* *gyroza* var. *parasitica*) does not prevent the spread of that disease.
- (2) The cost of inspection, cutting and removal is too high in comparison with the results obtained to warrant its adoption from a commercial standpoint.



a. Type of growth on Plots A and B, p. 488.



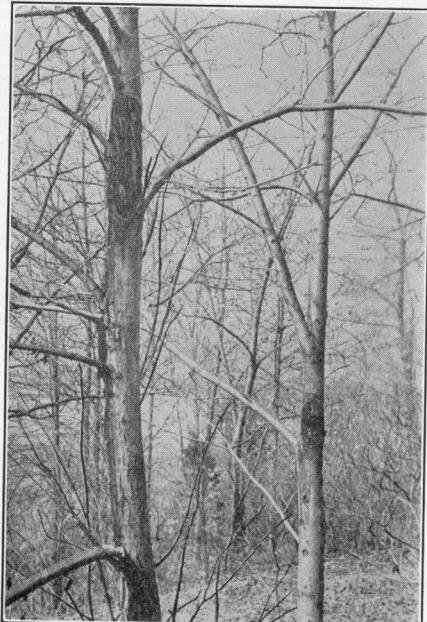
b. Type of growth on Plot J, p. 490.



a. Type of growth on Plots F, G, H, p. 490.



b. Type of growth on Plot III, p. 490.



c. Cankers on the trees.



d. Summer Fruiting Stage.

SEED ANALYSES MADE DURING 1912-1915.

MARY H. JAGGER,* *Seed Analyst.*E. M. STODDARD, *Assistant Botanist.*

Owing to changes in the personnel of the seed analysis division and to changes in the policies and lines of work undertaken, it has not been thought desirable to issue a report on the work during the past four years. The work previous to 1914 was conducted entirely by Miss Jagger, to whom full credit should be given for analyses made and the preparation of the material for this report. Since and including the year 1914 the work has been done in the Botanical Department by the assistant botanist and G. E. Graham, laboratory assistant.

On account of the large number of samples to be reported, it has been thought best not to make a detailed report on all samples, but to condense the data as much as possible; also it would not be fair to dealers and growers to report samples under their names which at present do not represent the stock being offered for sale. It is planned, however, for the future to issue a report every year or two giving in detail as far as possible all tests made during the period. By so doing we think that we can help the purchaser to know the dealers who are giving a "square deal," and it will also give the dealers in reputable seeds a chance to show the purchaser where such seeds can be secured. We believe more can be accomplished by educating the purchaser to the realization of the value of high quality seed, demanding it irrespective of higher cost, than can ever be accomplished by legislation.

At present the work of the seed analyst consists of making, free of charge, purity or germination tests, or both, of all samples of seed submitted by growers, dealers or purchasers. It is essential that the person sending a sample for test should send a large one which fairly represents the stock from which it is taken. By so doing the sender gets a more accurate report and we get more accurate data for our records, thus giving to each a larger measure of satisfaction for time spent. Our reports to dealers are not

* Resigned May 1, 1914.

intended for an advertisement for the particular seed tested, but rather for information which will enable him to secure better stock to place on the market. The larger part of the samples received are from dealers, a fact to which we have no objection, but we believe the department should be more largely patronized by the users of the seed than it is at present.

In this report the work of 1912-13 will be presented first, followed by the analyses made in 1914-15.

GRASS AND FORAGE CROP SEEDS, 1912-13.

Most of the samples received for examination were too small to justify the making of a weighed test, and the time is wasted if the seed does not fairly represent the stock from which it is taken. Therefore in most cases the seeds were looked over, notes taken, and a germination test conducted.

Red Clover.

The red clover samples have averaged fair to good, less than one-fifth containing dodder and the average germination being 90.9 per cent. Plantain, the usual red clover weed, was found in less than one-half the samples. In 1913 seven samples of red clover seed were bought by the Station agent in different parts of the state. Purity and germination of these are shown in Table I. The weed seeds were very plentiful, there being in one sample over 40,000 to the pound, or in other words, 7 pounds of weed seeds in every hundred pounds of clover. Green foxtail, narrow-leaved and Rugel's plantain, dock, sorrel, pigweed and catchfly were the most numerous. None of the samples contained dodder.

TABLE I.—RED CLOVER SEED BOUGHT IN 1913.

Station No.	8073	8074	8075	8076	8078	8082	8083
1,000 seeds weigh, grams	1.93	1.70	1.53	1.50	1.71	1.69	1.54
Pure seed, per cent ...	91.7	95.6	94.5	89.9	94.0	93.8	96.5
Inert material, per cent	3.8	1.7	1.2	2.1	2.9	2.9	1.2
Weed seeds, per cent ...	2.3	.1	3.4	7.1*	1.7	2.2	1.6
Foreign seeds other than weeds	2.2	.8	.9	.9	1.4	1.1	.7

* Of this 7.1 per cent, 4.5 per cent were seeds of green foxtail, 1.4 per cent were seeds of narrow leaved plantain and 1.2 per cent included other weed seeds.

White Clover.

Of the few samples of white clover, only one was considered of excellent quality. A purchased sample contained 4.2 per cent weed seeds, of which 2 per cent were seeds of peppergrass. This seed is admirably adapted in color, size and shape for use as an adulterant of white clover.

Alsike Clover.

The quality of these samples, with one exception, was good.

Crimson Clover.

Two of the crimson clovers were of low value both in purity and germination, two were good, and two were fair. Adulteration of this seed has been confined chiefly to the use of old seed. Fresh seed is pinkish and bright, while old seed is dull and brown. The viability should be 98 or 99 per cent. The samples averaged 79.6 per cent, 95 per cent being the highest.

Alfalfa.

Seven, or one-sixth of the samples, contained alfalfa dodder, and one, seeds of field dodder. The latter species has not been found before; but there is little doubt of its growing on alfalfa, as it is a decidedly prolific grower on red clover.

The average germination of the 42 samples was 89.6 per cent, which is above the standard for germination. Three samples contained over 40 per cent of hard seed which did not germinate in the test. In the case of leguminous seeds, as clovers and alfalfa, there are always more or less hard seeds, but it is assumed that at least one-third of these will sprout during the season; however, the use of seed which is 40 per cent hard, is not wise. Soaking in concentrated sulphuric acid has caused hard seed to germinate, but the resistance offered by different lots of seed varies so much, that the duration of the treatment would necessarily be variable, and definite rules cannot be given for its use.

The chalcid insect found in two samples was probably identical with that found in red clover seed.

The average weight per thousand alfalfa seeds in 95 samples tested was 2.04 grams, the average number of seeds to the pound 222,000.

Timothy.

As a rule the timothy seed was of good quality. Pepper grass and plantain were the most common weeds. The germination was good, only two samples sprouting below 80 per cent. For 100 samples the average weight per thousand seeds was .37 grams, the number of seeds to the pound 1,224,000.

Red Top.

Several lots of Red Top were dirty, chaffy or weedy. The average germination was 89.6 per cent. The average weight per thousand seeds in 60 samples was 0.8 grams, the average number of seeds to the pound 5,662,000.

Kentucky Blue Grass.

The methods of cleaning Kentucky Blue Grass usually leave from 10 to 20 per cent of chaff with the seed. Canada Blue Grass is an inferior species which costs only from one-third to one-half as much as Kentucky Blue Grass, and is often found in samples of the latter. As it matures seed later than the Kentucky species, only immature seeds would naturally occur with the seed, and the fact that well-formed mature seeds are found in Kentucky Blue Grass indicates the use of the Canadian species for adulteration. The resemblance between the seeds of the two species allows complete substitution of one for the other without arousing the suspicion of the purchaser.

In a sample bought in Connecticut the actual amount of pure seed that sprouted was 7 pounds to the hundred. This lot of seed was made up of 0.3 per cent pure Kentucky Blue Grass, 73.1 per cent Canadian Blue Grass, 21.5 per cent chaff and inert material, 5.1 per cent foreign seeds, and was labeled Kentucky Blue Grass!

Canadian Blue Grass.

These samples, all of which were bought in the state, were of fair quality.

Rhode Island Bent and Orchard Grass.

Of these seeds only a few samples were examined. The bent grass was found chaffy, as is usually the case, and germinated only fairly well.

TABLE II.—GRASS AND FORAGE CROP SEED TESTED IN 1912-13.

Kind of Seed.	No. of Samples.	Per cent of Samples						Test of 95-100% 85-90% 80-85% 75-80% 70-75% 65-70% 60-65%	90-95% 85-90% 80-85% 75-80% 70-75% 65-70% 60-65%	Per cent of Samples Good Quality.	Per cent of Samples Fair Quality.	Per cent of Samples Poor Quality.
		55-60%	60-65%	65-70%	70-75%	75-80%	80-85%					
Red Clover	23	...	...	...	...	...	8.7	21.7	60.9	8.7	30.4	30.4
White Clover	12	...	8.4	...	...	8.4	24.9	16.6	33.3	8.4	30.8	30.8
Crimson Clover	6	16.7	16.7	...	...	16.7	...	...	...	49.9	...	50.0
Alfalfa	42	...	...	7.1	...	3.5	9.7	12.0	46.0	21.7	36.4	25.8
Timothy	32	...	...	3.1	...	3.1	18.8	21.9	50.0	53.1	43.7	3.2
Red Top	15	...	...	...	...	...	13.2	33.4	40.2	13.2	40.0	33.3*
Ky. Blue Grass	8	Ranged from 15.5-64.0% germination.						Fair to poor quality.				26.7
Oats	6	“	“	19.0*-96.5%	“	“	Good to fair	“	“	“	“	“

* Had been bleached with sulphurous acid.

The purchased samples of orchard grass were all low in viability, and one showed very low vitality, bringing the viability down to 2.9 per cent, which means that there were actually less than three pounds of good live orchard grass seen in every hundred pounds. The large amounts of chaff and inert material signified adulteration, as good seed should be at least 90 per cent pure.

The samples sent in for examination were of fair quality.

MISCELLANEOUS SEEDS, 1912-13.

There were a number of miscellaneous seeds tested, among them samples of grasses, vetches, millet, oats and tobacco.

One sample of oats which was sold for seed had been bleached, with the result that only 19 per cent sprouted (see Table No. II). The bleaching of inferior grain with sulphurous acid is done to make it appear bright, fresh and plump, and bring the price of a higher grade seed. Not only is profit made by the improved appearance of the grain, but also by the increase in weight due to the additional moisture. Bleached oats are usually readily eaten by horses, but if used for seed it is advisable to make a germination test, for it is apparent that the vitality is greatly decreased.

THE VITALITY TEST OF VEGETABLE SEEDS, 1912-13.

Nine hundred and forty-five samples of vegetable seeds were tested for germination during the year 1912-13. These were sent to the Station by growers, dealers and purchasers. All of the common field and garden vegetables are included. The results reported to those interested cannot be given in detail here.

As usual, the deterioration of most seeds with age is shown and also the great difference in the vitality of seeds of the same year, caused by accidents of weather, improper harvesting, curing and storing, or neglect to separate and reject the light and imperfectly matured seed. Thus there were exhibited at some of the agricultural fairs held in the state a sample of California-grown onion seed of which 97.5 per cent sprouted and another grown in the same state and year of which only 40 per cent sprouted. A like comparison of seed grown in the same year showed celery

seed with 90.3 per cent and another with only 26.3 per cent germination, cucumber seed with 100 and with 55 per cent respectively, and beets with 140 sprouts and with only 16 sprouts from 100 seed balls.

Onion Seed.

Table III shows the average vitality of Connecticut-grown onion seed less than one year old, as far as were shown by our tests in the years named.

TABLE III.—VITALITY OF CROPS OF ONION SEED.

	No. of Samples Tested.	Average Percentage Sprouted.
In 1894	25	82.9
1895	13	85.5
1896	44	72.4
1897	39	77.9
1898	68	69.3
1899	62	89.0
1900	77	88.5
1901	60	71.0
1902	60	80.6
1903	59	62.0
1904	42	80.4
1905	37	78.6
1906	62	77.2
1907	24	88.8
1908	119	74.5
1909	89	72.5
1910	57	64.3
1911	11	84.0
1912	18	89.5
Average for 19 consecutive years, 75.5 per cent.		

The exceptionally low vitality of the 1910 seed was due to the blasting of the crop in the field.

The Sprouting Capacity of Different Varieties of Onions.

The average sprouting capacity of five varieties, of which a considerable number of samples were tested, was as follows. Only those samples were included which were stated to be less than one year old at the time of testing and were grown in Connecticut.

TABLE IV.—SPROUTING CAPACITY OF DIFFERENT VARIETIES OF ONION SEED.

	No. of Samples Tested.	Average Percentage of Sprouting Seed.
Yellow Globe	407	74.30
Red Globe	291	77.90
White Globe	212	78.33
White Portugal	34	70.82
Wethersfield Red	15	79.07

Vitality of Onion Seed as Affected by the Age of the Seed.

From 1896 to 1912 the Station examined 1,793 samples of onion seed of succeeding crops. The results are summarized in the following table:

TABLE V.—VITALITY OF ONION SEED.

	Connecticut Grown. No. of Samples.	California Grown. No. of Samples.	Per cent Sprouted.	Per cent Sprouted.
Seed stated to be less than one year old	890	424	75.13	88.29
Seed stated to be between one and two years old ..	168	257	65.63	78.85
Seed stated to be between two and three years old	24	28	21.90	60.55
Seed stated to be between three and four years old	1	1	59.50	10.00

In general, onion seed loses in vitality the second year, but it often happens that seed more than one year old from a crop grown and harvested under favorable conditions will sprout better than seed less than a year old which grew or was gathered under unfavorable conditions.

We believe that with sufficient skill in separating seed after threshing and winnowing, Connecticut seed can be put on the market which will have as high germinating power as the California seed. The following tests are instructive on this point, all seed used in the tests being less than one year old at the time of separating and testing:

TABLE VI.—CONNECTICUT ONION SEED SEPARATION.

Number.	Original Test.		Separation Tests.				Per cent of Increase in Germination of Heavy Seed over Light Seed.
			Heavy Seed.		Light Seed.		
	Weight 100 Seeds, Grams.	Germination, Per cent.	Weight 100 Seeds, Grams.	Germination, Per cent.	Weight 100 Seeds, Grams.	Germination, Per cent.	
5604 .....	.351	87.5	.380	88.0	.267	64.0	24.0
5607 .....	.295	43.3	.352	58.0	.198	25.5	32.5
5608 .....	.345	80.0	.391	80.0	.260	53.5	26.5
5609 .....	.371	89.5	.423	94.0	.295	66.0	28.0
5611 .....	.349	70.5	.386	83.0	.258	55.0	28.0
5613 .....	.344	84.0	.381	87.5	.289	79.5	8.0
5614 .....	.363	90.5	.397	95.5	.298	87.0	8.5
5615 .....	.270	49.0	.327	68.5	.222	44.3	24.2
5626 .....	.366	87.0	.371	89.5	.276	59.5	30.0
5627 .....	.306	71.5	.317	72.5	.223	36.5	36.0
5628 .....	.314	56.5	.320	61.5	.220	31.0	30.5
5629 .....	.355	60.0	.360	65.5	.273	47.0	18.5
5630 .....	.380	79.5	.400	89.0	.276	66.5	22.5
5631 .....	.327	51.5	.392	73.0	.239	39.0	34.0
5634 .....	.356	83.5	.365	88.0	.253	68.0	20.0
5635 .....	.352	76.5	.374	80.5	.268	50.0	30.5
5636 .....	.351	58.5	.373	64.5	.267	42.0	22.5
5640 .....	.362	84.5	.381	90.0	.299	87.5	2.5
5641 .....	.290	25.0	.327	32.0	.203	9.0	23.0

Corn.

The quality of the seed corn raised in the state would doubtless be much improved if more care were given to its proper curing and storing. Mature seed corn when harvested still contains a considerable amount of moisture, and sweet corn, especially, if kept in a warm place with insufficient ventilation, will mold badly, the fungi greatly reducing the vitality and very often killing the seed. A sample of corn received for examination during the past year contained about 70 per cent of moldy seed. The fungus *Penicillium* had penetrated the kernels, and in some the embryos were entirely destroyed. Lack of ventilation also often causes premature germination.

After corn is thoroughly cured it should be kept in a dry, cool place with a free circulation of air around it. With our very sudden changes from snow to rain and from moderate to zero

weather, even well-cured seed, if not kept dry, will absorb moisture and thus be liable to injury from freezing.

Soil and climate give this state an exceptional chance to be the center of sweet corn seed production. It is about the northern limit for the safe maturing of most varieties of sweet corn seed, and the quality of varieties grown here is generally believed to be better than those grown in a warmer climate.

Vitality of Sweet Corn Seed.

The following table gives the average, the maximum and the minimum vitality of Connecticut-grown sweet corn less than one year old, unless otherwise stated, tested during the years 1904 to 1912:

	No. of Samples Tested.	Average Percentage of Seed Sprouting.	Maximum.	Minimum.
Country Gentleman	20	88.4	100.0	59.0
Early Crosby less than one year old	12	93.5	100.0	77.0
Early Crosby one to two years old	4	63.6	85.0	42.0
Early Evergreen less than one year old	3	87.8	96.0	82.0
Early Evergreen one to two years old	1	91.0	....	....
"Evergreen" less than one year old	12	88.0	....	....
"Evergreen" one to two years old	3	80.7	92.0	73.0
Acme Evergreen one to two years old	1	80.0	....	....
Hickox	4	83.2	96.0	65.0
Metropolitan	4	91.7	99.0	85.0
Old Colony less than one year old	5	84.6	100.0	57.0
Old Colony one to two years old	1	80.0	....	....
Old Colony two to three years old	1	45.0	....	....
Stowell's Evergreen less than one year old	29	87.0	100.0	48.0
Stowell's Evergreen one to two years old	8	81.7	99.0	62.5
Early Dawn	1	96.0	....	....
Ne Plus Ultra	1	72.5	....	....

VEGETABLE AND FIELD CROP SEEDS, 1914-15.

The germination tests of seed received in sufficient quantity to warrant reporting average percentages are given in the following table. Peas and onion seed head the list for number of samples submitted for test, with sweet corn and tomatoes following as close seconds. Of field crops, corn and soy beans are first in number, followed by tobacco and vetch. Samples of nearly all the common vegetable seeds have been submitted in varying quantities, but not in large enough quantity to report, except to note that the quality ran uniformly good in most cases.

TABLE VII.—GERMINATION OF VEGETABLE SEEDS, ETC.

Kind of Seed.	No. Samples.	Minimum Germination.	Maximum Germination.	Average Germination.
Peas	36	51.5	100.0	89.6
Onion (white)	21	43.0	95.5	77.6
" (yellow)	21	49.5	95.0	81.1
" (red)	10	59.5	92.5	80.5
Sweet Corn	18	82.4	100.0	94.1
Tomatoes	13	76.0	97.5	89.1
Field Corn	20	84.0	100.0	97.3
Soy Beans	19	27.5	99.5	89.7
Tobacco	8	11.5	89.5	67.1
Vetch	5	61.0	71.5	65.9

GRASS AND FORAGE CROP SEEDS, 1914-15.

As in previous years, many of the samples of grass and forage crop seeds were too small to warrant making an accurate purity test; however, it has been possible to estimate the quality very closely from the samples at hand. From our records it appears that the larger percentage of the samples have given a lower percentage of germination than during 1912-13, but the proportion of good quality seed has increased considerably. We believe the improvement in quality has been due in part to a demand of the trade for a higher grade seed than formerly and the response to this demand on the part of the grower or dealer. Besides the samples recorded in the accompanying table, a few samples each of Kentucky blue grass, sweet vernal, Rhode Island bent, sweet and alsike clover and millet have been tested for germination and purity.

In a test of different grades of timothy and red top it is shown that the higher the grade of seed the higher the percentage of germination, the strictly prime timothy germinating 93 per cent while the grade designated as choice gave a germination of only 70 per cent, and the fancy recleaned red top germinating 75.5 per cent while the unhulled gave only 25.3 per cent. It is at once apparent that the lower grades of these seeds are much more expensive considering the resulting stand than the high grade seed.

TABLE VIII.—GRASS AND FORAGE CROP SEED TESTED IN 1914-15.

Kind of Seed.	No. of Samples.	Per cent of Samples Giving Germination Test of								Per cent of Samples, Good Quality.	Per cent of Samples, Poor Quality.
		Less than 65%.	65-70%.	70-75%.	75-80%.	80-85%.	85-90%.	90-95%.	95-100%.		
Red Clover	11	*18.2	...	...	18.2	27.3	18.2	9.05	9.05	81.8	18.2
Alfalfa	25	...	...	8.0	16.0	16.0	24.0	20.0	16.0	†	...
Timothy	5	...	...	...	40.0	40.0	20.0	...	...	85.8	14.2
Red Top	8	25.0	25.0	...	25.0	...	25.0	...	...	25.0	75.0
Oats	11	18.2	...	...	...	...	45.4	9.2	27.2	81.8	18.2

TREE SEEDS.

During the period covered by this report we have made several tests of tree seeds and while we realize that the number has been too small to warrant drawing any very definite conclusions there have been some interesting points brought out which are worthy of notice. Of course it is a question whether the testing of tree seed will enable the planter to determine accurately the amount of seed to plant from the results of the test, as these have to be made under conditions which are largely artificial. Yet from the results obtained in our tests it would seem that it would be perfectly possible to tell the extremes of quality even if the gradations between could not be so readily determined, that is to say one could tell fair to good seed from poor to very poor.

There are three methods of testing which have been used, namely, a cutting test, which determines quickly the per cent of seed which are filled but in no wise tells the per cent which have

* Experimental tests of samples of hard seed.

† Quality in general good.

vitality enough to sprout; a germinator test, in which the seeds are kept under the most ideal conditions for germination, which usually gives the per cent of germination in a shorter time than the third test, which is a soil test. In the soil test the seeds are sown broadcast in boxes of sand and leaf mold in the greenhouse and of all the tests it most closely approaches actual field conditions. This test gives usually a larger per cent of germination than the germinator test but the seeds sprout much slower. The temperature for the germinator tests averaged 68° F. for eighteen hours and 86° F. for six hours of each day and the soil tests were carried at an average minimum temperature of 55° F. and an average maximum of 85° F. with many intermediate variations.

Judging from the results of our tests the cutting test is the least reliable as the seed tested in this way uniformly showed a high per cent of what was apparently good seed while the actual germination of the same sample sometimes was very poor. Between the soil (S.) and germinator (G.) tests there does not seem to be so great a difference in the final result and frequently the difference is in favor of the former.

In Table IX it will be noted that the samples of white pine show considerable differences in vitality, and the results do not warrant making any summary of the behavior which may be expected of white pine seed under any given condition. Samples No. 8323 and 8324 were of the same age and tested under exactly the same conditions, the former being collected by a nursery company and the latter by a private party, but as we do not know the conditions of curing and storing it is impossible to tell the cause for the variation in per cent of germination. On the other hand we find that the samples of red pine show a marked uniformity in results. Five samples of the seven tested vary only 3 per cent, and it will also be noted that nearly all of the samples germinated in a comparatively short time as compared with the germination of the white pine. Sample No. 8390 gave 81.0 per cent of germination after being kept for five years at ordinary room temperature.

Sample No. 8387 was taken from the same lot of seed as sample No. 7759 and shows that this sample of Japanese Black Pine completely lost its vitality in five years. The samples of hemlock show uniformly poor germination, a condition which seems to be common in hemlock seed in the field. Sample No.

TABLE IX.—GERMINATION OF TREE SEEDS.

Test No.	Seed.	Age, Yrs.	Number of Days to First Sprouting.		Percent Five Weeks.	Total Per cent.	S. G.	Number of Weeks to Final Count.
			S.	G.				
6451	White Pine	I	14	8	56.0	54.5	58.0	64.0
6793	" "	I	21	II	20.0	42.0	96.5	79.5
6794	" "	I	21	I	19.0	44.0	84.5	78.5
8323	" "	#	..	21	..	46.5	..	57.5
8324	" "	#	..	30	..	11.5	..	25.5
8391	" "	3	..	..	..	..	..	10
8435	" "	3	..	21	..	18.0	..	27.5
7993	" "	2	..	II	..	20.5	..	37.0
7861	Red Pine	?	..	10	..	81.0	..	88.0
6452	" "	I	14	14	..	94.2	82.5	94.2
6792	" "	I	21	II	96.5	91.5	96.5	93.5
7992	" "	I	..	14	..	..	..	92.0
8325	" "	I	..	6	..	..	..	94.0
8326	" "	I	..	18	..	..	..	95.0
8390	" "	5	..	19	..	69.0	..	81.0
7367	Scotch Pine	I	18	7	68.0	56.5	68.0	62.0
7660	" "	?	..	8	..	28.0	..	31.0
8327	" "	?	..	II	..	23.0	..	25.5
7760	Mt. Pine	I	12	5	12.0	2.5	12.0	2.5
6796	Pitch Pine	#	21	8	51.5	33.0	67.5	64.0
7860	Jack Pine	?	18	8	53.0	47.0	84.0	80.0
7759	Japanese Black Pine	I	12	7	32.0	22.5	32.0	25.5
8387	" "	5	..	..	..	..	..	0.0
7863	Hemlock	#	..	..	..	..	..	0.0
7355	"	#	35	..	1.0	..	18.0	0.0
7757	"	?	35	63	7.5	..	22.0	1.0
8389	"	..	..	..	..	..	..	0.0
7368	Norway Spruce	I	18	7	41.0	42.0	44.5	42.0
8321	Siberian Larch	2	..	II	..	50.0	..	50.0
6538	European Spruce	?	..	6	..	76.0	..	76.0
7366	European Larch	I	17	7	17.0	29.0	29.5	29.0
7752	Japanese Larch	I	12	9	85.0	39.5	86.5	44.0
8388	" "	4	..	..	..	..	..	0.0
6795	Arbor Vitae	?	21	8	74.0	75.5	75.5	76.0
7753	Japanese Yew	I	..	..	..	..	0.0	0.0
7755	Japanese Cedar	?	..	..	..	..	0.0	0.0
7999	Douglas Fir	I	..	4	..	..	..	65.0
8322	" "	I	..	II	..	..	..	56.5
8209	" "	I	..	6	..	..	..	72.5
8000	White Fir	I	..	9	..	..	..	27.5
8328	" "	2	..	II	..	57.5	..	57.5
7656	Sycamore	I	14	2	..	..	41.0	40.0
7758	Beech	?	7	..	60.0	..	70.0	..
6550	Catalpa	I	12	5	..	..	84.0	60.0
6798	White Ash	#	287	5II	..	..	6.0	2.0
7356	" "	I	105	105	..	..	38.0	3.0
7754	Chinese Redbud	I	14	..	..	..	12.0	..
7751	Chinese Privet	I	56	..	..	..	84.0	..
7862	Sweet Gum	?	..	..	..	..	0.0	..
8494	Paper Birch	?	..	9	..	..	..	9.5
8502	White Birch	?	..	..	..	..	0.0	..
8263	Locust	?	..	19	..	..	..	1.5

Seed less than year old.

8388, taken from the same lot of seed as was Sample No. 7752, shows complete deterioration of Japanese Larch seed in four years. White ash seed took a long time to germinate and did not give a very high per cent at the best. White and paper birch, also locust, gave very poor results with the conditions under which they have been tested at this laboratory.

TABLE X.—CUTTING VERSUS GERMINATION TESTS OF TREE SEEDS.

Test No.	Seed.	Cutting Test.	Germination Test.	Variation.
6794	White Pine	96.0	84.5	11.5
6451	" "	96.0	71.0	25.0
6452	Red Pine	99.0	82.5	16.5
6792	" "	100.0	96.5	3.5
7760	Mt. Pine	91.0	12.0	79.0
6796	Pitch Pine	90.0	67.5	22.5
7860	Jack Pine	99.0	84.0	15.0
7759	Japanese Black Pine	93.0	32.0	61.0
7863	Hemlock	60.0	00.0	60.0
7757	"	67.0	22.0	45.0
7366	European Larch	66.0	29.5	36.5
7752	Japanese Larch	97.0	86.5	10.5

From Table X it will be seen that while nine of the samples on which cutting tests were tried showed a uniformly high per cent of good seed the corresponding germination tests showed a considerable variation. The soil tests were used for comparison as it was thought that these approximated more closely the results which could be expected under field conditions. Of course there is considerable variation between the soil and germinator tests but for the most part they do not show as gross a difference as is shown in the above table between cutting and germination tests which were conducted under conditions as near as possible to field practices. We believe that the cutting test will tell in a very general way what may be expected of a sample of seed and could be used in case of lack of time for any other test but that it is not reliable and should only be used in case of necessity where facilities or time for other tests are not to be had.

GERMINATION TESTS OF RADISH SEED BOUGHT IN 1915.

It was planned in the spring of 1915 to undertake some coöperative experiments with the vegetable department on the com-

parison of laboratory tests on germination with tests of the same samples under actual field conditions. Thirty-three samples of radish seed of the same variety were consequently collected from as many dealers throughout the state and germination tests were made in a standard germinating chamber and later field tests were made of the same samples. It has been decided that the results are not conclusive enough to warrant any publication at this time in regard to the comparison of the two tests so we will only present the data concerning the laboratory tests.

The samples showed variation of from 23.5 per cent to 99 per cent of germination with 25 samples or 62.5 per cent of the whole germinating over 80 per cent; 11 samples or 27.5 per cent germinating between 50 and 80 per cent, and 4 samples or 10 per cent germinating under 50 per cent. These results seem to indicate that the radish seed offered for sale in the state last year was for the most part of good quality. Our results also show that the appearance of the seed is not necessarily any criterion of its quality, as the sample that germinated only 23.5 per cent was the brightest looking lot of seed collected.

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ERRATA.

Page 54, sample No. 6172, Mapes Tobacco Manure, Wrapper Brand. In the fifth column of the table the figure for "Average retail cost of like amounts," etc., should be \$49.34 and not \$36.63, as there given.

Page 93, line twenty-seven from top: for *Pestalozzi* read *Pestalozzia*.

Page 455, line six from top: for *Ritzena* read *Ritzema*.

Page 458, fourteenth line from bottom: for *aristata* read *cristata*.