HATCH EXPERIMENT STATION

OF THE

MASSACHUSETTS

AGRICULTURAL COLLEGE.

BULLETIN NO. 81.

I. ANALYSES OF MANURIAL SUBSTANCES SENT ON FOR EXAMINATION.

II. ANALYSES OF PARIS GREEN.

III. INSTRUCTIONS TO MANUFACTURERS, IMPORTERS, AGENTS, AND SELLERS OF COMMERCIAL FERTILIZERS.

IV. ANALYSES OF LICENSED FERTILIZERS COLLECTED BY THE AGENT OF THE STATION DURING 1901.

V. INSTRUCTIONS REGARDING THE SAMPLING OF MATERIALS TO BE FORWARDED FOR INVESTIGATION.

VI. CONTRIBUTION ON THE TREATMENT OF BARN-YARD MANURE WITH ABSORBENTS.

VII. DISCUSSION OF TRADE VALUES OF FERTILIZING INGREDIENTS.

MARCH, 1902.

The Bulletins of this Station will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same.

AMHERST, MASS.:
PRESS OF CARPENTER & MOREHOUSE,
1902.

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1902-04

HATCH EXPERIMENT STATION

OF THE

Massachusetts Agricultural College,

AMHERST, MASS.

STATION STAFF:

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Charles A. Goessmann, Ph. D., LL. D.,	*Chemist* (Fertilizers).
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Henry L. Bodfish,	*Observer.*

The co-operation and assistance of farmers, fruit-growers, horticulturists, and all interested, directly or indirectly, in agriculture, are earnestly requested. The Bulletins will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same. General bulletins fertilizer analyses, analyses of feed-stuffs, and annual reports are published. Kindly indicate in application which of these are desired. Communications may be addressed to the

Hatch Experiment Station, Amherst, Mass.

DIVISION OF CHEMISTRY.

C. A. Goessmann.

I.

ANALYSES OF FERTILIZING SUBSTANCES SENT ON FOR FREE EXAMINATION.

WOOD ASHES.

1055—1059. I. Received from Medway, Mass.
II. Received from Sunderland, Mass.
III. Received from Sunderland, Mass.
IV. Received from North Hatfield, Mass.
V. Received from Holyoke, Mass.

	Per Cent.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.	10.71	14.51	10.93	3.43	16.00
Potassium oxide,	5.27	4.93	5.72	4.32	4.88
Phosphoric acid,	1.48	1.54	1.43	1.61	1.69
Calcium oxide,	34.44	31.87	35.05	34.43	37.65
Insoluble matter,	14.66	15.14	13.87	19.24	6.95

1060—1063. I. Received from Lakeville, Mass.
II. Received from Sunderland, Mass.
III. Received from Waltham, Mass.
IV. Received from Weston, Mass.

	Per Cent.			
	I.	II.	III.	IV.
Moisture at 100° C.	16.19	11.52	10.82	7.42
Potassium oxide,	4.63	5.36	5.80	4.72
Phosphoric acid,	1.35	1.16	1.33	1.48
Calcium oxide,	31.19	33.27	31.24	39.63
Insoluble matter,	13.52	15.10	18.45	7.42

1064—1069. I. and II. Received from Sunderland, Mass.
III. Received from Springfield, Mass.
IV. Received from Concord Junction, Mass.
V. Received from Concord, Mass.
VI. Received from Sunderland, Mass.

	Per Cent.					
	I.	II.	III.	IV.	V.	VI.
Moisture at 100° C.	10.29	17.01	1.31	2.64	13.30	6.61
Potassium oxide,	5.62	7.37	5.03	7.09	6.26	5.34
Phosphoric acid,	1.54	1.69	1.05	1.43	1.38	1.54
Calcium oxide,	32.97	28.52	38.31	34.24	35.18	29.79
Insoluble matter,	15.41	14.56	6.45	16.34	8.61	4.50

LIME KILN ASHES.

1070—1072. I., II. and III. Received from Holyoke, Mass.

	Per Cent.		
	I.	II.	III.
Moisture at 100° C.	10.43	2.54	3.36
Potassium oxide,	1.74	2.98	1.85
Phosphoric acid,	.72	1.22	.56
Calcium oxide,	53.24	46.38	49.70
Insoluble matter,	2.91	8.69	7.77

COTTON SEED MEAL.

1073—1075. I. and II. Collected at Sunderland, Mass.
III. Collected at Holyoke, Mass.

	Per Cent.		
	I.	II.	III.
Moisture at 100° C.	6.72	5.75	6.86
Nitrogen.	6.56	6.93	6.58

MISCELLANEOUS MATERIAL.

1076—1079. I. Burned bone received from Westminster, Mass.
II. Ground bone received from Clinton, Mass.
III. Dry ground fish collected at Sunderland, Mass.
IV. Tankage received from South Westport, Mass.

	Per Cent. I.	II.	III.	IV.
Moisture at 100° C.	.65	3.26	5.13	3.76
Total phosphoric acid,	38.68	22.96	6.98	19.37
Available phosphoric acid,	4.22	12.22	3.67	8.34
Insoluble phosphoric acid,	34.46	10.74	3.31	11.03
Nitrogen,	*	2.53	8.79	4.15

1080—1081. I. Acid phosphate collected at Amesbury, Mass.
II. Thomas slag phosphate received from Grafton.

	Per Cent. I.	II.
Moisture at 100° C.	10.57	.72
Total phosphoric acid,	18.53	18.78
Soluble phosphoric acid,	16.77	*
Reverted phosphoric acid,	1.53	5.98
Insoluble phosphoric acid,	.23	12.80
Calcium oxide,	*	45.80
Insoluble matter,	*	6.82

1082—1084. I. Jadoo fibre collected in Boston, Mass.
II. Mill waste received from West Springfield, Mass.
III. Dried and pulverized rock weed received from Marblehead, Mass.

	Per Cent. I.	II.	III.
Moisture at 100° C.	8.88	4.51	16.78
Phosphoric acid,	.26	1.07	.14
Potassium oxide,	.38	.58	1.56
Nitrogen,	.77	1.84	1.07
Calcium oxide,	*	*	2.11
Magnesium oxide,	*	*	1.72
Ferric and Aluminic oxides,	*	*	1.22
Sodium oxide,	*	*	4.04
Chlorine,	*	*	.16

*Not determined.

1085—1087. I. Milk casein received from Amherst, Mass.
II. and III. Sheep fertilizer received from Worcester.

	Per Cent. I.	II.	III.
Moisture at 100° C.	7.15	4.48	8.02
Phosphoric acid,	8.06	1.78	2.15
Potassium oxide,	.76	2.30	2.39
Nitrogen,	7.30	2.50	2.78
Calcium oxide,	11.78	1.64	*
Ferric and Aluminic oxides,	1.40	*	*
Insoluble matter,	.10	*	6.04

SOILS.

1088—1090. I. Received from Abington, Mass.
II. and III. Received from East Whately, Mass.

	Per Cent. I.	II.	III.
Moisture at 100° C.,	40.72	17.88	8.92
Phosphoric acid,	.46	.02	.18
Potassium oxide,	.26	.48	.33
Nitrogen,	.50	.10	.12
Calcium oxide,	trace	.88	.86

COMPOUND FERTILIZERS.

1091—1094. I. Received from South Boston, Mass.
II. Received from North Amherst, Mass.
III. Collected at Sunderland, Mass.
IV. Collected at Sunderland, Mass.

	Per Cent. I.	II.	III.	IV.
Moisture at 100° C.,	1.15	18.27	5.88	9.92
Total phosphoric acid,	3.55	10.36	10.70	9.86
Soluble phosphoric acid,	*	8.40	7.24	5.76
Reverted phosphoric acid,	*	1.84	1.92	2.56
Insoluble phosphoric acid,	*	.12	1.54	1.54
Potassium oxide,	.67	5.38	5.44	5.46
Nitrogen,	3.29	2.23	3.59	2.70
Calcium oxide,	12.32	*	*	*

*Not determined.

1095—1097. I. Received from Grafton, Mass.
II. and III. Received from Sunderland, Mass.

	Per Cent. I.	II.	III.
Moisture at 100° C.,	.92	4.10	8.70
Total phosphoric acid,	7.70	8.32	9.86
Soluble phosphoric acid,	*	1.28	7.30
Reverted phosphoric acid,	3.22	4.48	1.54
Insoluble phosphoric acid,	4.48	2.56	1.02
Potassium oxide,	24.88	12.62	5.06
Nitrogen,	*	4.85	3.38
Calcium oxide,	23.64	*	*

II.

ANALYSES OF PARIS GREEN.

The following samples of Paris green were bought, during the month of January, 1902, of dealers in the State of Massachusetts.

1098—1101.

I. Manufactured by E. and F. King Co., Boston, Mass. Bought in Boston, Mass., Jan. 31, 1902.

II. (Composite sample of three) Manufactured by C. T. Reynolds & Co., New York City. Bought in Northampton, Mass., Jan. 29, 1902. Samples of this material were also bought in Worcester and Boston, Mass., Jan. 31 and Feb. 3, 1902.

III. Manufactured by I. Pfeiffer, New York City. Bought in Boston, Mass., Jan. 31, 1902.

IV. Manufactured by Jas. A. Blanchard, New York City. (Composite sample of two) Bought in Springfield, Mass., Jan. 29, 1902, and Boston, Mass., Jan. 31, 1902.

*Not determined.

	Per Cent. I.	II.	III.	IV.
Moisture at 100° C.,	.60	.55	.63	.53
Copper oxide,	30.35	28.00	29.83	29.51
Arsenious oxide,	59.04	61.15	60.38	60.37
Insoluble matter,	.05	.01	*	.14

1102—1105.

I. Manufactured by Chas. N. Childs & Co., New York City, Bought in Worcester, Mass., Feb. 3. 1902.

II. Manufactured by Leggett & Bro., New York City. Bought in Worcester, Mass., Feb. 3, 1902.

III. Manufactured by A. B. Ansbacher & Co., New York City. Bought in Northampton, Mass., Jan. 29, 1902.

IV. Manufactured by A. B. Ansbacher & Co., New York City. Sent on for analysis to Amherst, Mass.

	Per Cent. I.	II.	III.	IV.
Moisture at 100° C.,	.78	.39	.86	*
Copper oxide,	30.32	28.95	29.94	30.80
Arsenious oxide,	60.71	60.60	60.04	58.52
Insoluble matter,	.02	.15	.02	*

*Not determined.

III.

INSTRUCTIONS TO MANUFACTURERS, IMPORTERS, AGENTS AND SELLERS OF COMMERCIAL FERTILIZERS AND MATERIALS USED FOR MANURIAL PURPOSES IN MASSACHUSETTS.

1. An application for a certificate of compliance with the regulations of the trade in commercial fertilizers and materials used for manurial purposes in this state must be accompanied:

First, with a distinct statement of the name of each brand offered for sale, the name of the manufacturer and place of factory.

Second, with a statement of the amount of phosphoric acid, of nitrogen and of potassium oxide guaranteed in each distinct brand.

Third, with the fee charged by the State for a certificate, which is five dollars for each of the following articles: nitrogen, phosphoric acid and potassium oxide guaranteed in any distinct brand.

2. The obligation to secure a certificate applies not only to compound fertilizers but to all substances, single or compound, used for manurial purposes offered for sale in this State.

3. The certificate of compliance with our State laws must be secured annually before the first of May.

4. Manufacturers, importers and dealers in commercial fertilizers can appoint in this State as many agents as they desire after having secured at this office the certificate of compliance with our laws.

5. Agents of manufacturers,importers and dealers in commercial fertilizers are held personally responsible for their transactions until they can prove that the articles they offer for sale are duly recorded in this office.

6. Manufacturers and importers are requested to furnish a list of their agents.

All inquiries regarding the sales of commercial fertilizers, etc., may be addressed to C. A. Goessmann, Amherst, Mass., Chemist in charge of the official inspection of these articles.

IV. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1901, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer	Sampled at
	Compound Fertilizer.		
433	Armour's Grain Grower,	Armour's Fertilizer Works, Baltimore, Md.,	Amherst.
441	Quinnipiac Climax Phosphate,	American Agric. Chem. Co. (Quinnipiac Co.),	Amherst.
444	Quinnipiac Havana Tobacco Fertilizer,	American Agric. Chem. Co. (Quinnipiac Co.),	Amherst.
442	Standard Guano,	American Agric. Chem. Co. (Standard Fert. Co.),	Amherst.
443	Standard Fertilizer,	American Agric. Chem. Co. (Standard Fert. Co.),	Amherst.
445	Standard Complete Manure,	American Agric. Chem. Co. (Standard Fert. Co.,	Amherst.
446	Standard Special for Potatoes,	American Agric. Chem. Co. (Standard Fert. Co.),	Amherst.
448	Tucker's Special Potato Fertilizer,	American Agric. Chem. Co. (Henry F. Tucker Co.),	Amherst.
449	Imperial Bone Superphosphate,	Ameriean Agric. Chem. Co. (Henry F. Tucker Co.).	Amherst.
447	High Grade Special,	American Agric. Chem. Co., (Williams & Clark Fert. Co.)	Amherst.
184	Wheeler's Corn Fertilizer,	American Agric. Chem. Co., (M. E. Wheeler & Co.),	Hudson.
440	Imperial Liquid Grass Fertilizer,	Eastern Chemical Co., Boston, Mass.,	Amherst.

Note.—The samples designated as "Sampled at Amherst" are certified samples forwarded by manufacturers.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
433	Armour's Grain Grower, ...	9.37	2.13	1.65-2.47	7.23	2.21	.67	10.11	10-12	9.44	8-10	2.63	2-3
441	Quinnipiac Climax Phosphate, ...	14.21	1.51	1.03-2.50	5.31	2.98	3.20	11.49	10-15	8.29	8-12	2.25	2-3
444	Quinnipiac Havana Tobacco Fertilizer, .	2.91	5.89	5.78-6.61	3.88	1.90	.69	6.47	6-9	5.78	5-7	10.92	10-12*
442	Standard Guano, ...	14.44	1.26	1.03-2.50	5.12	3.20	2.94	11.26	10-15	8.32	8-12	2.22	2-3
443	Standard Fertilizer, ...	14.09	2.19	2.06-2.88	5.95	4.90	1.38	12.23	10-13	10.85	8-10	1.80	1.5-2.5
445	Standard Complete Manure, ...	10.85	3.70	3.30-4.12	5.88	3.21	1.94	11.03	9-13	9.09	8-11	7.32	7-8
446	Standard Special for Potatoes, ...	14.88	2.26	2.06-2.88	6.19	3.48	2.10	11.77	10-13	9.67	8-10	3.22	3-4
448	Tucker's Special Potato Fertilizer, . .	15.13	2.12	2.06-2.88	7.42	1.86	2.23	11.51	10-13	9.28	8-10	3.38	3-4
449	Imperial Bone Superphosphate, . . .	14.42	1.23	1.03-2.50	4.86	3.44	2.82	11.12	10-15	8.30	8-12	2.08	2-3
447	High Grade Special, ...	10.95	3.46	3.30-4.12	5.95	2.88	2.25	11.08	9-13	8.83	8-11	7.26	7-8
184	Wheeler's Corn Fertilizer, ...	16.07	2.03	1.65-2.47	6.27	2.56	1.61	10.44	10-14	8.83	8-11	1.92	2-3
440	Imperial Liquid Grass Fertilizer, . . .	81.24	2.89	1	2.42	—	—	2.42	1	2.42	1	2.82	1

*Sulphate of potash, the source of potash.

IV. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1901 IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
431	Essex Tobacco Starter,	Russia Cement Company, Gloucester, Mass.,	Amherst.
434	Market Garden Manure,	Benjamin Randall, Boston, Mass.,	Amherst.
435	Farm and Field,	Benjamin Randall, Boston, Mass.,	Amherst.
436	Hubbard's Corn Phosphate,	The Rogers & Hubbard Co., Middletown, Conn.,	Amherst.
437	Hubbard's Soluble Corn Manure,	The Rogers & Hubbard Co., Middletown, Conn.,	Barre.
157	Hubbard's Soluble Tobacco Manure,	The Rogers & Hubbard Co., Middletown, Conn.,	Bridgewater.
14	Tobacco Formula "B,"	Lucien Sanderson, New Haven, Conn.,	Sunderland.
	Ground Bones.		
430	Pure Ground Bone,	C. A. Bartlett, Worcester, Mass.,	Amherst.
432	Steamed Bone,	McQuade Bros., West Auburn, Mass.,	Amherst.
438	Hubbard's Strictly Pure Fine Bone	The Rogers & Hubbard Co., Middletown, Conn.,	Amherst.
439	Hubbard's Raw Knuckle Bone Flour,	The Rogers & Hubbard Co., Middletown, Conn.,	Amherst.

Note.—The samples designated as, "Sampled at Amherst" are certified samples forwarded by manufacturers.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Total. Found.	Total. Guaranteed.	Available. Found.	Available. Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
431	Essex Tobacco Starter,	8.36	2.54	2.5-3.00	3.39	6.58	3.74	13.71	12-14	9.97	9-11	4.14	2.5-3.00*
434	Market Garden Manure,	15.92	3.27	3.25-4.00	4.93	4.05	1.05	10 03	—	8.98	8-10	3.31	4-5*
435	Farm and Field,	9.51	2.26	2-3	1.34	3.95	4.71	10.00	—	5.29	6-8	2.79	2-3
436	Hubbard's Corn Phosphate,	12.50	1.18	1.-1.50	7.07	3.58	.51	11.16	10-12	10.65	8-10	4.03	3.5-4.
437	Hubbard's Soluble Corn Manure,	9.50	2.73	2.5-3.30	1.02	5.76	2.94	9.72	8-10	6.78	6-8	7.98	8-9
157	Hubbard's Soluble Tobacco Manure,	5.53	5.03	5-6	.48	6.15	5.27	11.90	10-12	6 63	7-8.50	11.68	10-11*
14	Tobacco Formula "B,"	6.12	3.30	3.30-4.12	4.00	7.50	1.54	13.04	10-12	11.59	6-8	6.84	6-8*
	Ground Bones.												
430	Pure Ground Bone,	2.22	2.20	2-3	—	10.52	17.37	27.89	27-28	10.52	7-9		
432	Steamed Bone,	2.03	2.79	2.78	—	10.70	13.84	24.54	24.52	10.70	—		
438	Hubbard's Strictly Pure Fine Bone,	6.67	3.88	3.79-4.00	—	9.34	12.16	21.50	22-23	9.34	—		
439	Hubbard's Raw Knuckle Bone Flour,	6.89	3.82	3.82-4.00	—	7.86	17.83	25.69	24.7-25.60	7.86	—		

Laboratory Number.	Mechanical Analysis.			
	Fine Bone.	Fine Med.	Med.	Coar. Med.
430	71.39	23.74	4.87	—
432	64.60	20.60	12.30	2.50
438	31.70	31.00	28.10	9.20
439	52.40	47.60	—	—

*Sulphate of potash, the source of potash.

V.

INSTRUCTIONS REGARDING THE SAMPLING OF MATERIALS TO BE SENT ON FOR EXAMINATION WITH STATEMENTS OF CONDITIONS TO SECURE ANALYSES FREE OF CHARGE.

It is of the utmost importance that parties forwarding fertilizing substances for examination should take particular pains in sampling, packing and forwarding such materials in order that the analyses obtained may represent the average composition of the goods sampled, that no addition or loss of moisture in transportation may be effected and that the package be addressed to the proper department.

All samples are received and entered in the order of their arrival at this office. Each sample is assigned a number and is taken up for investigation in the order in which it has been received.

All samples should be addressed to Dr. C. A. Goessmann, Chemical Department of the Hatch Experiment Station, Amherst, Mass., to prevent confusion and possible delay. Express charges must always be prepaid. **The name of the sender should be enclosed in an envelope and placed inside the receptacle** together with a statement of the nature of the material forwarded for analysis; whether it is an agricultural chemical, mixed fertilizer, a wood ash or the by-product of some manufacturing industry.

The receipt of all samples will be acknowledged by return mail and the results of analysis will be forwarded free of charge to all farmers as soon as completed.

The results of all analyses of samples made at the Station, free of charge, are considered at the disposal of the managers for publication if deemed advisable.

SAMPLING OF MATERIAL IN BULK.

In sampling such materials as wood ashes, cotton hull ashes and in fact any material in bulk, portions should be taken from various parts of the heap and placed on a thick, smooth piece of paper and thoroughly mixed: from this mixture should be drawn a sample of about one pound which should be placed in a clean bottle, jar or tin can tightly stoppered and sealed in order to retain the moisture conditions of the original material.

SAMPLING OF MATERIAL IN BAGS.

In sampling material which is shipped in bags, portions should be drawn from at least ten per cent of the number of bags present. A fair sample may be obtained by emptying about ten per cent of the bags present on a clean floor or other smooth surface and thoroughly mixing: small amounts are then taken from different parts of the heap and an average sample drawn as has been previously described.

SAMPLING OF SOILS.

The correct taking of representative soil samples, when such are desired for chemical investigation, is of the first importance, as without a properly taken sample, the results which a careful chemical analysis will show become of little value. The sample should be taken from different portions of the field and to a depth not exceeding the downward limit of the surface soil. After selecting a place where a sample is to be taken, pull up all growing vegetation and remove all surface matter which is not a part of the soil. Dig a hole in the soil about two feet square, making the sides smooth and clean by means of a sharp pointed shovel or other instrument; now place a sharp bladed shovel at the point of separation of the surface soil from the subsoil and by means of another flat bladed instrument shave off a portion (about two inches) from all four sides of the aperture letting the soil fall into a shovel which is held in a proper position to receive the same. Place the soil in a suitable receptacle and proceed to take other samples in a like manner from several different parts of the field. The large bulk of soil which has thus been taken is now placed on a clean floor or on a large piece of thick paper and thoroughly broken up and mixed, after which an average sample is drawn and placed in a glass jar or bottle. The bottle is then securely stoppered and sealed, properly labelled and forwarded for the subsequent chemical examination.

A description of the soil should accompany the sample or be sent in a sealed letter, setting forth the locality, depth at which the sample was taken, nature of subsoil and depth, the method of fertilization and crop rotation which has been in practice, general fitness of land for cultivation and all other information that would be of interest or assistance to the chemist in formulating his report.

Care should be exercised in sampling when the weather conditions are normal and no time should be lost between the drawing of the sample and the forwarding of same to the laboratory. This point applies with equal force to all materials forwarded for investigation.

STATEMENT OF CONDITIONS TO SECURE ANALYSES FREE OF CHARGE.

APPLICATION FOR FREE ANALYSIS OF FERTILIZERS AND FERTILIZING MATERIAL.

Name of Material, ______________________________

Name of manufacturer or dealer, ______________________________

Address of manufacturer or dealer, ______________________________

Date of purchase, ______________________________

Price paid per ton, ______________________________

Whether bought for own use or for sale, ______________________________

Signature of Applicant, ______________________________

Post Office Address, ______________________________

A printed copy of the above stated questions will be sent hereafter from this office *to every applicant for an analysis free of charge,* to be answered by him according to his best information, before his request can be considered.

The object of this course is to impart a more general interest in the results of this work of the Station and to assist in an efficient management of the official inspection of commercial fertilizers and fertilizing materials by making known the names of licensed as well as unlicensed dealers in our State.

The call for free analysis has gradually reached such proportions that the expenses necessarily incurred in the work have become a serious feature in the management of the financial resources at our disposal.

It is to be hoped that all parties interested in this important work of the Station will aid us by complying with our request.

VI.

CONTRIBUTION ON THE TREATMENT OF BARN-YARD MANURE WITH ABSORBENTS TO PREVENT THE LOSS OF NITROGEN IN FORM OF AMMONIA COMPOUNDS.

H. D. Haskins.

The value of barn-yard manure, and other waste products of the farm, to maintain the fertility of the soil, are too well known to need any further statement. The most economical treatment of farm manures and vegetable composts, to prevent the serious loss of our most costly essential element of plant food, namely nitrogen, deserves our most serious consideration. The following list of chemical substances are those most commonly advocated for use in the preservation and composting of barn-yard manure, vegetable composts and other waste products of the farm : Sulphate of lime (gypsum), kainite, sulphate of magnesia (kieserite), sulphate of potash-magnesia (double manure salts), and high grade sulphate of potash. A series of experiments have been carried on in this department for the purpose of ascertaining which of these substances was the most efficient in absorbing ammonia compounds which are liberated in the process of decomposition of barn-yard manure.*

The first series of experiments covered a period of six weeks, and the second series of experiments covered a period of ten months. The results of the first tests were verified by the subsequent experiments and the order of excellence of the ammonia absorbents was shown to be as follows: Magnesium sulphate (kieserite), potash-magnesium sulphate, kainite, high grade sulphate of potash and sulphate of lime (gypsum).

In no case however was the total amount of nitrogen, which was given off during the process of decomposition, entirely absorbed by the fixer.

*A detailed description of these experiments has been reserved for publication in our annual report.

The following table shows the percentage of liberated nitrogen, in form of actual ammonia compounds, absorbed by each fixer:

Magnesium Sulphate (kieserite),	38.88%
Potash-magnesium sulphate,	34.25
Kainite,	27.67
High grade sulphate of potash,	11.45
Sulphate of lime (gypsum),	.86

From the above table it will be seen that sulphate of lime (gypsum), although enjoying the reputation of being the ammonia absorbent more commonly used in general farm practice, really possesses the lowest ammonia absorption capacity of any chemical under trial. This is no doubt due to the low solubility of the gypsum.

The above results, in all probability, do not represent the actual nitrogen absorption power of the chemicals as used in ordinary farm practice. In conducting the experiments it was necessary that the chemicals be placed in a suitable receptacle for the purpose of preserving the samples for a subsequent chemical analysis. When brought in direct contact and incorporated with the manure, the nitrogen absorption power of the chemicals would, no doubt, be very much greater, for the reason that, with the exception of the sulphate of lime (gypsum), the chemicals are all more or less soluble in water and in the condition of solution would have a much higher nitrogen absorption capacity than when in the dry pulverized form.

All of the information hoped for in conducting the experiments was to establish the comparative nitrogen absorption capacity, under similar physical conditions, of the different chemicals under consideration.

We publish this abstract of our experiments in advance of the detailed description of the same for the purpose of directing, once more, the attention of farmers to the necessity of saving, in the interest of good economy, all of the animal and vegetable refuse of their industry for the maintenance of the fertility of the soil.

VII.

TRADE VALUES OF FERTILIZING INGREDIENTS IN RAW MATERIALS AND CHEMICALS.

	1901	1902
	Cents per pound	
Nitrogen in ammonia salts,	16.5	16.5
" nitrates,	14.0	15.0
Organic nitrogen in dry and fine ground fish,meat,blood, and in high-grade mixed fertilizers,	16.0	16.5
" " " fine bone and tankage,	16.0	16.0
" " " medium bone and tankage,	12.0	12.0
Phosphoric acid soluble in water,	5.0	5.0
" " soluble in ammonium citrate,	4.5	4.5
" " in fine ground fish, bone and tankage,	4.0	4.0
" " in cottonseed meal, castor pomace and wood ashes,	4.0	4.0
" " in coarse fish, bone and tankage,	3.0	3.0
" " insoluble (in water and in am. cit.) in mixed fertilizers,	2.0	2.0
Potash as Sulphate, free from Chlorides,	5.0	5.0
" " Muriate,	4.25	4.25

The market value of low priced materials used for manurial purposes, as salt, wood ashes, various kinds of lime, barnyard manure, factory refuse and waste materials of different description, quite frequently does not stand in close relation to the current market value of the amount of essential articles of plant food they contain. Their cost varies in different localities. Local facilities for cheap transportation and more or less advantageous mechanical conditions for a speedy action, exert as a rule, a decided influence on their selling price.

The market cost of the different essential elements of plant food remains the same as in 1901, with the exception of the nitrogen in form of nitrates and the higher grades of organic nitrogenous fertilizing materials, which show a somewhat higher cost as compared with the previous year.

The above schedule of trade values is based upon the condition of the fertilizer market in centres of distribution in New England during the six months preceding March, 1902, and refers to the current market prices of the leading standard raw materials which enter largely into the manufacture of our commercial fertilizers.

The following is a list of such materials :

Sulphate of ammonia,	Dissolved bone,
Nitrate of soda,	Ground phosphate rock,
Azotine,	Acid phosphate,
Dried blood,	Refuse bone black,
Cotton seed meal,	High grade sulphate of potash,
Castor pomace,	Muriate of potash,
Linseed meal,	Sulphate of potash-magnesia,
Dry ground fish,	Kainite,
Bone and tankage,	Sylvinite,
Dry ground meat,	Crude saltpetre.

Valuation. The approximate value of a compound fertilizer or any material used for fertilizing purposes is obtained by calculating the value of each of the three essential elements of plant food (nitrogen, phosphoric acid and potassium oxide, including the different forms of each wherever different forms are recognized in the table), in one hundred pounds of the fertilizer and multiplying each product by twenty to change it to a ton basis. The sum of these values will give the total approximate value of the fertilizer per ton at the principal places of distribution.

HATCH EXPERIMENT STATION

—OF THE—

MASSACHUSETTS

AGRICULTURAL COLLEGE.

BULLETIN NO. 82.

ORCHARD MANAGEMENT.

COVER CROPS IN ORCHARDS.

PRUNING OF ORCHARDS.

REPORT ON FRUITS.

APRIL, 1902.

The Bulletins of this Station will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same.

AMHERST, MASS.:
PRESS OF CARPENTER & MOREHOUSE.
1902.

HATCH EXPERIMENT STATION

OF THE

Massachusetts Agricultural College,

AMHERST, MASS.

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The co-operation and assistance of farmers, fruit-growers, horticulturists, and all interested, directly or indirectly, in agriculture, are earnestly requested. The Bulletins will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same. General bulletins, fertilizer analyses, analyses of feed-stuffs, and annual reports are published. Kindly indicate in application which of these are desired. Communications may be addressed to the

Hatch Experiment Station, Amherst, Mass.

HORTICULTURAL DIVISION.

S. T. Maynard and Geo. A. Drew.

ORCHARD MANAGEMENT.

The questions oftenest asked this division of the Hatch Experiment Station are, "What is the best treatment for orchards as to cultivation, fertilization, pruning, training, cover crops," etc., etc. In this bulletin an attempt will be made to answer some of the above questions for the benefit of all. It is beyond question that the possibilities of profitable fruit growing in Massachusetts are very great for we have a population that consumes more of the comforts and luxuries of life than any people in the world.

The markets are at the very doors of the growers and there are to be found all conditions of soil and exposure, though not in large areas in any given tracts, that are favorable to the growth of the hardy fruits of a quality not excelled by that grown in any other section of the country. That most of our growers do not appreciate this advantage is evident, but this may be accounted for perhaps by the fact that there are more difficulties to contend with here, and that more skill and more energy are needed to produce profitable results than in other sections. It is my purpose in answering the above questions to discuss some of these advantages and obstacles, and to point out what will be the best practice to follow to produce the quantity and quality of fruit that will be profitable and secure the local markets for the local grower against those producing fruit in more favorable sections.

We may take it as an axiom or rule in fruit growing that "the more *good* fruit put into a market the greater will be the consumption and the better the prices in the end," for our people are not supplied with all the fruit they need or would like, and the more poor fruit put on the market the less the consumption and the lower the price, for if people cannot get good apples there are other choice kinds of fruits to be had, either in a fresh or a preserved condition and they will purchase these in preference to poor apples.

THE PRESENT CONDITION OF ORCHARDS.

There are few extensive orchards or fruit plantations in this State, the majority ranging from a few trees to a few thousand, and these are found under three conditions, 1st, those in stony land that cannot be cultivated, 2d, those in turf land that is smooth enough to cultivate and perhaps is in grass a part of the time and cultivated for a few years when the grass crop becomes light, and 3d those in land under cultivation all of the time. Nearly all of the orchards of the State are grown in connection with some other line of agriculture or horticulture, and do not receive the skilled attention of the specialist that is required to produce the best results in this or other lines of business.

1st. Among the trees growing on land that cannot be cultivated may often be found some that are vigorous and healthy and of desirable varieties, but the majority produce only cider apples. Those that are in a healthy condition are worth saving and if the trunks are not decayed, and the top is in a vigorous condition, with a little pruning, fertilizing and spraying, much good fruit will be produced; if, however, the trunks are decayed and the tops are in an unhealthy condition, it will be far better to cut them down, as they are only breeders of insects and fungous pests and any time spent upon them will be wasted. If we should make it a rule to cut down all the trees that we cannot properly care for, our profits would be much greater than they now are. Trees of undesirable varieties that are in a healthy condition and in good soil may be grafted with profitable kinds and in a few years be made to produce fruit of the best kinds. The process of cleft grafting is known to almost every one or can be learned very easily, but it will be found rather expensive if expert grafters are employed to do the work. It will pay however if economically done, for a well established tree in good soil after a new head is established should last a generation, if properly cared for; while a young tree cannot be brought up to full size under 20 or 25 years. Fig. 1 shows a regrafted tree after a growth of four years from the grafts. The fruit grown in good land under the above conditions has a reputation for high color, fine flavor and long keeping qualities, but it must be kept in mind that first class fruit cannot be grown under any condition of soil unless the trees are made to grow vigorously, and as there is no cultivation, by which plant food can be developed more fertilizing material must be used then if the land is cultivated. The amount of fertili-

FIG. 1.

zer to be applied must depend upon the growth of the trees. Good fertilizers under the abov condition per tree are:

Formula No. 1.—1 lb. to 5 lbs. Nitrate of Soda, 1 lb. to 5 lbs. Sulphate of Potash and 2 lbs. to 10 lbs. Acid Phosphate.

Formula No. 2.—1 lb. to 5 lbs. Nitrate of Soda, and 10 lbs. to 25 lbs. good hard-wood ashes.

Formula No. 3.—Stable manure, 5 to 20 large forks full, applied in the fall or winter and the same amount of potash and phosphoric acid, or wood ashes as in formulas No. 1 or 2.

The amount of these materials that should be used per tree, will depend upon the size and the vigor of the trees. A good growth *must* be produced if large fruit is expected. A very good rule to follow in this matter is to use enough to produce a growth at the ends of the branches of from six to twelve inches each year.

2d. The orchards that are grown with a rotation of turf and cultivation are more numerous than those that are grown under constant cultivation, and in most cases, unfortunately, this practice is carried out with the idea of obtaining both a crop of fruit and of grass or hay. This practice would be satisfactory in many cases, if it was realized that the amount of plant food required for the two crops is much larger than many growers are likely to apply. The greatest objection, however, to this method is, that after the land has been a long time in grass, in the attempt to turn over the turf, the roots, which have been working more and more to the surface the longer the trees are in grass, will be much cut and broken, and after this rotation is repeated a few times the trees are very seriously injured—,and as long life cannot be expected as where they are either in turf all the time or under constant cultivation.

3d. Very few orchards of any considerable age are to be found in this State that have been cultivated from the beginning, but from what experiments have been made I think it is beyond question that the quickest returns and the greatest profits will result from this practice. The advantages of constant cultivation are that the moisture of the soil is preserved in severe drouths, and in very wet times the air is let into it, the latent plant food in the soil is made available and much less plant food will be required to produce the growth necessary for profit, the roots are kept deep in the soil and are not as liable to injury from heat or cold, and in well drained soil no injury need be feared during excessively wet seasons that might occur if it was not underdrained.

Of the three systems of orcharding as practiced in Massachusetts, that of continued turf culture, where cheap land can be utilized, an abundance of fertilizers used, and continued cultivation employed, with cover crops on the land from the middle of August to the first of May, is best adapted to produce profitable results.

CULTIVATION OF ORCHARDS.

With the modern tools for orchard cultivation this work can be done very thoroughly and cheaply. The work for a season has been variously estimated at from $10 to $25 per acre. In plowing an orchard that has been long in turf, the greatest care must be taken not to cut and tear the large roots and to plow only three or four inches deep, using shallow working tools after the plowing has been done. With the modern low-headed orchard tree, Fig. 18, it will be impossible to plow close up to the trunks, and either the land will have to be plowed in strips only, or after the plow, may follow the wide-spreading harrows, Figs. 3. 4 and 5, which will keep down the weeds and keep the soil under the branches light and loose if the work is done early in the spring while the land is soft. A low-hanging landslide plow, similar to that shown in Fig. 6, with a long point and mold board will do much better work than the swivel or side-hill plow, though it may take more time to get about with it.

Many kinds of harrows have been tried, but those found most satisfactory are the acme or shears harrow, the wheel harrow and the spring-tooth harrow, all of which are arranged with the sections spread apart so that the horses will go outside the branches while the harrow will reach under them several feet, leaving but little hand hoeing to be done. Fig. 3, shows the acme harrow with the spring-tooth attachment, so that deep working may be done by the latter and shallow working by the former.

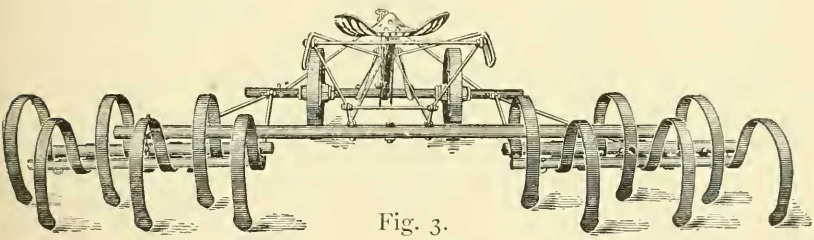


Fig. 3.

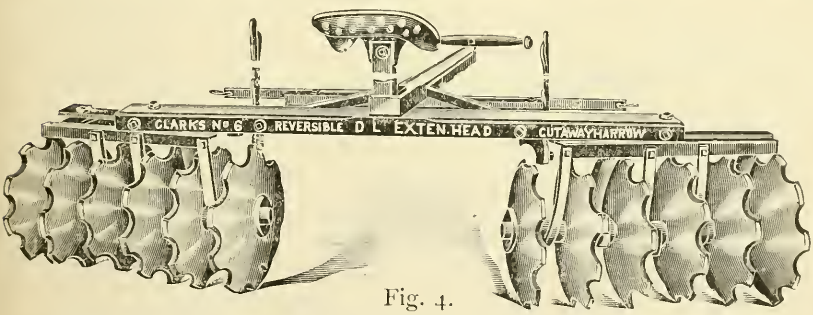


Fig. 4.

Fig. 4 shows the cutaway harrow with the spreader for orchard work.

Two sections of the common spring-tooth harrow, attached to the evener with a chain about two feet long, will work well where the trees are not too close together, being drawn in under the branches by swinging the horses around each tree, leaving but little hand hoeing to be done.

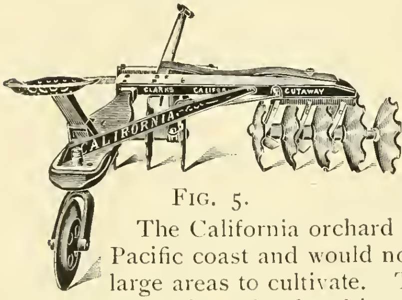


FIG. 5.

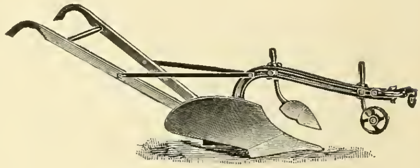
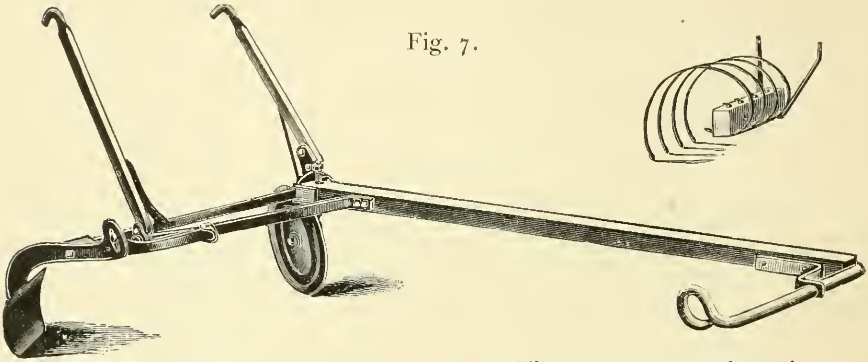


FIG. 6.

The California orchard harrow, Fig. 5, is largely used on the Pacific coast and would no doubt be of great value here if we had large areas to cultivate. The grape hoe, Fig. 7, is found of great value in orchard cultivation, for being drawn by one horse it can be more easily guided than with a pair of horses.

Fig. 7.



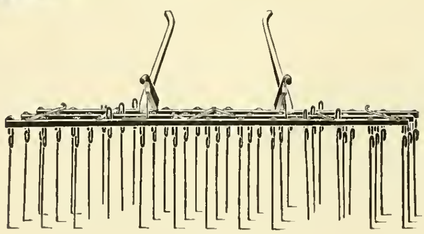


FIG. 7a.

The common weeder, Fig. 7a, is a great labor saver and if used frequently will keep the surface of the soil fine and mellow for about two inches in depth, but to give the best results, the spring-tooth or wheel harrow should be run once and then the weeder twice or three times. The weeders with straight teeth do better work in the orchard than those with curved teeth.

Some of these tools are perhaps too expensive for the small grower, and under such conditions two or more should join and purchase and use them together. Any of the above implements if properly housed when not in use and the wood parts kept painted should last a long time and do the work for many small growers.

Fig. 8.

COVER CROPS.

In growing fruit the most important question that we have to answer is how to obtain the necessary plant food to keep up a healthy growth and mature large crops. We may use the best tools and practice the best methods, and cultivation will in a measure supply plant food, but still the additional supply is one of the greatest sources of expense, and if we do not have an abundance of plant food in the soil, or if it is washed out during the fall, winter and spring we have much of our "labor for our pains".

The four important advantages of a cover crop in the orchard are: 1st, to supply nitrogen and organic matter or humus to the soil; 2d, to improve the mechanical condition of the soil, i. e., to lighten a heavy soil and make a light soil more retentive of moisture; 3d, to protect the roots from being injured by deep freezing, and 4th, to prevent the fine particles of soil and plant food from being washed away during the fall, winter and spring.

That "cover crops" do produce the above results has been proven by many experiments, and many kinds of plants have been employed. Those most used for this purpose are, rye, oats, barley, peas, soy bean, cow pea and hairy vetch. These may be divided into two classes, 1st, those that are hardy, i. e., live through the winter and make some growth in the spring before the trees start into growth, and 2d, those that make their growth in the fall and die in the winter, simply covering the ground and not absorbing any moisture from the soil by their spring growth. Of the former, the rye, Fig. 8, clovers, red and crimson, Fig. 9, and hairy vetch, Fig. 10, are shown sown in the vineyard and in the peach

Fig. 9.

Fig. 10.

FIG. 11.

FIG. 12.

FIG. 13.

FIG. 14.

orchard. Of the second group, peas and barley sown together are shown in Figs. 11 and 12, soy bean, Fig. 13, and the cow peas, Fig. 14.

It is a well settled fact that a rapidly growing cover crop, in a very dry time, may seriously injure the growth of the trees, and it is therefore important that such crops should be planted at a time when the trees are not growing rapidly or have nearly completed their growth, i. e., during the latter part of summer and through the fall, and before much growth of the trees is made in the spring. It may be said of these two groups that with the first no injury *can* come from the too rapid evaporation of moisture except in the fall, and that the ground will be protected from loss of moisture during the spring by the dead cover crop lying on the surface, and also that the land can be fitted in the spring with the wheel harrow at any time before tree growth has advanced much without any risk; while with the second, as there is some danger of serious loss of moisture in the spring, the crop must be turned under before it has made much growth and this work must be done with the plow, the wheel harrow not being heavy enough to cover it. The cover crops, about 1 acre each, represented by the above plates, were planted August 10th, broadcasted and harrowed in to a well prepared seed bed, the quantity of seed and cost being as follows :

Plot No. 1, Figs. 11 & 12,	Canada Peas, 1 1-2 bu. per acre, cost,	$2.10	
	Barley, 1 1-2 bu. per acre, cost,	$1.50	$3.60
Plot No. 2, Fig. 9,	Red Clover, 10 lbs. per acre, cost,	$1.30	
	Crimson Clover, 8 lbs. per acre, cost,	.96	$2.26
Plot No. 3, Fig. 10,	Hairy Vetch, 1 bu. per acre, cost,		$7.00
Plot No. 4, Fig. 14,	Cow Peas, 2 bu. per acre, cost,		$4.80
Plot No. 5, Fig. 13,	Soy Bean, 2 bu. per acre, cost,		$5.70

The soil of the plots is a strong clay loam filled with small stones and having a hard-pan subsoil, naturally good grass land, but hard to cultivate.

In plot No. 1, Fig. 12, the growth was heavy, holding the snow well and furnishing a most thorough protection to the ground from cold and washing.

Plot No. 2, Fig. 9. The clovers of both kinds made a good catch with a growth of about three inches and served the purpose of preventing washing of the soil, but offered no protection from frost and did not hold the snow. Unless this crop is allowed to grow considerably next spring the amount of organic material to be turned under will be very small. It is yet too early to determine whether the crimson clover will prove hardy here or not.

Plot No. 3, Fig. 10. The growth in this plot was much greater than in the last, being about 8 inches high and well matted, so as to cover the land well but not to hold much body of snow. This crop starts early in the spring and should supply a good body of organic matter rich in nitrogen to turn under earlier than the clovers.

Plot No. 4, Fig. 14. This crop made the smallest growth of all, probably due to the low temperature and abundant moisture that followed the planting for two or three weeks. Unless this crop can be sown very much earlier or will make a much larger growth in a warmer season it will be of little value.

Plot No. 5, Fig. 13. Next to the peas and barley this crop is the largest and holds the snow nearly as well, but from its coarse growth will not protect from frost as well. Its value in plant food is probably greater than that of No. 1 but the exact value under the present conditions can only be determined by several seasons' comparison.

PRUNING ORCHARDS.

The questions, "how to prune," "what to prune" and "when to prune," are what we will attempt to answer by a few illustrations. Many progressive orchardists are studying the problem very closely, and some of them have arrived at the conclusion that it is a very easy matter to prune too much and that it requires the *greatest* good judgment to prune just enough.

The following figures show some of the conditions found in many orchard trees. Fig. 15 illustrates a tree pruned up so that teams can work under the branches or so that cattle can be pastured

Fig. 15.

beneath them. There are serious objections to this severe pruning, for the exposure of the trunks and branches to the drying influences of the sun and air is a serious check to the circulation of the sap and consequently the growth of the trees.

Fig. 16 shows the result of close planting and the cutting out of the lower branches as they become weak, instead of heading in the top, and thus forcing the growth into the lateral branches where the fruit can be more easily gotten at, and spraying, thinning and harvesting done economically.

Fig. 16.

Fig. 17. A well formed young tree that has been headed in and none of the lower branches removed. Small branches have been removed from time to time but no large ones.

Fig. 18 shows a well formed tree 30 years old that has had an abundance of room and has been properly headed in at the top.

Fig. 19 shows a well formed tree, 30 years old headed in, but the picture was taken in such a position that it appears to be a very high topped tree, which is not the case, the tallest branches being not over 25 feet high.

Fig. 17.

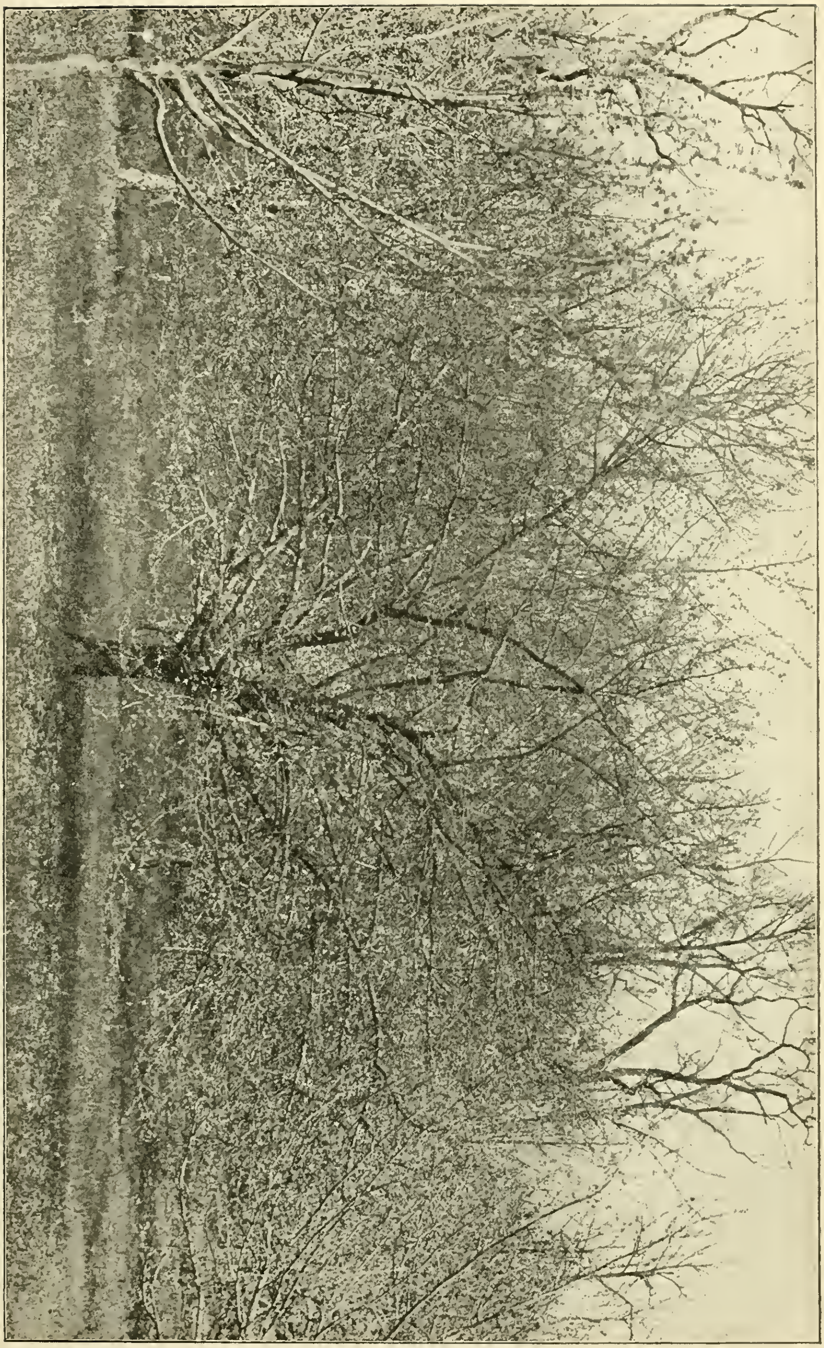


Fig. 18.

FIG. 19.

Rules for Pruning. 1. Never cut away more wood than is necessary to obtain the end in view. Err on the side of cutting too little rather than too much, for if too much is taken off it cannot be replaced in many years. Large crops of fruit cannot be grown on trees with a few exposed branches. 2. Cut out all dead wood as soon as it is discovered. (Summer is a good time to do this work as dead branches can be then seen at a glance.) 3. If two branches rub together so as to injure one another, the weakest should be cut away. 4. If one

FIG. 20.

FIG. 21.

branch rests on the top of another, Fig. 20, one should be removed. 5. Head back and thin out the top rather than cut off the lower branches to bring the fruit as low as possible on account of thinning, spraying, and harvesting, see Fig. 19. 6. Never remove side branches if it can be avoided. If it must be done, cut as shown in Fig. 22 B, and cover the injured parts with two coats of linseed oil paint, gas tar or grafting wax; cover all wounds over one-half inch in diameter with one of the above preservatives. 7. Remove branches that are too low or resting on the ground as in Fig. 21.

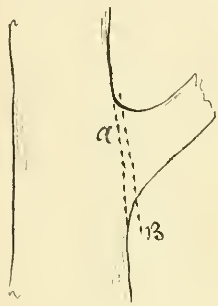


FIG. 22.

Time for Pruning. The winter is generally a time of most leisure to the farmer or orchardist, and it is a good time to prune, but if the work is done in the early part of the winter, more care must be given to protecting the injured parts, for with the freezing and thawing of several months the cut surface will dry in very deeply and the longer the exposure the greater the injury. If the work can be done the last of winter just before growth begins, the injury will be but little. The above practice will apply about equally to the apple, pear and plum, but perhaps should be applied with some variations to the peach.

The pruning of established peach trees is shown in the following photo engravings. Fig.

FIG. 23.

FIG. 24.

FIG. 25.

FIG. 26.

23 shows a peach orchard of three years old trees pruned ready for their fourth seasons' growth. Fig. 24 shows the same in full summer growth. Fig. 25 shows a four years old orchard with the trees pruned for their fifth season's growth and Fig. 26 shows the same in full foliage toward the last of the fifth season's growth. Fig. 27 shows a peach tree at the end of the fourth season and Fig. 28 the same pruned ready for the fifth season's growth.

Young trees like those in the figures will need but little more pruning, unless the shoots become thick as shown in Figs. 9 to 14, except to head back as shown; but as they grow older some of the small inside shoots must be removed or the head will become so close as not to produce the large healthy foliage needed to mature fruit of first quality. By this method of heading in, the tree is prevented from becoming "toppy" as in Fig. 29, and the fruit is borne where it can be easily cared for.

FIG. 27.

THINNING FRUIT.

Next to the proper fertilization and cultivation in orchard work, thinning of the fruit is of the most importance. It matters little how much we may enrich the ground, or prune our trees, there will be some seasons when well formed trees will set more fruit than they can properly mature to large size, good color and fine quality, and if we wish to produce the finest fruit, all of the imperfect specimens, all of the wormy, gnarly, distorted surplus and very small fruit must be removed as soon as its character can be determined. This time for different varieties and seasons will be about the first of July. The cost of this work on trees with very high branches as in Figs. 16 and 19, will be so great as to consume all profits from the crop, but on properly formed, low headed trees as in Fig. 18 the work can be done at comparatively little expense, and results in much profit to the grower and satisfaction to both the grower and consumer. For the most rapid work, step-ladders, and common ladders of several lengths should be on hand ready for use and only active, quick-sighted help should be employed. The cost of thinning the fruit on large trees where a considerable number have been done has been from 25 to 50 cents each and the profit has, in many cases, been more than doubled.

Fig. 28.

SPRAYING FRUIT TREES.

The season of 1901 was unusually favorable to the growth of many of the fungi that attack our fruit crops, and where spraying was not thoroughly done or not done at the right times much loss resulted. The peach, plum and cherry were especially injured by the Monilia or brown-rot, the black knot was abundant on the plum trees, and the apple scab on the apple leaves and fruit had not been so abundant for many years, but where spraying was thoroughly done the fruit was saved from injury.

No one can predict what the season will be, as affecting insect or fungous life, and it has become the practice of the most progressive growers to spray in such a way that no matter what the conditions of the season both insects and fungi shall be controlled. The Spraying Calendar of this division has been made up on this theory. See Bulletin No. 80.

FIG. 29.

VARIETY TESTING OF FRUITS.

The number of new varieties of large fruits that produced a crop was small, because of the imperfect fertilization of the flowers, owing to the abundance of rain at the time the flowers opened and perhaps to the conditions that in 1900 were unfavorable to the production of fruit buds.

The *Grape crop* was one of the best the vineyards have ever produced, but not one of the new varieties were shown to be superior to a few of the old standard sorts, the Worden, Campbell, Green Mountain, Concord and Delaware still retaining their place as the most valuable for Massachusetts.

Of the *Blackberries* the Agawam, Snyder, Taylor and Eldorado still retain their place among the old kinds, with Mersereau, and Rathbun as decidedly promising.

The *Raspberries* that stand at the head are the Cuthbert, King, Curtland, and London for a heavy soil.

Of the *Currants* the varieties stand as follows, Red Cross, Wilder, Fays, Cherry and Pomona.

Of the *Strawberries** fruiting the first time the following is the list with their yield per acre.

NEW VARIETIES.

Quarts per acre.

Brownie, ...	5287	Howard's No. 103, . .	5281
Howard's(Haverland Seedl'g)	4085	Pocomoke, ...	3999
Kansas, ...	3546	Pennell, ...	3260
Duff, ...	2612	Hitchcock's Seedl'g, No.67,	2280
Leheman's Seedling, No. 1,	2036	Howard's (Bubach Seedl'g)	1780
Howard's (Clyde Seedling)	1680	Gibson, ...	1668
Wheeler's Seedling, . .	1798	Lady Jane, ...	1524
Mammoth, ...	1400	Parson's Beauty, . . .	1392
Hero, ...	1080		

OLDER VARIETIES IN PLOTS.

Quarts per acre.

Howard's Seedling, No. 36,	8956	Haverland, ...	7192
Clyde, ...	6968	Sample, ...	6692
Seedling, M. A. C., . .	6563	Howard's No. 14, . . .	6468
Glen Mary, ...	6156		

OLDER VARIETIES IN FIELD.

Quarts per acre.

Clyde, ...	9456	Haverland, ...	9546
Brandywine, ...	6364	Sample, ...	8000
Glen Mary, ...	7091	Gandy Belle, ...	7637
Howard's No. 14, . . .	2910		

*A severe drought came on the first of June that seriously affected the yield, though with subsequent rains the last pickings were of good size and quality.

HATCH EXPERIMENT STATION

—OF THE—

MASSACHUSETTS

AGRICULTURAL COLLEGE.

BULLETIN NO. 83.

I. ANALYSES OF MANURIAL SUBSTANCES SENT ON FOR EXAMINATION.

II. ANALYSES OF LICENSED FERTILIZERS COLLECTED BY THE AGENT OF THE STATION DURING 1902.

JULY, 1902.

The Bulletins of this Station will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same.

AMHERST, MASS.:
PRESS OF CARPENTER & MOREHOUSE,
1902.

HATCH EXPERIMENT STATION

OF THE

Massachusetts Agricultural College,

AMHERST, MASS.

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The co-operation and assistance of farmers, fruit-growers, horticulturists, and all interested, directly or indirectly, in agriculture, are earnestly requested. The Bulletins will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same. General bulletins, fertilizer analyses, analyses of feed-stuffs, and annual reports are published. Kindly indicate in application which of these are desired. Communications may be addressed to the

Hatch Experiment Station, Amherst, Mass.

DIVISION OF CHEMISTRY.

C. A. GOESSMANN.

I.

ANALYSES OF COMMERCIAL FERTILIZERS AND MANURIAL SUBSTANCES SENT ON FOR EXAMINATION.

WOOD ASHES.

1106-1110. I. Received from Lexington, Mass.
II. Received from North Hadley, Mass.
III. Received from Concord, Mass.
IV. Received from Worcester, Mass.
V. Received from Shrewsbury, Mass.

	PER CENT.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	7.55	17.00	15.17	10.19	4.11
Potassium oxide,	5.26	5.36	5.28	5.28	6.21
Phosphoric acid,	1.46	1.40	1.38	1.54	1.41
Calcium oxide,	40.12	29.90	32.98	32.92	37.37
Insoluble matter,	10.02	15.98	10.07	15.71	14.58

1111-1115. I. Received from Grafton, Mass.
II. Received from East Dedham, Mass.
III. Received from North Hatfield, Mass.
IV. Received from Wollaston, Mass.
V. Received from Concord, Mass.

	PER CENT.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	12.89	8.00	10.37	6.97	9.22
Potassium oxide,	6.52	4.72	5.16	7.20	6.52
Phosphoric acid,	1.22	1.04	1.40	1.62	1.62
Calcium oxide,	36.46	41.96	39.05	36.48	36.25
Insoluble matter,	6.62	6.77	8.09	12.39	9.80

1116-1120. I. Received from Concord, Mass.
II. Received from Lenox, Mass.
III. Received from Beverly, Mass.
IV. Received from Sherborn, Mass.
V. Received from Amherst, Mass.

	PER CENT.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	3.20	none.	5.21	7.22	17.41
Potassium oxide,	7.52	4.12	4.72	5.92	4.60
Phosphoric acid,	1.66	1.40	1.74	1.58	1.28
Calcium oxide,	36.74	52.52	32.52	34.87	29.51
Insoluble matter,	7.54	13.24	18.13	11.92	14.47

1121-1124. I. Received from Concord Junction, Mass.
II. Received from South Deerfield, Mass.
III. Received from Great Barrington, Mass.
IV. Received from North Amherst, Mass.

	PER CENT.			
	I.	II.	III.	IV.
Moisture at 100° C.,	12.68	17.51	4.96	15.00
Potassium oxide,	5.64	5.88	6.28	4.56
Phosphoric acid,	1.64	1.74	1.54	1.46
Calcium oxide,	34.93	26.71	35.23	28.70
Insoluble matter,	7.96	14.48	10.99	16.45

1125-1128. I. Received from East Whately, Mass.
II. Received from Whately, Mass.
III. Received from Whately, Mass.
IV. Received from Hudson, Mass.

	PER CENT.			
	I.	II.	III.	IV.
Moisture at 100° C.,	8.71	22.06	14.99	8.98
Potassium oxide,	3.28	4.88	6.04	5.24
Phosphoric acid,	1.12	1.15	1.74	1.46
Calcium oxide,	18.09	34.97	27.90	32.75
Insoluble matter,	36.78	5.27	16.98	17.25

MISCELLANEOUS ASHES AND CORAL FORMATION.

1129-1131. I. Lime Ashes received from Bernardston, Mass.
II. Cotton Hull Ashes received from Southwick, Mass.
III. Coral formation received from Wellfleet, Cape Cod, Mass.

	PER CENT. I.	II.	III.
Moisture at 100° C.,	14.95	6.24	39.26
Potassium oxide,	3.16	17.08	.14
Phosphoric acid,	.70	7.32	.21
Nitrogen,	—	—	.28
Calcium oxide,	37.67	4.76	23.14
Magnesium oxide,	*	*	1.39
Insoluble matter,	5.20	8.85	16.98

DRY GROUND FISH.

1132-1136. I. Received from Sunderland, Mass.
II. III. IV. and V. Received from North Hatfield, Mass.

	PER CENT. I.	II.	III.	IV.	V.
Moisture at 100° C.,	6.92	6.92	4.32	8.55	10.01
Nitrogen,	8.55	8.40	7.18	6.06	8.54
Total Phosphoric acid,	7.54	8.90	7.80	7.20	7.17
Available Phosphoric acid,	4.34	6.22	*	4.73	5.14
Insoluble Phosphoric acid,	3.20	2.68	*	2.47	2.03

DRY GROUND FISH AND GROUND BONE.

1137-1141. I. and II. Dry Ground Fish, received from Hadley, Mass.
III. Dry Ground Fish, received from Somerset, Mass.
IV. Ground Bone received from Sunderland, Mass.
V. Ground Bone received from Southampton, Mass.

	PER CENT. I.	II.	III.	IV.	V.
Moisture at 100° C.,	8.72	8.47	10.93	3.75	5.92
Total Phosphoric acid,	11.89	7.60	10.93	25.92	20.47
Available Phosphoric acid,	6.48	4.90	6.20	8.72	9.07
Insoluble Phosphoric acid,	5.41	2.70	4.73	17.20	11.40
Nitrogen,	8.21	7.66	8.02	2.27	3.14

*Not determined.

CHEMICALS.

1142-1144. I. Sulphate of Potash, received from Middleboro, Mass.
II. and III. Carbonate of Potash, received from Agawam, Mass.

	PER CENT.		
	I.	II.	III.
Moisture at 100° C.,	1.14	9.21	7.96
Potassium oxide,	47.40	56.08	55.68

1145-1147. I. Nitre Lime, received from Amherst, Mass.
II. Vegetable potash, received from Springfield, Mass.
III. Acid phosphate, received from Middleboro, Mass.

	PER CENT.		
	I.	II.	III.
Moisture at 100° C.,	none.	2.44	3.16
Nitrogen,	10.44	—	—
Potassium oxide,	—	27.82	—
Total phosphoric acid,	—	2.55	14.07
Soluble phosphoric acid,	—	*	12.28
Reverted phosphoric acid,	—	*	.85
Insoluble phosphoric acid,	—	*	.94
Calcium oxide,	21.46	20.65	*
Insoluble matter,	3.25	9.70	*

MISCELLANEOUS MATERIAL.

1148-1150. I. Tobacco stalks, weather leached, received from Sunderland, Mass.
II. Wool waste, received from Islington, Mass.
III. Castor pomace, received from North Hadley, Mass.

	PER CENT.		
	I.	II.	III.
Moisture at 100° C.,	7.66	41.33	8.06
Nitrogen,	1.40	1.57	4.68
Potassium oxide,	4.01	1.07	1.16
Phosphoric acid,	.92	.16	1.92
Calcium oxide,	*	4.40	*
Insoluble matter,	*	30.40	*

*Not determined.

COMPLETE FERTILIZERS.

1151-1154. I. Received from Barre, Mass.
II. Received from Sunderland, Mass.
III. Received from North Hatfield, Mass.
IV. Received from Amherst, Mass.

	PER CENT.			
	I.	II.	III.	IV.
Moisture at 100° C.,	9.50	7.62	5.41	11.21
Total phosphoric acid,	9.72	10.42	11.09	11.14
Soluble phosphoric acid,	1.02	7.34	5.90	3.19
Reverted phosphoric acid,	5.76	2.18	2.03	5.19
Insoluble phosphoric acid,	2.94	.90	3.16	2.76
Potassium oxide,	7.98	5.38	8.14	6.78
Nitrogen,	2.73	3.45	3.95	3.74

1155-1158. I. and II. Received from Amherst, Mass.
III. Received from Bedford, Mass.
IV. Received from Amherst, Mass.

	PER CENT.			
	I.	II.	III.	IV.
Moisture at 100° C.,	6.44	5.93	10.41	3.25
Total phosphoric acid,	10.69	12.34	9.06	9.30
Soluble phosphoric acid,	6.18	5.86	6.01	1.46
Reverted phosphoric acid,	2.76	4.47	2.31	3.74
Insoluble phosphoric acid,	1.75	2.01	.74	4.10
Potassium oxide,	5.20	4.56	9.26	8.12
Nitrogen,	3.04	1.83	3.86	3.50

SOILS.

1159-1163. I. Received from Taunton, Mass.
II. Received from Webster, Mass.
III. Received from Concord, Mass.
IV. Received from Brookline, Mass.
V. Received from Hadley, Mass.

	PER CENT.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	1.01	—	29.36	19.15	6.66
Phosphoric acid,	.23	.03	.15	*	.32
Potassium oxide,	.22	*	*	*	.13
Nitrogen,	.34	*	.34	.39	.16
Calcium oxide,	traces.	none.	traces.	*	.40

*Not determined.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1902, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
157	Grass and Lawn Top Dressing,	American Agricultural Chemical Co., Boston, Mass.,	Bridgewater.
295	Grass and Lawn Top Dressing,	American Agricultural Chemical Co., Boston, Mass.,	Ayer.
349	Grass and Lawn Top Dressing,	American Agricultural Chemical Co., Boston, Mass.,	Fitchburg.
407	Grass and Lawn Top Dressing,	American Agricultural Chemical Co., Boston, Mass.,	Springfield.
16	Abbott's Tobacco Fertilizer,	W. H. Abbott, Holyoke, Mass.,	Sunderland.
336	Abbott's Tobacco Fertilizer,	W. H. Abbott, Holyoke, Mass.,	Holyoke.
324	Armour's Grain Grower,	Armour Fertilizer Works, Baltimore, Md.,	Danvers.
270	Armour's Grain Grower,	Armour Fertilizer Works, Baltimore, Md.,	Haverhill.
274	Bone, Blood and Potash,	Armour Fertilizer Works, Baltimore, Md.,	Harvard.
395	Bone, Blood and Potash,	Armour Fertilizer Works, Baltimore, Md.,	North Adams
302	Armour's All Soluble,	Armour Fertilizer Works, Baltimore, Md.,	Danvers.
441	Armour's All Soluble,	Armour Fertilizer Works, Baltimore, Md.,	North Adams.
46	Complete Tobacco Fertilizer,	Berkshire Fertilizer Company, Bridgeport, Conn.,	No. Amherst.
475	Complete Tobacco Fertilizer,	Berkshire Fertilizer Company, Bridgeport, Conn.,	W. Springfield.
58	Ammoniated Bone Phosphate,	Berkshire Fertilizer Company, Bridgeport, Conn.,	No. Amherst.
396	Ammoniated Bone Phosphate,	Berkshire Fertilizer Company, Bridgeport Conn.,	Pittsfield.
163	Stockbridge's Corn, Grain and Fodder Corn,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
251	Stockbridge's Corn, Grain and Fodder Corn,	Bowker Fertilizer Co., Boston, Mass.,	Haverhill.
317	Stockbridge's Corn, Grain and Fodder Corn,	Bowker Fertilizer Co., Boston, Mass.,	Beverly.
263	Farm and Garden Phosphate,	Bowker Fertilizer Co., Boston, Mass.,	Worcester.
418	Farm and Garden Phosphate,	Bowker Fertilizer Co., Boston, Mass.,	Pittsfield.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Total. Found.	Total. Guaranteed.	Available. Found.	Available. Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
157-295-349-407	Grass and Lawn Top Dressing, . .	8.18	4.11	3.91-4.73	2.75	2.63	1.64	7.02	6-9	5.38	5-7	2.90	2-3
16-336	Abbott's Tobacco Fertilizer, . .	8.45	4.34	4.5-5.5	1.47	8.91	3.02	13.40	12-14	10.38	9-10	9.34	10-11*
324-270	Armour's Grain Grower, . . .	9.49	1.84	1.65	6.78	1.59	.51	8.88	8	8.37	8	2.22	2
274-395	Bone, Blood and Potash, . . .	10.09	4.24	4.11-4.94	2.56	4.68	3.64	10.88	10-12	7.24	8-10	5.66	7-8
302-441	Armour's All Soluble, ...	13.37	2.75	2.88-3.70	7.78	1.38	.18	9.34	10-12	9.16	8-10	4.18	4-5
46-475	Complete Tobacco Fertilizer, . .	10.25	2.68	2.5-3.00	5.44	2.76	2.26	10.46	10-12	8.20	8-10	6.90	6-8*
58-396	Ammoniated Bone Phosphate, . .	8.85	1.19	.8-1.5	4.90	3.06	2.38	10.34	10-12	7.96	8-10	2.80	2-3
163-251-317	Stockbridge's Corn, Grain and Fodder Corn	11.80	3.20	3-4	6.52	1.84	1.72	10.08	10-12	8.36	8-10	7.16	7-9
263-418	Farm and Garden Phosphate, . .	12.63	2.16	1.5-2.5	7.48	1.96	1.02	10.46	10-12	9.44	7-10	2.18	2-3

*Sulphate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1902, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
203	Hill and Drill Phosphate,	Bowker Fertilizer Co., Boston, Mass.,	Boston.
301	Hill and Drill Phosphate,	Bowker Fertilizer Co., Boston, Mass.,	Haverhill.
89	Lawn and Garden Dressing,	Bowker Fertilizer Co., Boston, Mass.,	Taunton.
228	Lawn and Garden Dressing,	Bowker Fertilizer Co., Boston, Mass.,	Boston.
255	Lawn and Garden Dressing,	Bowker Fertilizer Co., Boston, Mass.,	Newburyport.
74	Potato and Vegetable Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Amherst.
133	Potato and Vegetable Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Lowell.
162	Potato and Vegetable Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
65	Fish and Potash,	Bowker Fertilizer Co., Boston, Mass.,	Northampton.
45	X. L. Superphosphate,	American Ag. Chem. Co. (Bradley Fertilizer Co.), Boston,	Fall River.
71	X. L. Superphosphate,	American Ag. Chem. Co. (Bradley Fertilizer Co.), Boston,	Weir.
127	X. L. Superphosphate,	American Ag. Chem. Co. (Bradley Fertilizer Co.), Boston,	Lowell.
129	X. L. Superphosphate,	American Ag. Chem. Co. (Bradley Fertilizer Co.), Boston,	Bridgewater.
42	Bradley's Potato Manure,	American Ag. Chem. Co. (Bradley Fertilizer Co.), Boston,	Fall River.
83	Bradley's Potato Manure,	American Ag. Chem. Co. (Bradley Fertilizer Co.), Boston,	Weir.
132	Bradley's Potato Manure,	American Ag. Chem. Co. (Bradley Fertilizer Co.), Boston,	Lowell.
69	Bradley's Potato Fertilizer,	American Ag. Chem. Co. (Bradley Fertilizer Co.), Boston,	Weir.
234	Bradley's Potato Fertilizer,	American Ag. Chem. Co. (Bradley Fertilizer Co.), Boston,	Amesbury.
269	Bradley's Potato Fertilizer,	American Ag. Chem. Co. (Bradley Fertilizer Co.), Boston.	Worcester.
159	Bradley's Complete for Potatoes and Vegetables,	American Ag. Chem. Co. (Bradley Fertilizer Co.), Boston,	Bridgewater.
258	Bradley's Complete for Potatoes and Vegetables,	American Ag. Chem. Co. (Bradley Fertilizer Co.), Boston,	Haverhill.
285	Bradley's Complete for Potatoes and Vegetables,	American Ag. Chem. Co. (Bradley Fertilizer Co.), Boston,	Worcester.
253	Bradley's Corn Phosphate,	American Ag. Chem. Co. (Bradley Fertilizer Co.), Boston,	Amesbury.
358	Bradley's Corn Phosphate,	American Ag. Chem. Co. (Bradley Fertilizer Co.), Boston,	Leominster.
385	Bradley's Corn Phosphate,	American Ag. Chem. Co. (Bradley Fertilizer Co.), Boston,	Lee.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaran-teed.	Found.	Guaran-teed.	Found.	Guaranteed.
	Compound Fertilizers.												
203-301	Hill and Drill Phosphate,	15.41	2.45	2.25-3.25	8.42	1.28	1.20	10.90	11-13	9.70	7-11	2.08	2-3
89-228-255	Lawn and Garden Dressing,	8.64	3.13	3-4	3.90	2.84	2.04	8.78	8-10	6.74	6-8	5.60	5-6
74-133-162	Potato and Vegetable Fertilizer,	14.06	2.55	2.25-3.25	7.29	1.85	1.30	10.44	10-12	9.14	8-10	3.80	4-6
65	Fish and Potash,	13.08	2.30	2.25-3.25	2.15	2.65	3.54	8.34	8-10	4.80	--	4.14	4-6
45-71-127-129	X. L. Superphosphate,	13.17	3.69	2.5-3.25	7.52	2.79	1.97	12.28	11-14	10.31	9-11	2.42	2-3
42-83-132	Bradley's Potato Manure,	10.58	2.59	2.5-3.25	4.35	2.74	2.79	9.88	8-11	7.09	6-8	5.42	5-6
69-234-269	Bradley's Potato Fertilizer,	12.04	2.06	2.06-2.88	6.75	2.15	2.10	11.00	10-13	8.90	8-10	3.24	3-4
159-258-285	Complete for Potatoes and Vegetables,	10.09	3.52	3.30-4.12	5.16	3.36	1.87	10.39	9-13	8.52	8-11	7.54	7-8
253-358-385	Bradley's Corn Phosphate,	14.47	2.12	2.06-2.88	7.04	2.10	3.12	12.26	10-13	9.14	8-10	1.80	1.50-2.50

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1902, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of manufacturer.	Sampled at
	Compound Fertilizers.		
94	Bradley's Eclipse Phosphate,	American Agric. Chem. Co. (Bradley Fertilizer Co.),	Weir.
217	Bradley's Eclipse Phosphate,	American Agric. Chem. Co. (Bradley Fertilizer Co.),	Amesbury.
415	Bradley's Eclipse Phosphate,	American Agric. Chem. Co. (Bradley Fertilizer Co.),	Lee.
235	Complete Manure with 10 per cent Potash,	American Agric. Chem. Co. (Bradley Fertilizer Co.),	Amesbury.
312	Complete Manure with 10 per cent Potash,	American Agric. Chem. Co. (Bradley Fertilizer Co.),	Boston.
41	Church's Fish and Potash,	American Agric. Chem. Co. (Bradley Fertilizer Co.),	Seekonk.
112	Church's Fish and Potash,	American Agric. Chem. Co. (Bradley Fertilizer Co.),	Weir.
145	Church's Fish and Potash,	American Agric. Chem. Co. (Bradley Fertilizer Co.),	New Bedford.
480	Church's Fish and Potash,	American Agric. Chem. Co. (Bradley Fertilizer Co.),	E. Longm'dow
193	Complete Animal Fertilizer,	Bartlett & Holmes, Springfield, Mass.,	Boston.
404	Complete Animal Fertilizer,	Bartlett & Holmes, Springfield, Mass.,	Springfield.
257	Complete Animal Fertilizer,	Bartlett & Holmes, Springfield, Mass.,	Boston.
291	Baker's A. A. Ammoniated Superphosphate,	American Agric. Chem. Co. (H. J. Baker & Bro.), N. Y.	Worcester.
410	Baker's A. A. Ammoniated Superphosphate,	American Agric. Chem. Co. (H. J. Baker & Bro.), N. Y.,	Springfield.
79	Baker's Complete Potato Manure,	American Agric. Chem. Co. (H. J. Baker & Bro.), N. Y.,	Fall River.
326	Breck's Market Garden Manure.	Joseph Breck & Sons, Boston, Mass.,	Boston.
378	Clark's Cove Bay State Fertilizer G. G.,	American Agric. Chem. Co. (Clark's Cove Fertilizer Co.),	Hudson.
414	Clark's Cove Bay State Fertilizer G. G.,	American Agric. Chem. Co. (Clark's Cove Fertilizer Co.),	Springfield.
344	Clark's Cove Potato Fertilizer,	American Agric. Chem. Co. (Clark's Cove Fertilizer Co.),	Hudson.
195	Crocker's Ammoniated Corn Phosphate,	American Agric. Chem. Co. (Crocker Fert. & Chem. Co.),	Haverhill.
327	Crocker's Ammoniated Corn Phosphate,	American Agric. Chem. Co. (Crocker Fert. & Chem. Co.),	Worcester.
240	Crocker's Potato, Hop and Tobacco,	American Agric. Chem. Co. (Crocker Fert. & Chem. Co.),	Haverhill.
292	Crocker's Potato, Hop and Tobacco,	American Agric. Chem. Co. (Crocker Fert. & Chem. Co.),	Worcester.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
94-217-415	Bradley's Eclipse Phosphate, . .	14.73	1.27	1.03-2.50	5.16	3.64	2.44	11.24	10-15	8.80	8-12	2.14	2-3
235-312	Complete Manure with 10 per cent. Potash,	6.15	3.32	3.30-4.12	4.16	2.98	1.58	8.72	7-10	7.14	6-10	10.40	10-12
41-112-145-480	Church's Fish and Potash, . . .	16.47	2.20	2.07-2.90	4.96	3.00	2.04	10.00	7.5-10.5	7.96	6-8	2.16	2-3
193-404-257	Complete Animal Fertilizer, . .	5.17	3.86	3.30-4.12	.45	8.37	7.09	15.91	14-17	8.82	—	8.26	7-8
291-410	A. A. Ammoniated Superphosphate, .	12.69	2.86	2.5-3.25	8.03	2.61	1.56	12.20	11-14	10.64	9-11	2.38	2-3
79	Baker's Complete Potato Manure, .	9.49	3.31	3.30-4.13	3.56	3.37	2.61	9.54	7-10	6.93	6-10	10.48	10-12
326	Breck's Market Garden Manure, .	13.41	2.54	2.47-3.30	6.12	3.60	2.28	12.00	11-14	9.72	9-11	2.38	2-3
378-414	Bay State Fertilizer G. G., . . .	11.30	2.53	2.06-2.88	5.86	2.94	3.53	12.33	10-13	8.80	8-10	1.96	1.5-2.5
344	Clark's Cove Potato Fertilizer, . .	13.23	2.11	2.06-2.88	5.35	3.35	2.38	11.08	10-13	8.70	8-10	2.92	3-4
195-327	Ammoniated Corn Phosphate, . .	13.58	2.09	2.06-2.88	4.60	3.92	3.12	11.64	10-13	8.52	8-10	2.36	1.5-2.5
240-292	Potato, Hop and Tobacco, . . .	12.60	2.07	2.06-2.88	6.31	2.77	2.15	11.23	10-12	9.08	8.10	3.66	3-4

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1902, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
400	Cumberland Superphosphate,	Amer. Agric. Chem. Co. (Cumberland Bone Phos. Co.),	Lanesboro.
424	Cumberland Potato Fertilizer,	Amer. Agric. Chem. Co. (Cumberland Bone Phos. Co.),	Lanesboro.
174	High Grade Ammoniated Bone Superphosphate,	E. Frank Coe Co., New York City,	Dighton.
188	Gold Brand Excelsior Guano,	E. Frank Coe Co., New York City,	Dighton.
110	Market Garden Special, American Farmers',	E. Frank Coe Co., New York City,	Seekonk.
161	Market Garden Special, American Farmers',	E. Frank Coe Co., New York City,	Dighton.
34	Complete Potato Manure, American Farmers',	E. Frank Coe Co., New York City,	Seekonk.
181	Complete Potato Manure, American Farmers',	E. Frank Coe Co., New York City,	Dighton.
57	Potato and Root Crop Manure,	Amer. Agric. Chem. Co. (L. B. Darling Fertilizer Co.),	No. Amherst.
288	Potato and Root Crop Manure,	Amer. Agric. Chem. Co. (L. B. Darling Fertilizer Co.),	Harvard.
331	Darling's Blood, Bone and Potash,	Amer. Agric. Chem. Co. (L. B. Darling Fertilizer Co.),	Concord.
284	Darling's Complete 10 per cent Manure,	Amer. Agric. Chem. Co. (L. B. Darling Fertilizer Co.),	Harvard.
307	Darling's Complete 10 per cent Manure,	Amer. Agric. Chem. Co. (L. B. Darling Fertilizer Co.),	Concord.
421	Great Eastern Northern Corn Special,	Amer. Agric. Chem. Co. (Great Eastern Fertilizer Co.),	Williamstown.
478	Great Eastern Northern Corn Special,	Amer. Agric. Chem. Co. (Great Eastern Fertilizer Co.),	E. Longm'dow
104	Great Eastern General Fertilizer,	Amer. Agric. Chem. Co. (Great Eastern Fertilizer Co.).	Seekonk.
473	Great Eastern General Fertilizer,	Amer. Agric. Chem. Co. (Great Eastern Fertilizer Co.),	E. Longm'dow
458	Pride of the Valley,	Thomas Kirley & Co., South Hadley, Mass.,	So. Hadley.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
400	Cumberland Superphosphate, . .	15.06	2.04	2.06-2.88	6.01	3 03	2.20	11.24	10-13	9.04	8-10	1.88	1.5-2.5
424	Cumberland Potato Fertilizer, . .	12.81	2.33	2.06 2.88	6.01	3.53	1.97	11 51	10-13	9.54	8-10	3.60	3-4
174	High Grade Ammoniated Bone Superphos.,	13.49	1.88	1.85-2.00	7.93	2.35	2.38	12.66	10-11	10.28	9-11	2.26	2.25-3.00*
188	Gold Brand Excelsior Guano, .	11 49	2.40	2.4-3.3	5.12	2.32	3.54	10.98	9-10	7.44	7.5-9	6.22	6-7*
110-161	Market Garden Special, . . .	8.96	3.61	3.30-4.12	6.65	1.72	2.07	10.44	9.5-10.5	8.37	8-9	6.72	7-8*
34-181	Amer. Farmers' Complete Potato Manure,	10.85	2.06	1-2	7.36	1.04	2.53	10.93	8.5-9.5	8.40	7-9	5.28	6-7*
57-288	Potato and Root Crop Manure, . .	7.89	3.69	3.30-412	4.93	3.67	.82	9.42	9-13	8.60	8-11	7.86	7-8
331	Darling's Blood, Bone and Potash, . .	9.64	4.50	4.12-4.94	4.99	3.30	.49	8.78	8-12	8.29	7-9	7.82	7-8
284-307	Darling's Complete 10 per cent Manure,	5.99	3.48	3.30-4.12	5.80	2.30	.62	8.72	7-10	8.10	6-8	10.20	10-11*
421-478	Great Eastern Northern Corn Special,	13.66	2.55	2.5-3.25	7.48	2.46	2.18	12.12	11-14	9.94	9-11	4.24	2-3
104-473	Great Eastern General Fertilizer,	12.11	1.18	.82-1.65	6.40	2.56	2.58	11.54	10-14	8 96	8-11	4.18	4-5
458	Pride of the Valley, ...	11.44	2.05	3.5-4.5	.38	6.04	4.32	10.74	7-9	6.42	—	3.30	7-8

*Sulphate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1902 IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
130	Swift's Lowell Bone Fertilizer,	Lowell Fertilizer Co., Boston, Mass.,	Bridgewater.
266	Swift's Lowell Bone Fertilizer,	Lowell Fertilizer Co., Boston, Mass.,	Worcester.
268	Swift's Lowell Bone Fertilizer,	Lowell Fertilizer Co., Boston, Mass.,	Ayer.
68	Swift's Animal Brand,	Lowell Fertilizer Co., Boston, Mass.,	Fall River.
120	Swift's Animal Brand,	Lowell Fertilizer Co., Boston, Mass.,	Bridgewater.
134	Swift's Animal Brand,	Lowell Fertilizer Co., Boston, Mass.,	Lowell.
137	Swift's Lowell Potato Phosphate,	Lowell Fertilizer Co., Boston, Mass.,	Bridgewater.
275	Swift's Lowell Potato Phosphate,	Lowell Fertilizer Co., Boston, Mass.,	Worcester.
381	Swift's Lowell Potato Phosphate,	Lowell Fertilizer Co., Boston, Mass.,	Hudson.
277	Swift's Fruit and Vine,	Lowell Fertilizer Co., Boston, Mass.,	Ayer.
345	Swift's Fruit and Vine,	Lowell Fertilizer Co., Boston, Mass.,	Hudson.
95	Swift's Lowell Potato Manure,	Lowell Fertilizer Co., Boston, Mass.,	Fall River.
126	Swift's Lowell Potato Manure,	Lowell Fertilizer Co., Boston, Mass.,	Lowell.
135	Swift's Lowell Potato Manure,	Lowell Fertilizer Co., Boston, Mass.,	Bridgewater.
437	Lister's Success Fertilizer,	Lister's Agricultural Chemical Works, Newark, N. J.,	Greenfield.
470	Lister's Success Fertilizer,	Lister's Agricultural Chemical Works, Newark, N. J.,	Agawam.
468	High Grade Special for Spring Crops,	Lister's Agricultural Chemical Works, Newark, N. J.,	Agawam.
445	Special Corn and Potato Fertilizer,	Lister's Agricultural Chemical Works, Newark, N. J.,	Greenfield.
464	Special Corn and Potato Fertilizer,	Lister's Agricultural Chemical Works, Newark, N. J.,	Agawam.
86	Mapes' Economical Potato Manure,	Mapes Formula & Peruvian Guano Co., New York City,	Taunton.
289	Mapes' Economical Potato Manure,	Mapes Formula & Peruvian Guano Co., New York City,	Worcester.
380	Mapes' Economical Potato Manure,	Mapes Formula & Peruvian Guano Co., New York City,	Leominster.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
130-266-268	Swift's Lowell Bone Fertilizer, . .	7.10	2.16	1.65-2.47	6.08	2.88	1.74	10.70	9-11	8.96	8-10	3.40	3-4
68-120-134	Swift's Animal Brand, ...	5.83	2.90	2.48-3.30	6.52	3.36	1.20	11.08	10-12	9.88	9-11	4.72	4-5
137-275-381	Swift's Lowell Potato Phosphate, .	6.69	3.10	2.47-3.30	6.46	1.30	.86	9.62	9-11	8.76	8-10	6.44	6-7*
277-345	Swift's Lowell Fruit and Vine, . .	7.49	3.44	3.29-4.12	6.95	1.01	1.64	9.60	8-11	7.96	7-9	6.78	6-7*
95-126-135	Swift's Potato Manure, . . .	6.13	2.05	1.65-2.47	5.09	2.02	1.41	8.52	8-10	7.11	7-9	4.28	4-5*
437-470	Lister's Success Fertilizer, . . .	12.20	1.68	1.24-1.65	7.42	2.43	2.53	12.38	11-13	9.85	9-12	2.22	2-3
468	High Grade Special for Spring Crops,	8.54	2.41	1.65-1.77	2.75	5.53	2.50	10.78	10-13	8.28	8-10	10.52	10-10.5
445-464	Special Corn and Potato Fertilizer, .	12.86	1.69	1.65-2.47	6.18	2.70	2.94	11.82	9-11	8.88	8-11	2.90	3-4
86-289-380	Mapes' Economical Potato Manure, .	9.15	3.45	3.29-4.12	2.30	1.94	3.10	7.34	6-8	4.24	4-5	8.78	8-10*

*Sulphate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1902, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
88	Mapes' Complete Manure for General Use,	Mapes Formula & Peruvian Guano Co., New York City,	Taunton.
281	Mapes' Complete Manure for General Use,	Mapes Formula & Peruvian Guano Co., New York City,	Worcester.
44	Hardy's Tankage, Bone and Potash,	Hardy Packing Co., Chicago, Ill.,	Hadley.
232	Hardy's Tankage, Bone and Potash,	Hardy Packing Co., Chicago, Ill.,	Amesbury.
360	Hardy's Tankage, Bone and Potash,	Hardy Packing Co., Chicago, Ill.,	Hudson.
461	Hardy's Tankage, Bone and Potash,	Hardy Packing Co., Chicago., Ill.,	Westfield.
87	Hardy's Tobacco and Potato Special,	Hardy Packing Co., Chicago, Ill.,	Hadley.
202	Hardy's Tobacco and Potato Special,	Hardy Packing Co., Chicago, Ill.,	Amesbury.
354	Hardy's Tobacco and Potato Special,	Hardy Packing Co., Chicago, Ill.,	Hudson.
125	Soluble Pacific Guano,	American Agric. Chem. Co. (Pacific Guano Co.), Boston,	Bridgewater.
221	Soluble Pacific Guano,	American Agric. Chem. Co. (Pacific Guano Co.), Boston,	Newburyport.
142	Pacific Potato Special,	American Agric. Chem. Co. (Pacific Guano Co.), Boston,	Bridgewater.
260	Pacific Potato Special,	American Agric. Chem. Co. (Pacific Guano Co.), Boston,	Newburyport.
51	Packers' Union Animal Corn Fertilizer,	Amer. Agric. Chem. Co. (Packers' Union Fertilizer Co.),	Amherst.
428	Packers' Union Animal Corn Fertilizer,	Amer. Agric. Chem. Co. (Packers' Union Fertilizer Co.),	S. Williamsto'n
48	Packers' Union Potato Manure,	Amer. Agric. Chem. Co. (Packers' Uuion Fertilizer Co.),	Amherst.
430	Packers' Union Potato Manure,	Amer. Agric. Chem Co. (Packers' Union Fertilizer Co.),	S. Williamsto'n
182	Plymouth Rock Brand,	Parmenter & Polsey Fertilizer Co., Peabody, Mass.,	Dighton.
481	Plymouth Rock Brand,	Parmenter & Polsey Fertilizer Co., Peabody, Mass.,	E. Longm'dow.
171	Special Fertilizer for Strawberries,	Parmenter & Polsey Fertilizer Co., Peabody, Mass.,	Dighton.
114	Quinnipiac Phosphate,	American Agric. Chem. Co. (Quinnipiac Co.), Boston,	Seekonk.
347	Quinnipiac Phosphate,	American Agric. Chem. Co. (Quinnipiac Co.), Boston,	Leominster.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Total. Found.	Total. Guaranteed.	Available. Found.	Available. Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
88-281	Complete Manure for General Use, .	9.90	3.49	2.29-4.12	2.41	4.81	4.96	12.18	10-12	7.22	8-10	4.88	4-5
44-232-360-461	Hardy's Tankage, Bone and Potash, .	10.90	1.67	1.24-2.06	4.52	4.30	2.22	11.04	10-12	8.82	8-10	2.76	2-3
87-202-354	Hardy's Tobacco and Potato Special,	10.21	1.76	1.65-2.47	4.14	6.20	2.14	12.48	10-12	10.34	8-10	3.84	4-5
125-221	Soluble Pacific Guano, ...	13.96	2.25	2.06-2.88	5.96	5.80	2.91	14.67	10-13	11.76	8-10	1.66	1.5-2.50
142-260	Pacific Potato Special, ...	12.24	2.27	2.06-2.88	6.56	2.63	1.97	11.16	10-13	9.19	8-10	3.28	3-4
51-428	Animal Corn Fertilizer, . . .	15.01	2.47	2.47-3.30	7.74	2.44	2.01	12.19	11-14	10.18	9-11	2.26	2-3
48-430	Packer's Union Potato Manure, . .	15.90	2.10	2.06-2.88	6.60	2.35	2.88	11.83	10-13	8.95	8-10	5.36	6-7
182-481	Plymouth Rock Brand, ...	7.74	2.60	2.47-3.29	4.30	4.49	1.38	10.17	9-13	8.79	8-11	4.62	4-4.25
171	Special Fertilizer for Strawberries, .	11.39	2.54	2.47-3.30	2.68	7.41	2.07	12.16	10-13	10.09	9-11	6.16	6-7
114-347	Quinnipiac Phosphate, ...	13.58	2.47	2.47-3.30	7.74	1.34	3.08	12.16	11-14	9.08	9-11	2.20	2-3

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1902, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at.
	Compound Fertilizers.		
35	Quinnipiac Potato Manure,	American Agric. Chem. Co. (Quinnipiac Co.), Boston,	Seekonk.
186	Quinnipiac Potato Manure,	American Agric. Chem. Co. (Quinnipiac Co.), Boston,	Bridgewater.
471	Complete Tobacco Fertilizer,	Olds & Whipple, Hartford, Conn.,	Westfield.
254	Tankage,	New Bedford Product Co., New Bedford, Mass.	New Bedford.
21	Hubbard's Soluble Tobacco Manure,	Rogers & Hubbard Co., Middletown, Conn.,	Hatfield.
372	Hubbard's Soluble Tobacco Manure,	Rogers & Hubbard Co., Middletown, Conn.,	Harvard.
423	Hubbard's for All Soils and All Crops,	Rogers & Hubbard Co., Middletown, Conn.,	Gr. Barrington.
452	Hubbard's for All Soils and All Crops,	Rogers & Hubbard Co., Middletown, Conn.,	E. Longm'dow.
26	Essex Dry Ground Fish,	Russia Cement Co., Gloucester, Mass.,	Hatfield.
165	Essex Dry Ground Fish,	Russia Cement Co., Gloucester, Mass.,	Dighton.
279	Essex Dry Ground Fish,	Russia Cement Co., Gloucester, Mass.,	Worcester.
76	Essex XXX Fish and Potash,	Russia Cement Co., Gloucester, Mass.,	Taunton.
296	Essex XXX Fish and Potash,	Russia Cement Co., Gloucester, Mass.,	Worcester.
236	Essex XXX Fish and Potash,	Russia Cement Co., Gloucester, Mass.,	Haverhill.
350	Potato and Vegetable Fertilizer,	Rogers Manufacturing Co., Rockfall, Conn.,	Leominster.
429	Potato and Vegetable Fertilizer,	Rogers Manufacturing Co., Rockfall, Conn.,	Pittsfield.
439	Potato and Vegetable Fertilizer,	Rogers Manufacturing Co., Rockfall, Conn.,	Lee.
55	High Grade Soluble Tobacco Manure,	Rogers Manufacturing Co., Rockfall, Conn.,	N. Amherst.
361	High Grade Soluble Tobacco Manure,	Rogers Manufacturing Co., Rockfall, Conn.,	Fitchburg.
419	High Grade Soluble Tobacco Manure,	Rogers Manufacturing Co., Rockfall, Conn.,	Greenfield.
392	Read's High Grade Farmers' Friend,	Amer. Agric. Chem. Co. (Read Fertilizer Co.), New York.	Greenfield.
131	Read's Practical Potato Special,	Amer. Agric. Chem. Co. (Read Fertilizer Co.), New York,	Bridgewater.
411	Read's Practical Potato Special,	Amer. Agric. Chem. Co. (Read Fertilizer Co.), New York,	Greenfield.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs. Found.	Nitrogen in 100 lbs. Guaranteed.	Phosphoric Acid in 100 lbs. Soluble.	Reverted.	Insoluble.	Total. Found.	Total. Guaran-teed.	Available. Found.	Available. Guaran-teed.	Potassium Oxide in 100 lbs. Found.	Potassium Oxide in 100 lbs. Guaran-teed.
	Compound Fertilizers.												
35-186	Quinnipiac Potato Manure,	11.86	2.54	2.5-3.25	4.05	1.95	3.54	9.54	8-11	6.00	6-8	5.02	5-6
471	Complete Tobacco Fertilizer,	7.45	5.08	5.5-6.5	.95	3.51	3.77	8.23	—	4.46	3-4	5.52	5.5-6.5†
254	Tankage,	8.24	2.77	—	—	1.05	1.02	2.07	—	1.05	—	—	—
21-372	Hubbard's Soluble Tobacco Manure,	7.95	4.83	5-6	1.15	6.92	4.56	12.63	10-12	8.07	7-8.5	10.44	10-11*
423-452	Hubbard's for All Soils and All Crops,	12.36	2.45	2.30-3.00	6.50	3.82	3.14	13.46	12-14	10.32	10-12	3.82	3-4
26-165-279	Essex Dry Ground Fish,	9.93	8.11	8-10	—	8.12	4.84	12.96	11-13	8.12	—	—	—
76-296-336	Essex XXX Fish and Potash,	11.69	2.53	2.1-3.00	3.28	5.60	4.25	13.13	12-14	8.88	9-10	2.86	2.25-3.25
350-429-439	Potato and Vegetable Fertilizer,	9.10	2.27	2.25-3.25	5.23	3.57	3.54	12.34	10-12	8.80	8-10	5.90	5-6
55-361-419	High Grade Soluble Tobacco Manure,	5.65	4.81	5-6	1.66	5.58	1.78	9.02	8-10	7.24	6-8	13.84	11-12*
392	Read's High Grade Farmer's Friend,	8.82	3.00	3.3-4.13	5.06	2.61	2.27	9.94	7-10	7.67	6-10	11.16	10-12
131-411	Read's Practical Potato Special,	6.13	1.07	.82-1.65	3.32	2.18	1.68	7.18	5-8	5.50	3-5	7.52	8-10

*Sulphate of potash, the source of potash.

†Carbonate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1902, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at.
	Compound Ferrtilizers.		
118	Wilcox Potato, Onion and Tobacco,	Wilcox Fertilizer Works, Mystic, Conn.,	Fall River.
36	Wilcox Fish and Potash,	Wilcox Fertilizer Works, Mystic, Conn.,	Fall River.
108	Wilcox Fish and Potash,	Wilcox Fertilizer Works. Mystic, Conn.,	Seekonk.
190	Royal Bone Phosphate,	Amer. Agric. Chem. Co. (Williams & Clark Fert. Co.),	Haverhill.
231	Royal Bone Phosphate,	Amer. Agric. Chem. Co. (Williams & Clark Fert. Co.),	Amesbury.
264	Prolific Crop Producer,	Amer. Agric. Chem. Co. (Williams & Clark Fert. Co.),	Worcester.
185	Wheeler's Corn Fertilizer,	Amer. Agric. Chem. Co. (M. E. Wheeler & Co.), Rutland,	Bridgewater.
403	Wheeler's Corn Fertilizer,	Amer. Agric. Chem. Co. (M. E. Wheeler & Co.), Rutland,	Greenfield.
432	Wheeler's Corn Fertilizer,	Amer. Agric. Chem. Co. (M. E. Wheeler & Co.), Rutland,	Williamstown.
144	Wheeler's Potato Manure,	Amer. Agric. Chem. Co. (M. E. Wheeler & Co.), Rutland,	Bridgewater.
431	Wheeler's Potato Manure,	Amer. Agric. Chem. Co. (M. E. Wheeler & Co.), Rutland,	Greenfield.
	Ground Bones.		
417	Ground Bone,	Bartlett & Holmes, Springfield, Mass.,	Springfield.
332	Dow's Pure Ground Bone,	John C. Dow & Co., Boston, Mass.,	Boston.
334	Dow's Pure Ground Bone,	John C. Dow & Co., Boston, Mass.,	Boston.
148	Meat and Bone,	Thomas Hersom & Co., New Bedford Mass.,	New Bedford.
139	Pure Ground Bone,	Thomas L. Stetson, Randolph, Mass.,	Brockton.
209	Pure Ground Bone,	Thomas L. Stetson, Randolph, Mass.,	Boston.
335	Pure Ground Bone,	Thomas L. Stetson, Randolph, Mass.,	Randolph.
214	Bone Dust.	Darius Whithed, Lowell, Mass.,	Boston.
340	Bone Dust,	Darius Whithed, Lowell, Mass.,	Lowell.
119	Pure Ground Bone,	Sanford Winter, Brockton, Mass.,	Brockton.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.		
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Total. Found.	Total. Guaran-teed.	Available. Found.	Available. Guaran-teed.	Found.	Guaran-teed.	
	Compound Fertilizers.													
118	Wilcox Potato, Onion and Tobacco,	13.70	3.47	3.3-4.3	5.11	3.00	1.99	10.10	8-10	8.11	7-9	6.82	6-8*	
36-108	Wilcox Fish and Potash,	19.06	2.52	2.46-3.29	2.24	3.56	1.56	7.36	6-8	5.80	5-7	3.90	3-5	
190-231	Royal Bone Phosphate,	13.73	1.30	1.03-2.5	5.16	3.00	3.10	11.26	10-15	8.16	8-12	2.14	2-3	
264	Prolific Crop Producer,	15.67	1.24	.82-1.65	4.80	2.26	2.94	10.00	8-10	7.06	7-9	1.14	1-2	
185-403-432	Wheeler's Corn Fertilizer,	18.14	1.69	1.65-2.47	6.08	2.72	3.08	11.88	10-14	8.80	8-11	2.14	2-3	
144-431	Wheeler's Potato Manure,	13.40	1.99	2.06-2.8	6.18	2.40	2.60	11.18	10-13	8.58	8-10	3.30	3-4	
											Mechanical Analysis.			
											Fine Bone	Fine Med.	Med.	Coarse Medium
	Ground Bones.													
417	Ground Bone,	7.63	2.08	2-3	—	11.28	15.02	26.30	27-29	11.28	53.80	46.20	—	—
332-334	Dow's Pure Ground Bone,	8.37	1.90	1.65-2.47	—	9.63	15.96	25.59	24-26	9.63	74.58	25.42	—	—
148	Meat and Bone,	7.59	4.87	5.02	—	8.26	9.14	17.40	18.4	8.26	54.25	35.05	7.37	3.38
139-209-335	Pure Ground Bone,	7.26	4.15	4.20	—	10.12	10.74	20.86	20.66	10.12	24.75	30.47	27.75	17.03
214-340	Bone Dust,	4.46	1.83	1.77	—	11.42	16.61	28.03	27.92	11.42	74.42	25.18	.40	—
119	Pure Ground Bone,	4.17	2.78	2.5-3.00	—	9.20	14.72	23.92	23.24	9.20	11.50	43.20	40.30	5.00

*Sulphate of potash, the source of potash.

TRADE VALUES OF FERTILIZING INGREDIENTS IN RAW MATERIALS AND CHEMICALS.

	1901	1902
	CENTS PER POUND	
Nitrogen in ammonia salts,	16.5	16.5
" nitrates,	14.0	15.0
Organic nitrogen in dry and fine ground fish, meat, blood, and in high-grade mixed fertilizers,	16.0	16.5
" " " fine bone and tankage,	16.0	16.0
" " " medium bone and tankage,	12.0	12.0
Phosphoric acid soluble in water,	5.0	5.0
" " soluble in ammonium citrate,	4.5	4.5
" " in fine ground fish, bone and tankage,	4.0	4.0
" " in cottonseed meal, castor pomace and wood ashes,	4.0	4.0
" " in coarse fish, bone and tankage,	3.0	3.0
" " insoluble (in water and in am. cit.) in mixed fertilizers,	2.0	2.0
Potash as Sulphate, free from Chlorides,	5.0	5.0
" " Muriate,	4.25	4.25

The market value of low priced materials used for manurial purposes, as salt, wood ashes, various kinds of lime, barnyard manure, factory refuse and waste materials of different description, quite frequently does not stand in close relation to the current market value of the amount of essential articles of plant food they contain. Their cost varies in different localities. Local facilities for cheap transportation and more or less advantageous mechanical conditions for a speedy action, exert as a rule, a decided influence on their selling price.

The market cost of the different essential elements of plant food remains the same as in 1901, with the exception of the nitrogen in form of nitrates and the higher grades of organic nitrogenous fertilizing materials, which show a somewhat higher cost as compared with the previous year.

HATCH EXPERIMENT STATION

—OF THE—

MASSACHUSETTS

AGRICULTURAL COLLEGE.

BULLETIN NO. 84.

I. ANALYSES OF MANURIAL SUBSTANCES SENT ON FOR EXAMINATION.

II. ANALYSES OF LICENSED FERTILIZERS COLLECTED BY THE AGENT OF THE STATION DURING 1902.

NOVEMBER, 1902.

The Bulletins of this Station will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same.

AMHERST, MASS.:
PRESS OF CARPENTER & MOREHOUSE.
1902.

HATCH EXPERIMENT STATION

OF THE

Massachusetts Agricultural College,

AMHERST, MASS.

STATION STAFF:

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William P. Brooks, Ph. D.,	*Agriculturist.*
George E. Stone, Ph. D.,	*Botanist.*
Charles A. Goessmann, Ph.D., LL.D.,	*Chemist*, (Fertilizers).
Joseph B. Lindsey, Ph. D.,	*Chemist* (Foods and Feeding.)
Charles H. Fernald, Ph. D.,	*Entomologist.*
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Edward B. Holland, M. Sc.,	*First Chemist* (Foods and Feeding).
Philip H. Smith, B. Sc.,	*Ass't Chemist* (Foods and Feeding).
——— ———	*Ass't Chemist* (Foods and Feeding).
George A. Drew, B. Sc.,	*Assistant Horticulturist.*
——— ———	*Assistant Horticulturist.*
Stephen C. Bacon,	*Observer.*

The co-operation and assistance of farmers, fruit-growers, horticulturists, and all interested, directly or indirectly, in agriculture, are earnestly requested. The Bulletins will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same. General bulletins, fertilizer analyses, analyses of feed-stuffs, and annual reports are published. Kindly indicate in application which of these are desired. Communications may be addressed to the

Hatch Experiment Station, Amherst, Mass.

DIVISION OF CHEMISTRY.

C. A. GOESSMANN.

ANALYSES OF COMMERCIAL FERTILIZERS AND MANURIAL SUBSTANCES SENT ON FOR EXAMINATION.

I.

WOOD ASHES.

1164—1168. I. Received from Westboro, Mass.
II. Received from Worcester, Mass.
III. Received from South Amherst, Mass.
IV. Received from North Sudbury, Mass.
V. Received from Granby, Mass.

	Per Cent.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	16.60	23.49	21.44	14.30	25.27
Potassium oxide,	5.78	4.16	4.66	5.84	6.00
Phosphoric acid,	1.58	1.64	1.28	1.40	1.40
Calcium oxide,	35.18	28.84	29.04	28.79	31.47
Insoluble matter,	5.83	9.73	10.35	16.27	13.09

1169—1173. I. Received from Centre Marshfield, Mass.
II. Received from Lexington, Mass.
III. Received from Amherst, Mass.
IV. Received from North Hadley, Mass.
V. Received from East Holliston, Mass.

	Per Cent.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	28.41	18.22	22.44	18.71	none
Potassium oxide,	3.98	4.76	4.06	6.54	.63
Phosphoric acid,	1.34	1.48	1.48	1.58	.98
Calcium oxide,	30.57	28.92	26.17	25.06	29.84
Insoluble matter.	4.80	14.41	11.75	34.62	40.34

1174—1178. I. Received from Millis, Mass.
II. Received from Concord, Mass.
III. Received from Boston, Mass.
IV. Received from Worcester, Mass.
V. Received from Fall River, Mass.

	Per Cent.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	8.09	15.95	2.94	10.33	19.05
Potassium oxide,	5.80	5.40	5.30	5.32	5.28
Phosphoric acid,	1.70	1.68	1.57	1.48	1.28
Calcium oxide,	31.49	29.84	32.79	36.17	33.42
Insoluble matter,	15.83	12.84	18.05	8.36	7.79

MISCELLANEOUS ASHES.

1179—1182. I. Hemp ashes, received from North Plymouth, Mass.
II. Waste ashes, received from Amherst, Mass.
III. Tan bark ashes, received from East Holliston, Mass.
IV. Brick-yard ashes, received from Montague, Mass.

	Per Cent.			
	I.	II.	III.	IV.
Moisture at 100° C.,	none	30.25	1.50	.77
Potassium oxide,	2.48	1.14	.52	3.32
Phosphoric acid,	1.74	.36	.77	1.33
Calcium oxide,	60.47	—	24.29	25.23
Insoluble matter,	3.14	—	13.54	41.94

BURNED BONE AND GROUND BONE.

1183—1185. I. Burned bone, received from New Bedford, Mass.
II. Ground bone, received from Palmer, Mass.
III. Ground bone, received from Boston, Mass.

	Per Cent.		
	I.	II.	III.
Moisture at 100° C.,	.67	2.67	5.55
Total phosphoric acid,	38.06	30.08	18.98
Reverted phosphoric acid,	1.20	12.84	7.62
Insoluble phosphoric acid,	36.86	17.24	11.36
Nitrogen,	—	1.86	3.23

CHEMICALS.

1186—1190. I. Nitrate of soda, received from Amherst, Mass.
II. Dissolved bone black, received from Amherst, Mass.
III. Muriate of potash, received from Amherst, Mass.
IV. Low grade sulphate of potash, received from Amherst, Mass.
V. Sulphate of ammonia, received from Amherst, Mass.

	Per Cent.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	2.07	14.82	2.35	6.50	1.21
Potassium oxide,	—	—	47.80	25.32	—
Total phosphoric acid,	—	17.12	—	—	—
Soluble phosphoric acid,	—	10.27	—	—	—
Reverted phosphoric acid,	—	3.47	—	—	—
Insoluble phosphoric acid,	—	3.38	—	—	—
Nitrogen,	15.40	—	—	—	21.66

MISCELLANEOUS MATERIAL.

1191—1195. I. Green celery stalk and leaf, received from Amherst, Mass.
II. and III. Manure, received from Amherst, Mass.
IV. Mould, received from Southboro, Mass.
V. Wool Waste, received from Methuen, Mass.

	Per Cent.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	82.97	53.01	71.73	26.07	5.56
Potassium oxide,	.79	.92	.51	.66	2.51
Phosphoric acid,	—	.59	.39	.45	.64
Nitrogen,	.62	.59	.42	.62	1.61
Calcium oxide,	—	.31	.79	—	1.53
Sodium oxide,	.84	—	—	—	—

1196—1199. I. Sizing paste, received from South Hadley, Mass.
II. Lime, received from Sunderland, Mass.
III. Wool mill waste, received from Lowell, Mass.
IV. Fibre waste, received from Peabody, Mass.

	Per Cent.			
	I.	II.	III.	IV.
Moisture at 100° C.,	63.11	—	3.81	61.53
Potassium oxide,	—	—	2.41	.49
Phosphoric acid,	.34	—	.17	.10
Nitrogen,	2.13	—	.86	.22
Calcium oxide,	—	62.90	4.08	.36
Insoluble matter,	—	—	49.88	.58

HORN DUST AND TANKAGE.

1200—1203. I. and II. Horn dust, received from Leominster, Mass.
III. Horn dust, received from Pratts Junction, Mass.
IV. Tankage, received from Springfield, Mass.

	Per Cent.			
	I.	II.	III.	IV.
Moisture at 100° C.,	9.50	11.60	4.80	4.95
Total phosphoric acid,	—	—	.40	17.71
Reverted phosohoric acid,	—	—	—	9.29
Insoluble phosphoric acid,	—	—	—	8.42
Nitrogen,	14.41	14.10	15.30	4.48

COMPLETE FERTILIZERS.

1204—1206. I. Received from South Sudbury, Mass.
II. and III. Received from Southboro, Mass.

	Per Cent.		
	I.	II.	III.
Moisture at 100° C.,	7.25	19.91	8.96
Total phosphoric acid,	5.88	5.56	9.93
Soluble phosphoric acid,	1.70	—	6.05
Reverted phosphoric acid,	2.85	3.62	2.16
Insoluble phosphoric acid,	1.33	1.94	1.72
Potassium oxide,	11.88	7.26	6.38
Nitrogen,	5.49	1.78	2.79

1207—1210. I. and II. Received from Granby, Mass.
III. Received from North Leominster, Mass.
IV. Received from Hatfield, Mass.

	Per Cent. I.	II.	III.	IV.
Moisture at 100° C.,	6.99	9.18	5.11	7.43
Total phosphoric acid,	8.34	14.20	6.58	2.30
Soluble phosphoric acid,	5.56	7.27	4.29	—
Reverted phosphoric acid,	1.16	.95	1.29	1.22
Insoluble phosphoric acid,	1.62	5.98	1.00	1.08
Potassium oxide,	10.74	3.40	10.26	5.75
Nitrogen,	3.48	3.20	2.77	5.73

SOILS.

1211—1216. I., II. and III. Received from New York City.
IV. and V. Received from Northampton, Mass.
VI. Received from Greenfield, Mass.

	Per Cent. I.	II.	III.	IV.	V.	VI.
Moisture at 100° C.,	15.71	10.86	17.04	4.52	.89	76.46
Phosphoric acid,	.05	trace	trace	.28	.20	.07
Potassium oxide,	.17	.13	.13	.30	.22	.07
Nitrogen,	.08	.02	.07	.18	.13	.57
Calcium oxide,	trace	1.47	.07	.58	.59	.84

1217—1222. I. Cuban soil, received from Boston, Mass.
II. Earthy deposit, received from Medfield, Mass.
III. Turf, received from Plymouth, Mass.
IV. and V. Soils, received from Conway, Mass.
VI. Soil, received from Taunton, Mass.

	Per Cent. I.	II.	III.	IV.	V.	VI.
Moisture at 100° C.,	4.20	—	30.21	8.31	17.59	14.21
Phosphoric acid,	.32	none	.19	.07	.07	.06
Potassium oxide,	.54	none	.32	.16	.17	.13
Nitrogen,	.40	—	1.16	.22	.36	.12
Calcium oxide.	3.99	much	1.64	none	none	trace

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1902, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
196	High Grade Fertilizer 10% Potash,	American Agricultural Chem. Co,, Boston, Mass.,	Haverhill.
333	High Grade Fertilizer 10% Potash,	American Agricultural Chem. Co., Boston, Mass.,	Concord.
467	Tucker's Tobacco Starter and Grower,	American Agricultural Chem. Co., Boston, Mass.,	Westfield.
52	Potato and Vegetable Phosphate,	Berkshire Fertilizer Co., Bridgeport, Conn.,	No. Amherst.
18	Abbott's Animal Fertilizer,	W. H. Abbott, Holyoke, Mass.,	Sunderland.
27	Abbott's Animal Fertilizer,	W. H. Abbott, Holyoke, Mass.,	Hatfield.
337	Abbott's Animal Fertilizer,	W. H. Abbott, Holyoke, Mass.,	Holyoke.
338	Abbott's Eagle Brand,	W. H. Abbott, Holyoke, Mass.,	Holyoke.
303	High Grade Potato,	Armour Fertilizer Works. Baltimore, Md.,	Danvers.
363	High Grade Potato,	Armour Fertilizer Works, Baltimore, Md.,	Harvard.
318	Ammoniated Bone with Potash,	Armour Fertilizer Works, Baltimore, Md.,	Danvers.
364	Ammoniated Bone with Potash,	Armour Fertilizer Works, Baltimore, Md.,	Harvard.
60	Bowker's Market Garden Fertilizer,	Bowker Fertilizer Co., Boston, Mass.	Northampton.
314	Bowker's Market Garden Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Concord.
215	Sure Crop Bone Phosphate,	Bowker Fertilizer Co., Boston, Mass.,	Haverhill.
121	Bowker's High Grade Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Lowell.
300	Bowker's High Grade Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Beverly.
128	Bone and Wood Ash Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Lowell.
207	Bone and Wood Ash Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Boston.
155	Gloucester Fish and Potash,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
261	Wood Ashes,	Bowker Fertilizer Co., Boston. Mass.,	Amesbury.
316	Wood Ashes,	Bowker Fertilizer Co., Boston, Mass.,	Danvers.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
196-333	High Grade Fertilizer 10% Potash,	9.97	2.38	2.4-3.3	3.70	3.36	2.48	9.54	7-10	7.06	6-8	9.64	10-12
467	Tobacco Starter and Grower,	9.45	3.30	3.30-4.12	5.22	3.28	1.50	10.00	10-13	8.50	8-10	4.80	*4-5
52	Potato and Vegetable Phosphate,	13.45	2.19	1.7-2.5	4.52	1.88	1.92	8.32	8-10	6.40	6-8	4.08	*4-6
18-27-337	Abbott's Animal Fertilizer,	11.64	3.59	3-4	1.64	9.22	7.68	18.54	17-19	10.86	15-17	—	—
338	Abbott's Eagle Brand,	11.65	2.81	3-4	1.32	8.26	5.06	14.64	12-14	9.58	9-10	9.92	*10-11
303-363	High Grade Potato,	9.34	1.71	1.65	6.37	2.41	.90	9.68	8-10	8.78	8	10	10
318-364	Ammoniated Bone with Potash,	9.14	2.56	2.47	4.26	2.55	1.07	7.88	6-8	6.81	6	2	2
60-314	Bowker's Market Garden Fertilizer,	12.71	2.47	2.25-3.25	4.71	2.25	2.00	9.16	7-10	7.16	6-8	9.90	10-12
215	Sure Crop Bone Phosphate,	11.99	.96	.75-1.50	4.26	3.62	1.66	9.54	11-12	7.88	6-8	2.16	2-4
121-300	Bowker's High Grade Fertilizer,	13.25	2.44	2.25-3.25	6.46	1.96	2.04	10.46	10-13	8.42	7-10	4.00	4-6
128-207	Bone and Wood Ash Fertilizer,	13.89	1.91	1.5-2.5	.25	5.23	4.38	9.86	8-10	5.48	6-8	2.78	†2-3
155	Gloucester Fish and Potash,	4.29	.85	.75-1.50	1.31	6.13	2.92	10.36	9-11	7.44	6-9	1.00	*1-2
261-316	Wood Ashes,	13.15	—	—	—	—	—	1.66	1	—	—	5.12	†4

*Sulphate of potash, the source of potash.
†Carbonate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1902, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
33	Fine Dry Ground Fish,	Bowker Fertilizer Co., Boston, Mass.,	Northampton.
177	Fine Dry Ground Fish,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
156	Fine Dry Ground Fish,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
329	Fine Dry Ground Fish,	Bowker Fertilizer Co., Boston, Mass.,	Concord.
123	Bone, Blood and Potash,	Bowker Fertilizer Co., Boston, Mass.,	Lowell.
409	Fish and Potato " D " Brand,	Bowker Fertilizer Co., Boston, Mass.,	Springfield.
367	Bowker's Corn Phosphate,	Bowker Fertilizer Co., Boston, Mass.,	Marlboro.
443	Bowker's Corn Phosphate,	Bowker Fertilizer Co., Boston, Mass.,	North Adams.
413	Bowker's Tobacco Ash Elements,	Bowker Fertilizer Co., Boston, Mass.,	Springfield.
455	Bowker's Tobacco Ash Elements,	Bowker Fertilizer Co., Boston, Mass.,	Southwick.
166	Bowker's Early Potato Manure,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
227	Bowker's Early Potato Manure,	Bowker Fertilizer Co., Boston, Mass.,	Amesbury.
310	Bowker's Early Potato Manure,	Bowker Fertilizer Co., Boston, Mass.,	Worcester.
180	Bowker's Fish and Potash,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
446	Bradley's Niagara Phosphate,	Amer. Agric. Chem. Co. (Bradley Fert. Co.), Boston,	Lee.
199	Complete For Top Dressing,	Amer. Agric. Chem. Co. (Bradley Fert. Co.), Boston,	Haverhill.
272	Complete For Top Dressing,	Amer. Agric. Chem. Co. (Bradley Fert. Co.), Boston,	Worcester.
102	Brightman's Fish and Potash,	Amer. Agric. Chem. Co. (Bradley Fert. Co.), Boston,	Fall River.
241	Seeding Down Manure	Amer. Agric. Chem. Co. (Bradley Fert. Co.), Boston,	Haverhill.
226	English Lawn Fertilizer,	Amer. Agric. Chem. Co. (Bradley Fert. Co.), Boston,	Haverhill.
233	English Lawn Fertilizer,	Amer. Agric. Chem. Co. (Bradley Fert. Co.), Boston,	Amesbury.
328	Breck's Lawn and Garden Dressing,	Joseph Breck & Sons, Boston, Mass.,	Boston.
486	Clark's Cove Bay State Fertilizer,	Amer. Agric. Chem. Co. (Clark's Cove Fert. Co.),	Boston.
484	Clark's Cove Potato Manure,	Amer. Agric. Chem. Co. (Clark's Cove Fert. Co.),	Boston.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Total. Found.	Total. Guaranteed.	Available. Found.	Available. Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
33-177-156-329	Fine Dry Ground Fish,	7.94	6.65	6.59-8.24	—	5.00	2.40	7.40	4.58-5.50	5.00	—	—	—
123	Bone, Blood and Potash,	9.92	5.03	5	3.77	1.27	1.46	6.50	8-10	5.04	—	6.47	7
409	Fish and Potash "D" Brand,	8.14	3.48	2.47-3.30	.64	3.38	3.30	7.32	8-10	4.02	—	1.96	2-3
367-443	Bowker's Corn Phosphate,	14.30	1.82	1.5-2.5	—	8.44	1.48	9.92	10-12	8.44	8-10	2.29	2-4
413-455	Bowker's Tobacco Ash Element,	6.32	—	—	—	4.52	5.50	10.02	—	4.52	6-7	14.15	†15-18
166-227-310	Early Potato Manure,	12.57	3.38	3.30-4.12	5.99	2.37	1.26	9.62	8-10	8.36	6-8	7.22	7-9
180	Bowker's Fish and Potash,	13.26	1.82	1.5-2.5	4.73	3.87	1.92	10.52	8-10	8.60	—	2.18	2-3
446	Bradley's Niagara Phosphate,	14.26	1.25	.82-1.65	5.16	3.20	2.74	11.10	8-11	8.36	7-9	2.14	1-2
199-272	Complete for Top Dressing,	9.47	4.96	4.95-5.78	2.47	3.15	1.64	7.26	6-8	5.62	5-7	2.74	*2.5-3.5
102	Brightman's Fish and Potash,	9.47	2.35	2-3	1.96	4.38	3.18	9.52	7.5-10.5	6.34	6-8	2.74	*2-3
241	Seeding Down Manure,	14.37	2.52	2.47-3.30	7.61	2.23	2.08	11.92	11-14	9.84	9-11	2.16	2-3
226-233	English Lawn Fertilizer,	8.42	4.93	4.95-5.78	2.98	2.40	1.74	7.12	6-8	5.38	5-7	3.26	*2.5-3.5
328	Lawn and Garden Dressing,	7.02	4.74	4.12-4.94	1.57	3.33	1.62	6.52	—	4.90	5-6	5.30	5-6
486	Bay State Fertilizer,	11.87	2.62	2.5-3.25	6.40	3.18	2.12	11.70	11-14	9.58	9-11	2.28	2-3
484	Potato Manure,	10.46	2.79	2.5-3.25	3.71	2.41	3.88	10.	8-11	6.12	6-8	5.04	5-6

*Sulphate of potash, the source of potash.
†Carbonate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1902, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
476	Clark's Cove Great Planet Manure,	Amer. Agric. Chem. Co. (Clark's Cove Fertilizer Co.),	E. Longm'dow
485	King Philip Alkaline Guano,	Amer. Agric. Chem. Co. (Clark's Cove Fertilizer Co.)	Boston.
391	Clark's Cove Grass Fertilizer,	Amer. Agric. Chem. Co. (Clark's Cove Fertilizer Co.),	Springfield.
489	Crocker's A. A. Complete Manure,	Amer. Agric. Chem. Co. (Crocker Fert. and Chem. Co.),	Boston.
201	Clay's London Fertilizer,	R. & J. Farquhar & Co., Boston, Mass., Agents,	Boston.
99	American Farmer's Corn King,	E. Frank Coe Co., New York City,	Seekonk.
383	New England Corn Fertilizer,	E. Frank Coe Co., New York City,	Greenfield.
477	New England Corn Fertilizer,	E. Frank Coe Co., New York City,	Holyoke.
402	New England Potato Fertilizer,	E. Frank Coe Co., New York City,	Greenfield.
472	New England Potato Fertilizer,	E. Frank Coe Co., New York City,	Holyoke.
153	Red Brand Excelsior Guano,	E. Frank Coe Co., New York City,	Dighton.
463	Columbian Phosphate,	E. Frank Coe Co., New York City,	Holyoke.
435	XXX Ammoniated Bone Super.,	E. Frank Coe Co., New York City,	Greenfield.
6	Darling's Potato Manure,	Amer. Agric. Chem. Co. (L. B. Darling Fert. Co.),	N. Amherst.
38	Darling's Potato Manure,	Amer. Agric. Chem. Co. (L. B. Darling Fert. Co.),	N. Amherst.
49	Darling's Corn Special,	Amer. Agric. Chem. Co. (L. B. Darling Fert. Co.),	N. Amherst.
342	Imperial Liquid Plant Food,	Eastern Chemical Co., Boston, Mass.,	Boston.
498	Canada Wood Ashes,	Wm. E. Fyfe & Co., Clinton, Mass.,	Amherst.
393	Vegetable, Vine and Tobacco,	Amer. Agric. Chem. Co. (Great Eastern Fert. Co.),	S. Williamst'n.
343	Ferti Flora,	C. W. Hastings, Jamaica Plain, Mass.,	Boston.
107	Dissolved Bone and Potash,	Lowell Fertilizer Co., Boston, Mass.,	Fall River.
427	Animal Brand and Potash No. 2,	Lister's Agricultural Chemical Works, Newark,	Greenfield.
397	Complete Manure for Light Soils,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Greenfield.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Total.		Available.		Found.	Guaranteed.
								Found.	Guaranteed.	Found.	Guaranteed.		
	Compound Fertilizers.												
476	Great Planet Manure,	12.06	3.30	3.30-4.12	6.82	2.20	1.82	10.84	9-13	9.02	8-11	7.46	7-8
485	King Philip Alkaline Guano,	16.60	1.31	1.03-2.50	5.35	3.55	2.02	10.92	10-15	8.90	8-12	2.10	2-3
391	Clark's Cove Grass Fertilizer,	7.45	3.98	3.91-4.73	1.83	4.13	1.44	7.40	6-9	5.96	5-7	2.84	*2-3
489	Crocker's "AA" Complete Manure,	13.10	3.25	3.30-4.12	4.32	3.74	2.12	10.18	9-13	8.06	8-11	6.58	7-8
290	Clay's London Fertilizer,	10.87	4.25	—	.33	2.14	5.15	7.62	—	2.47	—	.12	—
99	American Farmer's Corn King,	12.03	2.51	2.47-3.30	4.71	3.67	2.68	11.06	9.5-10.5	8.38	8-10	3.86	4-5
383-477	New England Corn Fertilizer,	10.12	1.17	.8-1	7.65	2.46	2.81	12.92	9-11	10.11	7.5-9	3.14	3-4
402-472	New England Potato Fertilizer,	10.66	1.05	.8-1	7.74	2.08	2.92	12.74	9-10	9.82	7.5-9	3.22	3-4
153	Red Brand Excelsior Guano,	10.13	3.17	3.30-4.12	8.06	1.76	2.26	12.08	10.5-11	9.82	9-10.5	4.92	*6-7
463	Columbian Phosphate,	8.33	1.64	1.2-1.65	7.80	2.38	2.69	12.87	10-11	10.18	8.5-9	2.52	2.5-3
435	XXX Ammoniated Bone Superphosphate,	15.09	1.03	.80-1.50	8.12	2.32	2.94	13.38	10-11	19.44	8.5-10	1.86	1.5-2
6-38	Darling's Potato Manure,	7.84	2.97	2.50-3.25	5.09	2.21	.82	8.12	7-10	7.30	6-8	6.18	*5-6
49	Darling's Corn Special,	10.26	3.43	2.48-3.30	5.69	2.73	1.36	9.78	7-10	8.42	6-8	6.46	5-6
342	Imperial Liquid Plant Food,	83.48	1.38	1.3	1.76	—	—	1.76	1.3	1.76	1.3	1.66	1.3
498	Canada Wood Ashes,	18.04	—	—	—	—	—	1.36	1-3	—	—	5.90	4.5-8
393	Vegetable, Vine and Tobacco,	12.19	2.14	2.06-2.88	6.18	1.84	3.32	11.34	10-13	8.02	8-10	5.82	6-7
343	Ferti Flora,	83.22	2.94	3.25	3.70	—	—	3.70	3.66	3.70	3.66	3.32	3.3
107	Dissolved Bone and Potash,	10.52	1.99	1.85-2.50	6.52	2.44	1.86	10.82	10-12	8.96	9-11	2.18	2-3
427	Animal Brand and Potash No. 2,	17.01	—	—	5.73	4.67	2.22	12.62	11	10.40	10	2.54	2
397	Complete Manure for Light Soils,	9.55	5.52	4.94-6.59	1.85	4.11	3.02	8.98	8-10	5.96	6-8	7.20	*6-8

*Sulphate of potash, the source of potash

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1902, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
382	Tobacco Manure Wrapper Brand,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Greenfield.
352	Complete Manure "A" Brand,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Leominster.
63	Complete Manure for Average Soils,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Northampton.
412	Complete Manure for Average Soils,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Pittsfield.
67	Mapes' Tobacco Starter Improved,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Northampton.
433	Mapes' Tobacco Starter Improved,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Greenfield.
72	Mapes' Corn Manure,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Northampton.
81	Mapes' Corn Manure,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Taunton.
280	Mapes' Corn Manure,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Worcester.
353	Mapes' Corn Manure,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Leominster.
73	Mapes' Cereal Brand,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Taunton.
278	Mapes' Cereal Brand,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Worcester.
379	Mapes' Cereal Brand,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Leominster.
43	Mapes' Potato Manure,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Northampton.
75	Mapes' Potato Manure,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Taunton.
283	Cauliflower and Cabbage Manure,	Mapes Formula and Peruvian Guano Co , N. Y. City,	Worcester.
91	Mapes' Lawn Top Dressing,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Taunton.
54	Mapes' Top Dressing,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Northampton.
70	Grass and Grain Spring Top Dressing,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Taunton.
357	Grass and Grain Spring Top Dressing,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Leominster.
225	Hardy's Complete Manure,	Hardy Packing Co., Chicago, Ill.,	Amesbury.
351	Hardy's Complete Manure,	Hardy Packing Co., Chicago, Ill.,	Hudson.
465	Hardy's Complete Manure,	Hardy Packing Co., Chicago, Ill.,	Westfield.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
382	Tobacco Manure, Wrapper Brand, . .	7.28	6.68	6.18	—	2 84	2.54	5.38	4.50	2.84	—	11.96	*10.5
352	Complete Manure "A" Brand, ...	14.22	2 65	2.47-3.29	1.97	6.19	4.64	12.80	12-16	8.16	10-12	3.48	2.5-3.5
63-412	Complete Manure Average Soils, . . .	9.65	4.78	4.12-4.94	2.69	4.29	1.94	8.92	8-9	6.98	7-8	5.20	*5-6
67-433	Tobacco Starter Improved, ...	10.05	4.14	4.12-4.94	1.08	5.14	4.76	10.98	8-10	6.22	6-8	1.54	*1-2
72-81-280-353	Mapes' Corn Manure, ...	10.00	2.61	2.47-2.88	2.30	5.74	3.94	11.98	10-12	8.04	8-10	6.00	6-7
73-278-379	Mapes' Cereal Brand, ...	14.71	1.82	1.65-2.47	3.03	3 07	3.70	9.80	8-10	6.10	6-8	3.26	3-3.5
43-75	Mapes' Potato Manure, ...	10.08	3.81	3.71-4.12	3.06	4.76	3.10	10.92	8-10	7.82	8	6.74	*6-8
283	Cauliflower and Cabbage Manure, . , .	10.55	4.25	4.12-4.94	1.25	3.23	4.60	9.08	6-8	4.48	—	6.40	6-8
91	Lawn Top Dressing, ...	5.40	2.48	2.47-2.88	1.09	1.81	2.12	5.02	3.5-4.5	2.90	—	3.20	2.5-3.5
54	Mape's Top Dressing, ...	10.13	4.46	4.94	.81	2.15	1.56	4.52	4	2.96	—	2.06	2
70-357	Grass and Grain Spring Top Dressing, .	12.42	4.99	4.94-5.76	1.73	3.49	2.20	7.42	6-8	5.22	5-6	7.44	*7-8
225-351-465	Hardy's Complete Manure, ...	12.21	2.92	3.30-4.12	4.35	3.77	1.04	9.16	10-12	8.12	8-10	5.50	7-8

*Sulphate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1902, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
213	Unleached Hard Wood Ashes,	John Joynt, Lucknow, Ontario, Can.,	Boston.
444	Unleached Hard Wood Ashes,	John Joynt, Lucknow, Ontario, Can.,	Pittsfield.
3	Chittenden's Market Garden Manure,	National Fertilizer Co., Bridgeport, Conn.,	Sunderland.
147	Chittenden's Market Garden Manure,	National Fertilizer Co., Bridgeport, Conn.,	N. Bedford.
374	Chittenden's Market Garden Manure,	National Fertilizer Co., Bridgeport, Conn.,	Leominster.
136	Ammoniated Bone Phosphate,	National Fertilizer Co., Bridgeport, Conn.,	N. Bedford.
373	Ammoniated Bone Phosphate,	National Fertilizer Co., Bridgeport, Conn.,	Leominster.
399	Ammoniated Bone Phosphate,	National Fertilizer Co., Bridgeport, Conn.,	Gr. Barringt'n.
2	Chittenden's Fish and Potash,	National Fertilizer Co., Bridgeport, Conn.,	Sunderland.
170	Chittenden's Fish and Potash,	National Fertilizer Co., Bridgeport, Conn.,	Dighton.
249	Chittenden's Fish and Potash,	National Fertilizer Co., Bridgeport, Conn.,	N. Bedford.
405	Chittenden's Universal Phosphate,	National Fertilizer Co., Bridgeport, Conn.,	Gr. Barringt'n.
448	Chittenden's Potato Phosphate,	National Fertilizer Co., Bridgeport, Conn.,	Gr. Barringt'n.
4	Complete Fertilizer for Tobacco,	National Fertilizer Co., Bridgeport, Conn.,	Sunderland.
25	Complete Fertilizer for Roots,	National Fertilizer Co., Bridgeport, Conn.,	Hatfield.
105	Complete Fertilizer for Roots,	National Fertilizer Co., Bridgeport, Conn.,	Seekonk.
150	Complete Fertilizer for Roots,	National Fertilizer Co., Bridgeport, Conn.,	Fairhaven.
487	Pacific High Grade General,	Amer. Agric. Chem. Co. (Pacific Guano Co.),	Boston.
220	Pacific Nobsque Guano,	Amer. Agric. Chem. Co. (Pacific Guano Co.).	Newburyport.
440	Gardner's Complete Manure,	Amer. Agric. Chem. Co. (Packers' Union Fertilizer Co.),	Greenfield.
434	Universal Fertilizer,	Amer. Agric. Chem. Co. (Packers' Union Fertilizer Co.),	S. Williamst'n
438	Wheat, Oats and Clover,	Amer. Agric. Chem. Co. (Packers' Union Fertilizer Co.),	S. Williamst'n

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
213-444	Unleached Hard Wood Ashes,	14.91	—	—	—	—	—	1.56	1.5-3	—	—	5.96	†5-8
3-147-374	Market Garden Manure,	11.53	2.32	2.47-3.30	6.84	1.98	1.92	10.74	9-10	8.82	7-10	5.68	6-8
136-373-399	Ammoniated Bone Phosphate,	12.18	1.77	1.65-2.47	6.43	1.99	2.50	10.92	10-12	8.42	8-10	2.80	2-3
2-170-249	Chittenden's Fish and Potash.	9.57	2.76	2.47-3.30	4.14	2.56	2.08	8.78	8-9	6.70	—	4.24	3-4
405	Chittenden's Universal Phosphate.	10.06	1.42	.8-1.65	4.43	2.87	2.22	9.52	10-12	7.30	8-10	1.12	1-2
448	Chittenden's Potato Phosphate,	13.07	2.65	2.66-2.88	7.62	.40	1.42	9.44	10-12	8.02	8-10	6.24	6-7
4	Complete Fertilizer for Tobacco,	9.76	3.46	3.30-4.12	7.50	1.16	1.58	10.24	10-12	8.66	8-11	5.42	*5.41-5.95
25-105-150	Complete Fertilizer for Roots,	11.42	3.43	3.30-4.12	7.01	2.07	1.34	10.42	10-12	9.08	8-10	6.08	6-8
487	High Grade General,	13.67	3.17	3.30-4.12	4.32	3.92	1.82	10.06	9-13	8.24	8-11	6.60	7-8
220	Pacific Nobsque Guano.	14.41	1.47	1.03-2.50	4.48	3.87	3.32	11.67	10-15	8.35	8-12	1.92	2-3
440	Gardner's Complete Manure,	7.30	2.30	2.40-3.30	2.53	3.77	1.40	7.70	7-10	6.30	6-8	10.40	*10-12
434	Universal Fertilizer,	13.67	1.30	.82-1.65	7.01	1.89	2.22	11.12	10-14	8.90	8-11	4.53	4-5
438	Wheat, Oats and Clover,	13.51	—	—	4.67	5.83	1.76	12.26	12-15	10.50	11-13	2.20	2-3

*Sulphate of Potash, the source of potash.
†Carbonate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1902, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
348	Quinnipiac Corn Manure,	Amer. Agric. Chem. Co. (Quinnipiac Co.), Boston,	Marlboro.
37	Market Garden Manure,	Amer. Agric. Chem. Co. (Quinnipiac Co.), Boston,	Seekonk.
158	Market Garden Manure,	Amer. Agric. Chem. Co. (Quinnipiac Co.), Boston,	Bridgewater.
24	Havana Tobacco Fertilizer,	Amer. Agric. Chem. Co. (Quinnipiac Co.), Boston,	Hatfield.
398	Quinnipiac Climax Phosphate,	Amer. Agric. Chem. Co. (Quinnipiac Co.), Boston,	Pittsfield.
97	Quinnipiac Potato Phosphate,	Amer. Agric. Chem. Co. (Quinnipiac Co.), Boston,	Fall River.
388	Quinnipiac Potato Phosphate,	Amer. Agric. Chem. Co. (Quinnipiac Co.), Boston,	Pittsfield.
15	Quinnipiac Onion Manure,	Amer. Agric. Chem. Co. (Quinnipiac Co.), Boston,	Hatfield.
90	Quinnipiac Dissolved Bone,	Amer. Agric. Chem. Co. (Quinnipiac Co.), Boston,	Fall River.
499	Corn Fertilizer	New England Fertilizer Co., Boston, Mass.,	Amherst.
453	Hubbard's Oats and Top Dressing,	Rogers & Hubbard Co., Middletown, Conn.,	E.Longm'd'ow
356	Grass and Grain Fertilizer,	Rogers & Hubbard Co., Middletown, Conn.,	Harvard.
474	Hubbard's Soluble Potato Manure,	Rogers & Hubbard Co., Middletown, Conn.,	Longmeadow.
389	Hubbard's Corn Phosphate,	Rogers & Hubbard Co., Middletown, Conn.,	Gr. Barringt'n
267	Hubbard's Corn Phosphate,	Rogers & Hubbard Co., Middletown, Conn.,	Harvard.
28	Soluble Corn and General Crop,	Rogers & Hubbard Co., Middletown, Conn.,	Hatfield.
442	Hubbard's Potato Phosphate,	Rogers & Hubbard Co., Middletown, Conn.,	Gr. Barringt'n
457	Soluble Corn and General Crop,	Rogers & Hubbard Co., Middletown, Conn.,	Westfield.
116	Complete for Potatoes, Roots and Vegetables,	Russia Cement Co., Gloucester, Mass.,	Taunton.
178	Complete for Potatoes, Roots and Vegetables,	Russia Cement Co., Gloucester, Mass.,	Dighton.
187	Complete for Potatoes, Roots and Vegetables,	Russia Cement Co., Gloucester, Mass.,	Bridgewater.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
348	Quinnipiac Corn Manure,	15.64	2.27	2.06-2.88	7.68	.84	3.02	11.54	10-13	8.52	8-10	1.84	1.5-2.5
37-158	Market Garden Manure,	11.16	3.46	3.30-4.12	4.94	4.34	1.08	10.36	9-13	9.28	8-11	7.70	7-8
24	Havana Tobacco Fertilizer,	3.28	5.82	5.78-6.61	4.66	1.76	.70	6.52	6-9	5.82	5-7	10.98	*10-12
398	Quinnipiac Climax Phosphate,	14.87	1.19	1.03-2.47	5.19	2.97	2.82	10.98	10-15	8.16	8-12	2.36	2-3
97-388	Quinnipiac Potato Phosphate,	8.61	2.06	2.06-2.88	5.64	2.74	3.08	11.46	10-13	8.38	8-10	2.92	3-4
15	Quinnipiac Onion Manure,	14.97	3.33	3.30-4.12	3.90	4.22	2.14	10.26	9-13	8.12	8-11	5.68	7-8
90	Quinnipiac Dissolved Bone,	15.96	1.56	1.65-2.47	9.02	1.84	2.90	13.76	12-15	10.86	10-12	—	—
499	Corn Fertilizer,	9.18	3.20	1.64-2.46	7.27	.95	5.98	14.20	9-11	8.22	8-10	3.40	3-4
453	Oats and Top Dressing,	4.40	7.72	8.80-9.50	.22	3.30	5.88	9.40	7.85-9	3.52	3.9-4.35	9.56	8.35-9.5
356	Grass and Grain Fertilizer,	6.84	3.01	2.5-3	.41	6.55	9.42	16.38	15-18	6.96	6.6-7.2	12.08	12.5-13.5
474	Soluble Potato Manure,	8.63	4.88	5-6	.12	7.45	5.27	12.84	10-12	7.57	7-8.5	5.98	*5-6
389-267	Hubbard's Corn Phosphate,	12.11	1.04	1-1.5	5.26	3.86	2.48	11.60	10-12	9.12	8-10	3.81	3.5-4
28	Corn and General Crops,	8.22	2.47	2.5-3	5.89	.43	3.20	9.52	8-10	6.32	6-7	8.7	8-9
442	Hubbard's Potato Phosphate,	14.85	1.96	2-2.5	6.89	4.05	1.36	12.30	10-12	10.94	9-10	5.02	5-6
457	Soluble Corn and General Crops,	8.75	2.55	2.5-3.0	2.71	3.96	3.33	10.00	8-10	6.67	6-7	8.80	8-9
116-178-187	Potatoes, Roots and Vegetables,	4.90	3.41	3.7-4.5	4.01	4.69	3.76	12.46	9-11	8.70	7-8	8.57	*8.5-10

*Sulphate of potosh, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1902, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
113	Complete for Corn, Grain and Grass,	Russia Cement Co., Gloucester, Mass.,	Taunton.
211	Complete for Corn, Grain and Grass,	Russia Cement Co., Gloucester, Mass.,	Haverhill.
294	Complete for Corn, Grain and Grass,	Russia Cement Co., Gloucester, Mass.,	Worcester.
82	Odorless Lawn Dressing,	Russia Cement Co., Gloucester, Mass.,	Taunton.
210	Odorless Lawn Dressing,	Russia Cement Co., Gloucester, Mass.,	Haverhill.
297	Odorless Lawn Dressing,	Russia Cement Co., Gloucester, Mass.,	Worcester.
77	Market Garden and Potato Manure,	Russia Cement Co., Gloucester, Mass.,	Taunton.
197	Market Garden and Potato Manure,	Russia Cement Co., Gloucester, Mass.,	Haverhill.
290	Market Garden and Potato Manure,	Russia Cement Co., Gloucester, Mass.,	Worcester.
172	Rhode Island Special for Roots,	Russia Cement Co., Gloucester, Mass.,	Dighton.
369	Essex A I Superphosphate,	Russia Cement Co., Gloucester, Mass.,	Hudson.
64	Fish and Potash,	Rogers Manufacturing Co., Rockfall, Conn.,	Hadley.
394	Fish and Potash,	Rogers Manufacturing Co., Rockfall, Conn.,	Pittsfield.
420	Fish and Potash,	Rogers Manufacturing Co., Rockfall, Conn.,	Greenfield.
370	High Grade for Oats and Top Dressing,	Rogers Manufacturing Co., Rockfall, Conn.,	Leominster.
447	High Grade for Oats and Top Dressing,	Rogers Manufacturing Co., Rockfall, Conn.,	Greenfield.
346	High Grade Grass and Grain,	Rogers Manufacturing Co., Rockfall, Conn.,	Leominster.
8	High Grade Complete Corn and Onion,	Rogers Manufacturing Co., Rockfall, Conn.,	N. Amherst.
39	High Grade Complete Corn and Onion,	Rogers Manufacturing Co., Rockfall, Conn.,	N. Amherst.
362	High Grade Complete Corn and Onion,	Rogers Manufacturing Co., Rockfall, Conn.,	Leominster.
449	Farm and Field,	Benjamin Randall, East Boston, Mass.,	Amherst.
450	Market Garden,	Benjamin Randall, East Boston, Mass.,	Amherst.
488	Read's Standard Superphosphate,	Amer. Agric. Chem. Co. (Read Fert. Co.),	Boston.
151	Read's Vegetable and Vine,	Amer. Agric. Chem. Co. (Read Fert. Co.),	Bridgewater.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
113-211-294	Complete for Corn, Grain and Grass,	13.53	3.13	3.30-4.12	2.01	5.99	3.02	11.02	9.5-11	8.00	7-8	8.88	9.5-11
82-210-297	Odorless Lawn Dressing,	3.65	3.65	3.7-4.5	.23	5.69	4.50	10.42	8-10	5.92	6-7	8.50	*7-8
77-197-290	Market Garden Potato Manure,	13.06	2.19	2-2.5	1.66	6.60	3.86	12.12	10-13	8.26	8-10	5.30	5-6
172	Rhode Island Special for Roots,	11.52	3.14	3-3.5	6.21	2.02	2.89	11.12	9-11	8.23	8-9	6.94	6.5-7
369	Essex A I Superphosphate,	7.34	1.39	1-1.25	1.60	5.56	5.54	12.70	9-11	7.16	7-8	2.24	2-2.5
64-394-420	Fish and Potash,	6.96	3.27	3.25-3.75	2.52	3.88	2.58	8.98	6-8	6.40	4-5	4.30	3.75-4.5
370-447	High Grade Oats and Top Dressing,	7.42	6.64	6.3-6.8	1.47	6.67	1.54	9.68	9-10.5	8.14	7-9	7.40	7.5-8.5
346	High Grade Grass and Grain,	7.21	3.33	3-4	—	7.56	9.72	17.28	16-17	7.56	—	11.66	12.5-14
8-39-362	High Grade Complete Corn and Onion,	10.23	3.48	3-6-4	3.67	3.59	2.56	9.82	8-9	7.26	6-7	7.92	7-8
449	Farm and Field,	20.46	2.02	2-3	—	6.73	4.45	11.18	—	6.73	6-8	.88	2-3
450	Market Garden,	16.65	3.45	3.25-4	2.92	4.00	3.28	10.20	—	6.92	8-10	3.86	*4-5
488	Read's Standard Superphosphate,	15.02	1.37	.82-1.65	4.32	3.54	2.78	10.64	10-14	7.86	8-11	4.02	4-5
151	Read's Vegetable and Vine,	9.58	2.07	2.06-2.88	6.14	2.56	3.12	11.82	10-13	8.70	8-10	5.04	6-7

*Sulphate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1902, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
122	Farmers' Friend Superphosphate,	Amer. Agric. Chem. Co. (Read Fertilizer Co.),	Bridgewater.
1	Tobacco Formula "B,"	Sanderson's Fertilizer and Chemical Co., New Haven, Ct.	Sunderland.
459	Tobacco Formula "B,"	Sanderson's Fertilizer and Chemical Co., New Haven, Ct.	Southwick.
387	Old Reliable Superphosphate,	Sanderson's Fertilizer and Chemical Co. New Haven, Ct.	Lanesboro.
456	Old Reliable Superphosphate,	Sanderson's Fertilizer and Chemical Co., New Haven, Ct.	Southwick.
436	Formula "A,"	Sanderson's Fertilizer and Chemical Co., New Haven, Ct.	Lanesboro.
491	Standard Guano for All Crops,	Amer. Agric. Chem. Co. (Standard Fertilizer Co.),	Boston.
492	Standard Complete Manure,	Amer. Agric. Chem. Co. (Standard Fertilizer Co.),	Boston.
490	Standard Special for Potatoes,	Amer. Agric. Chem. Co. (Standard Fertilizer Co.),	Boston.
494	Original Bay State Fertilizer,	Amer. Agric. Chem. Co. (H. F. Tucker Co.), Boston,	Boston.
493	Tucker's Special Potato Fertilizer,	Amer. Agric. Chem. Co. (H. F. Tucker Co.), Boston,	Boston.
500	Wood Ashes "Beaver Brand,"	Chas. Stevens, Naponee, Ontario, Can.,	Amherst.
501	Canada Hard Wood Ashes,	J. Stroup, Son & Co., Boston, Mass.,	Amherst.
117	Dry Ground Fish Guano,	Wilcox Fertilizer Works, Mystic, Conn.,	Fall River.
111	Wilcox Potato Manure,	Wilcox Fertilizer Works, Mystic Conn.,	Fall River.
40	Wilcox Grass Fertilizer,	Wilcox Fertilizer Works, Mystic, Conn.,	Fall River.
495	Americus High Grade Special,	Amer. Agric. Chem. Co., Williams & Clark Fert. Co.,	Boston.
497	Williams and Clark's Potato Phosphate,	Amer. Agric. Chem. Co., Williams & Clark Fert. Co.,	Boston.
365	Americus Corn Phosphate,	Amer. Agric. Chem. Co., Williams & Clark Fert. Co.,	Marlboro.
368	Americus Potato Manure,	Amer. Agric. Chem. Co., Williams & Clark Fert. Co.,	Marlboro.
496	Americus Superphosphate,	Amer. Agric. Chem. Co., Williams & Clark Fert. Co.,	Boston.
138	Superior Truck Fertilizer,	Amer. Agric. Chem. Co., M. E. Wheeler & Co.,	Bridgewater.
184	Bermuda Onion Grower,	Amer. Agric. Chem. Co.. M. E. Wheeler & Co.,	Bridgewater.
502	Corn Success,	Whitman & Pratt Rendering Co., Dracut, Mass.,	Dracut.
503	Potato Plowman,	Whitman & Pratt Rendering Co., Dracut, Mass.,	Dracut.
339	Champion Animal Fertilizer,	Darius Whithed, Lowell, Mass.,	Lowell.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
122	Farmer's Friend Superphosphate, . . .	13.35	2.26	2.06-2.88	6.18	2.08	4.56	12.82	10-13	8.26	8-10	3.26	3-4
1-459	Tobacco Formula "B,"	8.90	3.03	3.30-4.12	2.94	4.00	3.14	10.08	10-12	8.94	6-8	6.16	*6-8
387-356	Old Reliable Superphosphate, ...	9.85	2.51	2.47-3.30	1.13	5.75	4.92	11.80	10-12	6.88	7-8	2.38	2-3
436	Formula "A,"	10.22	3.74	3.30-4.12	2.34	4.02	3.88	10.24	10-12	6.36	6-8	7.74	6-8
491	Standard Guano for all Crops, ...	15.45	1.42	1.03-2.5	5.28	3.36	2.36	11.00	10-15	8.64	8-12	2.06	2-3
492	Standard Complete Manure, ...	13.54	3.13	3.30-4.12	3.88	4.54	2.30	10.72	9-13	8.42	8-11	6.64	7-8
490	Standard Special for Potatoes, ...	13.45	2.21	2.06-2.88	3.90	4.29	3.20	11.39	10-13	8.19	8-10	3.42	3-4
339	Champion Animal Fertilizer, ...	4.27	4.04	3.92	.32	7.16	7.06	14.54	13.56	7.48	—	9.28	7.46
494	Original Bay State Fertilizer, ...	16.75	2.50	2.06-2.88	6.43	2.73	2.02	11.18	10-13	9.16	8-10	2.40	1.5-2.5
493	Special Potato Fertilizer, ...	13.70	2.30	2.06-2.88	3.75	3.27	3.78	10.80	10-13	7.02	7-9	3.40	3-4
500	Wood Ashes "Beaver Brand,"	12.89	—	—	—	—	—	1.22	1.5-3	—	—	6.52	†5-7
501	Canada Hard Wood Ashes, ...	6.97	—	—	—	—	—	1.62	1.5	—	—	7.20	†5
117	Dry Ground Fish Guano, ...	5.67	8.29	8.5-10	—	4.10	3.32	7.42	—	4.10	—	—	—
111	Wilcox Potato Manure, ...	13.25	2.53	2.05-2.88	1.18	5.68	3.56	10.42	7-9	6.86	6-8	5.10	4.5-5.5
40	Wilcox Grass Fertilizer, ...	10.24	4.16	4.11-4.93	3.04	4.10	3.36	10.50	7-8	7.14	6-8	5.56	5-6
495	Americus High Grade Special, ...	13.52	3.15	3.30-4.12	4.39	4.17	2.10	10.66	9-13	8.56	8-11	6.56	7-8
497	Potato Phosphate, ...	10.03	2.83	2.5-3.25	3.20	3.02	3.88	10.10	8-11	6.22	6-8	5.78	5-6
365	Americus Corn Phosphate, ...	14.84	2.09	2.06-2.88	4.77	4.33	2.36	11.46	10-13	9.10	8-10	2.02	1.5-2.5
368	Americus Potato Manure, ...	14.58	2.19	2.06-2.88	5.10	3.08	3.36	11.54	10-13	8.18	8-10	3.60	3-4
496	Americus Superphosphate, ...	16.57	2.62	2.5-3.25	6.63	3.27	1.82	11.72	11-14	9.90	9-11	2.32	2-3
138	Superior Truck Fertilizer, ...	11.49	3.22	3.30-4.12	6.31	2.37	2.36	11.04	9-13	8.68	8-11	7.46	7-8
184	Bermuda Onion Grower, ...	12.50	1.04	.82-1.65	6.45	1.55	3.26	11.26	10-14	8.00	8-11	4.06	4-5
502	Corn Success, ...	7.87	2.91	2.47-3.30	3.54	5.10	2.44	11.08	10-13	8.64	8-10	3.98	3-4
503	Potato Plowman, ...	7.37	3.57	3.30-4.12	3.67	4.95	1.80	10.42	10-13	8.62	8-10	7.46	7.25-8.25

*Sulphate of Potash, the source of potash.
†Carbonate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1902, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Chemicals.		
32	Nitrate of Soda,	American Agricultural Chemical Co., Boston,	Fall River.
47	Nitrate of Soda,	American Agricultural Chemical Co., Boston,	N. Amherst.
98	Nitrate of Soda,	American Agricultural Chemical Co., Boston,	Seekonk.
140	Nitrate of Soda,	American Agricultural Chemical Co., Boston,	New Bradford.
146	Nitrate of Soda,	American Agricultural Chemical Co., Boston,	Bridgewater.
359	Nitrate of Soda,	American Agricultural Chemical Co., Boston,	Fitchburg.
377	Plain Superphosphate,	American Agricultural Chemical Co., Boston,	Fitchburg.
265	Plain Superphosphate,	American Agricultural Chemical Co., Boston,	Worcester.
53	Low Grade Sulphate of Potash,	American Agricultural Chemical Co., Boston,	N. Amherst.
330	Low Grade Sulphate of Potash,	American Agricultural Chemical Co., Boston,	Boston.
149	Muriate of Potash,	American Agricultural Chemical Co., Boston,	New Bedford.
191	Muriate of Potash,	American Agricultural Chemical Co., Boston,	Haverhill.
271	Muriate of Potash,	American Agricultural Chemical Co., Boston,	Worcester.
237	Dissolved Bone Black,	American Agricultural Chemical Co., Boston,	Haverhill.
355	Dissolved Bone Black,	American Agricultural Chemical Co., Boston,	Fitchburg.
250	Bradley's Kainit,	American Agricultural Chemical Co., Boston,	Amesbury.
286	High Grade Sulphate of Potash,	American Agricultural Chemical Co., Boston,	Worcester.
309	Sulphate of Ammonia,	American Agricultural Chemical Co., Boston,	Boston.
29	Cleveland Flax Meal,	American Linseed Co., Chicago, Ill.,	Hatfield.
12	Prime Cotton Seed Meal,	American Cotton Oil Co., New York City.	Hatfield.
13	Prime Cotton Seed Meal,	American Cotton Oil Co., New York City,	Sunderland.
422	Prime Cotton Seed Meal,	American Cotton Oil Co., New York City,	Lee.

Laboratory Number.	NAME OF BRAND.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Chemicals.												
32-47-98-140-146-359	Nitrate of Soda, ...	1.34	15.00	15.8	—	—	—	—	—	—	—	—	—
377-265	Plain Superphosphate, ...	13.15	—	—	9.98	4.62	.64	15.24	15-19	14.60	14-17	—	—
53-330	Low Grade Sulphate of Potash, . . .	.23	—	—	—	—	—	—	—	—	—	25.85	26.
149-191-271	Muriate of Potash, ...	2.66	—	—	—	—	—	—	—	—	—	49.24	50-55
237-355	Dissolved Bone Black, ...	13.64	—	—	9.53	4.39	2.72	16.64	16-19	13.92	15-18	—	—
250	Bradley's Kainit, ...	4.37	—	—	—	—	—	—	—	—	—	12.08	12-13
286	High Grade Sulphate of Potash, . . .	.87	—	—	—	—	—	—	—	—	—	48.68	48.
309	Sulphate of Ammonia, ...	.61	21.88	—	—	—	—	—	—	—	—	—	—
29	Cleveland Flax Meal, ...	10.43	6.17	6.08-6.4	—	—	—	—	—	—	—	—	—
12	Prime Cotton Seed Meal, . , ...	4.90	6.04	6.25	—	—	—	—	—	—	—	—	—
13-422	Prime Cotton Seed Meal, ...	8.52	6.75	7.	—	—	—	—	—	—	—	—	—

II. Analyses of Commercial Fertilizers Collected During 1902, in the General Markets by the Agent of the Hatch Experiment Station of the Massachusetts Agricultural College.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Chemicals.		
179	Nitrate of Soda,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
198	Nitrate of Soda,	Bowker Fertilizer Co., Boston, Mass.,	Boston.
229	Nitrate of Soda,	Bowker Fertilizer Co., Boston, Mass.,	Boston.
164	Dissolved Bone Black,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
222	Dissolved Bone Black,	Bowker Fertilizer Co., Boston, Mass.,	Boston.
61	Muriate of Potash,	Bowker Fertilizer Co., Boston, Mass.,	Northampton.
80	Muriate of Potash,	Bowker Fertilizer Co., Boston Mass.,	Fall River.
224	High Grade Sulphate of Potash,	Bowker Fertilizer Co., Boston, Mass.,	Boston.
192	Sulphate of Ammonia,	Bowker Fertilizer Co., Boston, Mass.,	Boston.
194	Sulphate of Ammonia,	Bowker Fertilizer Co., Boston, Mass.,	Boston.
239	Bowker's Superphosphate,	Bowker Fertilizer Co., Boston, Mass.,	Haverhill.
9	Magnolia Brand Cotton Seed Meal,	Chas. M. Cox Co., Boston, Mass.,	Sunderland.
219	Nitrate of Soda,	Lowell Fertilizer Co., Boston, Mass.,	Amesbury.
204	Acid Phosphate,	Lowell Fertilizer Co., Boston, Mass.,	Amesbury.
205	Muriate of Potash,	Lowell Fertilizer Co., Boston, Mass.,	Amesbury.
20	Vegetable Potash,	Olds & Whipple, Hartford, Conn.,	Sunderland.
23	Vegetable Potash,	Olds & Whipple, Hartford, Conn.,	Hatfield.
466	Vegetable Potash,	Olds & Whipple, Hartford, Conn.,	Southwick.
460	Stem Ashes,	Olds & Whipple, Hartford, Conn.,	Southwick.
66	Nitrate of Soda,	Russia Cement Co., Gloucester, Mass.,	Hadley.
96	Nitrate of Soda.	Russia Cement Co., Gloucester, Mass.,	Taunton.
287	Nitrate of Soda,	Russia Cement Co., Gloucester, Mass.,	Worcester.
451	Sulphate of Potash, High Grade,	Sanderson's Fertilizer and Chemical Co., New Haven, Ct.	Southwick.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs. Found.	Nitrogen in 100 lbs. Guaranteed.	Phosphoric Acid in 100 lbs. Soluble.	Reverted.	Insoluble.	Total. Found.	Total. Guaranteed.	Available. Found.	Available. Guaranteed.	Potassium Oxide in 100 lbs. Found.	Potassium Oxide in 100 lbs. Guaranteed.
	Chemicals.												
179-198-229	Nitrate of Soda,	2.71	15.12	15-16	—	—	—	—	—	—	—	—	—
164-222	Dissolved Bone Black,	8.49	—	—	10.80	6.70	1.22	18.72	16-20	17.50	15-18	—	—
61-80	Muriate of Potash,	2.14	—	—	—	—	—	—	—	—	—	48.60	50-52
224	High grade Sulphate of Potash,	.75	—	—	—	—	—	—	—	—	—	49.36	48-52
192-194	Sulphate of Ammonia,	1.04	22.16	19-20	—	—	—	—	—	—	—	—	—
239	Superphosphate,	9.35	—	—	9.02	4.84	3.10	16.96	15-17	13.86	13-15	—	—
9	Cotton Seed Meal,	7.91	6.66	7	—	—	—	—	—	—	—	—	—
219	Nitrate of Soda,	2.13	15.01	15.	—	—	—	—	—	—	—	—	—
204	Acid Phosphate,	10.26	—	—	10.68	5.02	3.46	19.16	16-18	15.70	—	—	—
205	Muriate of Potash,	1.75	—	—	—	—	—	—	—	—	—	53.12	50-53
20-23-466	Vegetable Potash,	4.89	—	—	—	—	—	—	—	—	—	25.96	25
460	Stem Ashes,	1.81	—	—	—	—	—	—	—	—	—	27.84	25
66-96-287	Nitrate of Soda,	1.76	15.58	15.8	—	—	—	—	—	—	—	—	—

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1902, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Ground Bones and Tankage.		
78	Fine Ground Bone,	American Agricultural Chemical Co., Boston, Mass.,	Weir.
141	Fine Ground Bone,	American Agricultural Chemical Co., Boston, Mass.,	New Bedford.
212	Fine Ground Bone,	American Agricultural Chemical Co., Boston, Mass.,	Haverhill.
223	Fine Ground Bone,	American Agricultural Chemical Co., Boston, Mass.,	Boston.
406	Fine Ground Bone,	American Agricultural Chemical Co., Boston, Mass.,	Pittsfield.
454	Fine Ground Bone,	American Agricultural Chemical Co., Boston, Mass.,	Westfield.
321	Bone Meal,	Armour Fertilizer Works, Baltimore, Md.,	Danvers.
101	Tankage,	Butchers' Rendering Co., Fall River, Mass.,	Fall River.
416	Tankage,	Bartlett & Holmes, Springfield, Mass.,	Springfield.
173	Fresh Ground Bone,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
305	Fresh Ground Bone,	Bowker Fertilizer Co., Boston, Mass.,	Concord.
319	Fresh Ground Bone,	Bowker Fertilizer Co., Boston, Mass.,	Beverly.
469	XXX Pure Ground Bone,	E. Frank Coe Co., New York City,	Southwick.
248	Pure Bone Meal.	Thomas Hersom & Co., New Bedford, Mass.,	New Bedford.
230	Swift's Ground Bone,	Lowell Fertilizer Co., Boston, Mass.,	Boston.
262	Steamed Bone,	McQuade Bros., Worcester, Mass.,	Worcester.
482	Strictly Pure Fine Bone,	Rogers & Hubbard Co., Middletown, Conn.,	Amherst.
483	Raw Knuckle Bone Flour,	Rogers & Hubbard Co., Middletown, Conn.,	Amherst.
425	Knuckle Bone Flour,	Rogers Manufacturing Co., Rockfall, Conn.,	Lee.
256	No. 1 Bone,	The Salisbury Cutlery Handle Co., Salisbury, Conn.,	Boston.
282	Pure Ground Bone,	Jas. P. Trainor, Jamesville, Mass.,	Worcester.
426	Tankage,	J. M. Woodard & Bro., Greenfield, Mass.,	Greenfield.
504	Pure Ground Bone,	Whitman & Pratt Rendering Co., Dracut, Mass.,	Dracut.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Mechanical Analysis.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Total. Found.	Total. Guaranteed.	Available. Found.	Available. Guaranteed.	Fine Bone.	Fine Medium.	Medium.	Coarse Medium.
	Ground Bones and Tankage.														
78-141-212-223-406-454	Fine Ground Bone,	9.75	2.44	2.47-3.30	—	9.08	17.98	27.06	22.8	9.08	—	63.15	27.92	8.93	—
321	Bone Meal,	8.95	2.67	2.47	—	8.78	15.10	23.88	24.	8.78	—	62.53	22.27	13.35	1.85
101	Tankage,	16.46	5.30	5-6	—	9.90	7.52	17.42	18-20	9.90	—	17.94	34.07	29.04	18.92
416	Tankage,	8.29	4.01	4.12-4.94	—	8.00	8.00	16.00	17-18	8.00	—	50.33	36.41	11.82	1.44
173-305-319	Fresh Ground Bone,	5.18	2.45	2.25-3.25	—	6.92	17.98	24.90	24-26	6.92	—	52.40	26.08	16.85	4.67
469	XXX Pure Ground Bone,	8.12	3.04	1.85-2.47	—	11.82	12.16	23.98	22.9-25.18	11.82	—	37.29	29.71	28.49	4.51
248	Pure Bone Meal,	3.55	2.08	2.17	—	9.32	18.60	27.92	29.12	9.32	—	78.22	17.16	2.20	2.42
230	Swift's Ground Bone,	8.08	3.92	2.47	—	5.96	18.84	24.80	23-28	5.96	—	34.96	29.08	28.17	7.79
262	Steamed Bone,	15.13	2.32	2.78	—	9.12	16.34	25.46	24.52	9.12	—	45.96	35.32	15.21	3.51
482	Strictly Pure Fine Bone,	5.25	3.81	3.79-4	—	7.74	14.74	22.48	20-23	7.74	—	—	—	—	—
483	Raw Knuckle Bone Flour,	6.71	4.20	3.82-4	—	6.60	19.24	25.84	24.7-25.6	6.60	—	—	—	—	—
425	Knuckle Bone Flour,	9.83	3.76	3.95-4.61	—	8.00	17.92	25.92	24-26	8.00	—	32.85	18.74	34.33	14.08
256	No. 1 Bone,	6.83	3.76	—	—	10.30	16.06	26.36	—	10.30	—	90.26	9.13	.61	—
282	Pure Ground Bone,	12.22	2.10	1.84	—	11.36	16.06	27.42	27.76	11.36	—	43.71	44.94	11.35	—
426	Tankage,	7.25	4.80	4-5	—	9.14	10.82	19.96	19-20	9.14	—	22.46	19.75	23.92	33.87
504	Pure Ground Bone,	5.22	2.71	2.47-3.30	—	13.80	13.30	27.10	25-28	13.80	—	72.73	18.60	7.51	1.16

TRADE VALUES OF FERTILIZING INGREDIENTS IN RAW MATERIALS AND CHEMICALS.

	1901	1902
	CENTS PER POUND	
Nitrogen in ammonia salts,	16.5	16.5
" nitrates,	14.0	15.0
Organic nitrogen in dry and fine ground fish, meat, blood, and in high-grade mixed fertilizers,	16.0	16.5
" " " fine bone and tankage,	16.0	16.0
" " " medium bone and tankage,	12.0	12.0
Phosphoric acid soluble in water,	5.0	5.0
" " soluble in ammonium citrate,	4.5	4.5
" " in fine ground fish, bone and tankage,	4.0	4.0
" " in cottonseed meal, castor pomace and wood ashes,	4.0	4.0
" " in coarse fish, bone and tankage,	3.0	3.0
" " insoluble (in water and in am. cit.) in mixed fertilizers,	2.0	2.0
Potash as Sulphate, free from Chlorides,	5.0	5.0
" " Muriate,	4.25	4.25

The market value of low priced materials used for manurial purposes, as salt, wood ashes, various kinds of lime, barnyard manure, factory refuse and waste materials of different description, quite frequently does not stand in close relation to the current market value of the amount of essential articles of plant food they contain. Their cost varies in different localities. Local facilities for cheap transportation and more or less advantageous mechanical conditions for a speedy action, exert as a rule, a decided influence on their selling price.

The market cost of the different essential elements of plant food remains the same as in 1901, with the exception of the nitrogen in form of nitrates and the higher grades of organic nitrogenous fertilizing materials, which show a somewhat higher cost as compared with the previous year.

HATCH EXPERIMENT STATION

—OF THE—

MASSACHUSETTS

AGRICULTURAL COLLEGE.

BULLETIN NO. 85.

JANUARY, 1903.

The Bulletins of this Station will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same.

AMHERST, MASS.:
PRESS OF CARPENTER & MOREHOUSE.
1903.

HATCH EXPERIMENT STATION

OF THE

Massachusetts Agricultural College,

AMHERST, MASS.

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The co-operation and assistance of farmers, fruit-growers, horticulturists, and all interested, directly or indirectly, in agriculture, are earnestly requested. The Bulletins will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same. General bulletins, fertilizer analyses, analyses of feed-stuffs, and annual reports are published. Kindly indicate in application which of these are desired. Communications may be addressed to the

HATCH EXPERIMENT STATION, Amherst, Mass.

Division of Foods and Feeding.

CONCENTRATED FEEDS.

JOSEPH B. LINDSEY.*

TABLE OF CONTENTS.

A. DEFINITION OF TERMS.

The term *concentrated feed*, or *concentrate*, taken in its broadest sense, is intended to include the grains and the seeds of other agricultural plants, as well as their manifold by-products left behind in the process of oil extraction and in the preparation of human foods.

All cattle feeds, whether concentrated or coarse, are composed of the following six groups of substances:

Water.—The several grains and by-products on the market contain from 6 to 12 per cent of water.

Ash represents the mineral ingredients which constitute the ashes after a feed is burned. These ashes consist of lime, potash, soda, magnesia, iron, phosphoric acid and sulfuric acid.

Protein is a collective name for all the nitrogenous matter. It corresponds to the lean meat in the animal, and may be termed

*With the coöperation of E. B. Holland, P. H. Smith, and J. E. Halligan.

"vegetable meat." It has the same elementary composition as animal flesh, and is the most valuable part of a feed.

Fiber or cellulose is the coarse or woody part of a plant. It may be called the plant's framework. It is present as a rule only to a limited extent in the grains and by-products.

Non-nitrogenous extract matter consists of sugars, starch and gums. The cereals are especially rich in starch and similar substances.

Fat includes not only the various oils and fats found in different feed stuffs, but also waxes, resins and coloring matters. It is sometimes termed ether-extract, because it is that portion of a plant soluble in ether. The fat found in grains and seeds is comparatively free from foreign substances (waxes, resins, etc.)

Carbohydrates.—The fiber and extract matter have the same functions in the process of nutrition, and together are termed carbohydrates.

Nutritive Ratio.—The numerical relation which the protein of a feed bears to the carbohydrates (and fat reduced to carbohydrates) is called its nutritive ratio. Fat is multiplied by 2.25 to convert it to carbohydrates. If a ton of feed should contain 60 pounds of digestible protein, and 948 pounds of digestible carbohydrates, it would have 15.8 times as much carbohydrates as protein or 1 : 15.8, which is its nutritive ratio. (See timothy hay).

Digestibility.—Any feed stuff is valuable as a source of nourishment only so far as its various constituents can be digested and assimilated. That the concentrated feeds are much more digestible than the coarse fodders may be shown by the following table :

	100 Pounds Timothy Hay			100 Pounds Gluten Meal		
	Composition	Per Cent. Digestible	Pounds Digestible	Composition	Per Cent. Digestible	Pounds Digestible
Water	15.0	—	—	9.5	—	—
Ash	4.3	—	—	1.0	—	—
Protein	6.3	48	3.0	37.2	88	32.7
Fiber	28.4	58	16.5	2.2	—	—
Extract Matter	43.6	63	27.5	47.9	88	42.1
Fat	2.4	61	1.5	2.2	93	2.1
Total	100.0	—	48.5	100.0	—	76.9

The timothy hay has only 48.5 pounds of digestible organic matter, while the gluten meal has 76.9 pounds.

B. CLASSIFICATION OF CONCENTRATED FEEDS.

DIVISION I. PROTEIN FEEDS.			DIVISION II. STARCHY (CARBOHYDRATE) FEEDS.	
CLASS I. 30 to 45% protein. 50 to 60% carbohydrates.* 75 to 90% digestible.	CLASS II. 20 to 30% protein. 60 to 70% carbohydrates.* 65 to 85% digestible.	CLASS III. 15 to 20% protein. 70 to 75% carbohydrates.* 60 to 75% digestible.	CLASS IV. 8 to 14% protein. 75 to 85% carbohydrates.* 60 to 90% digestible.	CLASS V. 8% and less protein. 85% carbohydrates.* 35 to 60% digestible.
Cottonseed meal. N. P. & O. P. linseed meals. Chicago, Cream and King gluten meals. Atlas and Biles XXXX distillers' grains.	Buffalo, Globe, Pekin Queen, Waukegan and other standard gluten feeds. Germ oil meal. Malt sprouts and dried brewers' grains.	Flour and standard wheat middlings, mixed feed and wheat bran. H-O dairy feed. Oat middlings.	Wheat, rye, barley, oat, corn and hominy meals. Corn and oat, H-O horse, Quaker dairy and Schumacher's Stock feeds.	Corn cobs. Oat feed. Peanut feed.

* Including fat reduced to carbohydrates.

C. FEED STANDARDS.

A standard for comparison is always necessary in passing accurate judgment on the quality of concentrated feed stuffs. The percentages of protein and fat serve as an index of the character of such feeds in the majority of cases.[1] The various concentrates should maintain the following percentages of protein and fat in addition to a good physical and mechanical condition to be of *standard quality*. Failure to substantially meet these requirements, indicates inferiority or adulteration, in proportion as it falls below.

	FEED STUFF.	PROTEIN.	FAT.
Protein Feeds.	*Cottonseed meal,*	43	9
	N. P. linseed meal,	37	2
	O. P. linseed meal,	32	6
	Gluten meal,	35	2
	Gluten feed,	25	3
	Germ-oil meal,	25	10
	Dried distillers' grains,	32–35	10–12
	Malt sprouts,	25	1
	Dried brewers' grains,	22	5
	Wheat middlings (flour),	18–20	5
	Wheat middlings (standard),	17–19	5
	Mixed feed,	16–18	4.5
	Wheat bran,	15–17	4.5
	H–O dairy feed,	18	4
	Oat middlings,	16	6
Starchy (Carbohydrate) Feeds.	*Corn meal,*	9	3
	Hominy meal,	11	8
	Ground oats,	11	4
	Ground barley,	11	2
	Corn and oat feed,	8–9	3.5
	Fortified oat feed (Quaker dairy),	12–14	3–5
	Oat feed,	5–8	2
Poultry Feeds.	*American poultry feed,*	14	5
	H–O poultry feed,	17	5
	H–O scratching feed,	12	4
	Clover meal,	12	2
	Meat and bone meal,	35	10
	Meat scraps,	50	10–15

[1] Among the exceptions are mixed goods and fortified feeds of a relatively low protein content where a fiber determination and possibly a microscopical examination is needed to show the nature and quality of the product.

D. RESULTS OF THE INSPECTION.

I. Protein Feeds.

Cottonseed Meal.

Brand	Manufactured by.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.
			%	%	%	%	%
	American Cotton Oil Co....	Holyoke			43.00		9.00
	American Cotton Oil Co....	Northampton...	6.41	46.85	43.00	8.52	9.00
	American Cotton Oil Co....	N. Hatfield.....			43.00		9.00
	American Cotton Oil Co....	Beverly			43.00		9.00
	American Cotton Oil Co....	Greenfield......			43.00		9.00
	American Cotton Oil Co....	Lawrence	7.97	45.15	43.00	8.69	9.00
	American Cotton Oil Co....	Marlboro.......			43.00		9.00
	American Cotton Oil Co....	Orange.........			43.00		9.00
ınary	R. W. Biggs & Co.	Ayer Junction ..	6.52	44.22	43.00	8.89	9.00
ınary	R. W. Biggs & Co.	Natick			43.00		9.00
reen Diamond	Chapin & Co.	S. Deerfield	6.38	44.01	43.00	9.27	9.00
reen Diamond	Chapin & Co.	Springfield			43.00		9.00
reen Diamond	Chapin & Co.	Ayer Junction ..			43.00		9.00
reen Diamond	Chapin & Co.	Fitchburg			43.00		9.00
reen Diamond	Chapin & Co.	N. Amherst	6.41	44.40	43.00	10.26	9.00
reen Diamond	Chapin & Co.	Southboro			43.00		9.00
	Cordele Oil Co............	S. Deerfield	7.30	44.89	7.50[1]	9.07	—
agnolia	Chas. M. Cox Co.	Westfield	7.35	46.73	43.00	9.31	9.00
agnolia	Chas. M. Cox Co.	Fall River........	6.99	43.96	43.00	8.55	9.00
	Hayley & Beine	Springfield	6.32	42.11	43.00	14.30	9.00
xie	Humphreys, Godwin & Co..	Northampton...	6.66	47.91	43.00	8.97	9.00
xie	Humphreys, Godwin & Co..	Springfield			43.00		9.00
	Planter's Cotton Oil Co.....	N. Hatfield... ...	7.39	45.10	7.5-8.5[2]	8.36	—
ar	Sledge & Wells Co.	Worcester........	7.37	42.60	43.00	11.06	9.00
	Southern Cotton Oil Co....	Holyoke	6.39	43.43	7.50[1]	10.97	—
	American Cotton Oil Co....	Greenfield			41.50		9.00
	American Cotton Oil Co....	Greenfield			41.50		9.00
	American Cotton Oil Co....	Holyoke	6.33	40.94	41.50	9.17	9.00
	American Cotton Oil Co....	Holyoke			41.50		9.00
	Independent Cotton Oil Co.	Northampton.....	7.70	41.55	43.00	9.11	9.00
	J. E. Soper & Co.	Northampton.....	6.47	40.01	38.60	9.45	—
	J. E. Soper & Co.	Beverly	6.59	41.29	43.00	7.74	9.10
	J. E. Soper & Co.	Newton Highl'ds			43.00		9.10
	Unknown..................	E. Walpole.......	7.56	40.72	43.00	8.22	9.00
	Low grade.						
eamo Feed	Tennessee Fibre Co........	Wakefield	8.59	27.25	25.00	5.84	6.00
	Unknown..................	Worcester.........	8.64	22.81	—	9.41	—
	Highest	....	7.97	47.91	—	14.30	—
	Lowest	....	6.32	22.81	—	5.84	—
	Average[3]	....	6.83	43.93	—	9.20	—

[1] As Ammonia equivalent to 38.57% Protein.
[2] As Ammonia equivalent to 38.57-43.71% Protein.
[3] Low grade excluded from average.

Linseed Meal.

Brand	Manufactured by:	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.
			%	%	%	%	%
	1. New Process.						
Cleveland Flax	American Linseed Co.	Newton Highl'ds	9.04	41.85	—	1.70	—
Cleveland Flax	American Linseed Co.	Salem			37.5-40		1-3
	American Linseed Co.	Salem	9.19	39.27	37.5-40	2.47	1-3
	American Linseed Co.	Worcester			37.5-40		1-3
	American Linseed Co.	Fitchburg			38-40		1-3
	American Linseed Co.	Leominster	6.56	39.40	38-40	1.89	1-3
	American Linseed Co.	Lowell			38-40		1-3
	American Linseed Co.	Taunton			38-40		1-3
	Average		7.84	39.99	—	1.99	—
	2. Old Process.						
	American Linseed Co.	Greenfield			32-36		5-7
	American Linseed Co.	Lawrence	9.73	34.10	32-36	6.27	5-7
	American Linseed Co.	Worcester			32-36		5-7
	Hauenstein & Co.	Orange	8.86	36.91	40.96	7.30	8.65
	Hunter Bros.	S. Framingham	8.42	33.79	34.00	8.76	6.50
	Mann Bros. Co.	Gt. Barrington	9.93	36.24	34.15	7.26	6.05
	Union Linseed Co.	N. Adams	11.59	37.34	—	3.86	—
	Wright & Hills Lins'd Oil Co.	Fitchburg	9.09	36.95	—	5.78	—
	Slightly below standard.						
	Metzger Seed & Oil Co.	Natick	9.56	31.06	32-36	7.61	5-7
	Metzger Seed & Oil Co.	N. Wilbraham			32-36		5-7
	Midland Linseed Oil Co.	Adams	9.12	29.71	32.5-37.5	7.59	5.5-8.
	Midland Linseed Oil Co.	Brookfield			32.5-37.5		5.5-8.
Square	Unknown	Lawrence	9.35	30.94	—	7.11	—
	Average		9.52	33.59	—	6.87	—

Gluten Meal.

Brand	Manufactured by:	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.
Chicago	Glucose Sugar Refining Co.	Fall River			38.00		3.0
Chicago	Glucose Sugar Refining Co.	Hudson	9.90	37.34	38.00	2.24	3.0
Chicago	Glucose Sugar Refining Co.	Winchendon			38.00		3.0
King	National Starch Co.	Clinton			35.50		3.7
King	National Starch Co.	Fitchburg	8.11	32.60	35.50	2.45	3.7
King	National Starch Co.	Lawrence			35.50		3.7
Cream	Chas. Pope Glucose Co.	Danversport			34.12		3.2
Cream	Chas. Pope Glucose Co.	Lowell	8.88	42.64	34.12	1.86	3.2
Cream	Chas. Pope Glucose Co.	Millbury			34.12		3.2
Cream	Chas. Pope Glucose Co.	Winchendon			34.12		3.2
	Average		8.95	38.04	—	2.15	—

Gluten Feed.

Brand	Manufactured by:	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.
			%	%	%	%	%
Buffalo	Glucose Sugar Refining Co.	Ayer Junction			28.00		3.00
Buffalo	Glucose Sugar Refining Co.	Lynn	8.74	26.50	28.00	2.49	3.00
Buffalo	Glucose Sugar Refining Co.	Natick			28.00		3.00
Buffalo	Glucose Sugar Refining Co.	Salem			28-30		3.5
Buffalo	Glucose Sugar Refining Co.	E. Walpole	9.35	27.07	27.50	2.66	3.80
Buffalo	Glucose Sugar Refining Co.	Ware			27.50		3.80
Buffalo	Glucose Sugar Refining Co.	Lawrence	10.10	25.71	—	3.22	—
Pekin	Illinois Sugar Refining Co.	Southboro	9.10	29.04	28.00	2.33	3.00
Pekin	Illinois Sugar Refining Co.	Ware			28.00		3.00
Pekin	Illinois Sugar Refining Co.	Worcester	8.27	26.24	27.50	3.38	3.30
	Illinois Sugar Refining Co.	Danvers	11.55	24.31	—	1.51	—
Queen	National Starch Co.	Beverly			27.10		3.20
Queen	National Starch Co.	Gt. Barrington	8.83	26.15	27.10	2.01	3.20
Queen	National Starch Co.	Southboro			27.10		3.20
Glen Cove	National Starch Co.	Amherst	9.28	24.13	31.70	2.71	4.30
Globe	New York Glucose Co.	Athol			27.50		3.38
Globe	New York Glucose Co.	Fitchburg	8.51	26.06	27.50	2.66	3.38
Globe	New York Glucose Co.	Shelburne Falls			27.50		3.38
New West	Noyes & Colby	Concord	9.49	25.71	—	3.39	—
	Powells & Co.	Lowell	7.95	24.92	—	1.68	—
Waukegan	United States Sugar Ref. Co.	E. Brookfield	9.26	26.11	27.30	3.59	3.30
	Unknown	Lowell	8.66	27.20	—	2.47	—
	Unknown	Lynn	10.28	25.23	—	1.71	—
	Unknown	Newburyport	9.32	26.99	—	2.32	—
	Unknown	Newton Highlands	9.56	26.02	—	2.91	—
	Highest		11.55	29.04	—	3.59	—
	Lowest		7.95	24.13	—	1.51	—
	Average		9.10	26.29	—	2.51	—

Distillers' Grains.

Atlas Gluten Meal	Atlas Feed & Milling Co.	Newburyport	7.46	36.11	36.00	14.81	11.00
XXXX Dist. Grains	J. W. Biles Co.	Concord			33.00		11.00
XXXX Dist. Grains	J. W. Biles Co.	Needham	7.67	34.84	33.00	10.50	11.00
XXXX Dist. Grains	J. W. Biles Co.	N. Amherst			33.00		11.00
XXXX Dist. Grains	J. W. Biles Co.	Taunton			33.00		11.00
	Average		7.63	35.09	—	11.36	—

Malt Sprouts.

Malt Sprouts	E. P. Mueller	Marlboro	10.32	22.51	26.25	1.07	1.91
Malt Sprouts	Unknown	Concord	10.36	25.32	—	1.04	—
Malt Sprouts	Unknown	Danvers	9.71	22.02	—	1.11	—
Malt Sprouts	Unknown	Marlboro	13.12	27.25	—	0.71	—
Malt Sprouts	Unknown	S. Framingham	6.70	27.64	—	2.97	—
Malt Sprouts	Unknown	Wakefield	11.03	25.19	—	1.13	—
Malt Sprouts	Unknown	Worcester	9.44	27.69	—	0.67	—
	Average		10.09	25.38	—	1.24	—

Wheat Middlings.

Brand	Manufactured by:	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.
			%	%	%	%	%
	1. Flour.						
?ancy	Andrews & Co.	Natick	9.62	21.15	—	5.38	—
?ancy	Andrews & Co.	N. Adams			—		—
	Armstrong Milling Co.	Newton Highl'nds	10.10	18.87	—	5.82	—
?ed Dog	Chas. M. Cox Co.	Lowell	10.07	19.83	—	5.12	—
?o. 1 Extra Flour	New Prague Flour. Mill Co.	Shelburne Falls	9.99	20.32	—	6.23	—
?o. 1 Extra Flour	New Prague Flour. Mill Co.	Ware			—		—
?XX Comet	Northwest. Consol. Mill. Co.	Northampton	10.43	20.89	—	5.99	—
?XX Comet	Northwest. Consol. Mill. Co.	Worcester			—		—
?lour	Northwest. Consol. Mill. Co.	Northampton	10.35	19.39	—	6.18	—
?X Daisy	C. A. Pillsbury	Hudson	10.42	20.71	—	5.77	—
?ancy Flour	Spencer Grain Co.	Fitchburg	10.30	19.88	—	5.47	—
?onitor	Unknown	Taunton	11.01	18.69	—	2.89	—
?ed Dog	Unknown	Marlboro	9.63	20.40	—	5.68	—
?lour	Unknown	Hudson	10.69	20.67	—	4.97	—
	Unknown	Ayer Junction	10.83	19.70	—	5.25	—
	Inferior—below standard.						
?hoice Winter	Valley City Milling Co.	Newburyport	10.69	16.14	—	4.20	—
?lour	Unknown	Woburn	11.82	13.42	—	3.51	—
	Average[1]		10.23	20.19	—	5.49	—
	2. Standard.						
	Ansted & Burk Co	Lowell	10.41	17.34	—	4.22	—
?nowball	Seymour Carter	Athol	10.27	19.39	—	4.93	—
?nowball	Seymour Carter	Greenfield			—		—
?iagara Standard	Cataract City Milling Co.	Lawrence	10.50	19.97	—	6.21	—
?. N. B.	Rodney J. Hardy & Sons	Athol	9.29	19.31	—	6.01	—
?tandard	New Prague Flour. Mill Co.	Danversport	10.36	17.95	—	5.47	—
?tandard	New Prague Flour. Mill Co.	Ware			—		—
?anhattan	New York City Milling Co.	New Bedford	9.74	20.14	—	5.93	—
?B.	Northwest. Consol. Mill. Co.	Northampton	9.34	17.86	—	5.76	—
	Northwest. Consol. Mill. Co.	Orange	10.30	18.25	—	5.56	—
?B.	C. A. Pillsbury	Ware	10.79	19.18	—	5.69	—
	F. W. Stock & Sons	Millbury	10.68	18.03	—	4.98	—
	F. W. Stock & Sons	Walpole			—		—
?tandard	Washburn-Crosby Co.	Ayer Junction	9.96	19.57	—	5.47	—
L. A. G. M. Winter	Unknown	Winchendon	9.99	20.79	—	6.40	—
	Unknown	Northampton	11.56	21.06	—	5.75	—
	Unknown	Westfield	10.00	18.60	—	5.91	—
	Average		10.27	18.99	—	5.51	—

[1] Inferior excluded from average.

Mixed Feeds.

Brand	Manufactured by:	Sampled at:	Water	Protein		Fat
				Found	Guar.	Found
			%	%	%	%
Acme	Acme Milling Co.	E. Walpole	10.82	17.64	—	4.65
Buckeye	American Cereal Co.	Norwood	11.36	18.03	17.75	4.55
Buckeye	American Cereal Co.	Worcester			17.75	
	Blish Milling Co.	Amherst	9.19	17.81	—	4.73
Royal	Brooks Elevator Co.	Leominster	10.13	15.97	—	4.95
Croesus	Seymour Carter	Ware	9.79	18.87	—	5.26
Ozark	Chapin & Co.	Worcester	10.23	19.18	—	4.51
U. S.	Chapin & Co.	Concord	9.50	18.38	—	5.65
Vermont	Chapin & Co.	Norwood	9.00	19.31	—	4.93
Columbia	Chas. M. Cox Co.	Concord	10.50	17.29	—	5.47
Columbia	Chas. M. Cox Co.	Westboro			—	
Boston	Duluth-Superior Milling Co.	Ayer Junction	11.47	18.30	—	5.06
Boston	Duluth-Superior Milling Co.	Marlboro			—	
Boston	Duluth-Superior Milling Co.	Orange			—	
S	Duluth-Superior Milling Co.	Lowell	10.88	18.21	—	4.91
S	Duluth-Superior Milling Co.	Natick			—	
Hiawatha	Duluth-Superior Milling Co.	Natick	9.53	17.95	—	5.20
Minkota	Duluth-Superior Milling Co.	Worcester	9.69	19.04	—	4.61
Hoosier Mill	Geo. T. Evans	Springfield	10.39	17.99	—	4.33
Hoosier Mill	Geo. T. Evans	Taunton			—	
Commander	Gregory, Cook & Co.	Norwood	10.72	19.22	—	5.97
Commander	Gregory, Cook & Co.	Taunton			—	
Berkshire	Rodney J. Hardy & Sons	Winchendon	10.26	18.51	—	5.01
Berkshire	Rodney J. Hardy & Sons	Worcester			—	
	Isaac Harter Co.	Lawrence	10.63	16.85	—	3.88
Queen	Hecker-Jones-Jewell Mill. Co.	Springfield	10.15	17.03	—	4.76
Erie	Hunter Bros.	Worcester	9.35	18.74	—	4.31
Sunshine	Hunter Bros.	Hudson	10.88	17.25	—	4.66
	Hunter Bros.	Springfield	9.63	17.38	—	4.46
Kyome	J. E. M. Milling Co.	Gloucester	10.69	18.07	—	4.20
Kyome	J. E. M. Milling Co.	Lowell			—	
Rex	Kehlor Bros.	Fitchburg	10.43	17.81	—	4.49
Rex	Kehlor Bros.	Winchendon			—	
	Kehlor Bros.	Fall River	10.69	18.60	—	4.46
	Kehlor Bros.	Lowell			—	
	Kehlor Bros.	Northampton			—	
Snowflake	Lawrenceburg Roll. M'ls Co.	Millbury	10.79	18.60	—	4.53
Snowflake	Lawrenceburg Roll. M'ls Co.	Taunton			—	
King	R. P. Moore Milling Co.	Lawrence	9.66	18.25	—	4.84
	Noblesville Milling Co.	Fitchburg	10.93	17.51	—	4.52
Fancy	C. A. Pillsbury	Ayer Junction	9.17	18.16	—	5.30
	Star & Crescent Milling Co.	Fitchburg	10.49	18.34	—	4.54
	David Stott	Lynn	10.80	17.34	—	4.88
	Thornton & Chester Mill Co.	Southboro	10.45	18.25	—	5.58
Farmer's Favorite	Valley City Milling Co.	Dalton	10.54	16.81	—	4.27
	Zaring	Norwood	10.28	15.53	—	3.81
Diamond	Unknown	Clinton	10.66	18.34	—	4.34
Diamond	Unknown	Millbury			—	
Diamond	Unknown	Newburyport			—	
Diamond	Unknown	Waltham			—	
E. M.	Unknown	Winchendon	11.49	20.40	—	4.66
Hamlin	Unknown	Danversport	11.08	18.47	—	4.29
N....	Unknown	Lynn	9.67	17.20	—	5.12
	Unknown	Gt. Barrington	10.28	18.25	—	4.30
	Unknown	Hudson	10.57	16.67	—	4.37
	Unknown	Lawrence	9.51	16.94	—	4.96
	Unknown	Newburyport	9.58	18.16	—	4.62
	Unknown	Salem	9.95	18.12	—	4.16
	Unknown	Westfield	10.63	18.16	—	4.40

MIXED FEEDS (continued).

Brand	Manufactured by:	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.
			%	%	%	%	%
	Adulterated.						
;elmore Mills	Diamond Mills	Springfield	9.50	12.38	12.75	3.33	2.96
:mpire State	Diamond Mills	Springfield	9.88	14.21	14.96	3.44	3.48
ersey	Kentucky Milling Co.	Springfield	9.81	13.38	11.56	3.59	3.65
;lue Grass	A. Waller & Co.	Ware	9.72	14.09	12.59	3.96	3.19
:entucky	Unknown	Athol	8.92	11.93	—	3.53	—
:entucky	Unknown	Quincy	9.44	12.86	—	3.04	—
:entucky	Unknown	Salem	8.62	12.77	—	3.29	—
:entucky	Unknown	Springfield	9.49	14.70	—	3.28	—
:entucky	Unknown	Taunton	9.46	13.38	—	4.03	—
:entucky	Unknown	Weymouth	8.77	12.29	—	2.84	—
:entucky Dairy	Unknown	Lawrence	9.54	12.64	—	3.07	—
:entucky Dairy	Unknown	Needham	9.58	12.69	—	3.04	—
:entucky Dairy	Unknown	New Bedford	8.94	12.99	—	3.16	—
:entucky Dairy	Unknown	New Bedford	8.89	11.98	—	3.23	—
	Unknown	Lowell	8.77	11.89	—	4.78	—
	Unknown	New Bedford	9.28	12.99	—	3.54	—
	Unknown	N. Adams	9.15	11.28	—	3.07	—
	Unknown	Orange	9.58	14.09	—	3.36	—
	Unknown	S. Framingham	9.57	13.21	—	3.15	—
	Highest		11.49	20.40	—	5.65	—
	Lowest		9.17	15.53	—	3.81	—
	Average[1]		10.42	18.06	—	4.53	—

WHEAT BRAN.

Brand	Manufactured by:	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.
;adger	Berger-Anderson Co.	Adams	10.00	17.90	—	4.46	—
	Bergen Roller Mills	Woburn	10.86	15.05	—	4.09	—
Jew York White	A. H. Brown & Bros.	Gloucester	11.48	16.37	—	4.46	—
:lover Leaf	Seymour Carter	Winchendon	9.41	17.55	—	4.87	—
Ionogram	Chas. M. Cox Co.	Salem	10.74	16.14	—	5.38	—
)uluth-Imperial	Duluth-Superior Milling Co.	Fitchburg	10.48	18.07	—	5.32	—
	Fenton Mills	Concord	10.99	16.06	—	3.79	—
	Isaac Harter	Lawrence	10.14	16.19	—	3.68	—
t. Louis	Hunter Bros.	Lowell	10.00	16.32	—	4.80	—
	Mosely & Motley Mill. Co.	N. Adams	10.17	18.12	—	5.65	—
;road Flake	New Prague Flour. Mill	Ware	9.87	16.72	—	5.05	—
ndependence	New York City Milling Co.	New Bedford	10.09	17.29	—	5.13	—
Iichigan Winter	Valley City Milling Co.	Dalton	10.39	16.76	—	4.49	—
:hoice Winter	Voigt Milling Co.	Winchendon	10.32	17.11	—	4.51	—
:oarse	Washburn-Crosby Co.	Marlboro	10.71	16.32	—	5.03	—
:oarse	Washburn-Crosby Co.	Winchendon			—		—
'ancy Canada	Unknown	Worcester	10.24	16.02	—	4.18	—
;t. Louis	Unknown	Athol	9.72	15.79	—	4.50	—
	Unknown	Hudson	10.91	17.90	—	4.51	—
	Unknown	Hudson	10.62	15.23	—	4.67	—
	Unknown	N. Wilbraham	10.40	16.10	—	4.75	—
	Average		10.39	16.63	—	4.68	—

[1] Adulterated excluded from average.

Dairy and Miscellaneous Feeds.

Brand	Manufactured by :	Sampled at :	Water	Protein		Fat	
				Found	Guar.	Found	Gua
			%	%	%	%	%
Blatchford's Calf M'l	J. W. Barwell	Beverly	10.05	25.09	26.00	4.94	5.0
Bibby Dairy Meal	J. Bibby & Sons	Waltham	9.82	18.92	—	9.75	—
Bibby Dairy Cake	J. Bibby & Sons	Concord	8.16	21.20	—	9.23	—
Germ Oil Meal	Glucose Sugar Refining Co.	Salem	9.56	25.14	25.50	9.36	10.5
H-O Dairy	H-O Co.	Athol	9.19	19.13	18.00	3.94	4.5
H-O Dairy	H-O Co.	N. Adams			18.00		4 5
Nutrene Dairy	Wogan Bros.	Leominster	11.17	14.08	17.00	2.85	5.0
Nutrene Dairy	Wogan Bros.	Newburyport			17.00		5.0
Oat Middlings	Unknown	Wakefield	7.90	18.47	—	6.96	—
Pea Meal	Unknown	Newburyport	10.37	24.62	—	1.55	—

II. Starchy (Carbohydrate) Feeds.

Corn Meal.

Brand	Manufactured by:	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.
			%	%	%	%	%
	Diamond Mills	Springfield	13.12	10.09	—	3.82	—
	Diamond Mills	Springfield	12.20	10.53	—	5.39	—
	J. W. Doon & Son	Natick	13.04	9.83	—	4.03	—
	Average		12.79	10.15	—	4.41	

Hominy Meal.

Brand	Manufactured by:	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.
	American Cereal Co.	Leominster	9.70	11.23	—	8.74	—
	American Cereal Co.	Worcester			—		—
	Buffalo Cereal Co.	Shelburne Falls	8.21	11.54	11.00	8.25	8.50
	Chas. M. Cox Co.	Lawrence	9.40	11.76	—	8.93	—
	Hunter Bros.	Worcester	10.74	12.42	11.02	9.26	7.70
	Miner-Hillard MillingCo.	Beverly	7.09	12.02	—	9.05	—
	Toledo Elevator Co.	Adams	9.03	10.97	10.93	8.80	7.05
	Toledo Elevator Co.	Worcester			10.93		7.05
	Unknown	Danvers	9.15	11.72	—	9.93	—
	Unknown	Walpole	9.19	11.72	—	9.17	—
	Unknown	Ware	9.63	10.71	—	8.09	—
	Average		9.16	11.48	—	8.89	—

Oat Feed.

Brand	Manufactured by:	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.
1	American Cereal Co.	Athol	7.29	7.42	2.50	3.11	2.75
yle	Great Western Cereal Co.	Westboro	7.14	5.49	6.97	1.34	2.83
am	Great Western Cereal Co.	Fall River	7.56	6.14	6.97	1.72	2.83
yal	Great Western Cereal Co.	Wakefield	6.97	7.37	7.53	2.93	2.55
ena	Illinois Cereal Co.	Lowell	8.07	4.87	—	1.31	—
yle	Norton-Chapman Co.	Newburyport	7.54	7.33	6.97	1.79	2.83
ston	J. E. Soper & Co.	Danvers	7.74	8.08	6.97	2.17	2.83
	H. W. Crowell	Newton Highl'nds	9.49	8.25	—	2.44	—
outs	Unknown	Wakefield	9.54	10.49	—	2.29	—
	Unknown	Lowell	8.26	8.30	—	4.22	—
	Unknown	Wakefield	7.75	6.49	—	3.39	—
	Inferior.						
nada	Unknown	Southboro	8.97	2.37	—	0.59	—
	Unknown	Ware	7.63	3.65	—	1.03	—
	Average[1]		7.94	7.29	—	2.43	—

[1] Inferior excluded from average.

Corn and Oat Feed—Provender.

Brand	Manufactured by:	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Gua
			%	%	%	%	%
Victor	American Cereal Co.	Athol			9.00		4.0
Victor	American Cereal Co.	E. Brookfield			9.00		4.0
Victor	American Cereal Co.	Leominster	9.60	9.52	9.00	3.63	4.0
Victor	American Cereal Co.	Lowell			9.00		4.0
Victor	American Cereal Co.	Taunton			9.00		4.0
Horse Feed	Buffalo Cereal Co.	New Bedford	8.48	13.16	12.00	4.57	4.5
Diamond	Diamond Mills	Gt. Barrington	10.61	8.65	9.44	3.82	4.7
De-Fi	Ellsworth & Co.	New Bedford	8.94	9.74	8.30	2.65	3.0
De-Fi	Ellsworth & Co.	Waltham			8.30		3.0
Red Tag A	J. B. Garland & Son	Millbury	8.62	11.41	12.75	4.96	3.5
Red Tag B	J. B. Garland & Son	Worcester	8.46	10.62	11.50	5.08	3.2
Boss	Great Western Cereal Co.	Holyoke	9.54	8.21	7.94	2.74	4.1
Durham	Great Western Cereal Co.	Gardner	9.51	8.78	9.46	3.06	3.9
Excelsior	Great Western Cereal Co.	Waltham	9.72	10.49	8.21	4.90	4.5
Excelsior	Great Western Cereal Co.	Ware	9.22	9.52	8.21	5.23	4.5
Haskell's	W. H. Haskell & Co.	Concord	8.27	9.21	12.00	6.66	6.2
H-O Horse	H-O Co.	Lowell	8.92	13.47	12.00	4.99	4.5
Star	Miner-Hillard Milling Co.	Marlboro	10.19	10.49	—	5.43	—
Lenox Stock	Strong-Lefferts Co.	Amherst	10.72	7.59	10.40	2.67	3.2
Lenox Stock	Strong-Lefferts Co.	Springfield	11.31	8.04	10.40	3.36	3.2
Lenox Stock	Strong-Lefferts Co.	Springfield	10.47	7.86	10.40	3.02	3.2
Lenox Stock	Strong-Lefferts Co.	Amherst	9.98	9.92	10.40	4.34	3.2
	Highest		11.31	13.47	—	6.66	—
	Lowest		8.27	8.04	—	2.65	—
	Average		9.54	9.80	—	4.01	—

Dairy and Miscellaneous Feeds.

Brand	Manufactured by:	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Gua
Quaker Dairy	American Cereal Co.	Fitchburg			14.00		3.5
Quaker Dairy	American Cereal Co.	Lawrence			14.00		3.5
Quaker Dairy	American Cereal Co.	Lowell	8.00	14.39	14.00	3.12	3.5
Quaker Dairy	American Cereal Co.	Shelburne Falls			14.00		3.5
Quaker Dairy	American Cereal Co.	Worcester			14.00		3.5
Schumacher's	American Cereal Co.	Fall River			13.00		5.0
Schumacher's	American Cereal Co.	Fitchburg	8.86	12.60	13.00	5.32	5.0
Schumacher's	American Cereal Co.	Shelburne Falls			13.00		5.0
	M. L. Crittenden	Clinton	9.65	14.21	—	5.07	—
Stock Feed	M. L. Crittenden	Hudson	10.02	12.73	11.97	4.12	4.0
Gt. Western Dairy	Great Western Cereal Co.	Chicopee Falls			12.25		3.2
Gt. Western Dairy	Great Western Cereal Co.	Gardner	7.79	9.70	12.25	2.85	3.2
Gt. Western Dairy	Great Western Cereal Co.	Winchendon			12.25		3.2
I. X. L.	New Occidental Mill Co.	Holyoke	10.53	13.47	—	4.80	—
Corn Bran	Unknown	Wakefield	10.73	12.99	—	2.76	—
Peanut Bran	Phoenix Milling Co.	Worcester	9.85	9.09	7.70	3.00	2.3

III. Poultry Feeds.

Brand	Manufactured by:	Sampled at:	Water	Protein		Fat	
				Found	Guar.	Found	Guar.
			%	%	%	%	%
merican	American Cereal Co........	Lowell	10.34	14.26	14.00	5.93	4.50
-O	H-O Co....................	Leominster.......	9.37	17.90	17.00	5.25	5.50
-O ScratchingFood	H-O Co....................	Wakefield	10.27	13.25	—	4.02	—
'yandot	Ross Bros.................	Ayer Junction....	8.81	9.48	—	2.88	—
	Average............	....	9.70	13.72	—	4.52	—

Meat and Bone Meals.

	Beach Soap Co.	Beverly	4.84	27.29	—	8.96	—
	Bowker Fertilizer Co.......	Leominster.......	4.99	36.11	—	7.65	—
	Average............	....	4.91	31.70	—	8.31	—

Meat Scraps.

	Joseph Breck & Sons	Newburyport.....	9.18	56.16	—	10.04	—
	Geo. E. Marsh & Co.	Lynn.............	12.62	48.14	—	11.01	—
	Average............	....	10.90	52.15	—	10.52	—

AVERAGE ANALYSES.

Feed Stuffs.	Number of Samples.	Composition.					
		Water.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
Protein Feeds.							
Cottonseed meal	206	7.0	6.5	45.4	6.1	24.5	10.5
Cleveland flax meal	19	9.0	5.3	38.3	8.8	36.2	2.4
Linseed meal (new process)	18	9.0	5.5	36.9	8.9	37.2	2.5
Linseed meal (old process)	77	8.5	5.2	34.6	8.6	36.8	6.3
Chicago gluten meal	49	9.5	1.0	37.2	2.2	47.9	2.2
Cream gluten meal	50	9.0	0.9	34.3	2.2	51.6	2.0
King gluten meal	8	9.0	—	32.7	—	—	2.8
Buffalo gluten feed	60	8.5	2.2	26.6	7.2	52.5	3.0
Glen Cove gluten feed	11	8.5	0.6	27.2	5.3	55.4	3.0
Globe gluten feed	3	8.5	1.3	26.1	7.3	54.1	2.7
Pekin gluten feed	3	8.5	—	28.2	—	—	2.7
Queen gluten feed	3	8.5	—	26.2	—	—	2.0
Waukegan gluten feed	13	8.5	1.1	26.5	7.7	52.8	3.4
Germ oil meal	24	9.0	2.9	22.1	9.3	46.5	10.2
Atlas gluten meal	1	8.0	1.8	35.9	12.6	27.0	14.7
Biles XXXX grains	4	8.0	1.8	34.7	13.6	31.4	10.5
Malt Sprouts	7	11.0	5.8	27.1	11.9	42.6	1.6
Dried brewers grains	5	8.0	3.8	23.1	10.8	49.4	4.9
Wheat middlings (flour)	69	10.0	3.2	19.4	3.2	59.4	4.8
Wheat middlings (standard)	224	10.0	4.3	18.1	7.0	55.6	5.0
Mixed feed	529	10.0	5.3	17.1	8.4	54.6	4.6
Wheat bran	285	10.0	6.2	16.2	10.1	53.1	4.4
H-O dairy feed	17	8.0	3.6	18.3	12.7	53.4	4.0
Starchy Feeds.							
Corn meal	56	14.0	1.4	9.5	1.9	69.9	3.3
Corn and cob meal	37	11.0	1.4	8.9	6.7	68.4	3.6
Hominy meal	36	9.0	2.6	11.2	4.2	64.2	8.5
Ground oats	3	12.0	3.3	11.4	8.7	60.8	3.8
Ground barley	5	13.0	2.3	11.3	5.7	65.8	1.9
Corn and oat feed	47	10.0	3.0	9.1	10.0	64.7	3.2
Victor corn and oat feed	48	10.0	3.5	8.7	11.0	63.1	3.7
H-O horse feed	16	9.0	3.2	12.5	9.8	62.1	3.4
Quaker dairy feed	41	8.0	4.6	13.2	16.8	54.3	3.1
Shumacher's stock feed	29	8.0	4.1	11.5	11.4	60.4	4.6
Oat feed (average)	114	7.0	5.3	7.8	21.8	55.3	2.8

E. DISCUSSION OF THE RESULTS.

I. Protein Feeds.

Cottonseed, Linseed, Gluten Meal, etc.

Cottonseed meal was not generally distributed in the market at the time of the present inspection, (October and November) and very little new meal had arrived. Nearly all of the samples collected were free from adulteration, although the guaranteed goods averaged lower than in the last two years. A noticeable number were slightly inferior and these as a rule carried a lower guaranty (38.60 to 41.50 per cent of protein.) Only two samples of low grade meal were found: one of which, termed "Creamo Feed," was guaranteed only 25 per cent of protein. There is a tendency for the manufacturers to more thoroughly remove the oil, hulls and linters, thus producing a meal with a higher protein content. It is reported that a new industry has been established for the manufacture of paper from cotton hulls. If such is the case, it will be a more satisfactory outlet for this material than as a northern feed product. Consumers are advised to purchase only branded meals, having a guaranty of *43 per cent* of protein.

The *new process linseed meals* were of excellent quality and exceeded their guaranty of 37.50 and 38.00 per cent in every case. The oil was more thoroughly removed.

All of the *old process meals* were free from adulteration although a number should be classed as inferior. An old process linseed meal should contain 32 per cent of protein, to be considered reasonably satisfactory.

The *gluten products* were fairly well distributed considering the shortage in the supply of old corn. Several samples of each of the three prominent brands of gluten meal were collected. The Chicago nearly maintained its guaranty in protein: the King *failed* by three per cent, while the Cream exceeded its protein guaranty decidedly, testing 42.64 per cent.

The *gluten feeds* were of good quality. There is a tendency for manufacturers to guaranty a slightly higher percentage of protein than the feeds contain. In only one case, however, that of the Glen Cove feed, is the guaranty *decidedly* higher than the percentage found, and the manufacturers should correct the error.

Germ oil meal was practically out of the market.

Dried distillers' grains are finding considerable sale in Massachusetts markets. The samples of Atlas and Biles' XXXX grains contained a high percentage of protein and were in excellent condition. The value of these products will be referred to elsewhere.

More *malt sprouts* were found than usual, and were well distributed in the eastern part of the state. The samples were free from adulteration, although some contained considerable cockle.

Wheat By-Products.

Wheat middlings—both flour and standard—were, with a few exceptions, of excellent quality. Most lots were marked with some special brand, and the manufacturer's name. Such branding inspires confidence on the part of the buyer and promotes the sale of standard goods. The two samples of inferior flour middlings, testing from 13 to 16 per cent of protein, contained an excess of starch and were not middlings in the general understanding of the term.

During the past summer several samples of middlings, which tested from 7 to 10 per cent of protein and containing a large amount of cellular material, presumably ground corn cobs, were sent in from the western part of the state.

Mixed feed is a mixture of varying proportions of bran and middlings. The best grades contain from 600 to 800 pounds of middlings to the ton. Generally speaking, the higher the percentages of protein, the more middlings, and the better the feed. Most of the unadulterated samples were of very satisfactory quality.

Of the 78 samples of mixed feed collected, 19 samples or 25 per cent were *seriously adulterated* with ground corn cobs, broom corn waste or a similar material. The mixture consisted of about 1500 pounds of bran to 500 pounds of cobs or broom waste, used in place of middlings. Several of these feeds were guaranteed to contain from 11.5 to 15 per cent of protein. While they may have substantially met their guaranties, the unsuspecting and misinformed consumer was deceived and purchased 25 per cent of low grade material in place of wheat middlings. The larger part of these adulterated mixtures were marked *Kentucky* or *Kentucky Dairy*, and a few were unbranded. The proportion of these adulterated feeds has decidedly increased over last year, one dealer carrying a very large stock. In the majority of cases, the retail price was found to be fully equal to that asked for the genuine.

Consumers are advised to beware of this deception. They are urged for their own protection, to purchase only those mixed feeds which have shown by previous analyses to contain 17 per cent or more of protein, and bear a distinct brand or trade mark and the name of a reputable manufacturer or jobber.

Wheat bran was fully up to the average in quality. Occasionally a sample was found to contain screenings and oat hulls. Buyers should examine the bran before purchasing, and refuse any lot not well cleaned.

Last spring a sample from a carload of material purporting to be first class *Canada bran* was sent to this Station for examination. It contained 7.5 per cent of protein and proved to be a mixture of bran and coffee hulls. The latter product was the inner fruit coat or husk of the coffee bean, and it has been offered in New Jersey unmixed under the name of "Cornaline." This substance contains only 2 to 3 per cent of protein and is largely indigestible woody fiber. It resembles the hulls of apple seeds, and when chewed is hard and unyielding in character. *Feed dealers as well as consumers are cautioned against this adulterant.*

Miscellaneous Feeds.

H-O dairy feed continues to maintain its guaranty and is as represented. It is rather expensive as compared with wheat middlings.

Oat middlings are distinct from oat feed, and nearly equal in value to wheat middlings. Small quantities are occasionally found in the market, showing 17 per cent or more of protein, *Bibby's dairy cake* and *Nutrene dairy feed* will be treated elsewhere.

II. Starchy Feeds.

Corn and Hominy Meals.

Few samples of *corn meal* were collected. Some meals,—apparently mixed with hominy,—were offered at slightly reduced prices. *Hominy meal* was well distributed and several lots were guaranteed. The samples taken were of the usual good quality. Hominy consists of the softer parts of the corn, and averages several per cent less water than corn meal, from 1 to 2 per cent more protein, and twice as much fat. The excess of fat is due to the presence of a considerable proportion of corn germs. Experiments have shown hominy meal to have about 10 per cent greater feeding value than corn meal.

Oat Feed. This material is generally understood to be the refuse from the manufacture of oat meal. It consists of the hulls, poor oats, more or less oat middlings, and sweepings. It varies in composition from 2 to 8 per cent of protein, and from 12 to 25 per cent of fiber, which is equivalent to 45 to 75 per cent of hulls. These feeds are frequently guaranteed and put out under attractive names. The samples collected were of the usual quality. They have a feeding value of 20 to 60 per cent less than corn meal, are considered *decidedly expensive* at the usual prices.

Corn and Oat Feed. Provender. Most of the so called *corn and oat feeds* are. mixtures of broken corn or hominy and oat offal, instead of ground oats. They are occasionally fortified with a little high grade nitrogenous material. Most of these feeds are now guaranteed. A number of samples were found in a sour mouldy condition, and utterly unfit for feeding. A casual examination was sufficient to condemn them. Salt is sometimes added to such inferior feeds to overcome these objections, and to induce animals to eat them. The Victor and the H-O horse feeds which have been on the market for a considerable time may be mentioned among the better grades of corn and oat feeds. Feeds similar to the Victor can probably be used with economy at a price 10 per cent less than corn meal. H-O horse feed approaches corn meal in value. The writer prefers to feed ground barley to most of these mixtures, and at present it can be purchased for less than corn.

The Lenox stock feed—a mixture of corn and oat offal,—put out by the Strong-Lefferts Co., continues to carry a higher protein guaranty than analysis warrants. The same may be said of Haskell's feed.

Miscellaneous Feeds. *Quaker dairy feed* is a fortified oat feed. The samples collected maintained the increased protein guaranty. *The Great Western dairy feed* consisted largely of oat offal and was noticeably below the guaranty.

The sample of *Crittenden stock feed* composed of oat offal, hominy and "red dog," was musty and sour, although it maintained its guaranty.

The *peanut bran* put out by the Phoenix Milling Co., of Virginia, consisted principally of ground peanut shells. An experiment with a similar feed made several years since at this Station, showed it to be worth about one-third as much as corn meal. In other words it is useful as an absorbent rather than as a feed. The retail price of $25 per ton was simply outrageous.

III. Poultry Feeds.

The various ground grain mixtures put out as *poultry feeds*, consisted largely of corn, fortified with some nitrogenous by-product. The *scratching feed* was composed of broken corn, oats and wheat. The Wyandot poultry feed consisted principally of corn and millet seed, together with wheat, oyster shells, and charcoal. In some mixtures poor barley or wheat screenings are used in place of wheat. The price asked for poultry mixtures is usually excessive.

Meat and bone meals and meat scraps were of the usual composition and the prices asked were reasonable.

F. NEW FEEDS.

Distillers' Grains. Considerable has been said concerning the source and character of distillers' grains in the Thirteenth Report, and in Bulletin 78 of this Station. These feeds are the residue in the manufacture of alcohol, spirits and whiskey from the several cereals. Briefly stated the process consists in grinding the grains and heating them with a solution of malt, thus converting the starch into sugar. The addition of yeast changes the sugar into alcohol, which is distilled, and the residue or distillery slop dried in especially constructed driers and put upon the market as a cattle feed. It is composed chiefly of the hull, germ, and protein matter of the grains. It has a slightly sour taste and smell, because of the fermentation. Several brands, Biles XXXX, Hall's AAAA, Ajax Flakes and Atlas (so called Atlas Gluten Meal) are at present being sold in Massachusetts. The samples recently collected had the following composition:

	Water.	Ash.	Protein.	Fiber.	Extract.	Fat.
Biles XXXX	7.67	1.84	34.84	13.67	31.48	10.50
Atlas	7.46	1.80	36.11	12.63	27.19	14.81

A feeding experiment with Biles XXXX grains has recently been completed. Briefly stated, the experiment covered four weeks (not including preliminary feeding) and was so arranged that four pounds of the distillers' grains were compared with an equal amount of Buffalo gluten feed. The results showed that the six cows produced 4338.37 pounds of milk on the distillers' grain ration, and 4078.82 pounds on the gluten feed ration. It was not possible to detect any objectionable taint in the milk when the distillers' grains were used. The grains are quite bulky, and in this respect can be used in place of bran. It is not regarded as advisable to feed more than 3 or 4 pounds daily, preferably mixed with other grains. (See grain rations on page 29).

In view of the fact that Buffalo gluten is considered an exceptionally desirable milk producing feed, the results of the above experiment place high grade dried distillers' grains in the list of economical and desirable feeds for dairy animals.

Bibby's Dairy Cake. This is an imported cake made by J. Bibby & Sons of Liverpool, and has been offered for a year or two in an eastern section of Massachusetts. It is composed of cottonseed with a large amount of hulls, barley or wheat, probably a considerable quantity of rice, sugar or molasses, fenugreek and salt. It analyzed as follows:

	Water.	Ash.	Protein.	Fiber.	Extract Matter.	Fat.
Per cent	6.65	7.31	20.44	9.80	47.01	8.79

The two samples in the fall collection tested 18.92 and 21.20 per cent of protein and 9.75 and 9.23 per cent of fat. The cake (sometimes sold ground) has a sweet taste and agreeable odor. The price, $26.00 a ton, was not excessive, but it cannot be considered as economical as cottonseed and similar products. It is hoped to test the digestibility of this material in order to form a more exact opinion as to its value.

Nutrene Dairy Feed. This feed was placed upon the market in the spring of 1902 by Wogan Bros. of New Orleans. The sample examined consisted of molasses, absorbed by oat clippings or similar material, together with cottonseed hulls, some corn and a little cottonseed meal. It had a sweet taste, was guaranteed to contain 17 per cent of protein and 5 per cent of fat, and analyzed as follows:

	Water.	Ash.	Protein.	Fiber.	Extract Matter.	Fat.
Per cent	11.00	12.13	16.01	17.43	39.75	3.67

The two samples collected in October showed 14.08 per cent of protein and 2.85 of fat. Such a large percentage of fiber indicates a considerable amount of cotton hulls or other woody substance. It has not been possible as yet to make any exact experiments to determine its feeding value although it was fed to several cows with fairly satisfactory results. The use of molasses as a cattle feed is to be encouraged. It is not believed, however, that at the price asked ($27.00 a ton at retail) it is economical when compared with gluten, wheat middlings and cottonseed meal. Such material can be used to better advantage in the South.

Corn and Oat Products. A number of feeds have recently been put out by the Buffalo Cereal Co. The hominy meal was found to be of good quality. The corn and oat feed for horses fully met the guaranty of 12 per cent protein and 4.5 per cent fat. This is evidently a mixture of oat offal and hominy slightly fortified with some nitrogenous by-product. It corresponds in composition and feeding value to the H-O horse feed.

G. WHY CONCENTRATES ARE FED.

Most of the home-grown coarse feeds are high in carbohydrates, low in protein, and comparatively indigestible. Nearly all of the concentrated feeds are very digestible and a large number are high in protein and low to medium in carbohydrates. Therefore the concentrated feeds are used in connection with the home raised coarse feeds, *first to increase the digestible matter, and second to increase the amount of protein in the daily ration.*

An illustration. Many experiments have demonstrated that an averaged-sized new milch cow producing 12 to 15 quarts of milk daily needs approximately the following amounts of digestible nutrients :

Digestible:	Protein.	Fat.	Carbohydrates.	Total.
Pounds,	2.0 to 2.5	0.5	13.0	16.0

Now if the animal should be fed as much good hay as she could consume (30 pounds) she would receive :

Digestible:	Protein.	Fat.	Carbohydrates.	Total.
Pounds,	1.4	.30	12.6	14.3

This ration is deficient both in *total nutrients* and *protein*, for the reason that the hay has a comparatively low digestibility and lacks protein. If seven pounds of the hay were replaced by an equal weight of corn meal, the hay and meal would furnish :

Digestible:	Protein.	Fat.	Carbohydrates.	Total.
Pounds,	1.5	.46	14.3	16.3

The corn meal being a very digestible, but a one-sided or starchy feed, would sufficiently increase the total digestible nutrients, but not the protein.

If four pounds of the corn meal were replaced by two pounds of wheat bran and two pounds of cottonseed meal, the several feeds would supply :

Digestible:	Protein.	Fat.	Carbohydrates.	Total.
Pounds,	2.30	.70	12.8	15.8

The replacing of seven pounds of hay with three pounds of corn meal, rich in digestible starchy matter, and with four pounds of bran and cottonseed meal, especially rich in digestible protein, would furnish the required amount of total digestible matter and digestible protein. Such a combination has been termed a *balanced ration.*

H. SUGGESTIONS TO FEEDERS.

Kinds of Concentrates. Concentrates have been divided into two classes, protein feeds, and starchy or carbohydrate feeds. The protein feeds are largely by-products from various industries, and vary in protein content. Cottonseed, linseed, gluten meal, and distillers' grains contain from 32 to 45 per cent ; gluten feed, brewers' grains, malt sprouts and red dog flour, from 20 to 30 per cent ; while mixed feed and wheat bran contain only 16 to 18 per cent. The starchy feeds are represented by the several cereals, such as corn, oats and barley, and by a number of by-products like hominy meal and oat offal. In addition, there are many mixtures offered, having oat offal for a basis, to which has been added more or less corn. Some of the corn and oat mixtures are fortified with a little cottonseed, gluten or other high grade material, thus producing a feed analyzing from 10 to 20 per cent of protein.

Satisfactory Protein Feeds.

In general the high grade protein feeds are the most economical, the buyer getting decidedly more nutritive value for the money invested, than when purchasing low grade feeds, costing a few dollars less a ton. The writer believes mixed feeds to be more expensive than unmixed. The consumer had better buy cottonseed or gluten meal, distillers' grains and wheat middlings, than feeds consisting of mixtures of oat offal to which small quantities of these nitrogenous feeds have been added. The cost of mixing grain rations amounts to very little, and the feeder knows of just what they consist.

Concerning Wheat Bran.

It is believed that many dairymen buy too large a proportion of wheat bran. It is a safe feed and excellent for diluting or "lightening up" the more concentrated by-products. It contains, however, only 13 per cent of digestible protein, and 35 to 40 per cent of indigestible matter. The long distance transportation of a material containing such a large amount of inert matter is an important factor in making the nutrients it contains relatively expensive. In the writer's opinion, the average eastern farmer cannot afford to use more than one-third bran in his ration. Dried distillers' grains are a bulky feed, and may be used in place of bran as a diluter, besides being very rich in nitrogenous matter.

Starchy Feeds not Economical to Purchase.

The farm has been aptly called the carbohydrate factory, the principle fodder crops produced being, hay, corn fodder, corn (grain) and similar materials, all low in protein, and high in carbohydrates. Therefore, as a rule it is not wise for the dairy farmer to purchase starchy feeds since he produces them. Exceptions to this statement may be made when the supply of corn is short, and it is necessary to feed horses, swine and poultry. Even in such cases, feeds medium in protein should be given the preference, for the reason that they contain considerably more nitrogen, phosphates, and potash than do the starchy feeds. Thus a ton of wheat bran contains twice, and a ton of cottonseed meal, three and one-half times as much of the elements of fertility as does a ton of corn meal. Milk producers who purchase all their feeds can, on the contrary, often use to advantage mixtures containing one-third corn or hominy meal.

Relative Values of Concentrates.

It is not intended in the following table to show the relative effects of the various feed stuffs on the flow of milk or the production of beef. The figures are offered rather as a help in deciding on the relative commercial value of the different feeds, based on the digestible nutrients contained in them. All who have attempted to prepare such a table are aware of the difficulties involved, and because of them many have refrained from making comparisons. While it is not claimed that the present table is absolutely accurate, it is believed that it can be safely used by those trying to purchase feed stuffs to the best advantage.

Protein Feeds.	*Cottonseed meal,*	212
	N. P. linseed meal,	182
	O. P. linseed meal,	181
	Gluten meal,	192
	Gluten feed,	155
	Germ oil meal,	129
	Dried distillers' grains,	168
	Malt sprouts,	124
	Dried brewers' grains,	122
	Wheat middlings (flour),	133
	Wheat middlings (standard),	119
	Mixed feed,	104
	Wheat bran,	100
	H-O dairy feed,	109
Starchy (Carbohydrate) Feeds.	*Corn meal,*	100
	Hominy meal,	111
	Ground oats,	101
	Ground barley,	106
	Corn and oat feed,	88
	Fortified oat feed (Quaker dairy),	107
	Oat feed,	31-81

How to Use the Table. The protein feeds are compared with each other, and likewise the starchy feeds. If wheat bran is worth 100, cottonseed meal is valued at 212 and gluten feed at 155. The figures can be easily converted into dollars. Thus if cottonseed meal is worth 212, or $28, gluten meal is worth 192 or $25.36. This is a case in simple proportion, 212 : 192 : : 28 : x, or $25.36.

Weight of Concentrates. The following table shows the approximate weight of a quart of the different feeds, and also the equivalent of a pound in quarts.

Feedstuff.	One Quart Weighs :	One Pound Measures :
Cottonseed meal	1.4 pounds.	0.7 quarts.
O. P. linseed meal	1.1 "	0.9 "
N. P. linseed meal	0.9 "	1.1 "
Gluten meal	1.7 "	0.6 "
Gluten feed	1.3 "	0.8 "
Germ oil meal	1.4 "	0.7 "
Dried distillers' grains	0.8 "	1.3 "
Malt sprouts	0.6 "	1.7 "
Dried brewers' grains	0.6 "	1.7 "
Wheat middlings (flour)	1.2 "	0.8 "
Wheat middlings (standard)	0.8 "	1.3 "
Mixed feed	0.6 "	1.7 "
Wheat bran	0.5 "	2.0 "
H-O dairy feed	0.7 "	1.4 "
Corn kernels	1.7 "	0.6 "
Corn meal	1.5 "	0.7 "
Corn and cob meal	1.4 "	0.7 "
Hominy meal	1.4 "	0.7 "
Corn bran	0.5 "	2.0 "
Oat kernels	1.2 "	0.8 "
Ground oats	0.7 "	1.4 "
Barley kernels	1.5 "	0.7 "
Ground barley	1.1 "	0.9 "
Wheat kernels	1.9 "	0.5 "
Victor corn and oat feed	0.7 "	1.4 "
Quaker dairy feed	1.0 "	1.0 "

Grain Mixtures. The following mixtures are offered as types, any one of which it is believed will prove satisfactory. Owing to market fluctuations, it is not safe in a publication of this kind to advise just what particular kinds of grain to purchase, in order to secure the most economical mixtures. The general suggestions offered, together with the table of relative values, will aid the purchaser in making his selection.

1.

100 lbs. bran.
100 lbs. flour middlings.
150 lbs. gluten feed.
Mix and feed 7 quarts daily.

2.

100 lbs. bran or mixed wheat feed.
150 lbs. gluten feed.
Mix and feed 9 quarts daily.

3.

100 lbs. bran.
100 lbs. flour middlings.
100 lbs. cottonseed, linseed or gluten meal.
Mix and feed 7 to 8 quarts daily.

4.

100 lbs. dried distillers' grain.
75 lbs. flour middlings.
Mix and feed 6 quarts daily.

5.

100 lbs. cottonseed or gluten meal.
150 lbs. corn and cob meal.
100 lbs. bran.
Mix and feed 7 to 8 quarts daily.

6.

100 lbs. dried distillers' grain.
100 lbs. corn and cob meal.
Mix and feed 5 to 6 quarts daily.

The above rations are intended for cows weighing from 800 to 1000 pounds yielding from 12 to 15 quarts of milk daily. For heavy milking Holstein cows, the quantity can be increased one-third or according to the judgment of the feeder. For cows producing less than 10 quarts of milk, the amount can be somewhat reduced. Owing to the present high prices for grain, many farmers will prefer to increase the roughage somewhat and decrease the daily grain ration.

I. CONDIMENTAL STOCK AND POULTRY FOODS.

Because of continued interest taken in condimental foods, it seemed advisable to publish a digest of the work reported in Bulletin 71, which has become exhausted. Representative samples of practically all of the prominent brands offered for sale in Massachusetts from 1898 to 1901 were collected and carefully examined both chemically and microscopically.

Ingredients. The substances generally employed as a basis for the stock foods were the cereals,—corn and wheat offal especially,—linseed meal, beans and rice. The poultry foods were composed of similar substances together with oyster shells and meat and bone meal. Among the remaining ingredients, added ostensibly for medicinal effect, are numbered many of the old time remedies such as common salt, charcoal, black pepper, cayenne, fenugreek, sulfur, Glauber and Epsom salts, and occasionally fennel, ginger, tumeric, and sulfate of iron. Fenugreek was a favorite in the stock mixtures and pepper in the poultry foods. Venetian red (oxide of iron) was often used simply to color and disguise the character of the other constituents. Finely ground charcoal acted in a similar manner. In several instances noticeable quantities of sand were found, but whether to increase the weight or as an accidental admixture, is difficult to say.

Value of Ingredients. As condimental foods depend largely on the grains and by-products for bulk, they have a distinct nutritive value. The majority of the mixtures carried from 10 to 20 per cent of protein, and a few from 20 to 25 per cent, the latter usually contained considerable linseed meal. A high percentage of fiber was invariably due to the addition of charcoal or waste products of a woody character, (cocoa shells, mustard hulls, etc.) The incorporation of salt, sulfates, and compounds of iron raised the percentage of ash. Poultry foods containing bone meal and shells sometimes showed 30 and even 50 per cent of ash. The *nutrients* in the different condimental foods could be purchased in the form of corn meal, wheat offal and linseed meal for one cent a pound. The mixtures, with few exceptions, cost from 6 to 25 cents a pound; therefore, as a food, these products are *unreasonably expensive.*

The usual medicinal constituents have been enumerated. None of an injurious nature were found. Salt from 2 to 15 per cent in amount was a common ingredient and is recognized as a necessary adjunct to a feed ration. Charcoal is valuable in so far as it is able to check fermentation and absorb gases. Epsom and Glauber salts, —frequently termed salts,—are cathartics, i. e. act mildly on the bowels. Fenugreek and fennel are aromatic substances of agreeable flavor, stomachics in effect, being used to relieve indigestion and flatulency. Black pepper and cayenne are stomachics and excite and stimulate the reproductive organs. Ginger is a local stimulant and stomachic and gentian, a bitter tonic, stomachic and alterative. Sulfur has a laxative and alterative effect, and increases the activity of the skin. Sulfate of iron is a tonic and a restorative and tumeric an aromatic heart stimulant. In brief, these drugs act as alteratives and tonics, increase the appetite, relieve indigestion, and hasten the removal of waste products from the system, and are unquestionably valuable as simple medicines, when properly used. It is certain, however, that they can be purchased *very much cheaper* separately, than in the prepared mixtures under discussion. Most dairy and stock farmers are familiar with the curative properties of these drugs, their uses and their limitations, and invariably keep a part of them, at least, on hand.

Claims of Manufacturers.

Apparently most of the condimental foods are sold for a short period because of particular efforts and claims of the manufacturers, and then the demand for them ceases. A few brands are extensively and continuously advertised and are well distributed throughout the state. The claims made for these products are numerous and extravagant. It is stated that they are appetizers (by imparting a pleasant odor and flavor, cause the animals to consume more food), promote perfect digestion, and assimilation, and thereby induce rapid growth and fattening, increase the quantity and improve the quality of the milk, cause a large increase in egg production, and make beautiful plumage. Medicinally they are claimed to be a panacea for all ills that horses, stock and poultry are heir to, a preventive and cure for all diseases.

Use and Effect.

Carefully conducted experiments by many investigatigators have proved conclusively that the claims relative to *growth* and *production* are *without foundation.* Furthermore, the use of such preparations should be condemned for reasons other than financial. Medicine should not be given to animals unless there is positive evidence that it is needed. Well animals are better without it, for in health there is an equilibrium of body functions, and all that is required to maintain this balance are good sanitary conditions, a sufficient quantity of pure food and water, and access to salt. Sick animals should be treated for the special trouble with which they are affected, or an end put to their suffering. It is far better to employ one or more drugs, adapted to the treatment of the particular ailment, than to attempt a cure with a "shot gun" mixture. In the end such specific treatment is infinitely less expensive, less dangerous and more satisfactory.

It is possible by the use of drugs to increase the functional activity of one or more organs to an abnormal degree, but this is followed by a corresponding weakness and depression of the function of that particular part. When the quantity of the drug is increased above a certain amount, or its use continued beyond a certain time, the effect is almost certain to be functional derangement, due to congestion and inflammation. The results of long continued use of condimental foods are dependent somewhat upon the amount administered and the condition of the animals receiving them, but in a general way there will be a more or less serious interference with that normal equilibrium of all body functions. To summarize briefly:

1. The nutrients, as well as the simple medicines used in the various condimental stock and poultry foods are *sold at prices far in excess of their value.*

2. Healthy animals are better off without medicine.

3. Sick animals should be treated for their specific ailment, or destroyed.

HATCH EXPERIMENT STATION

—OF THE—

MASSACHUSETTS AGRICULTURAL COLLEGE.

BULLETIN NO. 86.

ORCHARD TREATMENT FOR THE SAN JOSÉ SCALE.
ONE YEAR'S EXPERIMENTS IN MASSACHUSETTS.

FEBRUARY, 1903.

The Bulletins of this Station will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same.

AMHERST, MASS.:
PRESS OF CARPENTER & MOREHOUSE,
1903.

HATCH EXPERIMENT STATION

OF THE

Massachusetts Agricultural College,

AMHERST, MASS.

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The co-operation and assistance of farmers, fruit-growers, horticulturists, and all interested, directly or indirectly, in agriculture, are earnestly requested. The Bulletins will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same. General bulletins, fertilizer analyses, analyses of feed-stuffs, and annual reports are published. Kindly indicate in application which of these are desired. Communications may be addressed to the

Hatch Experiment Station, Amherst, Mass.

Division of Entomology.

ORCHARD TREATMENT FOR THE SAN JOSÉ SCALE.

One Year's Experiments in Massachusetts.

H. T. FERNALD.

SUMMARY.

Treatment of orchard trees by fumigation is the best method where the trees are small enough to be covered by a tent not costing too much. As the cost of a tent rapidly increases with its size, however, it does not pay to fumigate orchard trees more than 10 or 12 feet high and 6 or 8 feet across.

Spraying with crude petroleum is somewhat expensive and the results are not as satisfactory as with other materials. Other objections are the unreliability of the pump and the fact that a double tank pump is not included in the average spraying outfit.

Of the soaps, Bowker's Tree Soap gave the best results but was somewhat more expensive than the others.

All things considered the Lime, Sulphur and Salt wash proved the most satisfactory, giving the best results, while its cost was only medium, and only an ordinary spray pump was necessary for its application.

A fine aperture Vermorel nozzle worked satisfactorily with all the materials used.

None of the special materials sent for trial proved to be successful enough to warrant further tests another year.

These are the conclusions from one year's experiments, and may need to be changed after further trial. They constitute a statement of results thus far, only.

As the San José scale is difficult to recognize by those not familiar with it, anyone who suspects that it is present on his trees or shrubs is invited to send samples of the plant affected to the Hatch Experiment Station, Amherst, Mass., for examination, of the results of which he will be informed.

INTRODUCTION.

In the fall of 1901 the orchard of the Massachusetts Agricultural College was discovered to be quite generally infested with the San José scale. A careful examination was at once made and it was evident that this insect had been introduced on two Gano apple trees purchased in the spring of 1896. In 1901 the trunks and larger limbs of these trees were quite thoroughly encrusted with scales, while the leaves and fruit were also covered to a less degree.

The Orchard.

The orchard is about 150 yards wide and 500 yards long, extending approximately in a northeast-southwest direction. The greater portion is situated on a hillside sloping to the southeast and is protected on its northern and western sides by old growth forest. During the summer months the air currents usually appear to pass along the orchard rather than across it.

The trees are in five blocks, separated by driveways. Four of the blocks are rectangular while the fifth is triangular and separated from the northwestern side of the fourth by a road. The originally infested trees were situated near the middle of the last row of the first block, with only the width of the road between them and the first row in the second block.

The first block contains one row (the first, or northeast) of pear trees. The remainder of the block is composed of apple trees which have been set about five years and are just beginning to bear fruit. In the second block, apples, cherries, peaches and plums are represented, all of bearing size, though young. The third block contains large apple and cherry trees, some of them a foot in diameter at the base, and a few small cherries recently set. The fourth block contains few trees more than eight or ten years old while many are younger. Apples, pears, peaches, plums, prunes, quinces and cherries are included in this block. The fifth block contains trees of about the same size as those in the fourth and includes plums, prunes, apricots and nectarines.

Condition of Infestation.

The infestation was carefully studied by the entomologists of the Station and it was found that the scale had spread from the originally infested trees southwest along the middle of the orchard where it was very abundant, while toward the sides it was less in evidence and on some trees no scales could be found. As might be supposed from the location of the originally infested trees, the first and second blocks were in the most serious condition. Elsewhere the infestation was scattered, though in some cases a single tree without infested neighbors was found to be affected.

It was noticeable on nearly all the infested trees that the scale was present only on the smaller limbs and twigs except in cases where it was very abundant, when the upper part of the trunk often became involved. With slightly infested trees a single branch—usually nearly horizontal and at some spot not concealed by leaves—generally appeared to be the center of distribution, suggesting the thought that at that convenient spot some bird or insect carrying the crawling young had alighted. In a few cases after failure to find the scale by general inspection, an examination of such places revealed its presence.

The condition of the orchard was reported to the Trustees and experimental work in the orchard was authorized.

Preparatory Work.

There were 612 trees in the orchard, each of which was inspected to learn its condition. A number marked on a tag was attached to each tree and the number, kind, variety and condition of infestation were recorded on a plan of the orchard and also in a book. The trees were then cut back as severely as was deemed wise and the approximate height and spread of each after this pruning was added to the record.

Time of Treatment.

The spring of 1902 was about ten days later than usual at Amherst and treatment therefore was not begun till March 27th. From that date it was continued whenever conditions would permit till April 5th which was followed by a period of bad weather lasting till the 14th, on which day the work was completed. By the 14th the leaf buds were beginning to open and the flower buds in some cases were sufficiently open to show their color.

Results of Treatment on the Trees.

No injurious effects from any of the treatments were observed on any of the trees aside from one case given below, except that on three or four a few of the buds appeared to be somewhat browned and these trees seemed to be late in starting. As other trees of the same kind and variety, and treated in the same way, were not thus affected it is probable that the delay was not due to the treatment.

Weather Conditions.

Records of the temperature, force and direction of the wind, amount of cloudiness, and the relative humidity of the air were kept during the spraying, with the hope that anticipated differences in results might be explained in this way. The weather conditions were as variable as could have been desired for this purpose, being sometimes excellent, while at others they were very bad for the work. In some cases spraying was continued till rain or sleet began to fall, and in one case quite a heavy rain came on half an hour after the work for the day was ended. When the records were studied however, it became evident that weather conditions had little effect on the results except where rain began so soon after spraying as to wash the spray off the trees before it had had time to dry on. With the kerosene, however, spraying on a bright sunny day with a gentle wind blowing appeared to cause a quicker evaporation than on damp cloudy days, and probably the length of time during which it could act on the scales was thereby somewhat reduced, though no perceptible difference in the results on this account was found.

Method of Determining Results.

It has been customary to judge of the results of any treatment by examining the trees three or four weeks afterwards, and determining the percentage of living scales found. This method is defective however, as many scales normally die during the winter months and any such examination would fail to show the number really killed by the treatment. The method adopted, therefore, was to inspect the trees as soon as the first crawling young appeared (June 23d), and to reinspect every week or two during the summer and fall. In this way the abundance of young on a tree was an indication as to the success of the treatment.

The Treatments and their Results.

The methods used naturally fall into three groups: 1. Treatment by fumigation; 2. Treatment with standard materials; 3. Treatment with materials sent for trial by the manufacturers. These groups will now be considered in detail.

1. Fumigation.

For fumigation a canvas box tent was used, made according to the plans given in Bulletin 181 of the N. Y. Agricultural Experiment Station. The tent was made by stretching canvas over a light frame, the canvas having been painted with dark paint until it was air-tight. One side was removable and when in place shut against felt and was secured by bevelled buttons. The tent complete was ten feet high, six feet in diameter and cost $20.00. Twenty-five hundredths of a gram of Potassic cyanide, 99% pure, was used for each cubic foot of space within the tent, with one and a half times as much commercial Sulphuric acid of 1.83 specific gravity, and two and a quarter times as much water.

The tent was placed over a tree; the bottom flaps of canvas were covered with earth, and a porcelain lined kettle was placed on the ground near the middle of the tent. The water and then the acid were placed in this, and the cyanide, broken into small lumps was placed in a loose paper bag suspended above, and held by a string leading outside. The door was then shut and the string released, allowing the bag to fall into the kettle. After forty minutes the tent was opened and taken to another tree. Trees were fumigated in all cases after 9 A. M. but in all kinds of weather.

The trees thus treated were cherry, pear, peach and plum. None showed any effect of the treatment and no living scale was found on any, till late in October, when in two cases, a single young scale was discovered. In both of these cases it is probable that the trees were reinfested during the summer after the fumigation from badly affected ones near by.

2. Treatment with Standard Materials.

Good's Caustic Potash Whale Oil Soap No. 3. This soap was used at the rate of two pounds to a gallon of water, heat being used to dissolve it, and the solution was sprayed while warm. A Niagara nozzle was used at first, but a more even distribution over the trees with greater economy of material was obtained by the use of a fine aperture Vermorel which was found to give no trouble by clogging and which was therefore adopted for the greater portion of the work with this soap. Spraying was continued in each case till the trees were thoroughly covered and began to drip.

The results obtained with this soap were disappointing. Only 28.12% of the trees were freed from the scale while most of those which were badly infested remained so. The detailed results are given below in comparison with those from the other materials.

Bowker's Tree Soap. This is also a potash whale oil soap, manufactured by the Bowker Insecticide Co. of Boston. Like the last it was used at the rate of two pounds to a gallon of water, solution being hastened by heating, and was sprayed warm. It was slower in dissolving than Good's soap but sprayed equally well. It appeared to be more concentrated than Good's soap which perhaps explains the better results obtained, 52.6% of the trees treated with it being entirely freed, while none which were badly infested remained so, being either greatly improved or altogether freed from scales.

Good's Caustic Potash Whale Oil Tobacco Soap. This material is the same as that considered above, with the addition of tobacco, and was prepared and applied in the same way. The results were the best of any obtained with soaps, 53.8% of the trees treated being entirely freed from scales. As only a small amount of this material was available, however, but few trees could be treated with it, and the results are less reliable for that reason. Others have reported that it appears to injure the trees, but no such effect was noticed here.

Bowker's Insect (Soda Whale Oil) Soap. This material was tried for the purpose of comparing soda and potash soaps. It was not recommended for use against the scale by the manufacturer, who was in doubt as to its value for this purpose as compared with potash soaps but was glad to have it tested. It was prepared and applied like the potash soaps but dissolved more quickly. The effect of this treatment, while more satisfactory than with Good's Potash Soap was not equal to that with Bowker's Tree Soap, 40.7% of the trees being freed from scales.

Adler's Agricultural Soap. This substance was prepared and used like those already considered. In solution it was very frothy and during spraying great bubbles would form and fly some distance if the wind was blowing. It gave less satisfactory results however, than most of the other soaps, only $33\frac{1}{3}$% of the trees being freed from scales.

Crude Pretroleum. From this substance which has been highly recommended by some experimenters, much was expected. That the oil must be of at least 43° Beaumé to be safe for use on the trees, is the general opinion, and oil to meet this requirement was therefore ordered. When it arrived, however, it tested but 41° and was applied with some hesitation, but no injury developed among the nearly one hundred trees treated.

The oil was applied with a Kerowater barrel pump which shortly before its use had been in the hands of the manufacturers who had thoroughly overhauled it and had sent it back as being all right. In spite of this, however, it proved totally unreliable, for when set to give 30% of oil, it would often vary as much as 15% each way from this, and that too, while the pumping was continuous. As the stream emerged from the nozzle it was noticeable that the oil and water alternated instead of mixing perfectly, as the alternating white and yellow color of the stream plainly showed.

The result of this treatment was better than was expected under the circumstances, 43.2% of the trees being freed from scales. But if we consider that crude oil is an expensive material; that double tank pumps are not generally owned by the fruit growers; that any of these pumps may prove to be as unreliable as the one used for these experiments; and finally that better results can be obtained from other and nearly as cheap materials without the necessity of using a double tank pump, it would not seem advisable to use crude petroleum.

Kerosene. With kerosene the same difficulties were met as with crude petroleum though to a less degree. Variation in the percentage of oil ranged from 18 to 38 with the pump set for 30. Perhaps the fact that the amount of variation was less than with the crude petroleum is the explanation for the somewhat better results obtained, 44.4% of the trees being freed from the scales. The same objections as those named for the crude oil hold, however, for kerosene.

Lime, Sulphur and Salt Wash. This mixture was prepared as follows: 10 lbs. of fresh stone lime and 20 lbs. of sulphur were boiled in 20 gallons of water in a farmer's kettle for an hour and a half, the mixture being frequently stirred. Thirty pounds of lime were thoroughly slaked with hot water and 15 lbs. of salt were then added and stirred till the salt had all dissolved. This lime and salt mixture was then added to the lime and sulphur mixture and the whole was stirred and heated for half an hour more. It was then strained through burlap into the spraying tank, and water to make 60 gallons added. It was then ready to put on to the trees, and sprayed easily through a fine aperture Vermorel nozzle.

The objections to this material are: it is necessary to have a large kettle holding 50 or 60 gallons, in which to make it, unless some boiler is available where it can be boiled with steam; it is difficult to strain, the burlap becoming completely clogged by the time four or five gallons have been strained; the time required to prepare it is considerable—probably averaging at least four hours for each lot; and its action on pump and hose is very corrosive, calling for frequent repairs. It is inexpensive, however, so far as the materials go and gave excellent results, 65.6% of the trees treated being freed from scales, while every badly infested tree was either entirely freed or the infestation so reduced as to place the tree in the list of those slightly infested. An advantage in spraying which this wash also has, is that it turns yellowish-white as it dries, so that any places overlooked can easily be found and sprayed within a few mintes after the first application. It stayed on the trees so as to be noticeable for two months, even though heavy rains fell frequently during this time and particularly during the first two weeks after it was applied. The results obtained with the lime, sulphur and salt wash were so satisfactory that a further study of it, its methods of preparation and its results will be made the coming spring. Experiments in other states indicate that the salt may be omitted without affecting its value in any way.

3. Materials Sent for Trial.

Bowker's Disinfectant. This substance was applied diluted with water in three proportions. At the rate of one gallon of Disinfectant to ten gallons of water it killed many of the scales, but failed to entirely clear any of the trees. The condition of infestation, however was reduced from bad to slight. Where the Disinfectant was applied at the rate of one to twenty-five and one to fifty, the results were not as satisfactory. That concentrated applications of this material will kill at-least a portion of the scales is evident, but it is less efficient in this regard than some of the others used.

Walker's Wood Creosote Oil. This was obtained at the suggestion of a gentleman who claimed to have successfully freed plants from the Oyster-shell scale by its use. It was applied with a brush by painting all parts of the tree, and was successful in killing both scales and trees.

Walker's Creosote Disinfectant. This substance, sent for trial by the Walker Chemical Works, Harrison, N. J., appeared to destroy some of the scales on the trees to which it was applied but failed to kill more than a small percentage.

Black Soluble Insecticide Soap, sold by V. Casazza & Bro., 190-192 Prince St., New York, appeared to have no effect on the scales. When received it had corroded the tin cans in which it was shipped, to a considerable extent, and the agents claim that this may have had an effect upon its insecticidal value.

Adler's Copper Soaps. These were manufactured by the Adler Color and Chemical Works, 100 William St., New York. They failed to mix properly with the water and when spraying with them was attempted, they solidified in the hose so that no test of their value as insecticides could be obtained.

Good's Potash Whale Oil Soap nine parts; Lime, Sulphur and Salt one part was also tested but gave poorer results than the Lime, Sulphur and Salt alone.

The following tabular statement of the results obtained by the use of these different materials will enable closer comparison to be made.

Treatment.	Condition before Treatment.		Present Condition.		
	% Badly Infested.	% Slightly Infested.	% Badly Infested.	% Slightly Infested.	Free from Scales.
Good's Potash Whale Oil Soap No. 3.	59.5	40.5	31.2	40.5	28.12
Bowker's Tree Soap.	15.8	84.2	0.0	47.4	52.6
Good's Potash Whale Oil Tobacco Soap.	30.7	69.3	7.7	38.4	53.8
Bowker's Insect Soap.	18.5	81.5	3.7	55.5	40.7
Adler's Agricultural Soap.	0.0	100.0	0.0	66.6	33.3
Crude Petroleum.	41.0	59.0	8.4	48.4	43.2
Kerosene.	35.5	64.5	6.6	48.9	44.4
Lime, Sulphur and Salt.	40.5	59.5	0.0	34.3	65.6
Good's Potash Whale Oil Soap No. 3, 9 parts; Lime, Sulphur and Salt, 1 part.	23.0	77.0	7.7	53.8	38.4

Relative Cost of Materials.

Fumigation. The quantity of cyanide for a tent the size of that used in these experiments cost 8 cents. The acid should not cost over 7 cents per pound and the amount needed per tree would cost 3 cents. The wholesale price of this acid is about $2\frac{1}{2}$ cents but at retail 10 cents is often charged, which of course would make it more expensive. Eleven cents per tree would be a fair cost for fumigating where the tent used contains not more than 360 cubic feet, the cost of the tent and the labor not being included.

Good's Potash Whale Oil Soap No. 3, is manufactured by James Good, 939 and 941 N. Front St., Philadelphia. Pa. Its cost in 50 lb. kegs is 5 cents per lb.; in half bbls. containing about 275 lbs., the price is 3½ cents per lb.; while in bbls. containing about 425 lbs. the price is 3¼ cents per lb. The cost per tree of this material with the average amount applied, at half bbl. rates for the soap used, was about 8 cents.

Good's Caustic Potash Whale Oil Tobacco Soap is manufactured by the same firm. In 50 lb. kegs the price is 5½ cents per lb.; in half bbls. containing about 275 lbs. it is 4 cents, and in bbls. containing about 425 lbs. it is 3¾ cents. This would make the cost of the soap at half bbl. rates, about 9 cents per tree.

Adler's Agricultural Soap is manufactured by the Adler Color & Chemical Co., 100 William St., New York and is sold at 1½ cents per lb. It took a little more of this material to cover a tree, making the cost per tree about 3½ to 4 cents.

Crude Petroleum is obtained from the Standard Oil Company and varies in price, that used in these experiments costing 10½ cents per gallon. Spraying with this substance cost about 4 cents per tree for the oil.

The Kerosene used in these experiments cost 10 cents a gallon. It was of 150 degrees flash test and appeared to be consumed rather more quickly than the crude Petroleum. About 4¼ cents per tree was the cost for kerosene.

Good stone lime for the Lime, Sulphur and salt wash cost 1 cent per lb., only small amounts being purchased: sulphur cost 6 cents and salt 1⅓ cents. At these prices each tree cost a little over 5 cents for the materials sprayed upon it.

Bowker's Tree Soap is manufactured by the Bowker Insecticide Co., 43 Chatham St., Boston. Its cost in 50 lb. lots is 8 cents per lb.; in 100 lb. lots, 7 cents. and in 450 lb. (barrel) lots, 6 cents. The cost per tree for this material averaged about 15 cents.

Bowker's Insect Soap manufactured by the last named Company costs 7 cents per lb. in 50 lb. lots; 6 cents per lb. in 100 lb. lots, and 5 cents per lb. in 450 lb. (barrel) lots. The cost per tree for this material averaged about 12 cents as it seemed to go further than the Tree Soap.

The cost per tree given above is that for the material only; freights, labor, cost of apparatus and repairs not being considered. The cost as given on this basis will also vary with the size of the tree, these estimates being for trees about 10 feet high and with a spread of about 9 feet.

Summer Treatment.

Few experiments have been made along this line. Some badly infested trees were sprayed July 2, with 10% kerosene and excellent results obtained, no injury to the trees appearing, while the great majority of the young scales were destroyed. Enough remained, however, so that by the end of the fall the trees were considerably infested. Probably three or four such treatments during the summer and fall would prevent any marked increase in abundance of the scales, holding them in check till the more thorough winter treatment could be made.

The Following Bulletins are Available for Distribution to Those Who May Desire Them.

No. 27. Tuberculosis in college herd; tuberculin in diagnosis; bovine rabies; poisoning by nitrate of soda.
No. 33. Glossary of fodder terms.
No. 35. Agricultural value of bone meal.
No. 41. On the use of tuberculin (translated from Dr. Bang).
No. 54. Fertilizer analyses.
No. 57. Fertilizer analyses.
No. 59. Fertilizer analyses.
No. 64. Analyses of concentrated feed stuffs.
No. 67. Grass thrips; treatment for thrips in greenhouses.
No. 68. Fertilizer analyses.
No. 69. Rotting of greenhouse lettuce.
No. 70. Fertilizer analyses.
No. 72. Summer forage crops.
No. 75. Fertilizer analyses.
No. 76. The imported elm-leaf beetle.
No. 77. Fertilizer analyses.
No. 78. Concentrated feed stuffs.
No. 79. Growing China asters.
No. 80. Fungicides; insecticides; spraying calendar.
No. 81. Analyses of fertilizers and manurial substances; instructions to manufacturers, agents, etc.; discussion of trade values; treatment of barnyard manure with absorbents.
No. 82. Orchard management; cover crops in orchards; pruning orchards; report on fruits.
No. 83. Fertilizer analyses.
No. 84. Fertilizer analyses.
No. 85. Concentrated feeds.
Special bulletin,—The brown-tail moth.
Special bulletin,—The coccid genera Chionaspis and Hemichionaspis.
Index, 1888-95.

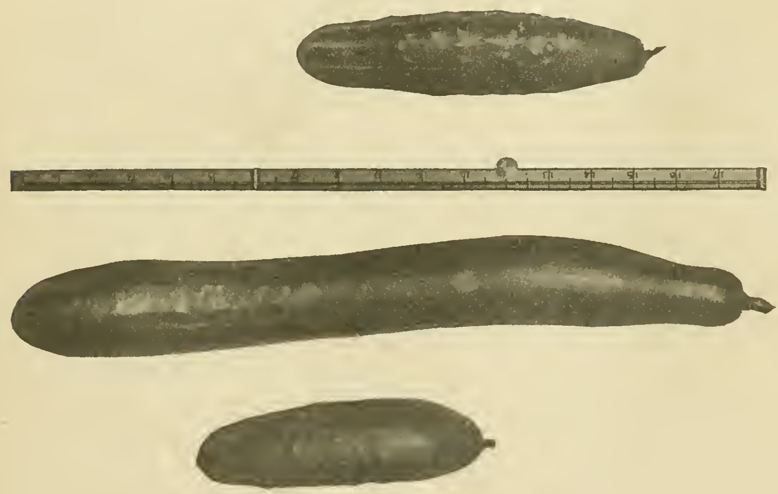
HATCH EXPERIMENT STATION

—OF THE—

MASSACHUSETTS AGRICULTURAL COLLEGE.

BULLETIN NO. 87.

CUCUMBERS UNDER GLASS.



FEBRUARY, 1903.

AMHERST, MASS.:
PRESS OF CARPENTER & MOREHOUSE,
1903.

HATCH EXPERIMENT STATION

OF THE

Massachusetts Agricultural College,

AMHERST, MASS.

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Hatch Experiment Station, Amherst, Mass.

Division of Botany.

CUCUMBERS UNDER GLASS.

GEORGE E. STONE.

Cucumbers have been grown under glass for the winter markets in Massachusetts for a number of years. Not many years ago cucumbers could be obtained only during their natural season. This, however, is not true at the present time, inasmuch as they can be procured in the market at any season of the year. In some sections of the State there are many greenhouses devoted to the production of winter cucumbers under glass to supply the Massachusetts and New York markets. The winter prices of cucumbers range from $0.75 to $3.00 per dozen, according to the season, and even at $1.00 per dozen there is a fair return for the care involved and labor expended on their production, provided diseases do not interfere with the normal yield of the crop. The prices formerly obtained averaged higher than at present, consequently the profits in the business were greater, as the cost of production and the investment required in the business have not been materially reduced. Cucumbers are disposed to a number of diseases induced by pathogenic organisms and abnormal treatment. That these diseases result in a loss to the grower is not surprising. This loss from diseases, however, is too often directly traceable to ignorance on the part of the grower having the crop in charge. Cucumbers do not constitute a difficult crop to handle under glass compared with other crops, such as lettuce, etc. Unfortunately, however, many growers have made this crop a specialty without previous experience in growing any indoor crops.

The production of greenhouse cucumbers in this State is on the increase, as shown by the building each year of many new houses either wholly or partially devoted to cucumber growing. The increase in the number of cucumber houses is not so great as of those devoted to lettuce. Since, however, most lettuce growers raise a spring crop of cucumbers in their houses each year, the production has increased. The growing of outdoor cucumbers is also carried on extensively in some localities in this State.

The Cucumber Plant.

The Cucumber (Cucumis sativus, L.) belongs to the Cucurbitaceae or gourd family, to which other important economic plants, such as the melon, squash, pumpkin, etc. belong. It is a dicotyledonous plant, i. e. it has two cotyledons or seed leaves, which are familiar to all who have observed its germination and development. The cucumber seed is of medium size, and is not supplied with an over-abundance or great variety of reserve material for independent growth, as shown by its habit of thr wing up its cotyledons quite early in its period of development. The cotyledons are withdrawn from the seed coat at an early period, and as soon as they become exposed to the light they turn green. At this period they commence to assimilate food from the air, the green cotyledons possessing the ability to decompose the atmospheric carbon dioxide under the influence of light.

The principal reserve materials which seeds contain are starch, proteids and oils. All seeds, however, are not supplied with these three reserve material constituents, but, on the other hand, may possess only two of these, such as proteids and oils. Such seeds as the pea, horse bean, etc., which contain an abundant supply of the three kinds of reserve material, do not lift their cotyledons into the air, but remain beneath the soil; whereas, such plants as the sunflower, white lupine, etc., which contain only proteids and oil (constituting a one-sided and incomplete supply of reserve material), immediately push their cotyledons above ground. The incomplete reserve material endowment of this latter class of plants causes them to unfold their cotyledons and expose them to the light, by which means they are enabled to assimulate food from the air, thus supplying their inherent deficiencies.

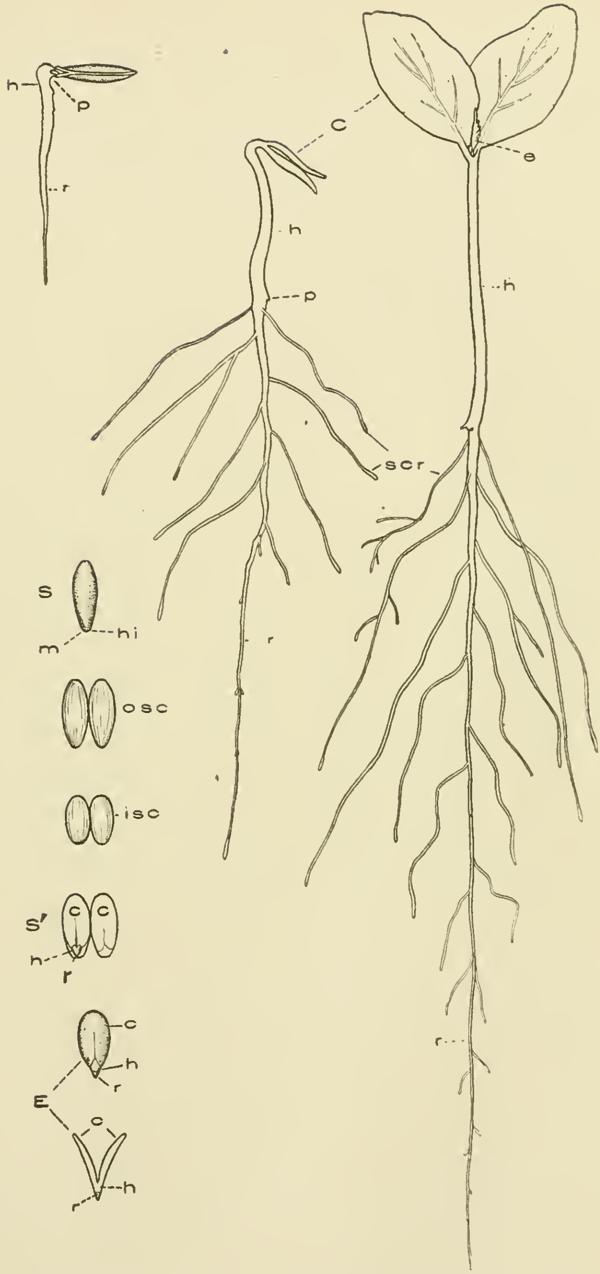

FIG. 1.—Showing three stages in the development of the cucumber seedling: *S*, seed; *S*[1], seed split in halves; *E*, embryo; *hi*, hilum; *m*, micropyle; *r*, radicle; *h*, hypocotyl; *osc*, outer seed coat; *isc*, inner seed coat; *c*, cotyledon; *e*, plumule; *scr*, secondary roots; *p*, peg.

The seed of the cucumber belongs to this latter class, i. e. it contains proteids and oil as a reserve material, but no starch. Hence arises the necessity of utilizing its cotyledons as assimilating organs at a very early stage in its development, in order that the plant may be supplied with carbohydrate material for metabolism and growth. Fig. 1 shows the seed of the cucumber and its various parts, together with the seedlings in different stages of development. Usually one end of the seed is more pointed than the other. The pointed end is where the root protrudes during the process of germination, and is that part of the seed where it is attached in the ovary or fruit, as is shown by the scar, which is known as the hilum. When seeds are soaked in water for a few hours, they swell. If we squeeze a water-soaked seed, it will be seen that water exudes at the hilum end. This is because there is a pore at that end called the micropyle which enables the seed to absorb water readily. The seed is provided with two coats; one which is thin and transparent, and an outer one which is opaque. Inside the coats is what is called the embryo, which consists of two cotyledons, or seed leaves; the radicle, or root; hypocotyl, or that portion of the stem under the cotyledons; and the plumule, or undeveloped stem. The embryo constitutes a minute plantlet. Three different stages of germination are also shown, and the various parts which we saw in the embryo have become greatly extended. The cucumber plantlet has an ingenious and peculiar way of getting out of its coats. The one-sided outgrowth (p) between the radicle and hypocotyl, known as a peg, acts as a lever in spreading the micropyle end of the seed, by which means the cotyledons may be more conveniently withdrawn.

Types of Houses.

So much depends upon the type or style of a house in the economic production of a healthy, vigorous, and prolific plant that it is essential to consider this in the growing of a crop of cucumbers. Different types of houses are utilized in the growing of cucumbers. Market gardeners who raise two or three crops of lettuce during the fall and winter generally plant cucumbers in their lettuce houses in late winter or early spring. These lettuce houses are almost invariably either two-thirds or even span, and they are provided with ground beds instead of benches. They are glazed with 16 by 24 or 16 by 28 inch glass, and in some of the modern houses 20 by 30 inch glass is used. The use of this larger glass results in giving a house considerably more light, thus increasing the photosynthetic* activities of the plant or capacity for carbon assimilation and growth. A house glazed with 20 by 30 inch glass requires only five sash bars to cover a space demanding six sash bars where 16 by 24 or 16 by 28 inch glass is used, and the inferior light conditions due to more frequent lapping are avoided.

A modern even span lettuce house constructed with 20 by 30 inch glass is indicated in the following table as number 13. According to our estimate a house of this size, constructed with sash bars 2 inches wide, would by the use of 16 inch width glass furnish about 745 square feet more opaque surface, due to the use of light obstructing material, than the same house constructed out of 20 by 30 inch glass; or in other words there would be about 19 per cent less sash bar surface to obstruct light in this house if glazed with 20 by 30 inch glass than if glazed with 16 by 24 inch glass. There would also be an improvement in the light conditions owing to the less frequent lapping reqqired by the larger glass. Assuming the glass to lap one-half inch, there would be about 129 square feet more lapped glass with the 16 by 24 inch size than with the 20 by 30 inch, or a gain of about 22 per cent, which, together with the smaller number of sash bars used, would amount to an appreciable gain in the light conditions for the whole house. That this increase in the amount of light is of great advantage in the growing of such crops as cucumbers and lettuce under glass in winter there is no doubt. It has long been known to vegetable physiologists that, where the light conditions fall below the normal requirements of the plant, increasing the amount or intensity of the light by artificial means, such as the use of electricity, etc., considerably accelerates the process of assimilation. It is indeed not difficult to observe practical and conclusive demonstrations of the positive beneficial effects which superior light conditions have upon such crops as lettuce and cucumbers in green houses. Many experiments have been made by the writer which show this. cf. p. 20.

*Photosynthesis is now universally used in all elementary text-books of botany to designate the processes by which the chlorophyll grains (green granules of the leaves), aided by light, manufacture carbohydrates from carbon dioxide and water, or in other words, to designate carbon assimilation.

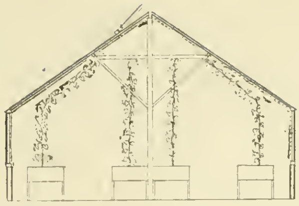

Fig. 2. Cross section of a typical even span double glazed cucumber house, 20 ft. by 106 ft. No. 3 in table I.

The most common type of house used is shown in figure 2. This house is especially built for cucumber growing and would not be adapted to lettuce. Houses of this type are furnished with beds containing about one foot of soil, in which is usually buried 2-inch porous tile for use in subirrigation. This type of house is usually 15 to 23 feet in width and from 100 to 200 feet in length. Many of these houses are provided with two layers of glass throughout, a space of $1\frac{1}{2}$ or 2 inches being left between the layers. Small ventilators are placed near the top of the roof but seldom on the sides. Some of these houses are built with heavy wooden frames which, together with the small and inferior glass frequently used, results in rendering light conditions too poor for the production of healthy plants or large crops. The outer row of plants is trained to follow up the sides and roof, and, when the house is 18 to 23 feet in width, one or more rows are planted through the middle. The middle rows are necessarily more shaded, and invariably prove of little value as crop producers in double glass houses.

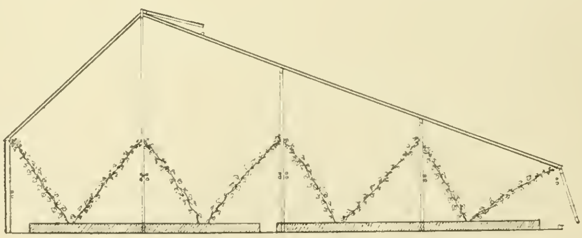

Fig. 3. Cross section of house used for cucumbers, 36 by 200 ft. No. 10 in table I.

The style of house shown in figure 3 is less frequently devoted to cucumbers, but occasionally such houses are made use of for that purpose. It is, however, a typical lettuce house, the highest side being boarded. The method of training the plants is shown in the illustration and is different from that practiced in regular cucumber houses. This method of training is generally adopted in houses of this type.

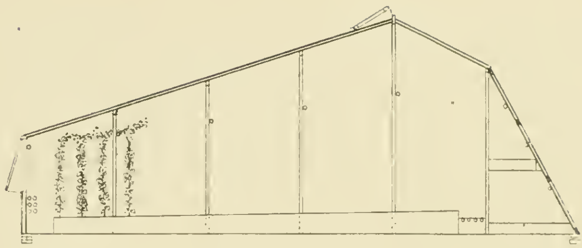

FIG. 4. Cross section of a house used for lettuce in winter and cucumbers in spring.

Figure 4 shows a similar house in which lettuce is grown in the winter months and cucumbers in the spring. The plants in this case are trained vertically. This method of training is one adopted by the owner of a large house represented in table I number 12. The oblique side is boarded, and rhubarb and other crops are raised in the two small beds shown in the cross section.

The variation existing in the arrangement of houses and the economy with which they are constructed and operated are quite marked. The following table makes this clear.

Table I. showing dimensions, cost, etc. of houses devoted to cucumbers, arranged according to their ground area:

No. of house.	Dimensions (feet).	Cost per linear foot.	Ground area.		Cub. cont'ts.		No. of rows of plants.	No. of plants per linear foot.	Coal Burned.		
			Square feet.	Cost (cents.)	Cubic feet.	Cost (cents.)			Per season (tons).	Per cubic ft. (pounds).	Per plant (pounds).
*1	23x80	—	1840	—	17480	—	4	2	24	2.74	300
*2	18x117	$14.52	2106	80	18954	8.9	4	2	23	2.42	188
*3	20x106	16.03	2120	80	19480	8.7	4	2	20	2.10	188
*4	20x125	16.80	2500	84	23750	8.8	4	2	25	2.10	208
5	20x130	12.69	2600	63	23400	7.0	4	2	30	2.56	230
*6	23x120	16.66	2760	72	26220	7.5	4	2	27	2.05	225
*7	23x120	20.93	2760	90	26220	9.5	4	2	30	2.28	250
*8	23x123	19.51	2829	84	26975	8.9	4	2	35	2.91	296
*9	23x200	15.00	4600	65	43700	6.8	4	2	40	1.82	200
10	36x200	10.00	7200	27	79200	2.7	8	4	100	2.52	250
11	40x200	10.00	8000	25	88000	2.2	8	4	20	0.45	66
12	80x250	28.00	20000	35	320000	2.1	11	5½			
13	40x630	9.52	25200	23	277200	2.1	8	4			

A critical examination of the preceding table will show that there exist considerable differences in cost and other economic features of these houses. All of these houses except Nos. 11 and 13 are devoted to cucumbers. The last named are utilized for lettuce, and in the spring cucumbers are grown in them. Those marked with an asterisk are constructed with double layers of glass. These houses, having been constructed at various times, show considerable variation in the cost per linear foot. By comparing the costs per linear foot (the expense of boiler and piping not being included), it will be seen that the cheapest houses are those which are largest. The houses which are 36 to 40 feet wide cost less per linear foot than those 18 to 23 feet wide. The cost of these houses, moreover, bears little relation to the price of the materials, since some of the cheapest ones were constructed when material was highest. The variation in cost is in part due to the mechanical skill and business capacity of the builders, and also to the fact that a large house can be built relatively cheaper than a small one. The larger houses besides costing less are the more substantially built ones. Even at the greatly increased prices of building materials, it is not necessary at the present time that a house should cost over $10 per linear foot. We have seen some of the best recently constructed iron houses built for this price. If we compare the cost of the various houses based upon the cubic contents, the difference will be seen to be much more marked than that shown in their cost per linear foot. In column 6 the cubic contents of each house is given, and the cost per cubic foot is shown in column 7. It will be noticed that the smaller houses cost the most per cubic foot. For example, house No. 2 costs 4.2 times as much as house No. 13. In other words house No. 13 constructed at the same rate at which house No. 2 was built would cost about $39 per linear foot instead of $9.52, and it would cost about $42 per linear foot to construct house No. 13 at the rate house No. 7 was constructed. House No. 7 is the most expensively constructed house, whether estimated by linear foot or cubic contents. If we compare the cost per square foot of ground surface which is shown in column 5, which after all constitutes the most important feature in a house, we find similar differences. House No. 7, which is the most expensive, cost 90 cents per square foot of ground surface, whereas house No. 13 cost only 23 cents per square foot of ground surface. House No. 12 is of unusual width, and was built upon the foundations of two houses which formerly were parallel. A house of this width must necessarily be very high in the center, and a great deal of space has to be heated which is of little use. This house contains 42,800 cubic feet more than house No. 13, while the ground area of house No. 13 exceeds that of house No. 12 by 5,200 square feet. Since it is bed area and not cubic contents which constitutes the most essential feature in a house devoted to the production of market garden crops, house No. 12 is not an economical one. When houses are constructed with one single even spanned roof, there is little to be gained by having them over 40 or 50 feet wide. Market gardeners have usually realized this fact, and houses exceeding 40 feet in width are very rare. The amount of coal burned in these various houses also shows considerable variation. In all of these houses hard coal is burned, except in houses 10 and 11. As far as we can ascertain, however, there is little difference in expense between hard coal and certain grades of soft coal, when the former is $7.00 per ton and the latter $5.00. If hard instead of soft coal was burned in house No 10, the coal per plant would be about 177 pounds instead of 250 pounds, there being little difference in cost. The amount of coal burned in houses Nos. 12 and 13 cannot be obtained and the figures for house No. 11 show the amount used in a lettuce house. The variation in the amount of coal is not due so much to exposure, or double roofing, or to differences in the temperature maintained, as to the type of boiler employed, and economic piping and firing. The amount of coal burned per cubic foot in the larger and smaller houses also differs. Unfortunately, however, data is not available for houses Nos. 12 and 13. The single glazed house, No. 5, is slightly higher in the amount of coal per cubic foot than most of the double glazed houses, but is not so high as the double glazed houses Nos. 1 and 8. The amount of coal* burned per plant is somewhat misleading, as the plants in the houses are by no means under the same conditions.

For example, the first nine houses in the table are from 18 to 23 feet wide; and while four rows of plants are set in them, they are not capable of accommodating more than two rows. In double glazed houses the light is so poor that the two middle rows are of

*No attempt has been made to distinguish between the grades of coal burned. So far as we are aware little difference exists in this respect.

little use, and a larger, better, and more profitable crop could be grown without them. One cucumber grower stated that the two outside rows averaged two-thirds more fruit than the two middle rows. This was what might be expected by one familiar with the results of inferior light conditions to which the plants are subject, and the characteristic abnormal features which they exhibit. One of the most expert growers of cucumbers remarked that he could obtain a larger crop with two rows in a house 30 feet wide than with four. This statement refers to a crop in the spring of the year when the light conditions are the best, and would have very much more weight if made with reference to winter crops. The number of rows of cucumbers in houses 10, 11, 12 and 13 allows more space and better light conditions for the plants than exist in any of the other houses, and a much fairer comparison of the amount of coal burned per plant would be obtained if it were based upon two rows instead of four in houses Nos. 1 to 10. If these houses were therefore estimated on the basis of two rows instead of four, which would double the amount of coal per plant in houses 1 to 10, the results would be quite different.

The cheapest and most economical house to build and operate in the production of cucumbers is an even or two-thirds span house of large dimensions, such as is most frequently used by lettuce growers. The construction, heating and management of a large house are proportionally cheaper than of a small house. It is a significant fact that the largest and most satisfactorily built and best lighted house in the table cost the least per linear and cubic foot. If a side hill with a southern slope were available, an economical house well lighted and easily heated could be built at probably cheaper rates than any shown in the table.

In conclusion it may be stated that the most important features brought out here are that a large house costs less per unit of structure than a small house. The cost of operating the same is proportionally less. The cost of production is less in a large house than in a smaller one, and it would be more economical to manage one large house 40 by 300 feet than three small ones 20 by 200 feet having the same total area. From various observations which have been made on greenhouses, it is evident that cucumber growers have in many instances shown a lack of thought and business ability in the construction of their houses, whereas lettuce and rose growers, who are subject to more competition in their business, are continually making use of the best materials and principles in greenhouse construction and management.

Varieties of Cucumbers Grown.

Most of the cucumbers grow in greenhouses are of the White Spine or some similar variety, and in many instances a *hybrid type is grown. This usually consists of a cross between the White Spine and Telegraph, or some other English type of cucumbers. The Telegraph bears large fruit, generally from 18 to 20 inches or more in length, and is largely used in forcing houses in England. In this country it does not find so ready a sale as the shorter varieties. Many people, however, who have eaten the long English Telegraph, like it; and, if it were found more extensively in the markets, there is no doubt that it would be utilized more largely. A stock of White Spine having about one-fourth of the English Telegraph in it (which constitutes the common hybrid type) makes a cucumber slightly longer than the White Spine, and of a considerably darker color. The quality of this Hybrid is good, but is not superior to that of the White Spine. Its darker green color makes it more desirable for some marketmen than the White Spine. The vine of the English Telegraph is a more rapid grower than that of the White Spine, and is, perhaps, more inclined to wilt than the latter. The Telegraph, so far as our experience goes, sets all its fruit on the laterals; whereas the White Spine and other varieties bear some fruit on the main shoot. The Giant Pera is sometimes crossed with the White Spine to form a hybrid. According to our observations it is not a desirable strain, either as a cross or by itself. It appears to be a very prepotent type. In a house where we had three other varieties growing in equal numbers, which were cross fertilized by bees, the seed selected from a large variety of typical vines showed in the succeeding year a remarkable predominance of the Giant Pera strain. Other varieties of English, Russian and Japanese cucumbers are sometimes grown for a novelty. As yet, however, they have not made headway in finding a market in this State.

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*See cover. Hybrid type at the top. Telegraph in middle, and White Spine at the bottom.

Soils and Fertilizers.

Cucumbers, unlike lettuce, are not susceptible to minute variations in soil texture. A great variety of soils can be utilized successfully for cucumbers, if plenty of organic matter is supplied. Those who make a specialty of growing cucumbers under glass generally use a soil made up of three-fourths decomposed sod and one-fourth horse manure. This makes a light soil containing a large amount of organic matter which is replenished each year by adding more horse manure.

The fertilizers usually employed are ground bone, wood ashes, and frequently some complete commercial fertilizer. As far as our observations go, cucumbers do not respond so readily to fertilizers as many other plants, i. e. the application of a fertilizer does not manifest itself so conspicuously as in other plants. They do respond, however, quite freely to the influence of sterilized soil. In supplying organic matter to the soil we have frequently practiced sowing some leguminous crop such as White Lupine or Canada peas in the beds during August and September when the houses were empty, and turning this crop under before replanting. Both of these plants are rapid growers, and the Lupine readily forms large nodules, which, when turned under, supply the soil with nitrogen as well as organic matter.

Temperature Required for Indoor Cucumbers.

Where cucumbers are grown under glass, it is necessary to supply them with considerable heat, the night temperature required being about 65° F. and the day temperature about 85° F. The temperature requirement varies with the condition of the weather. Higher temperatures can be maintained during sunshine than during cloudy weather. Houses are frequently run during the day at a temperature exceeding 85° F. High temperatures during cloudy weather will produce a weak growth, lacking a sufficient texture of foliage, etc., causing in the plant a marked tendency to wilt in strong sunlight. The conditions to which cucumbers are subject under glass are by no means the same as those which occur in the summer out of doors. Indoor cucumbers are subject to very different moisture conditions, and in the winter the light is none too good for a plant demanding strong light. In order that cucumber plants may be induced to grow under these adverse conditions, heat is substituted for light as a stimulus; which results in producing plants possessing a much more delicate structure, and, consequently, a much greater susceptibility to certain diseases. All cucumber crops grown under glass are more or less abnormal, or, in other words, they are forced; but there are considerable differences in the amount of forcing they receive from different growers, owing to different conceptions of manipulating the crop.

Moisture and Watering.

The watering of plants and regulation of moisture conditions constitute features which require most careful attention. There are probably no matters connected with the care of plants which offer more conspicuous examples of carelessness or ignorance on the part of the gardener than watering. Over watering of cucumber vines gives rise to unhealthy conditions. When this occurs during cloudy weather, under which conditions evaporation and transpiration become arrested, the soil becomes soaked, the root respiration is interfered with, and the plant is likely to become weakened. This condition of affairs is likely to cause succulent growth and a yellow foliage, and if prolonged will result in the death of the vines. During bright, sunny days transpiration and evaporation are so active that the soil is easily drained of superfluous water and the danger arising from over watering is not so great. Too much moisture in the air is conducive to fungous infection. This is especially true in regard to the Powdery and Downy Mildews.

Transplanting Cucumbers.

Most greenhouse cucumber growers start their seed in boxes, or in beds in special houses. When the seedlings are from two to four inches high, they transplant them into pots. They are allowed to grow six to eight inches high in pots before transplanting in the house. Some growers transplant twice in pots, and, as a rule, the seedlings are planted deeper each time in the soil, so that the cotyledons are just above the surface. It is claimed that a better root system is developed by this practice. The principal object to be gained by transplanting cucumbers is the saving of space, time and heat. Plants sufficient for a large establishment can be started in a small house especially devoted to seedlings, which can be operated at small expense; whereas, if the seeds are sown directly in beds, and not transplanted, it is necessary to go to the expense of heating a large house. It is also claimed that transplanted cucumbers will grow faster and make better plants. Our experiments have not verified this statement, as no difference has been noticed in the size of our plants, whether transplanted or sown direct in the beds. Other than the saving in space, heat, etc., which are important, we have never seen any advantage in transplanting cucumbers.

Importance of Light.

If one were to make a tour among the various growers of greenhouse cucumbers of Massachusetts, one of the principal things that would strike him would be the variation in the methods which are pursued. What might be considered a successful method in one locality would not be thought so in some other, hence arises a provincialism in methods of growing cucumbers which is sometimes quite marked. Going hand in hand with this provincialism is to be found a strong conservatism in regard to certain cherished notions which are not always easy to eradicate. The price paid for these conservative notions is not always evident to the grower, although it would not be difficult for one who is familiar with them to estimate in dollars and cents just what they represent when applied to the production of a crop. It is some of these conceptions to which we wish to call attention in treating of the effects of light upon cucumbers under glass.

It is maintained by some that cucumbers cannot be successfully grown in a house for more than two years. The reasons assigned for this failure are not always clear, but some of the factors which appear to be more or less the cause of it are the predominance of fungi and insect pests and the difference in the amount of light transmitted through old and new glass. However erroneous a conception may be, there is almost always to be found a substratum of truth in it. It is true that the older a house and the longer it has been used for growing plants, the more infected it is likely to become with fungi and insects. As to the matter of glass, there can be no doubt that its efficiency deteriorates with age, but this deterioration is largely due to conditions which can be in a great measure controlled by thorough cleaning. The glass in a cucumber house should be cleaned every year or two, especially if crops are to be grown between November and February. With a thorough cleaning of the glass occasionally, there is no reason why the deterioration should exceed 5 to 8 per cent at the end of five years.

Among cucumber growers in certain localities of the State there is and has been for many years a practice of double roofing as a means of keeping out the cold and economizing in fuel. In this method of construction, pieces of moulding are fastened to the inside of the sash bars which constitute the roof and sides of the house, these holding in place a second layer of glass. This forms a double roof and sides to the house, with a $1\frac{1}{2}$ or 2 inch air space between. Some constructors do not carry the double roofing to the ridge, but stop about one-half or two-thirds of the way up, thus leaving the upper part of the roof near the ridge with a single layer of glass, while the lower part is provided with two layers. Certain growers who make use of this plan maintain that it is impossible to grow plants in any other way, while others can not be induced to use it. We have observed a great many crops of cucumbers grown under both of these methods of construction with marked differences in results. The objection to the double roof system is the collection of moisture and dust which shuts out the light, and we have observed more than once houses constructed in this manner which it was almost impossible to see through. The double roof system is also costly, the glass becomes more readily corroded, and, while it may keep out a certain amount of cold, the advantage is, according to our observation, not so great as that which would result from differences in exposure or from the use of an economical boiler. Cucumbers are especially susceptible to light and even under the most favorable conditions in our latitude they not infrequently suffer from the want of it during the winter months. From the first of November to the first of February they should receive all the light possible, not only for their foliage, but for their fruit; and any method in the construction of greenhouses for cucumbers which fails to take this factor into consideration is radically wrong. We have seen many instances in double glass houses where the plants were unhealthy from the lack of light (cf. wilting p. 32). Such plants not infrequently show symptoms of partial etiolation, or, in other words, they exhibit symptoms peculiar to plants grown in the dark. Their leaves possess no texture nor healthy green color, their petioles are small and elongated, their fruit is often stunted in its growth and shows lack of color, and the plant's degree of maturity is not what it would be if grown under better light conditions. We have seen instances in cucumber houses where plants which had been shaded for a few hours each day by some adjoining building showed a loss of 50% in maturity. At the Station greenhouse we obtained differences ranging from 10% to 80% in the maturity of cucumber plants caused by exposures to single, double and triple layers of glass. A diagrammatic sketch of such a house is shown in fig. 5. It will be

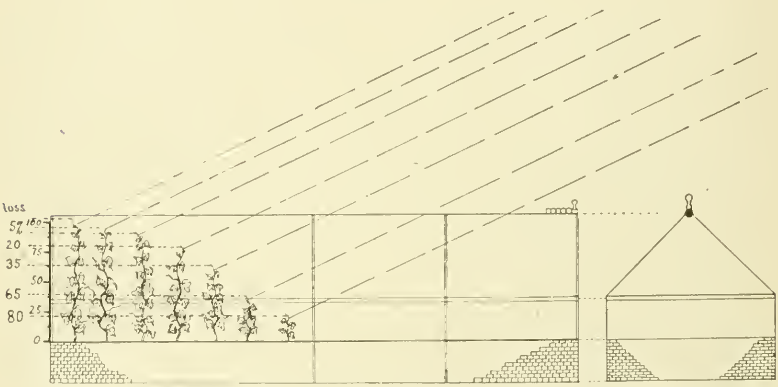

FIG. 5, showing longitudinal and cross sections of greenhouse with partitions running east and west, and illustrating the effect of poor light conditions. The oblique lines represent the path of the sun's rays.

noticed that at one end of the house where the plants are small the sun for a part of the day in winter had to pass through three layers of glass, namely, one roof and two glass partitions; while at the other end of the house the cucumber plants obtained their light throughout the day with only one layer of glass intercepting. The difference in the development of these plants is very striking, and, although the sketch is diagrammatic, the variations are no greater than occurred in the house under these conditions. The two scales and figures upon the side show the relative differences in the maturity of the plants,—the one to the left gives the loss due to inferior light conditions. In some cases, however, this loss was due to the degree of transparency of the glass caused by uncleanliness. From the results obtained in the Station house and from the many observations made in regard to the abnormal effects in those houses which made use of double glass, we determined to make some experiments which would offer more conclusive proof as to the relative merits of single and double lights of glass of various degrees of transparency, as affecting leaf assimilation or photosynthesis. Experiments of this nature would not be necessary to convince a physiologist, since the results of light starvation are too well known. Among certain growers the case is different.

Before passing on to a description of these experiments and their results, it would be well to briefly call attention to some matters connected with photosynthesis. Plants are dependent upon two sources for their food: namely, the soil and the air. The food which plants take from the soil consists of nitrogen, potash, phosphoric acid, etc., which, in order to be available as food, must be exceedingly dilute, and the same holds good, or at least such are the conditions as regards the carbon dioxide which is obtained from the air. Most cucumber growers, however, appear not to realize that over ninety per cent of the plant's food comes from the air and that assimilation of this food, which consists of carbon dioxide, requires the action of sunlight. Neither are they aware that photosynthetic activity increases proportionally to intensity of light. Furthermore, the activity with which carbon dioxide is assimilated depends not only upon the intensity of the light, but upon the position of the leaves. Cucumber leaves arrange themselves upon the stem in such a manner that light strikes them at the most favorable angle for carbon assimilation. In this respect training them on a trellis in a greenhouse during the winter is desirable, as it enables the light to act on the leaves to the best advantage. Growers, however, do not realize that a plant which grows as rapidly as the cucumber and which displays its large leaves at the most suitable angles and position for the rays of light, has any especial need for carbon assimilation. They seem to imagine that, if the soil contains a sufficient amount of plant food, that is all that is required except heat, and the matter of light is of comparatively little importance. It is not only a bad policy but contrary to all experimental knowledge and common sense to substitute heat for light as a growth stimulus, and yet it must be confessed that this is the very practice employed by some cucumber growers. In determining the relative carbon assimilation taking place in leaves exposed to different qualities and various layers of glass, we made use of leaves that were free from starch. In these experiments we compared a single light of clear glass with double lights of the same quality, also single lights of second quality with double lights of second quality. Most of our experiments were made with second quality glass, and where two lights were employed they were about an inch apart. In other experiments we tested the difference between one light of clean and one of unclean glass, also between one light of clean and two lights of unclean glass, and between clean glass and whitewashed glass. These experiments were always carried out during a bright sunny day and the time of exposure was not over six hours, after which the plants were taken out, their leaves removed, boiled, bleached and treated with iodine. The iodine solution colored the starch blue or bluish-black, and, if little or no starch was present, the leaves would attain only a slight blue or no coloration whatsoever. In other words, where the starch reaction was obtained carbon assimilation had taken place. When the plants had been subjected to either one or two lights of glass of inferior transmitting qualities, and the leaves treated as above, the results were practically the same, namely, they showed a little blue coloration of the leaves, or in some cases almost none. This showed, as might be anticipated, that carbon assimilation under such conditions was greatly interfered with : on the other hand, good deep coloration predominated in leaves of those plants subjected to one light of clean glass, showing that carbon assimilation was active. Figure 6 shows photographs of two series of cucumber leaves. The darker or bottom leaves in each series are those which were placed behind one layer of clear second quality representative green-house glass ; the upper ones or lighter leaves are those in which the light had to pass through two layers of unclean glass of the same quality as above. It will be seen by a comparison of the lighter and darker leaves in the two series that the difference in carbon assimilation was considerable, and, were cucumbers subject to such conditions throughout their period of life, the differences in the growth of the vines and the production of fruit would be appreciable. The cork experiment shown in fig. 7 is a common laboratory experiment and consists in pinning a cork upon the upper and under sides of a leaf for a short time, then removing the same and treating the leaves so as to bring out the starch reaction. Photographic negatives are frequently substituted for cork and the starch picture can be printed on the leaf. It is worthy of note that even the cork, which is about three-fourths of an inch in height in this experiment, cast a shadow sufficient to retard starch formation. This shaded or lighter portion is shown more prominently on the leaf than in the photograph. These experiments fully agree with our observations made in various green-houses, namely, that in cucumber plants grown in houses where the light conditions are poor the photosynthetic activity is greatly retarded to the detriment of the plant. These conditions, as has been already stated, are brought about by double layers of glass or by unclean lights of single glass. The matter of shade caused by heavy frames is also a factor that comes now and then into play in obstructing light, (See p. 7) and in the same manner do the shadows caused by adjacent buildings give rise to immature plants. It is just these conditions that retard carbon assimilation, and upon the extent of this retardation will depend the growth of the plant, other conditions being equal. The conditions to which we have referred are especially applicable to growing cucumbers in our latitude between the first of November and February ; after that the intense rays of light, or more properly the conditions to which they give rise in a house, are frequently objectionable, and recourse to shading is perfectly rational after that time. The practical importance of matters pertaining to light and carbon assimilation in cucumber growing cannot be neglected, if one wishes to secure the best results with his crop or the best returns for his investment.

Fertilization of Flowers.

Cucumbers are monoecious plants, i. e., the sexes are borne in separate flowers on the same plant. For this reason, when cucumbers are grown in greenhouses it is necessary to resort to hand pollination, or to employ bees to carry the pollen from the staminate to the pistillate blossoms. Bees are generally abundant enough in summer to accomplish fertilization of outdoor crops. It is stated, however, by some authorities*, that certain varieties of cucumbers, such as the Telegraph, or long English types, do not require fertilization, inasmuch as the fruit matures, whether fertilized or not, in the latter case a seedless fruit being formed. This is considered an advantage, inasmuch as there are no seeds to contend with. When seeds for propagating purposes are desired, however, the practice of fertilization becomes necessary.

Pruning Cucumbers.

When cucumbers are grown under glass in winter, the amount of space the plants occupy, together with the amount of fruit which they produce, is of prime importance from an economic point of view. It is quite essential, therefore, that as many plants shall be grown as possible, without overcrowding or interfering with conditions suitable for maximum production. To secure the best results in the least space, the plants are trained on wires or sticks. The cucumber plant is a prolific grower, and requires a great deal of space if allowed to develop naturally. As there is nothing to be gained in allowing a plant grown under glass to develop in its own manner, the practice of pruning is resorted to. Since the question of utilizing valuable space is an important one, it is necessary that the greatest amount of fruit should be restricted to the least possible space consistent with the normal requirements of the plant. The object of pruning is, therefore, to confine the growth of the plant to certain definite areas, and to concentrate the formation of fruit on the plant to certain desirable positions.

The two common methods of pruning are known as the single and double shoot system. In either case the laterals which arise from the main shoot are treated in the same manner. In the single shoot system a leader is allowed to grow, together with all the laterals or axillary branches which normally occur in the axil of each leaf. As a rule, fruit sets in the first axils of the laterals, and, in case this happens, the laterals are pruned, or the bud nipped, at the second leaf on each lateral. (See figure 8.) By nipping the bud or shoot

*Consult L. B. Bailey, Cornell Bulletin No. 31, 1891, also "The Forcing Book" page 195 etc. by the same author.

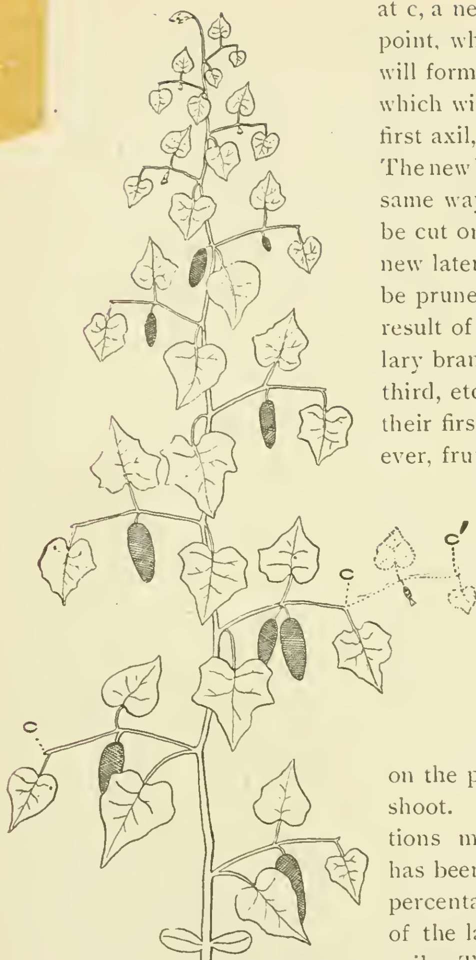

FIG. 8. Showing the single-shoot cucumber plant, with fruit set in the first axils of the laterals. The laterals are pruned at c. The dotted lines represent a new lateral, or tertiary branch, formed on an axillary, which is also nipped at c.

at c, a new lateral will form at this point, which, if allowed to grow, will form another axillary branch, which will set fruit as a rule in the first axil, as shown in the figure. The new lateral can be treated in the same way as the others, i. e., it can be cut or nipped back at c′. As new laterals are formed they can be pruned in a like manner, as the result of which we will have axillary branches of the first, second, third, etc. order, bearing fruit in their first axils. Sometimes, however, fruit does not set in the first axils of the laterals, but may in the second or third axils. In that case the lateral is nipped at the first leaf beyond, or at the third or fourth node of the lateral. By this method of pruning there is concentration of fruit on the plant to parts near the main shoot. From numerous observations made on various crops, it has been found that a very large percentage of the pistillate flowers of the laterals occur in the first axils. The usual number of internodes occurring between the successive formations of fruit on the plant was seven, in other words, fruit is found in the largest number of cases in every eighth axil.

Mr. E. H. Sharpe* has made some observations upon this point in connection with cucurbitaceous plants which are worthy of quota-

*E. H. Sharpe, Am. Gardening, Vol. XXI. 1900 No. 272 p. 167.

tion. He states: "Generally the first seven axes bear staminate flowers and the eighth axis will be pistillate and so on, every eighth axis producing pistillate flowers. The most important point of all comes in here, in relation to the bearing of pistillate and staminate flowers. Supposing the first axis to bear a staminate flower, then we shall find in ninety-nine cases out of a hundred, that the first axis of the axillary branch produced from this axis will bear a pistillate flower. Again, following the branching, we shall find that the tertiary branch produced from the axis of the pistillate flower will produce a staminate flower in its first axis. This seems to be a fixed rule in regard to the whole family, that where we have a staminate axis, the first axis of the axillary branch arising from this point will be pistillate, and where we have a pistillate axis, the first axis on the axillary branch from that point will bear staminate flowers. * * * From these staminate axillary axes, will arise tertiary branches, which will produce pistillate axes at the first axil of each branch; at the same time the axes which bore the pistillate flowers first, will have thrown out a lateral, which will bear staminate flowers in the first axil of that branch. By pruning in this way the plants can be placed closer together, and as we do not have to wait for the axillary branches to grow and spread out we shall get a large return of fruit sooner."

FIG. 9. Showing the development of the two-shoot system. The leader is cut at c, and two new laterals or leaders develop from axils, as shown in the dotted lines.

In the development of the two-shoot system it is necessary that the plants should be manipulated when small, or at that period when two leaves have developed. The plant in this stage of development is shown in figure 9, in which case the dotted lines represent the plant as it will appear as a result of cutting the leader at c. The cutting is best accomplished with a sharp knife, when the bud of the leader is very small. This causes a shoot to develop in the axil of the cotyledons and another in the axil at c. In this case we have a plant in which the two laterals form the two leaders. The subsequent process of pruning is similar to that described under the single shoot system.

There is a difference of opinion as to the relative merits of the single and double shoot system, some cucumber growers preferring the one shoot and others the two shoot system. With regard to this, however, it may be said that cucumbers do not stand over-crowding; and when they are planted in the greenhouse two feet or thirty inches apart, we believe the single shoot system is preferable. In some of the largest crops of cucumbers which we have observed the plants have had ample room for development. In one instance where a third row of vines was planted in a good sized house, the crop was only one-third of that where two rows were planted.

A number of experiments have been made on pruning cucumbers. Some of the more important results will be given here. In these experiments a careful record was kept of the position and number of flowers, together with the amount of fruit obtained from a crop of White Spine.

In one experiment that was made on all the plants constituting a crop, in which case a single leader and several of the laterals were allowed to grow without pruning, the following points were noticed:

The average yield of fruit on the main shoot was 18 per cent higher than upon the laterals. The lowest laterals, or those nearest the base of the plant, came next in the production of fruit, and the others or higher laterals followed in uniform succession in fruit production. The fruit matured earlier upon the main shoot than upon the laterals, the lowest lateral more nearly approaching the main shoot in this respect, and the other laterals following in uniform succession. The main shoot showed a gain of 36 per cent in the length of time required to mature its fruit over the first lateral. Of the fruit formed on the laterals, 61 per cent occurred in first axils. The number of internodes between the successive formation of fruit on the plant was in the largest number of cases seven.

In another experiment in the same house, the plants were allowed to develop a single leader and as many laterals as appeared. The latter, however, in this experiment were pruned at the second leaf, or in case fruit did not set in the first axil of the lateral, they were pruned just beyond the axil where it did set, which was usually the second.

This experiment includes such varieties as the Giant Pera, White Spine, Telegraph, and Hybrid. The following table II. will show the results obtained in one experiment where 36 plants were used.

Table II. showing the average number of flowers produced on four varieties of cucumbers:

	Pistillate.			Staminate.			Total Staminate and Pistillate.		
	Main shoot	Laterals	Total	Main shoot	Laterals	Total	Main shoot	Laterals	Total
Hybrid (White Spine and Telegraph)	0.3	12.5	12.8	15.5	16.3	31.8	15.8	28.8	44.6
Telegraph,	0.0	14.2	14.2	15.1	12.0	27.1	15.1	26.2	41.3
White Spine.	1.7	10.5	12.2	14.6	6.8	21.4	16.3	17.3	33.6
Giant Pera,	1.0	9.1	10.1	16.1	7.0	23.1	17.1	16.1	33.2

With the exception of the Hybrid variety the seeds for this crop were obtained in the market, and the plants from which they were taken were probably the ordinary type. The Hybrid variety, however, was obtained from a cucumber grower who developed this strain. and the stock represents some attempt at breeding and selection. Too much stress should not be laid on the varietal differences shown in this table, as it is the result of only one experiment. Moreover, the cucumber plant is quite plastic and subject to considerable variation. It is possible to develop any of these types along certain lines to such an extent that the results would be entirely different. By means of selection and breeding, some cucumber growers have succeeded in producing quite remarkable bearers. The plants represented in this experiment were grown under similar conditions as regards soil, heat, moisture, light, etc. The Hybrid showed the largest number of flowers of both sexes and this was followed by the Telegraph, White Spine and Giant Pera. No pistillate flowers were formed on the main shoot in the Telegraph, and only a small number were formed on the main shoot in the Hybrid. The Hybrid was a cross between the White Spine and the Telegraph, having three-fourths or more White Spine stock in it. The tendency to produce almost all of its pistillate flowers on the laterals appears to have been inherited from the Telegraph variety. On the other hand there is practically no difference in the number of staminate flowers on the main shoot and laterals of the Hybrid and Telegraph, whereas the White Spine and Giant Pera show an excess of 51 per cent of staminate flowers on the main shoot. Considering all varieties 52 per cent more staminate flowers were produced than pistillate, and 27 per cent more flowers of both sexes were found on the laterals than on the main shoot. There were 93 per cent more pistillate flowers on the laterals than on the main stem. Of the total number of flowers formed in the first axils of the laterals 85 per cent were pistillate, while the number of staminate flowers in the same axil was 15 per cent; and 91 per cent of the laterals bore pistillate flowers in their first axils. Only 13 per cent of pistillate flowers were found in the second axil of all varieties. The variety which showed the largest number of pistillate flowers in the first axil was the Telegraph. The production of fruit on the main stem in all varieties was, however, constant throughout the life history of the plant. The amount produced on the laterals at first was about the same as on the main shoot and then increased as the plants matured to four and six times as much. There was practically no difference in the time required to mature the fruit on the main shoot and on the laterals in this method of pruning. In these two experiments it is possible to compare the differences existing between plants in which the laterals were pruned and those in which they were not pruned. In the first experiment, where the laterals were not pruned, the yield of fruit was 18 per cent higher on the leader or main shoot than on the laterals; whereas in the latter experiment, where the laterals were pruned, this was reversed, and in this case there were 93 per cent more pistillate flowers formed on the laterals than on the leader. In the first experiment, the fruit on the leader matured earlier than on the laterals; in the latter experiment, where pruning was practiced, there was practically no difference. Cutting the leader of the main shoot or pruning the laterals caused an increase in the number of laterals. Where laterals are not cut, they are not formed as a rule in the axil of every leaf. Pruning causes a larger amount of fruit to set in the first axils of the laterals, as it was found that in the experiment were pruning was practiced 91 per cent of the axils produced fruit, against 55 per cent where no pruning took place. In some instances where the leader was nipped on unpruned plants, this resulted in causing a slight increase in the amount of fruit in the first axil of the laterals.

In conclusion it may be stated that from our experience the advantages of pruning seem to be an increase in the yield of fruit, and a concentration of fruit on the plant.

Physiology of Pruning.

One of the fundamental properties of protoplasm is irritability or its capacity to respond to stimuli. Light, heat, electricity, gravity, etc. act as stimuli, and these cosmic forces exert a profound influence on plants. Mutilation of any sort applied to a plant acts as a stimulus, which gives rise to a series of reactions or responses on the part of the organism. The nature of the response is dependent upon the nature and intensity of the stimulus applied. The manner of applying stimuli and the nature of the organs stimulated also exert an influence on the mode of reaction. In general, when secondary organs (branches, etc.) are cut, there are manifested important changes in the behavior of the primary organs (stem, etc.); and, conversely, when the primary organs are cut, changes take place in the characteristic behavior of secondary organs. The cutting of branches causes an elongation of the stem, and when the apex of the stem is decapitated there occurs an elongation of the branches. Similar phenomena occur in all plants, but these correlated growth changes are by no means the only ones that occur as a result of pruning. Indeed the variety of responses due to pruning which occurs in economic plants is quite numerous. Modifications of the fruit and the production of supernumerary structures may take place. In short, the mutilation of any portion of the plant affects the whole organism, the greatest effect occurring nearest the point of mutilation, as is illustrated in the production of new leaders and in the healing of wounds. The first shock given to an organism by a mutilation causes a retardation of growth which is subsequently followed by an accelerated growth. After a time acceleration decreases and the plant growth activities become normal. Coincident with these growth changes there occur characteristic respiratory and metabolic variations in the organism. The plant, in fact, behaves not unlike any organism which is injured, but the processes are so slow in the plant organism and it is apparently so irresponsive that they are not evident to common observation. It is only the ultimate effects of these physiological reactions of the plant that the practical man discerns and it is only these which concern him. It is always well, however, to bear in mind when we prune or apply other forms of stimuli just what we intend to accomplish. It is possible to stimulate plants in such a manner that they will bear fruit, whereas another stimulus of a counteracting nature might be employed to produce just the opposite result. It is also possible to stimulate plants in such a manner that they may become more susceptible to disease. The results of the application of this form of stimulation are too common among novices and inexperienced growers. Among other modifications which take place as the result of pruning the laterals of the cucumber is apparently an increase in the production of pistillate flowers in the axils of the first leaf, consequently concentration and increase of the fruit at that point.

CUCUMBER DISEASES.

A number of pathogenic organisms have been described that give rise to characteristic diseases of cucumbers. Dr. W. C. Sturgis's Host Index* gives a list of these. This list, however, makes no reference to those diseases induced by animal parasites, or those which are the result of specific functional derangements. All of these organisms do not occur on cucumbers cultivated under glass in this State, and others that have been reported a few times are of rare occurrence in greenhouses. There are abnormal conditions producing in the cucumber, as in other plants, diseases for which pathogenic organ-

*Twenty-fourth An. Report, Conn. Expt. Sta. for 1900.

isms are in no way responsible. These are the so-called physiological disorders which an inherent predisposition may encourage, but more commonly they are induced by abnormal environmental conditions due to treatment. Sharp lines, however, cannot always be drawn between the different types of diseases, inasmuch as functional disorders in themselves constitute favorable conditions for the development of pathogenic organisms, and in many well known instances these organisms would not be present, if the plants were not weakened in some way or rendered more susceptible by injudicious treatment. It is therefore quite essential that the conditions underlying infection should be well understood in the case of plants under glass, for here the environment is largely under control: and, what is equally important, the gardener should have a thorough knowledge of the plant's normal requirements and limitations. Since a large number of greenhouse diseases have their origin in unfavorable environmental conditions, the logical manner of treatment, or, more properly speaking, prevention, consists in applying the principles of hygiene and rational cultural methods, rather than in resorting to spraying. There are, indeed, few instances where spraying is necessary for indoor crops, and the time utilized in this manner could often be more profitably employed. Even in cases where a genuine parasite appears, it is frequently possible to modify the method of culture so as to reduce infection enormously. By modifying the light and moisture conditions in a house in such a manner as to cause the development of a firmer and more resistant texture in certain tissues, liability to infection would be greatly reduced. In order to bring this about, radical changes in cultural methods would have to be adopted which would not in certain cases seem feasible or practical at the present time. However, in many instances where it is feasible it is not always accomplished, because the gardener fails to understand the full significance of such matters.

Diseases Induced by Abnormal Treatment, Pathogenic Organisms Not Being Present.

Leaf Curl.

The curling of cucumber leaves into a spherical form is more or less experienced by cucumber growers. This trouble manifests itself in the wilting of the edges of the leaf which subsequently die, thus producing a narrow whitish area of dead tissue and preventing the leaf from further expansion. As the other part of the leaf grows, while the whitish dead edge is restricted in this respect, it results in the exterior surface of the leaf assuming a convex form with a contorted margin. In other words, the leaf is curled up more or less like a ball. Single plants now and then occur in a house affected in this manner, while all the other plants may be normal in this respect. Occasionally many plants will show only slight symptoms of curling, which would be the case when the wilting and dead areas occur after the leaves have practically reached their maximum size. There are various stages of this trouble ranging all the way from a slight curling to pronounced types. These various stages bear a relationship to the plasticity of the plant and its relative development, together with the nature of the cause and the degree of intensity with which the abnormal stimulus has been applied. This wilting and dying of the margin of the leaf may evidently be brought about in more than one way. In all instances that we have observed the phenomenon is one connected with absorption and transpiration or the taking on and giving off of water. The most frequent cause of this condition, however, is over manuring. We have succeeded in producing plants where practically all the leaves assumed the spherical form by growing them in an excess of manure. If strong horse manure at the rate of two-thirds or three-fourths is mixed with one-third or one-fourth soil, such results can usually be obtained. Some of the worst cases we have seen were where the soil had been liberally treated with horse manure with the addition of a considerable quantity of hen manure. Over manuring, however, is not the only cause, and cases have been observed by us where it has occurred without an excess of manure in the soil. It can be induced in various ways, and abnormal modifications in the light, soil and moisture conditions under which plants are grown are frequently responsible. Any cause which is likely to produce excessive transpiration, such as lack of texture in the leaf, etc., or anything which prevents root absorption, as the presence of a considerable amount of nitrate, etc. in the soil, will succeed in producing a curling of the leaf when other necessary conditions are at hand. Care should therefore be taken in not over manuring, also in the regulation of those conditions which produce plants of inferior texture.

Stem Curl.

This is merely a more pronounced case of the foregoing trouble due to an aggravated cause, which manifests itself in the curling of the apex of the stem and leaves, their growth being thus restricted. Plants affected in this manner are likely to remain in this condition for some days or even weeks without any signs of recovery. When the roots come in contact with soil not over manured or adapt themselves to these extreme conditions which lie at the bottom of this trouble, if that be possible, they will frequently show signs of improvement. Plants affected in this manner are capable of recovering, as has been shown by experiments, and in most cases it might be well to wait their recovery rather than to make an attempt to replant the crop.

Cucumber Wilt.

The wilting of cucumbers is a serious disorder with which some growers have to contend every year. Complaints in regard to this disease have always come from certain localities where it has, as a rule, been quite universal. The symptoms of the disease are a wilting of the plant, or, more strictly speaking, of the foliage, whenever it is subjected to the intense rays of the sun. In houses running north and south, the vines on the east side, which are subjected to the morning rays of the sun, will be entirely wilted; while those on the west side, and away from the sun's rays, will not be in the least affected. In the afternoon, when the sun has reached the west side of the house, the vines in that portion of the house will become badly wilted, while those on the east side, no longer exposed to the direct rays of the sun, will commence slowly to recover. Frequent examinations of wilted plants have failed to reveal the presence of any pathogenic organisms, and their unhealthy state is not difficult to understand when one takes into consideration the conditions under which the plants have been grown.

This wilt is due to the extremely abnormal conditions of the plant brought about by irrational methods of cultivation, causing defective transpiration (the giving off of water from the leaves). The activity of transpiration is affected by various causes. It is well known that the stomata or breathing pores of the leaf are open during sunshine and closed during darkness, and that the greatest activity in transpi-

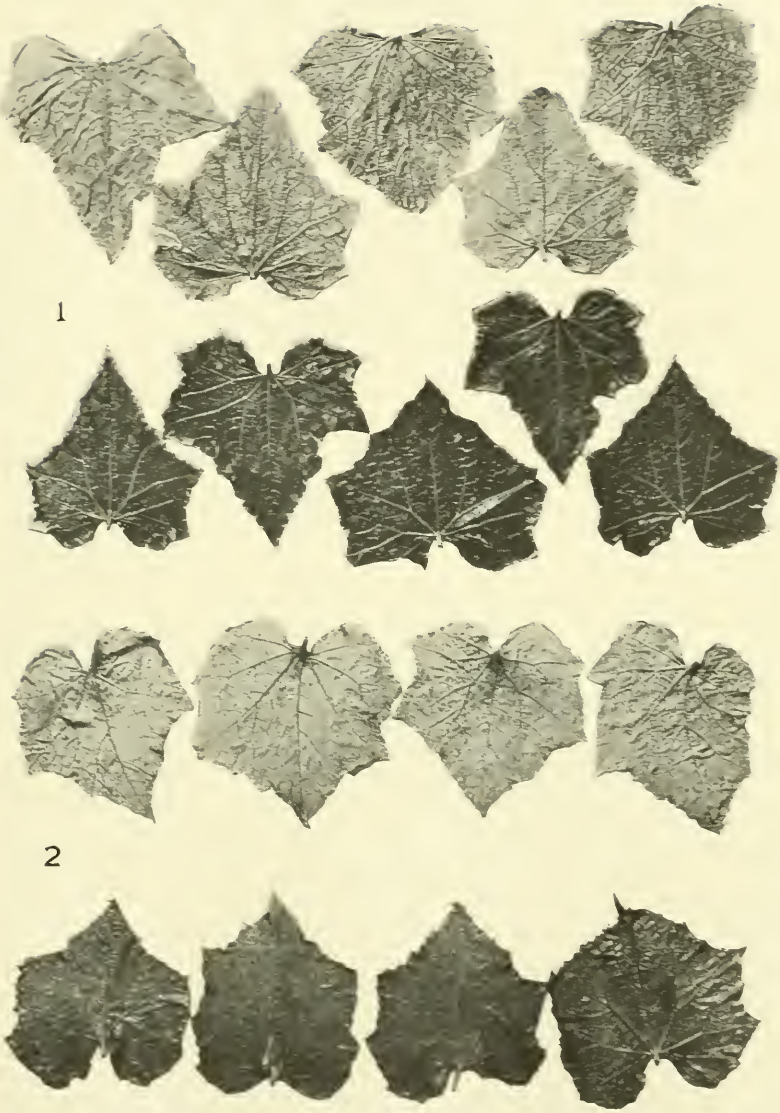

FIG. 6. Showing the results of starch production under single and double panes of glass. The darker leaves in 1 and 2 showing more starch were exposed to a single clean light of glass; the lighter leaves were exposed to two unclean lights of glass.

FIG. 11. Downy mildew.

FIG. 7. Experiments showing absence of starch formation in the white circular area where cork was pinned on the leaf.

FIG. 14. Nematode galls on roots of muskmelon.

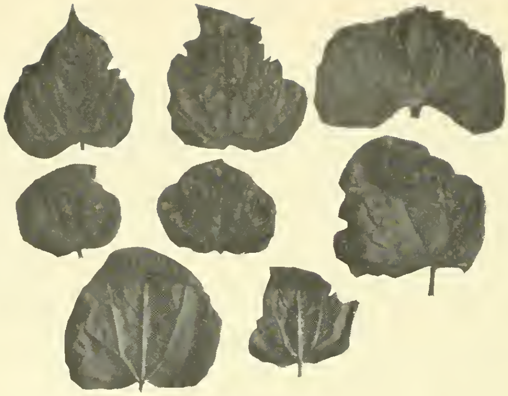

FIG. 10. Leaf curl.

FIG. 15. Effect of nematodes on growth of muskmelon vines. On right normal, left badly affected.

ration takes place during sunshine. This fact is often demonstrated by young cucumber plants in tolerably good health, which not infrequently show some indications of wilt in sunshine, though not enough to cause any appreciable harm. This is especially so when they are forced too rapidly, and when the texture of the leaf is not sufficiently developed. The temperature of the air affects transpiration. A plant in an atmosphere saturated with moisture will not exhale any watery vapor, provided that the temperature of the plant is not higher than that of the air; but when the temperature of the air is high, and the proportion of moisture small, transpiration is promoted. Transpiration is further affected by the temperature of the soil in which the roots are embedded. When the roots are warmed, transpiration becomes more active, and there exists more root absorptive activity. The nature of liquids which the roots absorb and the kind of soil in which they grow also affect transpiration. Plants transpire more when grown in clay than when grown in sandy soil; also when grown in acid soil than when grown in alkaline soil. Potassium nitrate and other salts diminish transpiration, and we have been able to produce severe cases of the wilt by watering pots of cucumber plants with a solution of potassium nitrate.

The methods of growing cucumbers where the wilt occurs are radically wrong in many ways. The houses are imperfectly equipped for ventilation, consequently little use can be made of this necessary feature. Then, again, they are frequently constructed with two layers of glass, which are set about two inches apart, thus leaving an air space between for the purpose of keeping out the cold, but which in reality becomes filled up with dirt, and is an excellent aid in shutting out the light. Plants started in such a house in winter continually suffer from lack of light,—a feature which we have often observed in the greenhouses in this State. Their leaves become pale, their petioles are elongated and slender, and they present all the characteristics of partial etiolation, or, in other words, they resemble plants grown in the dark. If we add to such conditions an enormously high temperature, without proper ventilation, we have a crop that is so tender and abnormally matured that it is incapable of standing strong sunlight. If such a crop is carried over until spring, and subjected to the more intense rays of the sun, the tender, etiolated, sickly colored leaves commence to wilt even with the house closed and a considerable degree of moisture.

We have observed as many as a dozen houses in a single locality affected in this way, and in not a single one could there be discovered more than half a dozen of what might be termed fairly good-colored and healthy plants. Whenever a plant was observed which possessed any color or texture in its leaves, and such plants were always situated where they could obtain either light or air, the vines showed no indication of the wilt; and entire crops of the same variety and age grown at the same season of the year, having been furnished with light and ventilation, were in a vigorous condition and free from wilt. These facts show that it is necessary to bear in mind that the first essential is to secure those conditions which are normal to plants.

While the cucumber wilt is due, as we have already pointed out, to irrational methods of greenhouse management, the specific cause can be traced directly to the lack of texture in the plants, brought about by too high a temperature and defective light in the beginning, rendering them unable to endure the more intense rays of the spring sun, as the amount of water thrown off from their tender leaves is more than can be supplied by their roots. This irrational method seems to have its origin in a desire to save coal, by utilizing double layers of glass, thus starving the plant, and an inclination to indulge in too much forcing; or, in other words, to get more out of the plant in a certain length of time than its inherent capacity warrants. In these methods of culture, prevailing, as they do, in certain localities, we see nothing but practice based upon a disregard of the normal functions of the plant, and mistakes due to local conception of greenhouse management. The remedy in such a case is obvious, and consists in giving the plants during their early stages of growth enough air and light to produce a definite texture of foliage, and not allowing them to grow too spindling. Cucumber plants grown in this manner will possess color and texture, and they will be capable of standing the spring rays of the sun without excessive wilting.

Diseases Caused by Fungi and Other Organisms.

Of the various diseases caused by pathogenic organisms to which cucumbers are subjeet, the following, viz. Bacteriosis (Bacillus tracheiphilus, Smith.) and Wilt (Neccosmospora vasinfecta. (Atk.) Smith.) have not been observed in Massachusetts on greenhouse cucumbers. Bacteriosis has been observed on cucumbers out of doors in Massachusetts, but inocculations of greenhouse soil through pure cultures failed to produce this disease in one experiment which was made on some winter grown plants. The Leaf-Glaze (Acremonium sp.), Leaf-Spot (Phyllosticta Cucurbitacearum, Sacc.), and Scab (Cladosporium cucumerinum, Ell. & Arth.) have been observed only once or twice on indoor cucumbers in this State. Those diseases which are the most common are the following :

Anthracnose.

(Colletotrichum Lagenarium, (Pass.) Ell. & Hals.)

This fungus is responsible for a great deal of damage both on cucumbers and on muskmelons and is quite frequently seen in spring and summer on greenhouse cucumbers. We have never been able to discover a case of infection during the early fall or winter. The earliest record obtained in the spring is March 24. at which time it was just making its appearance on the vines. The first indications of anthracnose are yellow spots on the leaves, which multiply and enlarge, and in a very short time the whole plant succumbs. The spread of the disease out of doors is frequently so rapid that it requires only a few days for the entire crop to die. Crops killed by this fungus present a dry, parched aspect, as if they had been subjected to hot and dry winds of the greatest intensity. Some growers have suggested as a possible cause of infection the great difference between the day and night temperatures unavoidable in a greenhouse in spring after the fires have gone out, but the more probable reason why winter infection does not occur is that the fungus requires a resting period or that conditions are not favorable.

The best results* obtained by spraying out of door plants are not very encouraging at the present time. Possibly by keeping the moisture off the foliage as much as possible infection might be avoided to some extent. In growing crops of muskmelons under glass during the summer months, and keeping the foliage perfectly dry, we have not experienced any trouble from this fungus, notwithstanding it has been more or less common out of doors every season.

*Dr. Halstead in N. J. Agr. Expt. Sta. Rept. XVII., 1896, pp. 340-343.

Downy Mildew.

(Plasmopara Cubensis. (B. & C.) Humphrey.)

This fungus, like the preceding, has never been observed by us on greenhouse cucumbers in winter, neither has it been observed in greenhouses in spring and early summer. It has recently occurred quite extensively on greenhouse cucumbers planted in August and is found on late spring crops running into mid-summer. During the past summer it appeared about August first on greenhouse and outdoor crops. A considerable amount of this Mildew has appeared within the last two years. Its presence can be detected by the yellowish angular spots on the leaves, and it is not difficult to distinguish from other leaf fungi when once carefully observed (see fig. 11). This Mildew was first observed in this State* by Humphrey in 1891 and it was not noticed again until 1900. Since that time it has made its appearance annually on outdoor melons and cucumbers. It occurs very extensively in the South, causing much damage to cucurbitaceous plants. Conditions, however, do not appear to be favorable for its appearance on winter crops in this latitude. Crops of cucumbers set in August under glass appear to be subject to this Mildew, but those set in October and later have shown no tendency to become infected. Prof. A. D. Selby of the Ohio Agricultural Experiment Station is of the opinion that this fungus is perennial in the South and travels north every season, the plants farther north becoming infected later than those in the south. At least this has been the condition in Ohio. Prof. Selby writes as follows: "This disease has occurred regularly on field cucurbits in Ohio at least since 1896, without missing a year. The disease also appears earlier in the southern part of the state than it does in the northern part. I am entirely convinced through repeated experiments in our pathologium that it is not propagated in the cucumber fields by any resting forms contained in old leaves or vines. My cooperative studies, made through inquiry from Florida to your own state and New Hampshire, have thoroughly convinced me of what I apprehended previously; namely, the *Plasmopara* spreads northward each year by its conidia." It has been shown that spraying† with Bor-

*Eighth Annual Rept. Mass. State Expt. Sta. pp. 210-213.
†F. C. Stewart, N. Y. Agr. Expt. Sta., Bull. 138, p. 636-639.

deaux mixture constitutes an effective means for the prevention of this Mildew. Where outdoor crops were sprayed once in two weeks between July 15 and August 1, this disease was almost entirely prevented. In case indoor cucumbers are planted in August and have become infected, it would be well to spray the under side of the leaves a few times with Bordeaux mixture, made after the 4-4-50 formula. As a means of preventing infection we would advise keeping the vines as free from moisture as possible. In support of this method of prevention it may be stated that two crops of melons were grown in our house the past season without the slightest trace of Mildew, whereas outdoor crops were invariably infected with *Plasmopara*. The foliage during the summer months was kept entirely free from moisture. Another method of prevention would be to plant late, preferably in September and October, when the Mildew has apparently gone by.

TIMBER ROT.

(Sclerotinia Libertiana, Fckl.)

This disease is common to cucumbers and tomatoes. It attacks the stem, causing a shrivelled, dry, and lifeless appearance of that portion affected. It also sometimes attacks the fruit. Black masses, or sclerotia, which are about $\frac{1}{32}$ to $\frac{3}{16}$ inch in diameter, appear on the surface of the affected region (see fig. 12). These will germinate and infect other plants, if the conditions are favorable. The fungus which produces the timber rot is a soil fungus apparently not commonly propagated by spores, and is believed to be the same as that which causes the so-called "drop" in lettuce. It does not, however, as a rule, cause very much damage to cucumbers and tomatoes. We have grown tomato plants for five years in soil which was so badly infested with this fungus that nearly one hundred per cent of the lettuce plants would succumb to Drop. In only a few

FIG. 12. Timber rot on stem.

NOTE.—A discussion of the life history of this fungus is given by my colleague, R. E. Smith, in the Botanical Gazette, Vol. XXIX, No. 6, 1900.

For a discussion of the results of soil sterilization consult 14th annual report of the Hatch Experiment Station 1902, p. 74.

instances, however, have tomato plants become affected with Timber Rot when grown in this soil. Should it ever become serious, the surest remedy to apply will be to sterilize the soil. Under the most favorable conditions this method of treatment can be applied at a low cost at the present time, and, when thoroughly done, it constitutes a certain remedy for this and other diseases due to fungi that have their origin in the soil.

Damping Off.

(Pythium De Baryanum, Hesse.)

Damping off of seedlings frequently causes a great deal of trouble to cucumber growers, and, so far as our observations go, is due invariably to the above-named fungus, see fig. 16. Damping off in cucumbers is preeminently a seedling disease and is comparable in the human family to such diseases as whooping-cough, chicken pox, measles, etc. Seedlings up to a certain age are peculiarly susceptible to that trouble. When, however, the plants are a few weeks old they appear to be quite immune to the attacks of this fungus. Damping off is largely the result of abnormal conditions to which the seedlings are subjected. Too rapid forcing which gives rise to the development of weak tissues renders plants more susceptible to this disease.

Fig. 16. Damping off—caused by Pythium De Baryanum.

If the seeds are sown in plats and allowed to germinate over hot steam pipes, they are very likely to develop conditions favorable to infection. Too much moisture in the air or soil, lack of ventilation and insufficient light are detrimental to the development of hardy seedlings and are conducive to Damping off. Anything in fact which tends to produce weak, spindling seedlings may be responsible for this disease. While general hygienic conditions essential to the development of healthy seedlings are necessary in order to prevent or lessen the amount of Damping off, recourse can be had to the sterilization of the soil as a remedy for this trouble. This method of treatment should be resorted to when Damping off is considerable, especially if the grower wishes to make use of extreme forcing conditions. Since cucumbers are frequently started in plats and transplanted in pots, the amount of soil which would have to be treated would be small and the expense insignificant. Numerous experiments made at this Station for some years, as well as those made by Atkinson,* have shown that sterilization of the soil is a positive remedy for this trouble. In some experiments made by us it was found that, where pots of soil had been treated by steam heat sufficient to reach a temperature of 140° F., no Damping off took place, while it occurred in those pots which had been heated to only 127° F. We consider it worth while to plant seeds in sterilized soil regardless of the Damping off fungus, since the increase in the per cent of germination and the accelerated growth of the seedlings amounts to considerable.

Powdery Mildew.

(Erysiphe Polygoni, DC.)

This is the most common Mildew occurring on cucumbers and the one with which practical men are most familiar. It does not, however, usually occur in sufficient abundance to cause very much damage if proper precautions are followed. It appears as a whitish growth on the upper surface of the older leaves, usually confines itself to small areas, and if the conditions are favorable for it to spread it will completely cover the leaves and eventually affect the whole crop. The most favorable conditions for Mildew infection are lack of light and ventilation, too much moisture, and too high temperature. These conditions produce plants of inferior texture and resistant properties which render them more susceptible. This Mildew has never occurred in our house except as it has been purposely introduced, and when certain plants have been infected intentionally one season there never has been any indication of its reappearing the following year. We have endeavored a number of times to induce Mildew to grow on our crops, but only succeeded once in getting a good growth. When certain plants were inocculated, only a slight growth would occur which showed no tendency to spread. In order to obtain much infection it was necessary to cover some of the plants with glass and darken them with opaque paper, thus producing a condition of moisture and shade which was desirable. On one occasion when the Mildew had been quite well established on one or two plants it quickly spread over the whole house and affected

*Cornell University, Agricultural Experiment Station, Bull, 94, 1895.

mature leaves of all the plants. The unusual spread of the Mildew on this occasion was accomplished by bees which seemed to be especially attracted by it, as shown by the fact that they were continually lighting upon the infected leaves. The prevention of this Mildew consists in growing the plants under normal conditions as regards ventilation, light, heat, moisture, etc. In case infection should occur to a large extent from some mishap in the management of the crop, recourse could be had to some spraying mixture such as Ivory soap applied warm. It is prepared by dissolving one ten-cent bar of soap in 15 gallons or more of hot water, and should be applied warm.

Troubles Caused by Animal Parasites.

Some other troubles with which growers of greenhouse cucumbers have to contend are caused by organisms belonging to the animal kingdom such as aphis, thrips, nematode or gall-forming worms, etc. See figs. 14 and 15. Freezing or sterilizing the soil constitutes an efficient remedy for the extermination of nematode worms.

General Treatment of Cucumber Houses.

Since pests of various kinds are likely to increase with the age of the house, it is good practice to follow some systematic treatment of the house each year as a means of prevention. As cucumber houses are usually empty for a portion of the year it is possible to apply stringent remedies. We have made a practice each year of thoroughly fumigating our houses with either burnt sulphur or hydrocyanic gas or both before putting in the crop. We have burned sulphur at the rate of 200 grams (about 6 oz.) to 1000 cubic feet of space and hydrocyanic gas at the rate of

25 grams cyanide (nearly 1 oz.)
$\frac{1}{2}$ more by weight of sulphuric acid.
$\frac{1}{2}$ more by weight of water than acid.

This amount is sufficient for 100 cubic feet.

The sulphur treatment is not as expensive as the cyanide, and while the sulphur is desirable for some things the cyanide is better adapted for others. Either of these treatments will effectually remove certain pests common to greenhouses, and we believe it desirable for growers to practice fumigation methods.

Crooked or Imperfectly Formed Fruit.

Crooked or imperfectly developed cucumbers are not infrequently produced on vines. It is maintained by some authorities that crooked or ill-formed fruit is the result of imperfect fertilization. In many instances this is no doubt the case, but there are other causes underlying the production of inferior formed fruit. It can be safely stated, however, that good plants are endowed with the capacity to produce good fruit, and, conversely, that it must not be expected that perfect fruit will be produced on weak plants. From our observations we are led to believe that crooked or imperfectly developed cucumbers are in the largest number of cases produced by plants which are not normal. For example, plants affected with nematode galls, or weakened by thrips, etc., will develop poor fruit. Anything, in fact, that affects assimilation or interferes with the normal function of the plant weakens it, and the result is poorly developed cucumbers. Since cucumbers are sorted into what is known as No. 1 and No. 2, which bring a different price, the production of straight fruit is a thing to be desired from a financial point of view. One grower, however, informs me that he has no seconds, as he practices a method of treatment which will develop inferior into perfect fruit. His method consists in the manipulation of the spines. For example: if the fruit is growing too large at either end, the spines are rubbed away on that portion which shows the greatest development. This it is maintained will cause the undeveloped portion to fill out and result in a perfectly formed fruit. In the same manner, if one side is developing faster than the other, the spines of that side should be destroyed, which results in stimulating the undeveloped side. As far as I am aware this theory is original with my informer, and we have never discovered any one else who practiced it. It should therefore be accepted for what it is worth.

Bitter Fruit.

Occasionally trouble is experienced by the production of bitter fruit. The cause of this is not known but there seems to be a general agreement among growers as to some of the conditions which are responsible for it. It is the general opinion that bitter fruit occurs late in the season when the plants are deteriorating and the fruit is maturing slowly. It has also been noticed that poorly developed or stunted cucumbers are more likely to be bitter. Outdoor cucumbers are known to be occasionally bitter. It would appear that the bitter fruit is caused by some abnormal metabolic process in the plant not at present understood.

Lack of Color in Fruit.

Too light colored cucumbers do not command as high a price as those well colored, consequently they are not so desirable. The fruit of the Hybrid (Telegraph x White Spine) possesses more color than the White Spine, and on this account is preferred by many. Sometimes the White Spine becomes abnormally light, which is believed to be due to the absence of certain fertilizers in the soil. Many growers believe they obviate this trouble by using nitrate of soda as a fertilizer. Since nitrate of soda is very likely to be used in excess, thus causing injury to the crop, care should be exercised in applying it. Too heavy doses of nitrate to the soil restrict root absorption, thus causing a wilting of the foliage. It would seem desirable to put nitrate of soda on in a liquid form with some such device as the Kinney Pump. A solution containing one part of nitrate of soda to eight hundred or one thousand parts of water can be used occasionally and constitutes a desirable form to apply.

Productiveness of Cucumbers.

The White Spine is probably the most productive of any strain grown under glass. Since cucumbers are quite dependent upon light, the largest yields occur in the spring or summer when the sun is high, the days longer and the light more intense. In one house containing 460 plants set out April 1, there were picked between May 1 and Aug. 25, 30,000 cucumbers, or an average of about 65 to a plant, which sold for 3 cents each. The plants were in good condition and bearing prolifically at the last named date. Another house containing 986 vines yielded from May to October 47,094 salable cucumbers, or an average of 47 to a plant. A larger yield would undoubtedly have been obtained in this house if fewer vines had been planted. A crop started June 19 and running to September gave an average yield of 88 cucumbers per plant. One grower maintains that his spring and summer crop usually averages about 90 to a plant. In a house containing 200 plants 31,060 cucumbers were produced between June 1 and July 15 or an average of 155 cucumbers per plant. They brought from 2 to 7 cents each. W. W. Rawson, who plants cucumbers after two or three crops of winter lettuce is said to produce 600,000 cucumbers per year. He picks about 2000 per day in March, 4000 in April, 10,000 in May, and 15,000 in June. The largest picking he records is 50,000 in one day. It will be noticed that these records are all for spring and summer crops. The yield for fall and winter crops is much smaller. A fall and winter crop that will average 25 to 50 cucumbers per plant is a desirable one. The yield of individual plants is sometimes quite remarkable. In one instance 149 No. 1 cucumbers were picked from one plant. In another instance over 200 were picked from a single plant, 21 of which were picked on three consecutive days. The largest amount of fruit occurring in a single axil of which we have a record is six. Outdoor cucumbers for pickles are noted as great producers. The largest and best crop we saw last summer gave a yield of 102,700 pickle cucumbers from three acres as a result of two pickings during one week.

Vitality of Seeds.

Considerable difference exists in the germinating capacity of seeds and in the time which it takes them to germinate. Some seeds germinate in two or three days, while others of the same variety will require one or two weeks, even under the same conditions as regards temperature, etc. Seeds one year old according to our experience will germinate quickly, whereas older seeds germinate more slowly. Mr. W. W. Rawson who has had large experience as a grower and seedsman states that " new seed will produce the strongest vines and will germinate much quicker than older seed, say two or three days. I prefer seed five or six years old that will germinate in six or seven days. They will produce more fruit with less vine than new seed. I do not think the percentage of germination is any better in new seed than in seed five or six years old."

THE FOLLOWING BULLETINS ARE AVAILABLE FOR DISTRIBUTION TO THOSE WHO MAY DESIRE THEM.

No. 27. Tuberculosis in college herd; tuberculin in diagnosis; bovine rabies; poisoning by nitrate of soda.
No. 33. Glossary of fodder terms.
No. 35. Agricultural value of bone meal.
No. 41. On the use of tuberculin (translated from Dr. Bang).
No. 54. Fertilizer analyses.
No. 57. Fertilizer analyses.
No. 59. Fertilizer analyses.
No. 64. Analyses of concentrated feed stuffs.
No. 67. Grass thrips; treatment for thrips in greenhouses.
No. 68. Fertilizer analyses.
No. 69. Rotting of greenhouse lettuce.
No. 70. Fertilizer analyses.
No. 72. Summer forage crops.
No. 75. Fertilizer analyses.
No. 76. The imported elm-leaf beetle.
No. 77. Fertilizer analyses.
No. 78. Concentrated feed stuffs.
No. 79. Growing China asters.
No. 80. Fungicides; insecticides; spraying calendar.
No. 81. Analyses of fertilizers and manurial substances; instructions to manufacturers, agents, etc.; discussion of trade values; treatment of barnyard manure with absorbents.
No. 82. Orchard management; cover crops in orchards; pruning orchards; report on fruits.
No. 83. Fertilizer analyses.
No. 84. Fertilizer analyses.
No. 85. Concentrated feeds.
No. 86. Orchard treatment for the San José scale. One year's experiments in Massachusetts.
No. 87. Cucumbers under glass.
Special bulletin,—The brown-tail moth.
Special bulletin,—The coccid genera Chionaspis and Hemichionaspis.
Index, 1888-95.

A CATALOGUE

OF THE

COCCIDAE OF THE WORLD.

MRS. MARIA E. FERNALD, A. M.

AMHERST, MASS., U. S. A.
PRESS OF CARPENTER & MOREHOUSE,
1903.

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Author's Edition.

This edition differs from Bulletin 88, of the Hatch Experiment Station of the Massachusetts Agricultural College, only in the omission of the name of the Station and number of the Bulletin from the title page, and the names of the Station staff on the second page. It was printed at the same time as the Bulletin edition.

Introduction.

More than twenty-five years ago I took up the work of making a card catalogue of the Tortricidae for the use of my husband, Prof. C. H. Fernald, who had previously begun this task. Later the utility of the catalogue became so evident that it was extended to include all orders of North American insects for use at the Hatch Experiment Station. The Coccidæ proved to be so important from an economic standpoint, that it was decided to include for this family as complete references as possible to all the scientific literature of the world, and the convenience of such a catalogue to others has led to its publication in this form.

No references have been made in the present work, to literature published before 1758, the date of the first volume of the tenth edition of the Systema Naturæ of Linnæus, except when such references seemed to give necessary information. It has been difficult and in some cases impossible to obtain or even find copies of a few desirable works, and in some instances it was necessary to have certain papers copied from some of the larger European libraries. Doubtless some important works may have been over-looked. All references found in current newspapers not of a scientific standing have been omitted, as have also the names and references to literature of the fossil Coccidæ. With the exception of Targioni's Catalogue, the names in which have been generally accepted, no references to catalogues are given unless some new combination is made. No references have been made to literature published after Feb. 28, 1903. Only those common names most generally in use in North America have been given.

The lists of food plants are far from complete as it was not practicable to include all the plants upon which these insects feed, but additional ones may be found in the "Food Plants of Scale Insects," by Prof. T. D. A. Cockerell, published in the Proceedings of the U. S. National Museum, Vol. XIX, p. 725 (1897). Many references have been purposely omitted as they contained no additional information, or gave only new food plants or habitats which were added without giving the references.

It gives me much pleasure to acknowledge numerous favors and great assistance received in the preparation of this work, from gentlemen who have kindly sent me copies of their published works, and have also given me valuable advice or information. Especial mention should be made of Dr. L. O. Howard, Entomologist to the Department of Agriculture, Washington, D. C., who, with his assistants, Messrs. Marlatt, Banks and others gave me most valuable help and information during a recent visit to Washington. Especially am I indebted to Prof. T. D. A. Cockerell, who for the past two years has been constantly sending me separata and references to foreign literature, besides giving me all possible assistance in regard to classification and synonomy, the result of his extensive studies on the Coccidæ from all parts of the world. To him is due much of whatever value there may be in this catalogue. I feel it not only a duty but a pleasure to say that I never should have prepared this catalogue but for the assistance and constant encouragement of my husband, who has made great efforts to obtain the necessary literature and who has helped me in every possible way.

This catalogue will doubtless be criticised because of the many changes in generic names, but a study of the original works of the older authors has led to the conclusion that these changes are necessary. Entomologists at the present time differ so much in their opinions on classification that it cannot be expected that these changes will meet with universal approval. Professor Cockerell writes me that "the classification of the Coccidæ is not yet in a satisfactory state. While we know such a small number of the existing forms, and of those we know, we are in so many cases ignorant of the larvae, males, etc. it is utterly impossible to reach final or approximately final conclusions in a large number of cases."

In the preparation of a work like this no one can be more conscious of its omissions and imperfections than the author, but the study of the Coccidæ as a whole is still in its infancy, and there will doubtless be great changes made in their classification as further study is made of the group and new species are discovered. It is hoped, however, that notwithstanding its imperfections this work may be of assistance to those engaged in the study of this important family of insects.

M. E. FERNALD.

Amherst, Mass., March, 1903.

Abbreviations of Names of Authors.

Aldr.—Aldrich
Amy.—Amyot
Ashm.—Ashmead
Atk.—Atkinson
Baer.—Baerensprung
Bdv.—Boisduval
Bechst.—Bechstein
Benn.—Bennett
Berl.—Berlese
Bern.—Bernard
Beth.—Bethune
Blanch.—Blanchard
Bosc.—Bosc d'Antic
Buck.—Buckton
Burm.—Burmeister
Chav.—Chavannes
Ckll.—Cockerell
Comst.—Comstock
Coq.—Coquillett
Curt.—Curtis
Dalm.—Dalman
de Charm.—de Charmoy
DeG.—DeGeer
Del Guer.—Del Guercio
Dougl.—Douglas
Eckst.—Eckstein
Ehrenb.—Ehrenberg
Ehrh.—Ehrhorn
Fab.—Fabricius
Fern.—Fernald
Fonsc.—Fonscolombe
Först.—Förster
Fourc.—Fourcroy
F. Phil.—F. Philippi
Franc.—Franceschini
Frauenf.—Frauenfeldt
Frog.—Froggatt
Full.—Fuller
Galv.—Galvez
Genn.—Gennadius
Geoff.—Geoffroy
Gmel.—Gmelin
Gour.—Goureau
Guer.—Guerin-Meneville
Harr.—Harris
Hart.—Hartig
Haw.—Haworth
Hemp.—Hempel
How.—Howard
Iher.—von Ihering
Johns.—Johnson
Kalt.—Kaltenbach
Kenn.—Kennicott
Koll.—Kollar
Künck.—Künckel
Kuw.—Kuwana
Laem.—Laemmerhirt
Lam.—Lamarck
Latr.—Latreille
LeB.—LeBaron
Lederm.—Ledermueller
Lefroy.—Maxwell-Lefroy
Leon.—Leonardi
Licht.—Lichtenstein
Lidg.—Lidgett
Linn.—Linnæus
Lint.—Lintner
Lounsb.—Lounsbury
Macq.—Macquart
Marl.—Marlatt
Mask.—Maskell
Mod.—Modeer
Mont.—Montrouzier
Morg.—Morgan
Murtf.—Murtfeldt
Newm.—Newman
Newst.—Newstead
Niediel.—Niedielski
Nietn.—Nietner
Oliv.—Olivier

Pack.—Packard
Panz.—Panzer
Parr.—Parrott
Patt.—Patterson
Planch.—Planchon
Putn.—Putnam
Quaint.—Quaintance
Rath.—Rathvon
Ratz.—Ratzeburg
Reaum.—Reaumur
Rübs.—Rübsaamen
Sanders.—Sanderson
Saund.—Saunders
Schr.—Schrank
Schrad.—Schrader
Serv.—Serville
Sign.—Signoret
Snell. v. Voll.—Snellen von Vollenhoven
Targ.—Targioni Tozzetti
Tasch.—Taschenberg
Tepp.—Tepper
Thieb.—Thiebaut de Berneaud
Thier. Menonv.—Thiery de Menonville
Thom.—Thomas
Tins.—Tinsley
Towns.—Townsend
Tyr.—Tyrrell
Vall.—Vallot
Walk.—Walker
Washb.—Washburn
Webst.—Webster
Westw.—Westwood
Witl.—Witlaczil
Zehnt.—Zehntner
Zett.—Zetterstedt
Zimm.—Zimmermann
Zinck.—Zincken

Abbreviations of Literature.

Abr. Ins.—Histoire Abrégée des Insectes, etc. Paris. (Geoffroy). 1762.
Actes Soc. Sci. Chili.—Actes de la Société Scientifique de Chili.
Act. Goth.—Actes Götheborgska Vetenskaps och Vitterhets samhällets Skrifter. 1778.
Ag. Gaz. N. S. W.—Agricultural Gazette of New South Wales.
Am. Ent.—The American Entomologist.
Am. Farm Ency.—American Farm Encyclopedia.
Am. Gard.—The American Garden.
Am. Mon. Micr. Journ.—The American Monthly Microscopical Journal.
Am. Nat.—The American Naturalist.
Anat. Cocc.—Anatomy of the Coccidæ. (Mark).
Annali di Agr.—Annali di Agricoltura.
Ann. del. Minist. Agric.—Annali della Ministero di Agricoltura, Industria e Commercio.
Ann. Mag. N. H.—Annals and Magazine of Natural History.
Ann. Rep. Com. Fish. Game. etc.—Annual Report of Commissioners of Fish, Game, etc., New York.
Ann. Rep. Roy. Bot. Soc.—Annual Report of the Royal Botanical Society, Ceylon.
Ann. Soc. Ent. Fr.—Annales de la Société Entomologique de France.
Ann. Soc. Linn. Lyon.—Annales de la Société Linnéenne de Lyon.
Arc. Ent.—Arcana Entomologica. (Westwood).
Atti dei Georgofili.—Atti della R. Accademia dei Georgofili.
Atti del. Istituto Ven. Sci.—Atti dell' Istituto Veneto di Scienze, etc.
Atti del. R. Accad.—Atti della Reale Accademia delle Scienze, etc.
Atti del. R. Ist. d' Incorrag.—Atti della R. Istituto d' Incorragiamento, etc.
Atti del Soc. Ital.—Atti della Societe Italiano di Scienze Naturali, Milano.
Beitr. z. Naturg.—Beiträge zur Naturgeschichte Inseckten. (Schrank). 1776.
Berl. Ent. Zeit.—Berliner Entomologische Zeitung.
Bibl. Zool.—Bibliotheca Zoologica.
Bien. Rep. Cal. Bd. Hort.—Biennial Report of California State Board of Horticulture.
Biol. Centr. Amer.—Biologia Centrali-Americana.
Bol. Com. Parasit. Agric.—Boletin de la Comisión de Parasitologia Agricola, Mexico.
Boll. di Notiz. Agr.—Bolletino di Notizzie Agrarie.
Boll. Ent. Agr.—Bolletino Entomologia Agraria.
Boll. Mus. Torino.—Bolletino dei Musei di Zoologia, etc. Torino.
Brit. Ent.—The British Entomologist.

Bull. Ag. Coll. Univ. Tokio.—Bulletin of the Agricultural College, University of Tokio.

Bull. Bot. Dep. Jam.—Bulletin of the Botanical Department, Jamaica.

Bull. de Ferussac.—Bulletin Universel des Sciences, etc. de Ferussac.

Bull. Div. Ent. Dep. Ag.—Bulletin of the Division of Entomology, U. S. Department of Agriculture.

Bull. Ill. St. Lab. N. H.—Bulletin of the Illinois State Laboratory of Natural History.

Bull. Kew Gard.—Bulletin of the Kew Gardens.

Bull. N. Y. St. Mus.—Bulletin of the New York State Museum.

Bull. Ent. Soc. Fr.—Bulletin de la Société Entomologique de France.

Bull. Soc. Ent. Ital.—Bulletino della Société Entomologica Italiana.

Bull. Soc. Linn. Norm.—Bulletin de la Société Linnéenne de Normandie.

Bull. Soc. Tosc. di Ortic.—Bulletino della Société Toscano di Orticultura.

Bull. T. s. Dep. Ag.—Bull. Technical series, Division of Entomology, U. S. Department of Agriculture.

Can. Ent.—The Canadian Entomologist.

Cat. Br. Mus., Hom.—Catalogue of Insects in British Museum, Homoptera. (Walker).

Check List.—A Check List of the Coccidæ. (Cockerell).

Cherm. Ital.—Chermotheca Italica.

Circ. Roy. Bot. Gard. Ceyl.—Circular of the Royal Botanical Gardens, Ceylon.

Cocc. Amer.—Coccidæ Americanæ.

Cocc. Ceylon.—Coccidæ of Ceylon. (Green). 1896, 1899.

Cocc. deg. Agr. Ital.—Cocciniglie degli Agrumi in Italia.

Cummun. Mus. Buen. Aires.—Communicationes del Museo Nacional de Buenos Aires.

Contr. a l'etude Gom. laques.—Contribution à l'etude des Gommes laques des Indes et de Madagascar. 1893.

Contr. Ia. Ag. Coll.—Contributions to the Department of Entomology of the Iowa Agricultural College.

C. R. Soc. Biol.—Comptes Rendus Société Biologique de Paris.

D'Alton, Zeit. für Zool.—D'Alton, Zeitschrift für Zoologie und Zootomie.

DeG., Mem. Ins.—DeGeer, Mémoires pour servir à l'histoire des Insectes.

Degli Ins. del Olivo.—Degli Insetti sopra dell' Olivo.

Dep. Ag. N. S. W.—Department of Agriculture of New South Wales.

Destr. Ins. Vict.—Destructive Insects of Victoria. (French).

Deutsch. Ent. Zeit.—Deutsche Entomologische Zeitung.

Dict. d'Hist. Nat.—Dictionaire d'Histoire Naturelle de Deterville.

Die Geog. Verbr. Coch.—Die Geographische Verbreitung de Cochenillezucht. (Wiepen). 1890.

Die Pflanz.—Die Pflanzenfeinde aus der Klasse des Insekten. (Kaltenbach). 1874.

Die Schädl. Forst. & Obst. Ins.—Die Schädlichen Forst-und Obstbaum Inseckten. (Henschel). 1895.

Econ. Ent.—Economic Entomology. (Smith).
Edinb. Ency.—Edinburgh Encyclopædia. 1815.
Elem. Zool.—Éleménts de Zoologie. (Sicard).
Ency. Brit.—Encyclopædia Brittanica.
Ency. Meth.—Encyclopedie Methodique. ' (Olivier).
Ent. Beitr.—Entomologische Beiträge.
Ent. Hort.—Entomologie Horticole. (Boisduval). 1867.
Ent. Mag.—The Entomologist's Magazine.
Ent. Mon. Mag.—The Entomologist's Monthly Magazine.
Ent. Nach.—Entomologische Nachrichten.
Ent. News.—Entomological News.
Entom. Tidskr.—Entomologisk Tidskrift.
Ent. Paris.—Entomologia Parisiensis. (Fourcroy).
Ent. Record.—The Entomological Record.
Ent. Syst.—Entomologia Systematica. (Fabricius).
Enum. Ins. Austr.—Enumeratio insectorum Austriae.
Essai Hist. Nat. Oranges.—Essai sur l'Histoire Naturelle des Oranges. (Risso).
Estud. sob. Ins. Cocc.—Estudios sobre algunos Insectos de la familia de los Coccidos. Colvee.
Evid. Com. Ag. Ont.—Evidence before the Commissioner of House of Commons on Agriculture, etc. Ontario.
Faun. Boic.—Fauna Boica. (Schrank).
Faun. Etrusc.—Fauna Etrusca. (Rossi).
Faun. Frid.—Faunae Fridrichsdalinae novicia, etc. 1767.
Faun. Reg. Nap., Cocc.—Fauna del Regno di Napoli, Cocciniglie.
Faun. Suec.—Fauna Suecica. (Linnaeus).
Feuille des jeunes Nat.—Feuille des jeunes Naturalistes.
Forstins.—Forstinseckten. (Ratzeburg). 1837.
Forstins.—Vollständige Naturgeschichte aller schädlichen Forstinsekten. (Bechstein).
Forst. Zool.—Forstliche Zoologie. (Eckstein). 1897.
g.—genus.
Gac. Agr. del Minist. de Fomento.—Gaceta Agricola del Ministerio de Fomento. 1880.
Gard. Chron.—The Gardener's Chronicle.
Gen. Crust. et Ins.—Genera Crustaceorum et Insectorum, etc. (Latreille).
Gen. e Spec. Diaspiti, Asp.—Generi e specie di Diaspiti, Aspidiotus. (Leonardi).
Gen. Ins.—Genera Insectorum.
Gen. Zool.—General Zoölogy.
Gesch. Ins.—Geschichte Insekten. (Sulzer). 1776.
Hamb. Mag.—Hamburgisches Magazin.
Handb. Destr. Ins. Vict.—Handbook of Destructive Insects of Victoria. (French).
Handb. Ent.—Handbuch der Entomologie. (Burmeister). 1835.

Hist. Abr. Ins.—Histoire Abrégée des Insectes, etc., Paris. (Geoffroy).
Hist. Nat. Anim.—Histoire Naturelle des Animaux sans Vertèbres. (Lamarck).
Hist. Nat. Coch.—Histoire Naturelle de la Cochenille. (Melchior). 1729.
Hist. Nat. Crust. Ins.—Histoire Naturelle des Crustacés et des Insectes. (Latreille).
Hist. Nat. Ins.—Histoire Naturelle des Insectes. (Blanchard). 1840.
Hist. Nat. Oranges.—Essai sur l'histoire Naturelle des Oranges.
Ind. Mus. Notes.—Indian Museum Notes.
Ins. Aff. the Orange.—Insects Affecting the Orange. (Hubbard). 1885.
Ins. Inj. to Fruits.—Insects Injurious to Fruits. (Saunders).
Ins. Inj. to Trees.—Insects Injurious to Trees.
Ins. Lap.—Insecta Lapponica descripta. 1840.
Ins. Life.—Insect Life (Washington, D. C.).
Ins. Life, Lond.—Insect Life (London).
Ins. Nox. Ag. N. Z.—Insects Noxious to Agriculture in New Zealand.
Ins. nuis aux Forêts.—Insectes nuisables aux Forêts.
Intr. Ent.—Introduction to the Study of Entomology. (Comstock).
Intr. Sec. Mem. Studii Cocc.—Introduzione alla Seconda Memoria per gli Studi sulle Cocciniglie, etc. Feb. 1869.
Jahrb. Nass. Ver. Nat.—Jahrbücher des Nassauischen Vereins für Naturkunde.
Jahrb. Hamb. Wiss. Anst.—Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten.
Jahr. u. d. Forstwiss.—Jahresberichte ueber die Fortschritte der Forstwissenschaft, etc.
Jn. Bomb. N. H. Soc.—Journal of the Bombay Natural History Society.
Jn. de Pharm.—The Pharmaceutical Journal.
Jn. de Phys.—Journal de Physique, de Chimie et d'Histoire Naturelle, Paris.
Jn. Inst. Jam.—Journal of the Institute of Jamaica.
Jn. Linn. Soc. Lond.—Journal of the Linnaean Society of London.
Jn. N. Y. Ent. Soc.—Journal of the New York Entomological Society.
Jn. Quekett Micr. Club.—Journal of the Quekett Microscopical Club.
Jn. Roy. Hor. Soc.—Journal of the Royal Horticultural Society.
Jn. Trin. Nat. Club.—Journal of the Trinidad Field Naturalists' Club.
K. Vet. Akad. Handl.—Kongliga Svenska Vetenskaps Akademiens Handlingar.
Kan. Univ. Quar.—Kansas University Quarterly.
Lab. di Ent. Portici.—Laboratorio di Entomologia Agraria, Portici.
La gen. autun. de Dias. pentagona.—La generazione autunnale delle Diaspis pentagona.
Lehrb. der Mittel. Forstins.—Lehrbuch der Mitteleur. Forstinsecktenkunde.
Lint., N. Y. Rep.—Lintner's Report on the Injurious and other Insects of New York.
Mag. Ency.—Magazin Encyclopedique.

Man. Inj. Ins.—A Manual of Injurious Insects. (Ormerod).
Man. Ins.—A Manual for the Study of Insects. (Comstock). 1895.
Mant. Ins.—Mantissa Insectorum. (Fabricius).
Mass. Agr. Rep.—Report of the Massachusetts State Board of Agriculture.
Mass. Crop Rep.—Massachusetts Crop Report.
Meddel. Soc. Faun. Flo. Fenn.—Meddelanden af Societas pro Fauna et Flora Fennica.
Mede. Proef. Suik., Java.—Mededeel. van het Proefstation Oost-Java.
Mediz. Zool.—Medizinischen Zoologie. (Brandt & Ratzeburg).
Mem. Acad. Dijon.—Mémoires de l'Académie des Science, Dijon.
Mem. Acad. St. Petersb.—Mémoires de l'Académie des Science, St. Petersbourg.
Mem. Ins.—Mémoires pour servir à l'histoire des Insectes.
Mem. d' Hist. Nat. Acad.—Mémoires d'Histoire Naturelle Académie de Science.
Mem. Ins. grana Coch.—Memoria del grana Cochenilla. 1795.
Mem. Soc. Imp. Agr.—Mémoires Société Imperiale Agricole de France.
Mem. Soc. Ital.—Memorie della Société Italiana di Scienze naturale.
Mem. Soc. Linn.—Mémoires de la Société Linnéenne de Paris.
Metamorph. & Anat.—Metamorphose und Anatomie de Aspidiotus nerii. (Schmidt).
Mikrosk.—Mikroskopische Gemüths u. Augen Ergötzung.
Mitth. Schw. Ent. Ges.—Mittheilungen der Schweizerischen Entomologische Gesellschaft.
Mod. Class. Ins.—The Modern Classification of Insects. (Westwood).
Monats. Kakteenkunde.—Monatschrift der Kakteenkunde.
Mon. Brit. Cocc.—A Monograph of the British Coccidæ. (Newstead). 1901.
Monom.—Monomie. (Amyot). 1848.
N. Am. Ent.—The North American Entomologist.
Nat. der Thier.—Naturgeschichte des Thierreiche. (Gistel). 1848.
Nat. Misc.—Vivarium Naturæ, or the Naturalist Miscellany. 1790—1813.
Nat. Sci.—Natural Science.
Naturg. Ins.—Naturgeschichte des Inseckten. (Bouche). 1834.
Notes on Cocc. W. Austr.—Notes on the Coccidæ of West Australia.
n. s.—new series.
Nuev. Estud. Cocc.—Nuevos Estudios Coccidos.
N. Z. Trans.—Transactions of the New Zealand Institute.
Ohio Nat.—The Ohio Naturalist.
Penn. Farm Journ.—The Pennsylvania Farm Journal.
Philos. Trans.—Philosophical Transactions.
Pract. Ent.—The Practical Entomologist.
Pr. Ac. N. Sci. Ph.—Proceedings of the Academy of Natural Science, Philadelphia.
Pr. Am. Assoc. Adv. Sci.—Proceedings of the American Association for the Advancement of Science.
Pr. Biol. Soc. Wash.—Proceedings of the Biological Society of Washington.

Pr. Cal. Ac. Sci.—Proceedings of the California Academy of Science.

Pr. Dav. Ac. Sci.—Proceedings of the Davenport Academy of Natural Science.

Pr. Ent. Soc. Wash.—Proceedings of the Entomological Society of Washington.

Pr. Ga. Hor. Soc.—Proceedings of the Georgia Horticultural Society.

Pr. Ia. Ac. Sci.—Proceedings of the Iowa Academy of Science.

Pr. Linn. Soc. N. S. W.—Proceedings of the Linnæan Society of New South Wales.

Pr. Roy. Hor. Soc. Lond.—Proceedings of the Royal Horticultural Society of London.

Pr. Soc. Amic. Scien.—Proceedings of the "Société Amicale Scientifique de Mauritius."

Pr. U. S. Nat. Mus.—Proceedings of the U. S. National Museum.

Pr. Zool. Soc. Lond.—Proceedings of the Zoological Society of London.

Prospetto di Metod. Cocc.—Prospetto di una nuova descrizione metodica, Coccus. (Costa.)

Queensland Ag. Journ.—The Queensland Agricultural Journal.

Rech. Hem.—Recherches anatomiques et physiologiques sur les Hémiptères. (Dufour). 1833.

Registro trim.—Registro trimestre o collecion de historia, etc.

Relaz. del. Staz. Ent. Agr.—Relazione della Regia Stazione di Entomologia Agraria, Firenze.

Rep. Am. Assoc. Nurserymen.—Report of the American Association of Nurserymen.

Rep. Can. Exp. Farm.—Report of Entomologist of the Canadian Experimental Farm.

Rep. Dep. Ag. N. S. W.—Report of the Department of Agriculture of New South Wales.

Rep. Dep. Ent. Corn. Univ.—Report of the Department of Entomology of Cornell University.

Rep. Ent. Cape Good Hope.—Report of the Entomologist of Cape of Good Hope.

Rep. Ent. Soc. Ont.—Report of the Entomological Society of Ontario.

Rep. Inj. Ins.—Report of Observations on Injurious Insects. (Ormerod).

Rep. Ins. Ill.—Report on the Noxious & Beneficial Insects of Illinois.

Rep. Ins. Mass. Inj. Veg.—Report on the Insects of Massachusetts, Injurious to Vegetation. (Harris). 1841.

Rep. Ins. N. Y.—Report on the Insects of New York.

Rep. Mass. Ag. Coll.—Report of the Massachusetts Agricultural College.

Rep. Meet. Austr. Assoc. Adv. Sci.—Report of the Meeting of the Australian Association for the Advancement of Science.

Rep. N. J. St. Bd. Ag.—Report of the New Jersey State Board of Agriculture.

Rep. Ont. Dep. Ag.—Report of the Ontario Department of Agriculture.

Rep. Roy. Bot. Gard.—Report of the Royal Botanical Gardens.

Rep. U. S. Dep. Ag.—Report of the U. S. Department of Agriculture.
Rep. U. S. Ent. Com.—Report of the U. S. Entomological Commission.
Rev. Chil. Hist. Nat.—Revista Chilena de Historia natural.
Rev. Ent. Fr.—Revue Entomologique de France.
Rev. & Mag. Hist. Nat.—Revue & Magazin d' Histoire Naturelle.
Rev. Mus. Paul.—Revista do Museu Paulista.
Rev. Zool.—Revue Zoologique.
Riv. Pat. Veg.—Rivista di Patologia Vegetale.
Scale Ins. Less. Antil.—Scale Insects of the Lesser Antilles (Lefroy).
Scale Ins. Trin.—The Scale Insects of Trinidad.
Scale Ins. Lac.—Scale Insects that produce Lac. (Froggatt). 1900.
Schädl. Gart. Ins.—Naturgeschichte der Schädlichen Garten Insecten. (Bouché). 1833.
Scien. Amer.—The Scientific American.
s. g.—subgenus.
Sitzb. K. Bohm. Ges. Wiss.—Sitzungsberichte der K. Bohmisch Gesellschaft der Wissenschaften.
Sitz. Akad. Wiss. Wien.—Sitzungsberichte der Akademie der Wissenschaften, Wien.
Soc. d'Acclim.—Société Impériale d'Acclimatation.
Spec. Ins.—Species Insectorum. (Fabricius).
s. sp.—sub-species.
St. Nat. Hist.—The Standard Natural History.
Stett. Ent. Zeit.—Stettiner Entomologische Zeitung.
Studi bot. sug. Agr.—Studi botanici sugli Agrumi.
Studii sul. Cocc.—Studii sulle Cocciniglie. (Targioni Tozzetti). 1867.
Symb. Phys.—Symbolæ Physicæ.
Synop. Gen. Br. Ins.—Synopsis of the Genera of British Insects. (Westwood).
Syst. Antl.—Systema Antliatorum. (Fabricius).
Syst. Ent.—Systema Entomologiæ. (Fabricius).
Syst. Nat.—Systema Naturæ. (Linnæus).
Syst. Rhyng.—Systema Rhyngotorum. (Fabricius).
Targ. Catalogue.—Coccidarum Catalogus. (Targioni Tozzetti). Feb. 1869.
The Entom.—The Entomologist.
The Ent. Student.—The Entomological Student.
Tijds. voor Entom.—Tijdschrift voor Entomologie.
Traité phys. de la Coch.—Traité physique de la Cochenille. (Richter).
Tr. Am. Ent. Soc.—Transactions of the Entomological Society. (Philadelphia).
Tr. Ent. Soc. Lond.—Transactions of the Entomological Society of London.
Tr. Ent. Soc. N. S. W.—Transactions of the Entomological Society of New South Wales.
Tr. Ia. Hor. Soc.—Transactions of the Iowa Horticultural Society.
Tr. Linn. Soc. Lond.—Transactions of the Linnæan Society of London.

Tr. Mass. Hor. Soc.—Transactions of the Massachusetts Horticultural Society.

Tr. Micr. Soc. Lond.—Transactions of the Microscopical Society of London.

Tr. Penin. Hor. Soc.—Transactions of the Peninsular Horticultural Society.

Tr. Roy. Soc. S. Austr.—Transactions of the Royal Society of South Australia.

Treat. Ins.—Treatise on Insects. (Major).

Treat. Ins. Inj. Fruit & For. Trees.—Treatise on Insects Injurious to Fruit & Forest Trees in California.

Treat. Ins. Inj. Veg.—Treatise on Insects Injurious to Vegetation. (Harris).

Verh. d. Nat. Ver. pr. Rh.—Verhandlungen des Naturhistorischen, Vereins der preussischen Rhinelande.

Verh. z. b. Ges Wien.—Verhandlung der zoologisch-botanischen Gesellschaft, Wien.

Vick, Mon. Mag.—Vick's Monthly Magazine.

West Am. Scien.—West American Scientist.

Wien. Ent. Zeit.—Wiener Entomologische Zeitung.

Zeit. f. Wiss. Zool.—Zeitschrift für wissenschaftliche Zoologie.

Zeit. fur Zool.—D'Alton, Zeitschrift für Zoologie & Zootomie.

Zool. Anzeiger.—Zoologischer Anzeiger.

Zool. Med.—Zoologie Medicale.

Zur Morph. Anat. Cocc.—Zur Morphologie und Anatomie der Cocciden. (Witlaczil). 1885.

||—Preoccupied.

Family COCCIDÆ

Subfamily MONOPHLEBINÆ.

Genus **MONOPHLEBUS** Burm. Type, atripennis.

Monophlebus Burm., Handb. Ent., ii. p. 80 (1835): Westw., Arc. Ent., i, p. 22 (1841): Sign., Ann. Soc. Ent. Fr., (5), v, p. 363 (1875): Mask., N. Z. Trans., xix, p. 107 (1886): Ckll., The Entom., xxxv, pp. 232, 317 (1902).

1. **Monophlebus atripennis** Burm.

Monophlebus atripennis Burm., Handb. Ent., ii, p. 80 (1835).
" " Westw., Arc. Ent., i, p. 22 (1841).
" " Sign., Ann. Soc. Ent. Fr., (5), v, p. 364 (1875).
" " Ckll., The Entom., xxxv, p. 318 (1902).

Habitat.—Java.

2. **Monophlebus**(?) **dalbergiæ** "Green," Stebbing.

Monophlebus dalbergiæ "Green," Stebbing, Dep. Notes Ins. Forestry, p. 142, pl. 1, fig. 8 (1902).

Habitat.—India.

On "Sissu" trees.

3. **Monophlebus dubius** (Fab.).

Chironomus dubius Fab., Syst. Antl., p. 46 (1805) [not Coccus dubius Fab. Ent. Syst.].
Monophlebus Fabricii Westw., Arc. Ent., i, p. 22 (1841).
" dubius Sign., Ann. Soc. Ent. Fr.,(4), viii, p. 851 (1868).
" Fabricii " " " " " (5), v, p. 365 (1875).
" dubius Ckll., The Entom., xxxv, p. 318 (1902).

Habitat.—Sumatra.

4. **Monophlebus** (?) **fortis** Ckll.

Monophlebus fortis Ckll., The Entom., xxxiv, p. 224 (1901).
" " " " " xxxv, p. 319 (1902).

Habitat.—Natal.

On Eucalyptus.

5. **Monophlebus**(?) **fulleri** Ckll.

Monophlebus fulleri Ckll., The Entom., xxxiv, p. 223 (1901).
" " " " " xxxv. p. 319 (1902).

Habitat.—Natal.

On grass.

6. **Monophlebus**(?) **illigeri** Westw.

Monophlebus Illigeri Westw., Arc. Ent., i, p. 22, pl. 6, fig. 4 (1841).
" " Sign., Ann. Soc. Ent. Fr., (5), v, 365 (1875).
" " Mask., N. Z. Trans., xxv. p. 245 (1892).
" " Ckll., The Entom., xxxv, p. 319 (1902).

Habitat.—Tasmania.

7. **Monophlebus**(?) **raddoni** Westw.

Monophlebus Raddoni Westw., Arc. Ent., i, p. 22, pl. 6, fig. 3 (1841).
" " Sign., Ann. Soc. Ent. Fr., (5), v, p. 366 (1875).
" " Ckll., The Entom., p. 319 (1902).

Habitat.—West Africa.

8. **Monophlebus**(?) **stebbingii** "Green," Stebbing.

Monophlebus stebbingii "Green," Stebbing, Dep. Notes Ins. Forestry, p. 135, pl. 1. fig. 7 (1902).

Habitat.—India.

On "Sal" trees.

9. **Monophlebus**(?) **tectonæ** "Green," Stebbing.

Monophlebus tectonæ "Green," Stebbing, Dep. Notes Ins. Forestry, p. 145 (1902).

Habitat.—India.

On teak trees (Tectona grandis).

Genus **TESSAROBELUS** Montr. Type, guerinii.

Tessarobelus Montr., Ann. Soc. Linn. Lyon., xi, p. 246 (1864): Sign., Ann. Soc. Ent. Fr., (5), vi, p. 600 (1876).

10. **Tessarobelus championi** (Ckll.).

Monophlebus Sp? Ckll., Biol. Centr. Amer., ii, pt. 2, p. 3 (1899).
" championi " Ann. Mag. N. H., (7), ix, p. 26 (1902).
Tessarobelus " " The Entom., xxxv, pp. 233, 318 (1902).

Habitat.—Panama.

11. **Tessarobelus guerinii** Montr.

Tessarobelus guerinii Montr., Ann. Soc. Linn. Lyon., xi, p. 246 (1864).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 600 (1876).
" " Ckll., The Entom., xxxv, p. 318 (1902).

Habitat.—New Caledonia.

On Melaleucae and Filices.

Genus **LLAVEIA** Sign. Type, axin.

||Ortonia Sign., Ann. Soc. Ent. Fr., (5), v, p. 363 (1875).

Llaveia Sign., Ann. Soc. Ent. Fr., (5), v, p. 370 (1875): The Entom., xxxv, p. 319 (1902).

s. g. Protortonia Towns., Jn. N. Y. Ent. Soc., vi. p. 169 (1898): g. Ckll., Check List, Suppl., p. 390 (1899).

12. Llaveia axin (Llave).

Coccus axin Llave, Registro trim. Sci. Arts, i, p. 147 (1832).
" axinus Sallé, Rev. & Mag. Zool., (2), xiii, p. 374 (1861).
Llaveia " Sign., Ann. Soc. Ent. Fr., (5), v, p. 370 (1875).
Coccus adipofera Dondé Ruiz, La Emulacion, ii, p. 174 (1879).
" " " " Scien. Amer., Suppl., p. 2729 (1879).
" " " " " " xlii, p. 10 (1880).
Llaveia axinus Comst., 2d Rep. Dep. Ent., Corn. Univ., p. 136 (1883).
" axin Ramirez, La Naturaleza, vi, p. 172 (1884).
Coccus adipofera Tasch., Bibl. Zool., ii, p. 1526 (1889).
Llaveia axinus Ckll., Can. Ent., xxix, p. 271 (1897).
" " " Pr. Ac. N. Sci. Ph., p. 259 (1899).
Monophlebus axinus Ckll., Biol. Centr. Amer., ii, pt. 2, p. 2 (1899).
Llaveia axin Ckll., The Entom., xxxv, pp. 233, 319 (1902).
Habitat.—Mexico.
On Spondias myrobolanus; Jatropha curcas; mango.

Llaveia axin dorsalis (Dugès).

Monophlebus axinus var. dorsalis Dugès, Nat. Mex., (2), i, p. 160 (1888).
Habitat.—Mexico.

13. Llaveia bouvari (Sign.).

Ortonia Bouvari Sign., Ann. Soc. Ent. Fr., (5), v, p. 368 (1875).
Llaveia " Ckll., Pr. Ac. N. Sci. Ph., p. 259 (1899).
Monophlebus Bouvari Ckll., Biol. Centr. Amer., ii, pt. 2, p. 2 (1899).
Llaveia " " The Entom., xxxv, p. 319 (1902).
Habitat.—Guatemala.

14. Llaveia cacti (Linn.).

Coccus cacti Linn., Syst. Nat., Ed. x, i, p. 457 (1758).
" " " " " " xii, i, p. 742 (1766).
" " Fab., Syst. Ent., p. 744 (1775).
" " DeGeer, Mem. Ins., vi, p. 447 (1776).
" " Fab., Spec. Ins., ii, p. 395 (1781) in part.
" " Gmel., Syst. Nat., Ed. xiii, p. 2220 (1789) in part.
" " Fab., Ent. Syst., iv, p. 227 (1794) in part.
" " " Syst. Rhyng., p. 311 (1803) in part.
Monophlebus cacti Ckll., Science, n. s., xv, p. 718 (1902).
Llaveia " " The Entom., xxxv, p. 319 (1902).
Habitat.—St. Eustatius Island, Lesser Antilles.
On Cactus.

15. Llaveia mexicanorum (Ckll.).

Ortonia mexicanorum Ckll., Ann. Mag. N. H., (7), i, p. 430 (1898).
Protortonia " " Check List, Suppl., p. 390 (1899).
Llaveia " " Pr. Ac. N. Sci. Ph., p. 260 (1899).
Monophlebus " " Biol. Centr. Amer., ii, pt. 2, p. 2 (1899).
Llaveia " " The Entom., xxxv, p. 319 (1902).
Habitat.—Mexico.
On Acacia greggi?

16. **Llaveia primitiva** (Towns.).

Ortonia primitiva Towns.. Jn. N. Y. Ent. Soc., vi, p. 169 (1898).
Protortonia " Ckll., Check List, Suppl., p. 390 (1899).
Llaveia " " Pr. Ac. N. Sci. Ph., p. 260 (1899).
Monophlebus primitivus Ckll., Biol. Centr. Amer.. ii, pt. 2, p. 2 (1899).
Llaveia primitiva " The Entom., xxxv, p. 319 (1902).
Habitat.—Mexico.
On " Nettle-tree " (Manihot?).

17. **Llaveia saundersii** (Westw.).

Monophlebus Saundersii Westw., Arc. Ent., i, p. 22 (1841).
" " Sign., Ann. Soc. Ent. Fr.. (5), v, p. 367 (1875).
Llaveia " Ckll., The Entom., xxxv, p. 318 (1902).
Habitat.—East Indies.

18. **Llaveia uhleri** (Sign.).

Ortonia Uhleri Sign., Ann. Soc. Ent. Fr., (5), v, p. 369 (1875).
" " Uhler, St. Nat. Hist., ii, p. 219 (1884).
Llaveia " Ckll., Pr. Ac. N. Sci. Ph., p. 259 (1899).
" " " The Entom., xxxv, p. 319 (1902).
Habitat.—Ecuador.

Genus **DROSICHA** Walk. Type, contrahens.

Drosicha Walk., Cat. Br. Mus., Hom., iv, Suppl., p. 306 (1858): Sign., Ann. Soc. Ent. Fr., (5), v, p. 353 (1875).

19. **Drosicha burmeisteri** (Westw.).

Monophlebus Burmeisteri Westw., Arc. Ent., i, p. 22, pl. 6, fig. 2 (1841).
" " Sign., Ann. Soc. Ent. Fr., (5), v, p. 364 (1875).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 46 (1902).
Drosicha " Ckll., The Entom., xxxv, pp. 233, 318 (1902).
Habitat.—Japan; China; Java.
On pine.

20. **Drosicha contrahens** Walk.

Drosicha contrahens Walk., Cat. Br. Mus., Hom., iv, Suppl., p. 306 (1858).
" " Sign., Ann. Soc. Ent. Fr., (5), v, p. 354 (1875).
" " Ckll., The Entom., xxxv, pp. 233, 318 (1902).
Habitat.—Ceylon; N. China.

21. **Drosicha corpulenta** (Kuwana).

Monophlebus corpulentus Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 46 (1902).
Drosicha corpulenta Ckll., The Entom., xxxv, p. 318 (1902).
Habitat.—Japan.
On oak.

22. Drosicha crawfordi (Mask.).

Monophlebus crawfordi Mask., Tr. Roy. Soc. S. Austr., pp. 101, 108 (1888).
" " " N. Z. Trans., xxiii, p. 28 (1890).
" " " " " " xxiv. pp. 48, 51 (1891).
" " " " " " xxv, p. 243 (1892).
" " " " " " xxvi, p. 102 (1893).
Drosicha " Ckll., The Entom., xxxv, p. 318 (1902).
Habitat.—Australia.
On Eucalyptus.

Drosicha crawfordi levis (Mask.).

Monophlebus crawfordi var. levis Mask., N. Z. Trans., xxv, p. 244 (1892).
" " " " " " " " xxvi, p. 102 (1893).

Drosicha crawfordi pilosior (Mask.).

Monophlebus crawfordi var. pilosior Mask., N. Z. Trans., xxv, p. 244 (1892).
" " " " " " " " xxvi, p. 102 (1893).
Habitat.—Australia.
On Eucalyptus.

23. Drosicha leachii (Westw.).

Monophlebus Leachii Westw., Arc. Ent., i, p. 22 (1841).
" " Sign., Ann. Soc. Ent. Fr., (5), v, p. 365 (1875).
" " Mask., N. Z. Trans., xxv, p. 245 (1892).
Drosicha leachii Ckll., The Entom., xxxv, pp. 233, 318 (1902).
Habitat.—India.

24. Drosicha maskelli (Ckll.).

||Monophlebus burmeisteri Mask. (non Westw.), N. Z. Trans., xxix, p. 327 (1897).
Monophlebus maskelli Ckll., Science, n. s., xv, p. 718 (1902).
Drosicha " " The Entom., xxxv, p. 318 (1902).
Habitat.—Japan; China; Java.
On pine; Ficus; Gardenia florida.

Genus **MONOPHLEBULUS** Ckll. Type, fuscus.

Monophlebulus Ckll., The Entom., xxxv, pp. 233, 318 (1902).

25. Monophlebulus fuscus (Mask.).

Monophlebus fuscus Mask., N. Z. Trans., xxv, p. 244 (1892).
Monophlebulus " Ckll., The Entom., xxxv, pp. 233, 318 (1902).
Habitat.—Australia.

Genus **GUERINIA** Targ. Type, serratulæ.

Guerinia Targ., Catalogue, p. 31 (1869): Sign., Ann. Soc. Ent. Fr., (5), v, p. 356 (1875).

26. Guerinia serratulæ (Fab.).

Coccus serratulæ Fab., Syst. Ent., p. 744 (1775).
" " " Spec. Ins., ii, p. 395 (1781).
" " " Mant. Ins., ii, p. 319 (1787).
" " Gmel., Syst. Nat., Ed. xiii, p. 2220 (1789).
Chermes " Oliv., Ency. Meth., vii, p. 442 (1792).
Coccus " Fab., Ent. Syst., iv, p. 227 (1794).
" " " Syst. Rhyng., p. 310 (1803).
" picridis Fonsc., Ann. Soc. Ent. Fr., iii, p. 201 (1834).
" fabæ Guér., Bull. Soc. Ent. Fr., (3), iii, p. lxviii (1855).
" " " Rev. et Mag. Zool., p. 347 (1856).
Cochenille de la Féve Guér., Bull. Soc. Ent. Fr., (3), iv, p. lxxiv (1856).
Coccus fabæ Bdv., Ent. Hort., p. 354 (1867).
Guerinia tinctoria Targ., Catalogue, p. 31 (1869).
" serratulæ Sign., Ann. Soc. Ent. Fr., (5), v, p. 356 (1875).
" " Targ., Annali di Agr., p. 403 (1884).
" " Berl. e Leon., Annali di Agr., p. 46 (1898).
" " " " Riv. Pat. Veg., vi, p. 321 (1898).

Habitat.—Algeria; Europe.
On Serratula.

Genus **STIGMACOCCUS** Hemp. Type, asper.

Stigmacoccus Hemp., Rev. Mus. Paul., iv, p. 399 (1900); Ann. Mag. N. H., (7), vii, p. 110 (1901); Ckll., The Entom., xxxv, p. 233 (1902).
Perissopneumon Newst., Ent. Mon. Mag., xxxvi, p. 250 (1900).

27. Stigmacoccus asper Hemp.

Stigmacoccus asper Hemp., Rev. Mus. Paul., iv, p. 400 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 114 (1901).

Habitat.—Brazil.
In nests of Camponotus: on bark of Inga.

28. Stigmacoccus ferox (Newst.).

Perissopneumon ferox Newst., Ent. Mon. Mag., xxxvi, p. 250 (1900).
Stigmacoccus " Ckll., The Entom., xxxv, p. 233 (1902).

Habitat.—India.
In ants' nests.

Genus **LOPHOCOCCUS** Ckll. Type, mirabilis.

Lophococcus Ckll., The Entom., xxxiv, p. 227 (1901), & xxxv, p. 233 (1902).

29. Lophococcus mirabilis Ckll.

Lophococcus mirabilis Ckll., The Entom., xxxiv, p. 248 (1901).

Habitat.—Natal.
On Mimosa.

Genus **PALÆOCOCCUS** Ckll. Type, fuscipennis.

Leachia Sign., Ann. Soc. Ent. Fr., (5), v, p. 359 (1875).
Palæococcus Ckll., Can. Ent., xxvi, p. 36 (1894); The Entom., xxxv, p. 233 (1902).
s. g. Crypticerya Ckll., Psyche vii, Suppl., I, p. 15 (1895); g. Check List, Suppl., p. 390 (1899). Type, rosæ.

30. Palæococcus australis (Mask.).

Icerya rosæ var. australis Mask., N. Z. Trans., xxvi, p. 101 (1893).
" " " " " " " " xxviii, p. 406 (1896).
" australis Ckll., Check List, p. 323 (1896).
Palæococcus " " The Entom., xxxv, p. 233 (1902).
Habitat.—Australia.
On Hakea gibbosa.

31. Palæococcus braziliensis (Walk.).

Monophlebus braziliensis Walk., Cat. Br. Mus., Hom., p. 1089 (1852).
" " Targ., Catalogue, p. 31 (1869).
Leachia " Sign., Ann. Soc. Ent. Fr., (5), v, p. 359 (1875).
Palæococcus " Ckll., The Entom., xxxv, p. 233 (1902).
Habitat.—S. America.

32. Palæococcus ewarti (Newst.).

Icerya ewarti Newst., Ent. Mon. Mag., xxxii, p. 132 (1896).
Crypticerya ewarti Ckll., Check List, Suppl., p. 390 (1899).
Palæococcus " " The Entom., xxxv, p. 233 (1902).
Habitat.—W. Africa.
On "Peppet."

33. Palæococcus fuscipennis (Burm.).

?Coccus hirticornis Fonsc., Ann. Soc. Ent. Fr., iii, p. 203 (1834).
Monophlebus fuscipennis Burm., Handb. Ent., ii, p. 80 (1835).
" " Westw., Arc. Ent., i, p. 22 (1841).
" hirticornis Targ., Catalogue, p. 31 (1869).
" fuscipennis Kalt., Die Pflanz., p. 92 (1874).
Leachia " Sign., Ann. Soc. Ent. Fr., (5), v, p. 351 (1875).
?Coccus hirticornis " " " " " " " p. 358 (1875).
Palæococcus fuscipennis Ckll., Check List, p. 322 (1896).
" " Berl. e Leon., Annali di Agr., p. 46 (1898).
Habitat.—Brazil; France; Germany.
On oak; maple; fir; pine.

34. Palæococcus hellenicus (Genn.).

Monophlebus hellenicus Genn., Ann. Soc. Ent. Fr., (6), iii, p. 32 (1883).
Palæococcus " Ckll., Check List, p. 322 (1896).
Habitat.—France.

35. **Palæococcus hempeli** (Ckll.).

Icerya hempeli Ckll., Can. Ent., xxxi, p. 43 (1899).
Crypticerya hempeli Hemp., Rev. Mus. Paul., iv, p. 376 (1900).
Habitat.—Brazil.
On Mimosa?

36. **Palæococcus mexicanus** (Ckll. & Parr.).

Crypticerya rosæ var. mexicana Ckll. & Parr., Biol. Centr. Amer., ii, pt. 2, p. 4 (1899).
Palæococcus mexicanus Ckll., in litt. (1902).
Habitat.—Mexico.
On Prosopis.

37. **Palæococcus nudatus** (Mask.).

Icerya nudata Mask., N. Z. Trans., xxviii, p. 405 (1896).
Crypticerya " Ckll., Check List, Suppl., p. 390 (1899).
Habitat.—Australia.
On Cosmos; Verbena.

38. **Palæococcus plucheæ** (Ckll.).

Icerya townsendi var. plucheæ Ckll., Jn. N. Y. Ent. Soc., iv, p. 202 (1896).
Crypticerya " " " " Check List, Suppl., p. 390 (1899).
" plucheæ Ckll., Psyche, ix, pp. 175, 176 (1901).
Palæococcus " " The Entom., xxxv, p. 233 (1902).
Habitat.—New Mexico.
On Pluchea borealis.

39. **Palæococcus rosæ** (Riley & Howard).

Icerya rosæ Riley & How., Ins. Life, ii, p. 333 (1890).
" " " " " " iii, pp. 93, 94, 95, 97 (1890).
" " Ckll., Bull. Bot. Dep. Jam., No. 46, p. 2 (1893).
" " Towns. & Ckll., Jn. N. Y. Ent. Soc., vi, p. 168 (1898).
Crypticerya rosæ Ckll., Biol. Centr. Amer., ii, pt. 2, p. 4 (1899).
Palæococcus " " The Entom., xxxv, p. 233 (1902).
Habitat.—Fla.; Mex.; Jamaica; Australia.
On rose; sugar-apple; lime; lemon; Amherstia nobilis; Lignum-vitæ; Euphorbia; Prosopis julifera; Hakea gibbosa.

40. **Palæococcus townsendi** (Ckll.).

Icerya townsendi Ckll., Jn. N. Y. Ent. Soc., iv, p. 201 (1896).
Crypticerya " " Check List, Suppl., p. 390 (1899).
" " " Psyche, ix, p. 175 (1901).
Palæococcus " " The Entom., xxxv, p. 233 (1902).
Habitat.—New Mexico.
On Townsendia grandiflora; Gutierrezia sarothræ; Picradenia florabunda; Grindelia squarrosa; Bahia chrysanthemoides.

Genus **WALKERIANA** Sign. Type, floriger.

Walkeriana Sign., Ann. Soc. Ent. Fr., (5), v, p. 390 (1875): Ckll., Can. Ent., xxxi, p. 274 (1899).

41. Walkeriana andreæ Green.

Walkeriana andreæ Green, Ann. Mag. N. H., (7), iii, p. 45 (1899).
Habitat.—Congo, Africa.

42. Walkeriana compacta Green.

Walkeriana compacta Green, Ind. Mus. Notes, iv, No. 1, p. 6 (1896).
Habitat.—Ceylon.

43. Walkeriana euphorbiæ Green.

Walkeriana euphorbiæ Green, Ind. Mus. Notes, iv, No. 1, p. 6 (1896).
Habitat.—Ceylon.
On Euphorbia antiquorum.

44. Walkeriana floriger (Walk.).

Coccus floriger Walk., Cat. Br. Mus., Hom., iv, Suppl., p. 205 (1858).
Walkeriana floriger Sign., Ann. Soc. Ent. Fr., (5), v, p. 391 (1875).
Coccus laniger Kirby, Jn. Linn. Soc. Lond., xxiv, p. 175 (1891).
Walkeriana floriger Green, Ind. Mus. Notes, iv, No. 1, p. 6 (1896).
" " Ckll., Check List, Suppl., p. 391, note (1899).
Habitat.—Ceylon.
On Litzea Zeylandica.

45. Walkeriana pertinax Newst.

Walkeriana pertinax Newst., Pr. Zool. Soc. Lond., p. 947, pl. 59, figs. 1—9 (1900).
Walkeriana pertinax Ckll., Science, n. s., xv, p. 717 (1902).
Habitat.—Central Africa.

46. Walkeriana poleii Green.

Walkeriana poleii Green, Ind. Mus. Notes, iv, No. 1, p. 6 (1896).
Habitat.—Ceylon.
On Dodonæa viscosa.

47. Walkeriana senex Green.

Walkeriana senex Green, Ind. Mus. Notes, iv, No. 1, p. 6 (1896).
Habitat.—Ceylon.
On Dodonæa viscosa.

Genus **ICERYA** Sign. Type, seychellarum.

Icerya Sign., Ann. Soc. Ent. Fr., (5), v, p. 351 (1875): Comst., Rep. U. S. Dep. Ag., 1880, p. 347 (1881): Mask., Ins. Nox. Agr. N. Z., p. 104 (1887): Ckll., The Entom., xxxv, p. 257 (1902).
Crossotosoma Dougl., Ent. Mon. Mag., xxvi. p. 79 (1890).
s. g. Proticerya Ckll., Psyche, vii, Suppl., 1, p. 15 (1895). Type, rileyi.

48. Icerya ægyptiaca (Dougl.).

(*The Egyptian Mealy Bug.*)

Crossotosoma ægyptiacum Dougl., Ent. Mon. Mag., xxvi, p. 79 (1890).
An Egyptian mealy bug, Riley & How., Ins. Life, ii, p. 256 (1890).
Icerya ægyptiacum " " " " iii, pp. 97, 105 (1890).
" " " " " " " p. 423 (1891).
" ægyptiaca Newst., Ent. Mon. Mag., xxix, p. 167 (1893).
" " Mask., N. Z. Trans., xxvi, p. 99 (1893).
" ægyptiacum Riley & How., Ins. Life, v, p. 361 (1893).
" " " " " " vi, pp. 46, 137 (1893).
" ægyptiaca Mask., Ins. Life, vi, p. 268 (1894).
" ægyptiacum Riley & How., Ins. Life, vii, pp. 51, 271 (1894).
" " Cotes, Ind. Mus. Notes, iii, No. 5, p. 48 (1894).
" ægyptiaca Newst., Ent. Mon. Mag., xxxiii, p. 60 (1896).
" " " Jn. Roy. Hor. Soc., xxiii, p. 36 (1900).
Habitat.—Egypt; India; Australia; Ceylon.
On Ficus; Croton; Goodenia ovata; Aristolochia saccata.

49. Icerya albolutea Ckll.

Icerya seychellarum var. albolutea Ckll., The Entom., xxxi, p. 259 (1898).
" albolutea Ckll., Ent. Mon. Mag., xxxviii, p. 86 (1902).
Habitat.—W. Africa.
On Anona squamosa.

50. Icerya braziliensis Hemp.

Icerya braziliensis Hemp., Rev. Mus. Paul., iv, p. 370 (1900).
" " " Ann. Mag. N. H., (7), vi, p. 389 (1900).
Habitat.—Brazil.
On Liriodendron tulipifera; Laurus camphora; Codiaeum.

51. Icerya crocea Green.

Icerya crocea Green, Ind. Mus. Notes, iv, No. 1, p. 7 (1896).
Habitat.—Ceylon.
On Citrus; Croton; Cocculus.

52. Icerya formicarum Newst.

Icerya formicarum Newst., Ent. Mon. Mag., xxxiii, p. 169 (1897).
Habitat.—India.
In ants' nests.

53. Icerya koebelei Mask.

Icerya koebelei Mask., Ent. Mon. Mag., xxviii, p. 184 (1892).
" " " N. Z. Trans., xxv, p. 245 (1892).
Habitat.—Australia.
On Leptospermum lævigatum; Acacia.

54. Icerya littoralis Ckll.

Icerya (Proticerya) littoralis Ckll., Ann. Mag. N. H., (7), i, p. 429 (1898).
" " " Towns. & Ckll., Jn. N. Y. Ent. Soc., vi, p. 168 (1898).
Habitat.—Mexico.
On Croton.

Icerya littoralis mimosæ Ckll.

Icerya littoralis var. mimosæ Ckll., Ann. Mag. N. H., (7), i, p. 430 (1898).
Habitat.—Mexico.
On Mimosa.

55. Icerya montserratensis Riley & Howard.

Icerya montserratensis Riley & How., Ins. Life, iii, pp. 99, 101 (1890).
" " " " " " iv, p. 407 (1892).
" " Ckll., Bull. Bot. Dep. Jam., No. 46, p. 2 (1893).
Habitat.—West Indies; Mexico; Grenada.
On Chrysophyllum; Clusia alba; palms; orange; banana; avocado pear.

56. Icerya natalensis (Dougl.).

Ortonia natalensis Dougl., Ent. Mon. Mag., xxv, p. 86 (1888).
" " " " " " " pp. 232, 233 (1889).
Icerya " Ckll., Check List, p. 323 (1896).
Habitat.—Natal.
On Acacia; orange; lemon.

57. Icerya palmeri Riley & Howard.

Icerya palmeri Riley & How., Ins. Life, iii, p. 104 (1890).
" " Ckll., Bull. 7, N. Mex. Exp. Sta., p. 14 (1892).
" " Newst., Ent. Mon. Mag., xxxiii, p. 170 (1897).
" " Towns. & Ckll., Jn. N. Y. Ent. Soc., vi, p. 167 (1898).
Habitat.—Mexico.
On grape-vine; Coursetia.

58. Icerya pilosa Green.

Icerya pilosa Green, Ind. Mus. Notes, iv, No. 1. p. 7 (1896).
Habitat.—Ceylon.
On grass.

59. Icerya purchasi Mask.

(*The Cottony Cushion Scale.*)

(*Fluted Scale.*)

Icerya purchasi Mask., N. Z. Trans., xi, p. 221 (1878).
" " Comst., Rep. U. S. Dep. Ag., 1880, p. 347 (1881).
" " Saund., Ins. Inj. to Fruits, p. 400 (1883).
" " Mask., N. Z. Trans., xvi, p. 140 (1883).
" " " " " " xvii, p. 30 (1884).
" " Targ., Annali di Agr., p. 385 (1884).

Icerya purchasi Hubbard, Ins. Aff. the Orange, p. 66 (1885).
" " Mask., N. Z. Trans., xix, p. 45 (1886).
" " " " " " xx, p. 104 (1887).
" " " Ins. Nox. Agr. N. Z., p. 104 (1887).
" " Riley, Rep. U. S. Dep. Ag., 1886, p. 466 (1887).
" " Penzig, Annali di Agr., p. 534 (1887).
" " Ormerod, Notes on "Australian Bug" in S. Afr. (1887).
" " Morse, Bull. 71, Cal. Exp. Sta., (1887).
" " Riley, Pacific Rural Express, June 11, (1887).
" " " Bull. 15, Div. Ent. Dep. Ag., (1887).
" " Comst., Intr. Ent., p. 139 (1888).
" " Riley, Ins. Life, i, pp. 92, 126, (1888).
" " Mask., Bull. 32, Kew Gardens, p. 191 (1889).
" " Dougl., Ent. Mon. Mag., xxv, p. 232 (1889).
" " How., Can. Ent., xxi, p. 182 (1889).
" " Riley, Ins. Life, i, pp. 260, 377 (1889).
" " Willits " " ii, p. 15 (1889).
" " Koebele, Bull. 21, Div. Ent. Dep. Ag., p. 9 (1890).
" " Lint., 6th Rep. Ins. N. Y., p. 104 (1890).
" " Riley & How., Ins. Life, iii, p. 439 (1891).
" " Coq., Ins. Life, iii, p. 457 (1891).
" " Riley & How., Ins. Life, iv, p. 215 (1891).
" " Enock, Tr. Ent. Soc. Lond., p. 361 (1891).
" " Lint., 7th Rep. Ins. N. Y., App., p. 361 (1891).
" " Riley, Ins. Life, vi, p. 135 (1893).
" " Coq., " " " p. 176 (1893).
" " Wight, " " " p. 194 (1893).
" " French, Handb. Destr. Ins., Victoria, p. 37 (1893).
" " Mask., N. Z. Trans., xxvi, pp. 17, 277 (1893).
" " Riley & How., Ins. Life, vi, p. 347 (1894).
" " " " " " vii, p. 271 (1894).
" " Ckll., Jn. Trin. Nat. Club, i, p. 3 (1894).
" " Comst., Man. Ins., p. 166 (1895).
" " Smith, Econ. Ent., p. 108 (1896).
" " Lounsb., Rep. Ent. Cape Good Hope, p. 92 (1896).
" " Webster, Bull. 2, n. s., Dep. Ag., p. 82 (1896).
" " Berl., Boll. Ent. Agr., No. 12 (1897).
" " Berl. e Leon., Annali di Agr., p. 15 (1898).
" " Leon., Riv. Pat. Veg., vi, p. 293 (1898).
" " Berl. e Leon., Cherm. Ital., Fasc. iii, No. 72 (1898).
" " Forbes, 20th Rep. Ins. Ill., p. 22 (1898).
" " Howard, Bull. 10, n. s., Dep. Ag., p. 89 (1898).
" " Lounsb., Rep. Ent. Cape Good Hope, p. 21 (1898).
" " Berl., Boll. Ent. Agr., No. 4, p. 361 (1898).
" " Marlatt, Yearbook U. S. Dep. Ag., p. 278 (1900).
" " Jordan & Kellogg, Animal Life, p. 142, fig. 79 (1900).

Icerya purchasi Quaint. & Scott, Cocc. Amer., Dec. iii-iv, No. 1 (1901).
" " Gossard, Bull. 56, Fla. Exp. Sta., p. 312 (1901).
" " Fuller, 1st Rep. Ent. Natal, p. 104 (1901).
" " Frog., Agr. Gaz. N. S. W., July, p. 20 (1902).

Habitat.—N. Zealand; Australia; S. Africa; Fiji; Sandwich Islands; Portugal; Trinidad; Mexico; U. S.

On orange; lemon; Cypress; pine; rose; Pittospermum; Acacia; grass; etc. Full list in Rep. U. S. Dep. Ag., 1886, p. 741 (1887).

Icerya purchasi crawii Ckll.

Icerya purchasi var. crawii Ckll., Psyche, viii, p. 94 (1897).

Habitat.—California.

Icerya purchasi maskelli Ckll.

Icerya purchasi var. maskelli Ckll., Psyche, viii, p. 94 (1897).
" " " " Towns. & Ckll., Jn. N. Y. Ent. Soc., vi, p. 166 (1898).

Habitat.—California.

On orange.

60. Icerya rileyi Ckll.

Icerya rileyi Ckll., Psyche, vii, Suppl., I, p. 15 (1895).
" " " Am. Nat., xxix, p. 588 (1897).
" " " Ckll. & Parr., The Industrialist, p. 281 (1899).

Habitat.—New Mexico; Mexico.

On Mesquite; Larrea.

61. Icerya schrottkyi Hemp.

Icerya schrottkyi Hemp., Rev. Mus. Paul., iv, p. 373 (1900).
" " " Ann. Mag. N. H., (7), vi, p. 391 (1900).

Habitat.—Brazil.

62. Icerya seychellarum (Westw.).

Dorthesia seychellarum Westw., Gard. Chron., p. 830 (1855).
Coccus sacchari Guér., Rev. et Mag. Zool., (2), xix, p. 451 (1867).
Orthezia seychellarum Targ., Catalogue, p. 30 (1869).
Coccus sacchari Sign., Ann. Soc. Ent. Fr., (4), ix, pp. 93, 94 (1869).
Icerya " " " " " " (5), v, p. 352 (1875).
" " Riley, Ins. Life, i, p. 129 (1888).
" " Riley & How., Ins. Life, iii, p. 105 (1890).
" seychellarum Mask., N. Z. Trans., xxix, p. 329 (1897).
" " de Charm., Pr. Soc. Amic. Scien., p. 47 (1899).

Habitat.—Seychelles Islands; Mauritius; Madeira; China; New Zealand; Formosa.

On sugar cane; guava; palms; rose; Citrus; Podocarpus.

63. Icerya tangalla Green.

Icerya tangalla Green, Ind. Mus. Notes, iv, p. 7 (1896).

Habitat.—Ceylon.

On Gutierrezia sarothræ.

Subfamily MARGARODINÆ.

Genus **MARGARODES** Guilding. Type, formicarum.

Margarodes Guilding, Tr. Linn. Soc. Lond., xvi, p. 115 (1828): Lataste. Actes Soc. Sci. Chili, vii, pp. 99, 102 (1897): Ckll., Am. Nat., xxxiii, p. 415 (1899).
Porphyrophora Brandt, Mediz. Zool., ii, p. 355 (1833): Mem. Acad. St. Petersb. (6), iii, pt. 2, p. 66 (1833): Sign., Ann. Soc. Ent. Fr., (5), v, p. 377 (1875).
Sphæraspis Giard, C. R. Soc. Biol., Paris, (10), iv, No. 25, p. 683 (1897). Type, capensis.

64. Margarodes capensis (Giard).

Sphæraspis capensis Giard, C. R. Soc. Biol., (10), No. 25, p. 683 (1897).
Margarodes " Ckll., Check List, Suppl., p. 390 (1899).
Habitat.—Europe.

65. Margarodes formicarum Guild.

Margarodes formicarum Guild., Tr. Linn. Soc. Lond., p. 115 (1828).
" " Sign., Ann. Soc. Ent. Fr., (5), v, p. 385 (1875).
" " Comst., Rep. U. S. Dep. Ag., 1880, p. 277 (1881).
" " Uhler, St. Nat. Hist., ii, p. 218 (1884).
" " Ckll., Bull. Bot. Dep. Jam., p. 17 (1894).
" " Giard, C. R. Soc. Biol., Paris, p. 710 (1894).
" " Howard, Ins. Life, vii, p. 359 (1895).
" " Leon., Riv. Pat. Veg., iii, p. 362 (1895).
Habitat.—Antigua: Bahama Islands: East Indies.

66. Margarodes gallica (Sign.).

Porphyrophora gallica Sign., Ann. Soc. Ent. Fr., (5), v, p. 380 (1875).
Habitat.—France.

67. Margarodes hamelii (Brandt).

Coccus hamelii Brandt, Mediz. Zool., ii. p. 355 (1833).
Cochenille am Ararat, Hamel, Mem. Acad. St. Petersb., (6), iii, pt. 2, p. 9 (1834).
Porphyrophora hameli Brandt, Mem. Acad. St. Petersb., (6), iii, pt. 2, p. 65 (1834).
Porphyrophora hamelii Burm., Handb. Ent., ii, p. 78 (1835).
" armeniaca " " " " p. 78 (1835).
" hameli Targ., Catalogue, p. 30 (1869).
" hamelii Sign., Ann. Soc. Ent. Fr., (5), v, pp. 380, 383 (1875).
" hameli Blanch., Les Coccides utiles, pp. 99 (1883).
Habitat.—Armenia: Europe.
On Poa pungens.

68. Margarodes hiemalis Ckll.

Margarodes hiemalis Ckll., Am. Nat., xxxiii, p. 416 (1899).
" " " Can. Ent., xxxi, p. 36 (1899).
Habitat.—New Mexico.

69. Margarodes perrisii (Sign.).

Porphyrophora perrisii Sign., Ann. Soc. Ent. Fr., (5), v, p. 381 (1875).
Habitat.—France.

70. Margarodes polonicus (Linn.).

Coccus polonicus Linn., Syst. Nat., Ed. x, i, p. 456 (1758).
" " " Faun. Suec., p. 265 (1761).
Chermes radicum purpureus Geoff., Abr. Ins., i, p. 504 (1762).
Coccus polonicus Linn., Syst. Nat., Ed. xii, i, p. 741 (1766).
" " Fab., Syst. Ent., p. 744 (1775).
" " Mod., Act. Goth., i, p. 34 (1778).
" " Fab., Spec. Ins., ii, p. 395 (1781).
Chermes " Fourc., Ent. Paris, p. 228 (1785).
Coccus " Fab., Mant. Ins., ii, p. 319 (1787).
" " Gmel., Syst. Nat., Ed. xiii, p. 2219 (1789).
" " Oliv., Ency. Meth., vi, p. 96 (1791).
" " Fab., Ent. Syst., iv, p. 227 (1794).
" " Schr., Fauna Boica, ii, pt. 1, p. 147 (1801).
" " Fab., Syst. Rhyng., p. 310 (1803).
" " Latr., Animal Kingdom, [Cuvier], ii, p. 78 (1829).
Porphyrophora polonicus Brandt, Mediz. Zool., ii, p. 356 (1833).
" frischii " " " " p. 225 (1833).
" " " Mem. Acad. St. Petersb., (6), iii, pt. 2, p. 67 (1834).
Porphyrophora polonica Burm., Handb. Ent., ii, p. 78 (1835).
Dactylopius polonicus Costa, Faun. Reg. Nap., Cocc., p. 17 (1835).
Porphyrophora " Blanch., Hist. Nat. Ins., iii, p. 212 (1840).
" " Hagen, Stett. Ent. Zeit., xvi, p. 110 (1855).
" frischii Targ., Catalogue, p. 30 (1869).
" (Coccus) polonica Kalt., Die Pflanz., p. 502 (1874).
" polonica Sign., Ann. Soc. Ent. Fr., (5), v, pp. 380, 382 (1875).
" " Blanch., Les Coccides utiles, p. 94 (1883).
" polonicus Ckll., Pr. Ac. N. Sci. Ph., p. 260 (1899).
Habitat.—Europe; Mexico.
On Scleranthus perennis.

71. Margarodes rileyi Giard.

Margarodes rileyi Giard, C. R. Soc. Biol., Paris, p. 710 (1894).
" " Ckll., Am. Nat., xxxiii, p. 415 (1899).
Habitat.—Europe; Florida Keys; West Indies.

72. Margarodes trimeni Giard.

Margarodes trimeni Giard, C. R. Soc. Biol., Paris, iv, pp. 126, 412, 712 (1894).
Habitat.—S. Africa.

73. Margarodes vitium (Giard).

Heterodera vitis F. Phil., Bull. Soc. Nat. Chili (1884). [Imperfectly described].
Margarodes vitium Giard, C. R. Soc. Biol., Paris, pp. 126, 412, 710 (1894).
" " " Actes Soc. Sci. Chili, iv, pp. lxx, cxvi, ccix (1894).
" " Lataste, " " " " " pp. lx, cxxxii (1894).
" " Peglion, Riv. Pat. Veg., ii, p. 392 (1894).
" " Leon., " " " iii, p. 362 (1895).
" " Giard, C. R. Soc. Biol., Paris, p. 383 (1895).
" " Lataste, Ann. Soc. Sci. Chili, iv, p. ccxxix (1895).
" trilobitum Reed, Ent. News., vi, p. 86 (1895).
" vitis Ckll., " " " p. 123 (1895).
" vitium Howard, Pr. Ent. Soc. Wash., iv, p. 33, (1896).
" " Mayet, Ann. Soc. Ent. Fr., (7), vi, p. 419 (1896).
" " " Bull. " " " " " p. cxxxvi (1896).
" " Giard, Actes Soc. Sci. Chili, v, pp. xxxi, xliii, cii (1896).
" " Lataste, " " " " " p. cxxxvi (1896).
" " Ckll., Am. Nat., xxxiii, p. 416 (1899).
" vitis Sharp, Cambridge Nat. Hist., vi, p. 598 (1899).

Habitat.—Chili.

On the roots of grapevine.

Genus **CŒLOSTOMIDIA** Ckll. [new name.] Type, zealandica.

||Cœlostoma Mask., N. Z. Trans., xii, p. 294 (1879); Ins. Nox. Agr. N. Z., p. 107 (1887); N. Z. Trans., xxv, p. 241 (1892).
Cœlostomidia Ckll., Nature, p. 367 (1900).

74. Cœlostomidia assimilis (Mask.).

Cœlostoma assimile Mask., N. Z. Trans., xxii, p. 153 (1889).
" " " " " " xxiii, p. 30 (1890).
" " " Ent. Mon. Mag., xxvi, p. 279 (1890).
" " Hubbard, Bull. 18, n. s., Dep. Ag., p. 17 (1898).
Cœlostomidia assimilis Ckll., The Entom., xxxv, p. 258 (1902).

Habitat.—New Zealand.

On Fagus menziesii; F. fusca; Phyllocladus trichomanes.

75. Cœlostomidia compressa (Mask.).

Cœlostoma compressum Mask., N. Z. Trans., xxiv, p. 45 (1891).
Cœlostomidia compressa Ckll., The Entom., xxxv, p. 258 (1902).

Habitat.—N. Zealand.

On Podocarpus totara.

76. Cœlostomidia pilosa (Mask.).

Cœlostoma pilosum Mask., N. Z. Trans., xxiii, p. 29 (1890).
" " " " " " xxiv, p. 49 (1891).
Cœlostomidia pilosa Ckll., The Entom., xxxv, p. 258 (1902).

Habitat.—New Zealand.

On Podocarpus totara; Fagus.

77. Cœlostomidia wairoensis (Mask.).

Cœlostoma wairoense Mask., N. Z. Trans., xvi, p. 141 (1883).
" " " Ins. Nox. Agr. N. Z., p. 109 (1887).
Cœlostomidia wairoensis Ckll., The Entom., xxxv, p. 258 (1902).
Habitat.—New Zealand.
On Phormium tenax; Leptospermum scoparium.

78. Cœlostomidia zealandica (Mask.).

Cœlostoma zealandicum Mask., N. Z. Trans., xii, p. 299 (1879).
" " " " " " xiv, p. 226 (1881).
" " " " " " xix, p. 42 (1886).
" " " Ins. Nox. Agr. N. Z., p. 107 (1887).
" " " Tr. Roy. Soc. S. Austr., p. 101 (1888).
" " Hubbard. Bull. 18, n. s., Dep. Ag., p. 17 (1898).
Cœlostomidia zealandica Ckll., The Entom., xxxv, p. 258 (1902).
Habitat.—New Zealand.
On Muhlenbeckia adpressa; Rhipogonum scandens.

Genus **CALLIPAPPUS** Guérin. Type, westwoodii.

Callipappus Guérin-Meneville, Rev. Zool., p. 129 (1841): Amy. & Serv., Hist. Nat. Ins., Hem., p. 619 (1843): Sign., Ann. Soc. Ent. Fr., (5), v, p. 374 (1875): Full., Tr. Ent. Soc. Lond., p. 435 (1899): Ckll., The Entom., xxxv, p. 258 (1902).

79. Callipappus australis (Mask.).

Cœlostoma australis Mask., Pr. Linn. Soc. N. S. Wales, p. 280 (1890).
" " " N. Z. Trans., xxv, p. 242 (1892).
" " " " " " xxvii, p. 69 (1894).
Callipappus " Ckll., The Entom., xxxv, p. 258 (1902).
Habitat.—Australia.
On Eucalyptus: Augophora.

80. Callipappus bufo Full.

Callipappus bufo Full., Notes on Cocc. W. Austr., p. 11 (1897).
" " " Tr. Ent. Soc. Lond., p. 438 (1899).
Habitat.—W. Australia.
On Casuarina humilis; Banksia attenuata; B. menziesii; B. ilicifolia.

81. Callipappus farinosus Full.

Callipappus farinosus Full., Notes on Cocc. W. Austr., p. 10 (1897).
" " " Tr. Ent. Soc. Lond., p. 437 (1899).
Habitat.—W. Australia.
On Casuarina.

82. Callipappus immanis (Mask.).

Cœlostoma immane Mask., N. Z. Trans., xxiv, p. 49 (1891).
" " " " " " xxv, p. 241 (1892).
" " " " " " xxvii, p. 69 (1894).
" " Tepp., Tr. Roy. Soc. S. Austr., xxiii, p. 278 (1899).

Callipappus immanis Ckll., The Entom., xxxv, p. 258 (1902).
Habitat.—Australia.
On Acacia aneura ; Eucalyptus.

83. Callipappus rubiginosus (Mask.).

Cœlostoma rubiginosum Mask., N. Z. Trans., xxv, p. 242 (1892).
Callipappus rubiginosus Ckll., The Entom., xxxv, p. 258 (1902).
Habitat.—Australia.
On Banksia integrifolia.

84. Callipappus westwoodii Guérin.

Callipappus westwoodii Guér., Rev. Zool., xii, p. 129 (1841).
" " Sign., Ann. Soc. Ent. Fr., (5), v, p. 375 (1875).
" " Full., Notes on Cocc. W. Austr., p. 11 (1897).
" " " Tr. Ent. Soc. Lond., p. 437 (1899).
Habitat.—Australia.
On Eucalyptus.

Genus **KUWANIA** Ckll. [new name.] Type, quercus.

||Sasakia Kuwana, Pr. Cal. Ac. Sci., (3), iii, p. 47 (1902): Ckll., The Entom., xxxv, p. 258 (1902).
Kuwania Ckll., in litt., (1902.)

85. Kuwania quercus (Kuwana).

Sasakia quercus Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 47 (1902).
Habitat.—Japan.
On oak.

86. Kuwania zeylanicus (Green).

Monophlebus zeylanicus Green, Ind. Mus. Notes, iv, p. 6 (1896).
Habitat.—Ceylon.
On Antidesma bunius.

Genus **XYLOCOCCUS** Loew. Type, filiferus.

Xylococcus Loew, Verh. z. b. Ges., Wien, xxxii, p. 271 (1882): Sign., Bull. Soc. Ent. Fr., (6), ii, p. clxxxv (1882): Hubbard, Bull. 18, n. s., Dep. Ag., p. 18, (1898): Ckll., The Entom., xxxv, p. 259 (1902).

87. Xylococcus betulæ Perg.

Xylococcus betulæ Perg., Bull. 18, n. s., Dep. Ag., pp. 18, 19 (1898).
Habitat.—Lake Superior region.
On birch.

88. Xylococcus filiferus Loew.

Xylococcus filiferus Loew, Verh. z. b. Ges., Wien, pp. 271, 274 (1882).
" " Sign., Bull. Soc. Ent. Fr., (6), ii, p. clxxxv (1882).
" " Mask., Ent. Mon. Mag., xxvi, p. 278 (1890).
" " Hubbard, Bull. 18, n. s., Dep. Ag., p. 17 (1898).
Habitat.—Austria.
On Tilia europæa: T. grandifolia.

89. Xylococcus quercus Ehrh.

Xylococcus quercus Ehrh., Can. Ent., xxxii, p. 311 (1900).
Habitat.—California.
On Quercus chrysolepis.

Subfamily ORTHEZIINÆ.

Genus **ORTHEZIA** Bosc. Type, characias = urticæ.

Orthezia Bosc, Journ. de Phys., xxiv, p. 173 (1784): Latr., Gen. Crust. et Ins., iii, p. 175 (1802): Amy. & Serv., Hist. Nat. Ins., Hem., p. 620 (1843): Sign., Ann. Soc. Ent. Fr., (5), v. p. 386 (1875): Dougl., Ent. Mon. Mag., xvii, p. 176 (1881): Comst., Rep. U. S. Dep. Ag., 1880, p. 349 (1881): Lounsb., 32nd Rep. Mass. Ag. Coll., p. 121 (1895): Giard, Bull. Soc. Ent. Fr., lxvii, p. 8 (1898): Ckll., The Entom., xxxv, p. 259 (1902).
Dorthesia l'Abbé d.Orthez, Journ. de Phys., xxvi, p. 207 (1785).
Cionops Leach, Edinb. Ency., ix, pt. 1, p. 126 (1815).
Cyphoma Gistel, Naturges. des Theirreiche, p. 151 (1848).

90. Orthezia americana (Walk.).

Dorthesia americana Walk., Cat. Br. Mus., Hom., iv, p. 1091 (1852).
" " Sign., Ann. Soc. Ent. Fr., (4), viii, p. 843 (1868).
Orthezia " Comst., Rep. U. S. Dep. Ag., 1880, p. 349 (1881).
" " " 2nd Rep. Dep. Ent. Corn. Univ., p. 136 (1883).
Dorthesia " Dougl., Ent. Mon. Mag., xxvii, p. 246 (1891).
Orthezia " Lounsb., 32nd Rep. Mass. Ag. Coll., p. 124 (1895).
" " Osborn, Contr. Ia. Ag. Coll., p. 2 (1898).
Habitat.—Canada: New York: Iowa.

91. Orthezia annæ Ckll.

Orthezia annæ Ckll., Ann. Mag. N. H., (6), xii, p. 403 (1893).
" " " Can. Ent., xxvi, p. 285 (1894).
" " Lounsb., 32nd Rep. Mass. Ag. Coll., p. 123 (1895).
Habitat.—New Mexico; Arizona; Colorado.
On Chenopodium: Atriplex canescens.

92. Orthezia artemisiæ Ckll.

Orthezia artemisiæ Ckll., Can. Ent., xxx, p. 19 (1898).
Habitat.—New Mexico.
On Artemisia (sage-bush).

93. Orthezia cataphracta (Shaw).

Coccus cataphractus Shaw, Nat. Misc., v, pl. 182 (1794).
" " " Gen. Zool., vi, p. 194 (1806).
Dorthesia cataphracta Westw., Mod. Class. Ins., ii, p. 445 (1840).
" chiton Zett., Ins. Lapp., p. 314 (1840).

Orthezia signoreti F. B. White, Scottish Naturalist, iv, p. 160 (1877).
Dorthesia chiton Hart., The Entom., xiii, p. 284 (1880).
Orthezia signoreti Dougl., Ent. Mon. Mag., xvii, pp. 172, 205 (1881).
" cataphracta " Tr. Ent. Soc. Lond., p. 299; Proc., p. ix (1881).
Dorthesia " " Ent. Mon. Mag., xvii, p. 173 (1881).
Orthezia " Loew, Wien. Ent. Zeit., i, p. 190 (1882).
" " Lounsb., 32nd Rep. Mass. Agr. Coll., p. 127 (1895).
" uva Blanch., Ann. Soc. Ent. Fr., lxv, p. 681 (1896).
" cataphracta Giard, Bull. Soc. Ent. Fr., lxvii, p. 8 (1898).

Habitat.—Greenland; Lapland; Norway; Scotland; Ireland; Northern England.

On grass; Saxifraga aizoön.

94. **Orthezia cheilanthi** Tins.

Orthezia cheilanthi Tins., Can. Ent., xxx, p. 12 (1898).

Habitat.—Organ Mts., New Mexico.

On Cheilanthus fendleri.

95. **Orthezia delavauxii** (Thieb.).

Dorthesia delavauxii Thieb., Mem. Soc. Linn., Paris, iii, p. 285 (1825).
?Coccus glecomæ "Fab.", Dougl., Ent. Mon. Mag., xvii, p. 175 (1881).
Dorthesia delavauxii " " " " " p. 203 (1881).
Orthezia " Giard, Bull. Soc. Ent. Fr., lxvii, p. 10 (1898).

Habitat.—France.

On Teucrium scorodonia.

96. **Orthezia garryæ** Ckll.

Orthezia garryæ Ckll., Ann. Mag. N. H., (7), ii, p. 401 (1898).

Habitat.—New Mexico.

97. **Orthezia graminis** Tins.

Orthezia graminis Tins., Can. Ent., xxx, p. 13 (1898).

Habitat.—New Mexico.

On grass.

98. **Orthezia insignis** Dougl.

(*The Greenhouse Orthezia.*)

Orthezia insignis Dougl., Jn. Quekett Micr. Club, p. 169 (1887).
" " " Ent. Mon. Mag., xxiv, p. 169 (1888).
" " " " " " xxv, p. 270 (1889).
" " McIntire, Timehri, p. 308 (1889).
" " Ward, " p. 304 (1890).
" " Ckll., Jn. Inst. Jam., i, p. 136 (1892).
" " Trimen, Ann. Rep. Roy. Bot. Gard., Ceylon (1893).
" " Ckll., Ann. Mag. N. H., (6), xii, pp. 51, 403 (1893).
" " " Can. Ent., xxvi, p. 35 (1894).
" nacrea Buck., Ind. Mus. Notes, iii, No. 3, p. 103 (1894).

Orthezia insignis Green, "Tropical Agriculturist," p. 437 (1895).
" " Lounsb., 32nd Rep. Mass. Ag. Coll., p. 111 (1895).
" " Morris. Bull. Kew Gardens, p. 162 (1895).
" " Dougl., Ent. Mon. Mag., xxxi, p. 137 (1895).
" " Ckll., Ann. Mag. N. H., (6), xvi, p. 60 (1895).
" " Green, "An Insect Enemy" (1895).
" " " Ind. Mus. Notes, iv, p. 6 (1896).
" nacrea Barlow, " " " " p. 25 (1896).
" insignis Craw, 5th Rep. Cal. Bd. Hort., p. 46 (1896).
" " Green, Ent. Mon. Mag., xxxiii, p. 74 (1897).
" " Lounsb., Rep. Ent. Cape Good Hope, p. 36 (1898).
" " Berl. e Leon., Cherm. Ital., Fasc. iii, No. 73 (1898).
" " de Charm., Pr. Soc. Amic. Scien., p. 46 (1899).
" " Green, Circ. Roy. Bot. Gard., Ceylon, p. 83 (1899).
" " Hemp., Rev. Mus. Paul., iv, p. 376 (1900).
" " Newst., Jn. Roy. Hor. Soc., xxiii, p. 34 (1900).
" " Full., 1st Rep. Ent. Natal, p. 109 (1901).

Habitat.—England; S. Africa; Mauritius; Ceylon; China; Brazil; British Guiana; Trinidad; Jamaica; Mexico; U. S.

On Coleus; Lantana; Ipomœa; Thunbergia; Strobilanthus; Verbena; Achillea; Salvia; Cuphea; Capsicum; Ageratum; Vernonia; Gardenia; Chrysanthemum; Lonicera; various species of Citrus; tea plant; strawberry; tomato, and many other plants.

99. **Orthezia lasiorum** Ckll.

Orthezia lasiorum Ckll., Can. Ent., xxxiii, p. 209 (1901).

Habitat.—New Mexico.

In nests of Lasius americanus.

100. **Orthezia mænariensis** Dougl.

Orthezia mænariensis Dougl., Tr. Ent. Soc. Lond., p. 81 (1884).
" " Karsch, Ent. Nach., xi, p. 381 (1885).
" " Lounsb., 32nd Rep. Mass. Ag. Coll., p. 132 (1895).

Habitat.—Island of Montecristo, Italy.

On Erica arborea.

101. **Orthezia monticola** Ckll.

Orthezia monticola Ckll., Ann. Mag. N. H., (7), ii, p. 402 (1898).

Habitat.—New Mexico.

102. **Orthezia nigrocincta** Ckll.

Orthezia nigrocincta Ckll., Am. Nat., xxix, p. 730 (1897).
" " " Can. Ent., xxx, p. 20 (1898).

Habitat.—New Mexico.

On Gutierrezia.

103. **Orthezia occidentalis** Dougl.

Orthezia occidentalis Dougl.. Ent. Mon. Mag., xxvii, p. 245 (1891).
" " Ckll., Tr. Am. Ent. Soc., xx, p. 366 (1893).
" " " Ann. Mag. N. H., (6), xii, p. 404 (1893).
" " " Pr. U. S. Nat. Mus., xvii, p. 623, note (1895).
" " Lounsb., 32nd Rep. Mass. Ag. Coll., p. 122 (1895).
Habitat.—Col.; N. Mex.
In ants' nests.

104. **Orthezia prælonga** Dougl.

Orthezia prælonga Dougl., Ent. Mon. Mag., xxvii, p. 246 (1891).
" " Lounsb., 32nd Rep. Mass. Ag. Coll., p. 126 (1895).
" " Hemp., Rev. Mus. Paul., iv, p. 377 (1900).
Habitat.—British Guiana: Brazil; Jamaica; Trinidad.
On Capsicum; Croton; Citrus; Sanchezia.

105. **Orthezia sonorensis** Ckll.

Orthezia sonorensis Ckll., Bull. 4, T. s., Dep. Ag., pp. 10, 38 (1896).
Habitat.—Mexico.
On Hymenoclea monogyra.

106. **Orthezia ultima** Ckll.

Orthezia ultima Ckll., Can. Ent., xxxiv, p. 88 (1902).
Habitat.—Argentine Republic.
On Compositæ?

107. **Orthezia urticæ** (Linn.).

Aphis urticæ Linn., Syst. Nat., Ed. xii, i, p. 736 (1766).
Orthesia characias Bosc, Journ. de Phys., xxiv, p. 173 (1784).
Dorthesia " " " " " xxvi, p. 207 (1785).
" " Gmel., Syst. Nat., Ed. xiii, p. 2208 (1789).
" " Rossi, Faun. Etrusc., p. 262 (1790).
Coccus " Oliv., Ency. Meth., vi, p. 99 (1791).
" dubius Fab., Ent. Syst., iv, p. 228 (1794).
" " Panz., Faun. Germ., xxxvi, p. 21 (1796).
Aphis urticata Stewart, Elem. Nat. Hist., ii, p. 110 (1802).
Dorthesia characias Fab., Syst. Rhyng., p. 311 (1803).
" " Latr., Gen. Crust. et Ins., p. 175 (1807).
" " Leach, New Edinb. Ency., viii, pt. 2 (1815).
Coccus dubius Kirby & Spence, Intr. Ent., iii, p. 183 (1828).
" " Dufour, Rech. Hem., p. 102 (1833).
" " Burm., Handb. Ent., ii, p. 76 (1835).
Dorthesia urticæ " " " " p. 76 (1835).
" characias Lam., Hist. Nat. Anim., iv, p. 116 (1835).
" " Westw., Mod. Class. Ins., i, pl. 1, fig. 8 (1839).
Coccus dubius Blanch., Hist. Nat. Ins., iii, p. 212 (1840).
Orthezia urticæ Amy. & Serv., Hem., p. 624 (1843).

Dorthesia characias Amy., Monom., p. 544 (1848).
Orthezia " Newm., Pr. Ent. Soc. Lond., p. 4 (1856).
" " Targ., Studii sul. Cocc., p. 24 (1867).
?Dorthesia dispar Kalt., Die Pflanz., p. 486 (1874).
" urticæ " " " p. 11 (1874).
" " Mark, Anat. Coccidae. p. 15 (1876).
?Dorthesia dispar Sign., Ann. Soc. Ent. Fr., (5), vi, p. 614 (1876).
Orthezia characias Riley, Am. Ent., iii, p. 20 (1880).
Dorthesia " Dougl., Ent. Mon. Mag., xvii, pp. 174, 204 (1881).
Orthezia urticæ " " " " " p. 174 (1881).
" " " Tr. Ent. Soc. Lond., p. 297 (1881).
? " dispar " Ent. Mon. Mag., xvii, p. 204 (1881).
" urticæ Loew. Wien. Ent. Zeit., iii, pp. 11, 16 (1884).
" " Lounsb., 32nd Rep. Mass. Ag. Coll., p. 129 (1895).
" dispar Ckll., Check List, p. 327 (1896).
" characias Blanch., Ann. Soc. Ent. Fr., lxv, p. 679 (1896).
" urticæ " " " " " " p. 679 (1896).
" " Giard. Bull. " " " lxvii, p. 10 (1898).

Habitat.—Europe.

On Matricaria; Caltha; Teucrium; Leontodon hastilis; Tunica saxifraga; Achillæa; Dodder.

Genus **NEWSTEADIA** Green. Type, floccosa.

s. g. Newsteadia Green, Ent. Mon. Mag., xxxviii, p. 285 (1902): g. Ckll., in litt. (1902).

108. Newsteadia floccosa (De Geer).

Coccus floccosus De G., Mem. Ins., vii, p. 604 (1778).
Dorthesia " Kirby & Spence, Intr. Ent., iii, p. 183 (1826).
Orthezia urticæ Sign., Ann. Soc. Ent. Fr., (4), viii, pl. xi, fig. 13 (1868).
" floccosa Targ., Catalogue, p. 29 (1869).
" urticæ Sign., Ann. Soc. Ent. Fr., (5), v, p. 389 (1875) in part.
Coccus floccosus Dougl., Ent. Mon. Mag., xvii, pp. 174, 204, note (1881).
Orthezia floccosa " Tr. Ent. Soc. Lond., p. 447 (1881).
" normani " " " " " p. 300, & Proc. ix, (1881).
" floccosa Lounsb., 32nd Rep. Mass. Ag. Coll., p. 131 (1895).
" " Giard. Bull. Soc. Ent. Fr., lxvii, p. 9 (1898).
" (Newsteadia) floccosa Green, Ent. Mon. Mag., xxxviii, p. 284 (1902).
Newsteadia floccosa Ckll., in litt. (1902).

Habitat.—Europe: Australia.

On grasses and sedges.

Genus **ORTHEZIOLA** Sulc. Type, vejdovskyi.

Ortheziola Sulc, Sitzb. K. Bohm. Ges. Wiss., No. 44, p. 5 (1894).

109. Ortheziola fodiens Giard.

Ortheziola fodiens Giard, C. R. Soc. Biol., Paris, (10), iv, p. 583 (1897).
Habitat.—Guadeloupe.
On roots of coffee-tree.

110. Ortheziola signoreti (Haller).

Orthezia signoreti Haller, Mitth. Schw. Ent. Ges., vi, p. 6 (1880).
Ortheziola " Giard, Bull. Soc. Ent. Fr., lxvii, p. 11 (1898).
Habitat.—France.

111. Ortheziola vejdovskyi Sulc.

Ortheziola vejdovskyi Sulc, Sitzb. K. Bohm. Ges. Wiss., No. 44, p. 5 (1894).
" " Ckll., Ann. Mag. N. H., (6), xvi, p. 137 (1895).
Habitat.—Prague.
Under leaves and moss.

Subfamily PHENACOLEACHIINÆ,

Genus **PHENACOLEACHIA** Ckll. Type, zealandica.

Phenacoleachia Ckll., Can. Ent., xxxi, p. 274 (1899); Nature, lxi, p. 367 (1900).

112. Phenacoleachia zealandica (Mask.).

Leachia zealandica Mask., N. Z. Trans., xxiii, p. 26 (1890).
" " " Ent. Mon. Mag., xxxii, p. 225 (1896).
Palæococcus " Ckll., Check List, p. 322 (1896).
Phenacoleachia zealandica Ckll., Can. Ent., xxxi, p. 274 (1899).
Habitat.—New Zealand.
On Podocarpus totara; Cupressus dacrydioides; Fagus.

Subfamily CONCHASPINÆ.

Genus **CONCHASPIS** Ckll. Type, angræci.

Conchaspis Ckll., Gard. Chron., (3), xiii, p. 548 (1893); Journ. Inst. Jam., i, p. 256 (1893); Bull. Bot. Dep. Jam., p. 101 (1895): Green, Cocc. Ceylon, pt. i, p. 19 (1896).
Pseudinglisia Newst., Ent. Mon. Mag., xxix, p. 153 (1893).

113. Conchaspis angræci Ckll.

Conchaspis angræci Ckll., Gard. Chron.. (3), xiii, p. 548 (1893).
" " " Journ. Inst. Jam., i, p. 246 (1893).
Pseudinglisia rodrigueziæ Newst., Ent. Mon. Mag., xxix, p. 153 (1893).

Conchaspis angræci Ckll., Bull. Bot. Dep. Jam., p. 101 (1895).
Habitat.—Jamaica; Trinidad; England.
On Angræcum; Rodriguezia secunda.

Conchaspis angræci hibisci Ckll.

Conchaspis angræci var. hibisci Ckll., Psyche, vii, Suppl. 1, p. 19 (1896).
" " " " " Bull. 4, T. s., Dep. Ag., p. 36 (1896).
Habitat.—Mexico.
On Hibiscus floridanus.

114. Conchaspis newsteadi Ckll.

Conchaspis newsteadi Ckll., Can. Ent., xxix, p. 270 (1897).
Habitat.—Mexico.
On Zuchil-tree (*Plumieria*).

115. Conchaspis socialis Green.

Conchaspis socialis Green, Cocc. Ceylon, pt. i, p. 20 (1896).
Habitat.—Ceylon.

Subfamily DACTYLOPIINÆ.

Genus **FRENCHIA** Mask. Type, casuarinæ.

Frenchia Mask., N. Z. Trans., xxiv, p. 56 (1891): Ckll., Can. Ent., xxxi, p. 276 (1899).

116. Frenchia casuarinæ Mask.

Frenchia casuarinæ Mask., N. Z. Trans., xxiv, pp. 57, 58 (1891).
" " Frog., Agr. Gaz. N. S. W., p. 15 (1898).
Habitat.—Australia.
On Casuarina equisetifolia; C. quadrivalvis.

117. Frenchia semiocculta Mask.

Frenchia semiocculta Mask., N. Z. Trans., xxvii, p. 70 (1894).
" " Frog., Agr. Gaz. N. S. W., p. 15 (1898).
Habitat.—Australia.
On Casuarina.

Genus **APIOMORPHA** Rübs.

||Brachyscelis Schrader, Tr. Ent. Soc. N. S. W., i, p. 1 (1862): Sign., Ann. Soc. Ent. Fr., (4), vi, p. 593 (1876): Frog., Agr. Gaz. N. S. W., May, p. 8 (1898): Ckll., Can. Ent., xxxi, p. 276 (1899).
Apiomorpha [new name] Rübs., Berl. Ent. Zeit., xxxix, pp. 201, 204 (1894).

118. Apiomorpha attenuata (Frog.).

Brachyscelis attenuata Frog., Pr. Linn. Soc. N. S. W., p. 375 (1898).
Habitat.—S. Australia.
On Eucalyptus.

119. Apiomorpha bäuerleni (Frog.).

Brachyscelis bäuerleni Frog., Pr. Linn. Soc. N. S. W., p. 359 (1892).
" " Tepp., Tr. Roy. Soc. S. Austr., p. 272 (1893).
Apiomorpha " Rübs., Berl. Ent. Zeit., xxxix, pp. 208, 213 (1894).
Brachyscelis " Frog., Agr. Gaz. N. S. W., ix, p. 11 (1898).
Habitat.—New South Wales. Australia.
On Eucalyptus.

120. Apiomorpha beyeriæ (Tepp.).

Brachyscelis beyeriæ Tepp., Tr. Roy. Soc. S. Austr., p. 276 (1893).
Apiomorpha " Ckll., Check List, p. 328 (1896).
Habitat.—Australia.
On Beyeria opaca.

121. Apiomorpha calycina (Tepp.).

Brachyscelis calycina Tepp., Tr. Roy. Soc. S. Austr., p. 275 (1893).
Apiomorpha " Ckll., Check List, p. 328 (1896).
Brachyscelis " Frog., Agr. Gaz. N. S. W., p. 13 (1898).
Habitat.—S. Australia.
On Eucalyptus dumosa.

Apiomorpha calycina neumani (Tepp.).

Brachyscelis neumani Tepp., Tr. Roy. Soc. S. Austr., p. 275 (1893).
" " Frog., Agr. Gaz. N. S. W., p. 13 (1898).
Habitat.—S. Australia.
On Eucalyptus dumosa; E. oleosa.

122. Apiomorpha citricola (Schrad.).

Brachyscelis citricola Schrad., Tr. Ent. Soc. N. S. W., i, p. 3 (1862).
" " " Verh. z. b. Ges. Wien. p. 160 (1863).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 597 (1876).
Habitat.—Australia.

123. Apiomorpha conica (Frog.).

Brachyscelis conica Frog., Pr. Linn. Soc. N. S. W., p. 365 (1892).
" " Tepp., Tr. Roy. Soc. S. Austr., p. 272 (1893).
" regularis " " " " " " p. 273 (1893).
Apiomorpha conica Rübs., Berl. Ent. Zeit., xxxix, pp. 209, 213 (1894).
" similis " " " " " pp. 210, 213 (1894).
Brachyscelis regularis Full., Agr. Gaz. N. S. W., vii, p. 4 (1896).
" " Frog., " " " " ix, p. 12 (1898).
" conica " " " " " " p. 12 (1898).
Habitat.—N. S. Wales; S. Australia.
On Eucalyptus viminalis.

Apiomorpha conica subconica (Tepp.).

Brachyscelis subconica Tepp., Tr. Roy. Soc. S. Austr., p. 274 (1893).
" " Frog., Agr. Gaz. N. S. W., ix, p. 12 (1898).
Apiomorpha var. " Ckll., Check List, p. 328 (1896).
Habitat.—S. Australia.
On Eucalyptus uncinata.

124. **Apiomorpha cucurbita** Full.

Apiomorpha cucurbita Full., Notes on Cocc. W. Austr.. p. 9 (1897).
" " " Tr. Ent. Soc. Lond., p. 446 (1899).
Habitat.—W. Australia.

125. **Apiomorpha dipsaciformis** (Frog.).

Brachyscelis dipsaciformis Frog., Pr. Linn. Soc. N. S. W., p. 202 (1895).
Apiomorpha " Ckll., Check List, p. 328 (1896).
Brachyscelis " Frog., Agr. Gaz. N. S. W., p. 13 (1898).
Habitat.—North Queensland.

126. **Apiomorpha duplex** (Schrad.).

Brachyscelis duplex Schrad., Tr. Ent. Soc. N. S. W., i. p. 2 (1862).
" " " Verh. z. b. Ges. Wien, p. 160 (1863).
" " Sign., Ann. Soc. Ent. Fr., (5). vi, p. 596 (1876).
" " Frog., Pr. Linn. Soc. N. S. W., p. 358 (1892).
" " Tepp., Tr. Roy. Soc. S. Austr., p. 272 (1893).
" " Frog., Nat. Science, v, p. 111 (1894).
" " Full., Agr. Gaz. N. S. W., p. 3 (1896).
Apiomorpha " Ckll., Check List, p. 328 (1896).
Brachyscelis " Frog., Agr. Gaz. N. S. W., p. 10 (1898).
Habitat.—N. S. Wales; S. Australia.
On Eucalyptus.

127. **Apiomorpha ellipsoidalis** (Tepp.).

Brachyscelis ellipsoidalis Tepp., Tr. Roy. Soc. S. Austr., p. 272 (1893).
Habitat.—W. Australia.
On Eucalyptus.

128. **Apiomorpha excupula** (Full.).

Brachyscelis excupula Full., Agr. Gaz. N. S. W., p. 9 (1896).
Apiomorpha " Ckll., Check List, Suppl., p. 393 (1899).
Habitat.—N. S. Wales.

129. **Apiomorpha floralis** (Frog.).

Brachyscelis floralis Frog., Pr. Linn. Soc. N. S. W., p. 376 (1898).
Habitat.—Central Australia.
On Eucalyptus.

130. Apiomorpha helmsii Full.

Apiomorpha helmsii Full., Notes on Cocc. W. Austr., p. 9 (1897).
" " " Tr. Ent. Soc. Lond., p. 447 (1899).
Habitat.—W. Australia.
On Eucalyptus.

131. Apiomorpha karschi (Rübs.).

Brachyscelis karschi Rübs., Berl. Ent. Zeit., xxxix, pp. 211, 213 (1894).
" " Frog., Agr. Gaz. N. S. W., p. 13 (1898).
Apiomorpha " Full., Tr. Ent. Soc. Lond., p. 444 (1899).

Apiomorpha karschi fletcheri (Full.).

Brachyscelis fletcheri Full., Agr. Gaz. N. S. W., p. 7 (1896).
Apiomorpha " Full., Notes on Cocc. W. Austr., p. 8 (1897).
" " Full., Tr. Ent. Soc. Lond., p. 444 (1899).
Habitat.—N. S. Wales; W. Australia.
On Eucalyptus.

132. Apiomorpha maliformis Full.

Apiomorpha maliformis Full., Notes on Cocc. W. Austr., p. 9 (1897).
" " " Tr. Ent. Soc. Lond., p. 446 (1899).
Habitat.—W. Australia.
On Eucalyptus patens.

133. Apiomorpha minor (Frog.).

Brachyscelis minor Frog., Pr. Linn. Soc. N. S. W., p. 363 (1892).
" " Tepp., Tr. Roy. Soc. S. Austr., p. 272 (1893).
Apiomorpha " Ckll., Check List, p. 328 (1896).
Brachyscelis " Frog., Agr. Gaz. N. S. W., p. 11 (1898).
Habitat.—N. S. Wales.
On Eucalyptus hæmastoma.

134. Apiomorpha munita (Schrad.).

Brachyscelis munita Schrad., Tr. Ent. Soc. N. S. W., p. 2 (1862).
" " " Verh. z. b. Ges. Wien, p. 160 (1863).
" " Sign., Ann. Soc. Ent. Fr., (5). vi, p. 597 (1876).
" " Frog., Pr. Linn. Soc. N. S. W., p. 359 (1892).
" " Tepp., Tr. Roy. Soc. S. Austr., pp. 271, 273 (1893).
" reducta " " " " " p. 271 (1893).
" foliosa " " " " " p. 273 (1893).
Apiomorpha cornifex Rübs., Berl. Ent. Zeit., xxxix, p. 205 (1894).
Brachyscelis munita Full., Agr. Gaz. N. S. W., p. 3 (1896).
" " Frog., " " " " p. 9 (1898).
" " Lidg., The Wombat, iv, p. 93 (1899).
Habitat.—Australia.
On Eucalyptus robusta.

Apiomorpha munita tricornis (Frog.).

Brachyscelis tricornis Frog., Pr. Linn. Soc. N. S. W., p. 361 (1892).
Apiomorpha " Ckll., Check List, p. 328 (1896).
Brachyscelis " Frog., Agr. Gaz. N. S. W., p. 10 (1898).
Apiomorpha munita var. tricornis Ckll., Check List, Suppl., p. 393 (1899).
Habitat.—Australia.
On Eucalyptus siderophloia.

Apiomorpha munita munitior Full.

Apiomorpha munita var. munitior Full., Tr. Ent. Soc. Lond., p. 445 (1899).
Habitat.—W. Australia; N. S. Wales.

135. Apiomorpha ovicola (Schrad.).

Brachyscelis ovicola Schrad., Tr. Ent. Soc. N. S. W., p. 3 (1862).
" " " Verh. z. b. Ges. Wien, p. 160 (1863).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 596 (1876).
" " Frog., Pr. Linn. Soc. N. S. W., p. 367 (1892).
" " Tepp., Tr. Roy. Soc. S. Austr., p. 272 (1893).
" " Frog., Agr. Gaz. N. S. W., p. 11 (1898).
Apiomorpha " Ckll., Check List, p. 328 (1896).
Habitat.—N. S. Wales; W. Australia.
On Eucalyptus hæmastoma; E. gracilis; E. leucoxylon.

Apiomorpha ovicola glabra (Tepp.).

Brachyscelis glabra Tepp., Tr. Roy. Soc. S. Austr., p. 278 (1893).
Apiomorpha ovicola var. glabra Ckll., Check List, p. 328 (1896).
" glabra Full., Tr. Ent. Soc. Lond., p. 445 (1899).
Habitat.—Australia.
On Eucalyptus rostrata.

136. Apiomorpha ovicoloides (Tepp.).

Brachyscelis ovicoloides Tepp., Tr. Roy. Soc. S. Austr., p. 277 (1893).
Apiomorpha " Ckll., Check List, p. 328 (1896).
Habitat.—Australia.
On Eucalyptus incrassata.

137. Apiomorpha pedunculata (Full.).

Brachyscelis pedunculata Full., Agr. Gaz. N. S. W., pp. 4, 212 (1896).
Apiomorpha " Ckll., Check List, p. 328 (1896).
Brachyscelis " Frog., Agr. Gaz. N. S. W., p. 14 (1898).
Habitat.—Australia.
On Eucalyptus.

138. Apiomorpha pharetrata (Schrad.).

Brachyscelis pharetrata Schrad., Tr. Ent. Soc. N. S. W., p. 3 (1862).
" " " Verh. z. b. Ges. Wien, pl. 3, fig. 2 (1863).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 595 (1876).
" " Frog., Pr. Linn. Soc. N. S. W., p. 370 (1892).
" " " Nat. Science, v, p. 111 (1894).

Brachyscelis pharetrata Full., Agr. Gaz. N. S. W., p. 3 (1896).
Apiomorpha " Ckll., Check List, p. 328 (1896).
Brachyscelis " Frog., Agr. Gaz. N. S. W., p. 14 (1898).
Habitat.—N. S. Wales.
On Eucalyptus sieberiana; E. corymbosa; E. capitellata.

139. Apiomorpha pileata (Schrad.).

Brachyscelis pileata Schrad., Tr. Ent. Soc. N. S. W., p. 3 (1862).
" " " Verh. z. b. Ges. Wien, p. 190 (1863).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 593 (1876).
" " Frog., Pr. Linn. Soc. N. S. W., p. 362 (1892).
" " Tepp., Tr. Roy. Soc. S. Austr., p. 272 (1893).
" " Frog., Nat. Science, v, p. 112 (1894).
Apiomorpha " Ckll., Check List, p. 328 (1896).
Brachyscelis " Frog., Pr. Linn. Soc. N. S. W., p. 372 (1898).
" " " Agr. Gaz. N. S. W., p. 10 (1898) (larva).
Habitat.—N. S. Wales.
On Eucalyptus robusta.

140. Apiomorpha pomiformis (Frog.).

Brachyscelis pomiformis Frog., Pr. Linn. Soc. N. S. W., p. 367 (1892).
" " Tepp., Tr. Roy. Soc. S. Austr., p. 272 (1893).
Apiomorpha " Ckll., Check List, p. 328 (1896).
Brachyscelis " Frog., Agr. Gaz. N. S. W., p. 12 (1898).
Habitat.—Australia.
On Eucalyptus rostrata.

141. Apiomorpha rosæformis (Frog.).

Brachyscelis rosæformis Frog., Pr. Linn. Soc. N. S. W., p. 204 (1895).
Apiomorpha rosiformis Ckll., Check List, p. 328 (1896).
Brachyscelis rosæforma Frog., Agr. Gaz. N. S. W., p. 14 (1898).
Habitat.—N. S. Wales.

142. Apiomorpha rugosa (Frog.).

Brachyscelis rugosa Frog., Pr. Linn. Soc. N. S. W., p. 369 (1892).
" " Tepp., Tr. Roy. Soc. S. Austr., p. 272 (1893).
" " Full., Agr. Gaz. N. S. W., p. 3 (1896).
Apiomorpha " Ckll., Check List, p. 328 (1896).
Brachyscelis " Frog., Agr. Gaz. N. S. W., p. 11 (1898).
Habitat.—Australia.
On Eucalyptus.

143. Apiomorpha sessilis (Frog.).

Brachyscelis sessilis Frog., Pr. Linn. Soc. N. S. W., x, p. 203 (1895).
Apiomorpha " Ckll., Check List, p. 328 (1896).
Brachyscelis " Frog., Agr. Gaz. N. S. W., p. 13 (1898).
Habitat.—N. S. Wales.
On Eucalyptus.

144. Apiomorpha sloanei (Frog.).

Brachyscelis sloanei Frog., Pr. Linn. Soc. N. S. W., p. 373 (1898).
Habitat.—N. S. Wales.
On "White-Gum."

145. Apiomorpha strombylosa (Tepp.).

Brachyscelis strombylosa Tepp., Tr. Roy. Soc. S. Austr., p. 277 (1893).
" " Full., Agr. Gaz. N. S. W., p. 4 (1896).
" crispa " " " " " p. 5 (1896).
" strombylosa Frog., " " " " p. 11 (1898).
Apiomorpha " Full., Tr. Ent. Soc. Lond., p. 445 (1899).
Habitat.—Australia.
On Eucalyptus incrassata.

146. Apiomorpha thorntoni (Frog.).

Brachyscelis thorntoni Frog., Pr. Linn. Soc. N. S. W., p. 371 (1892).
" " Tepp., Tr. Roy. Soc. S. Austr., p. 272 (1893).
" " Full., Agr. Gaz. N. S. W., p. 3 (1896).
" " Frog., " " " " p. 14 (1898).
Apiomorpha " Ckll., Check List, Suppl., p. 393 (1899).
Habitat.—Australia.

Apiomorpha thorntoni nux (Full.).

Brachyscelis nux Full., Agr. Gaz. N. S. W., p. 6 (1896).
Apiomorpha thorntoni var. nux Ckll., Check List, Suppl., p. 393 (1899).
Habitat.—N. S. Wales; S. Australia.
On Eucalyptus.

147. Apiomorpha turbinata (Lidg.).

Brachyscelis turbinata Lidg., Science Gossip, Aug., p. 77 (1901).
Habitat.—Victoria, Australia.

148. Apiomorpha umbellata (Frog.).

Brachyscelis umbellata Frog., Pr. Linn. Soc. N. S. W., p. 336 (1893).
Apiomorpha " Ckll., Check List, p. 328 (1896).
Brachyscelis " Frog., Agr. Gaz. N. S. W., p. 11 (1898).
Habitat.—N. S. Wales.
On Eucalyptus.

149. Apiomorpha urnalis (Tepp.).

Brachyscelis urnalis Tepp., Tr. Roy. Soc. S. Austr., p. 274 (1893).
" " Frog., Pr. Linn. Soc. N. S. W., p. 371 (1898).
" " " Agr. Gaz. N. S. W., p. 13 (1898).
" " Lidg., The Wombat, iii, p. 93 (1898).
Apiomorpha " Ckll., Check List, Suppl., p. 393 (1899).
Habitat.—N. S. Wales.
On Eucalyptus uncinata; E. gracilis; E. meliodora; E. polyanthema.

Apiomorpha urnalis schraderi (Full.).

Brachyscelis schraderi Full., Agr. Gaz. N. S. W., p. 6 (1896).
Apiomorpha urnalis var. schraderi Ckll., Check List, Suppl., p. 393 (1899).
Habitat.—N. S. Wales.
On Eucalyptus.

150. Apiomorpha variabilis (Frog.).

Brachyscelis variabilis Frog., Pr. Linn. Soc. N. S. W., p. 364 (1892).
" " Tepp., Tr. Roy. Soc. S. Austr., p. 272 (1893).
" " Frog., Nat. Science, v, p. 112 (1894).
Apiomorpha " Ckll., Check List, p. 328 (1896).
Brachyscelis " Frog., Pr. Linn. Soc. N. S. W., p. 374 (1898).
" " " Agr. Gaz. N. S. W., p. 12 (1898).
Habitat.—N. S. Wales; Australia.
On Eucalyptus piperita.

Genus OPISTHOSCELIS Schrader. Type, subrotunda.

Opisthoscelis Schrad., Tr. Ent. Soc. N. S. W., i, p. 10 (1862); Verh. z. b. Ges. Wien, xiii, p. 189 (1863): Sign., Ann. Soc. Ent. Fr., (5), vi, p. 597 (1876): Rübs., Berl. Ent. Zeit., xxxix, p. 214 (1894): Frog., Agr. Gaz. N. S. W., p. 16 (1898): Ckll., Can. Ent., xxxi, p. 276 (1899).

151. Opisthoscelis conica Full.

Opisthoscelis conica Full., Notes on Cocc. W. Austr., p. 11 (1897).
" " " Tr. Ent. Soc. Lond., p. 464 (1899).
Habitat.—W. Australia.
On Eucalyptus.

152. Opisthoscelis fibularis Frog.

Opisthoscelis fibularis Frog., Pr. Linn. Soc. N. S. W., p. 344 (1893).
" " " Agr. Gaz. N. S. W., p. 17 (1898).
Habitat.—N. S. Wales.
On Eucalyptus.

153. Opisthoscelis globosa Rübs.

Opisthoscelis globosa Rübs., Berl. Ent. Zeit., xxxix, pp. 213, 214, 219 (1894).
" " Frog., Agr. Gaz. N. S. W., p. 16 (1898).
Habitat.—N. S. Wales.
On Eucalyptus capitellata.

154. Opisthoscelis maculata Frog.

Opisthoscelis maculata Frog., Pr. Linn. Soc. N. S. W., p. 345 (1893).
" " " Agr. Gaz. N. S. W., p. 17 (1898).
Habitat.—N. S. Wales.
On Eucalyptus gracilis; E. leucoxylon.

155. Opisthoscelis mammularis Frog.

Opisthoscelis mammularis Frog., Pr. Linn. Soc. N. S. W., p. 344 (1893).
" " " Agr. Gaz. N. S. W., p. 17 (1898).
Habitat.—Australia.
On Eucalyptus.

156. Opisthoscelis maskelli Frog.

Opisthoscelis maskelli Frog., Pr. Linn. Soc. N. S. W., p. 340 (1893).
" " " Agr. Gaz. N. S. W., p. 16 (1898).
Habitat.—Australia.
On Eucalyptus.

157. Opisthoscelis nigra Frog.

Opisthoscelis nigra Frog., Pr. Linn. Soc. N. S. W., p. 376 (1893).
Habitat.—N. S. Wales.
On Eucalyptus.

158. Opisthoscelis pisiformis Frog.

Opisthoscelis pisiformis Frog., Pr. Linn. Soc. N. S. W., p. 343 (1893).
" " " Agr. Gaz. N. S. W., p. 17 (1898).
Habitat.—N. S. Wales, Australia.
On Eucalyptus melliodora; E. robusta; E. piperita; E. resinifera.

159. Opisthoscelis serrata Frog.

Opisthoscelis serrata Frog., Pr. Linn. Soc. N. S. W.; p. 346 (1893).
" " " Agr. Gaz. N. S. W., p. 17 (1898).
Habitat.—Australia.
On Eucalyptus.

160. Opisthoscelis spinosa Frog.

Opisthoscelis spinosa Frog., Pr. Linn. Soc. N. S. W., p. 341 (1893).
" " " Agr. Gaz. N. S. W., p. 17 (1898).
Habitat.—Australia.
On Eucalyptus siderophloia.

161. Opisthoscelis subrotunda Schrad.

Opisthoscelis subrotunda Schrad., Tr. Ent. Soc. N. S. W., p. 10 (1862).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 597 (1876).
" " Frog., Pr. Linn. Soc. N. S. W., p. 210 (1893).
" " Rübs., Berl. Ent. Zeit., xxxix, p. 213 (1894).
Habitat.—Australia.
On Eucalyptus capitellata.

Opisthoscelis subrotunda gracilis Schrad.

Opisthoscelis gracilis Schrad., Tr. Ent. Soc. N. S. W., p. 10 (1862).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 598 (1876).
" " Rübs., Berl. Ent. Zeit., xxxix, p. 213 (1894).
" subrotunda var. gracilis Ckll., Check List, p. 328 (1896).
Habitat.—Australia.

162. **Opisthoscelis verrucula** Frog.

Opisthoscelis verrucula Frog., Pr. Linn. Soc. N. S. W., p. 338 (1893).
" " " Agr. Gaz. N. S. W., p. 17 (1898).
Habitat.—Australia.
On Eucalyptus.

Genus **ASCELIS** Schrader. Type, præmollis.

Ascelis Schrad., Tr. Ent. Soc. N. S. W., p. 10 (1862); Sign., Ann. Soc. Ent. Fr., (5), vi, p. 598 (1876); Ckll., Can. Ent., xxxi, p. 276 (1899).
Cystococcus Full., Tr. Ent. Soc. Lond., p. 462 (1899).

163. **Ascelis attenuata** Frog.

Ascelis attenuata Frog., Pr. Linn. Soc. N. S. W., p. 214 (1893).
" " " Agr. Gaz. N. S. W., p. 16 (1898).
Habitat.—Australia.
On Eucalyptus piperita.

164. **Ascelis echiniformis** (Full.).

Cystococcus echiniformis Full., Notes on Cocc. W. Austr., p. 11 (1897).
" " " Tr. Ent. Soc. Lond., p. 462 (1899).
Ascelis " Ckll., in litt. (1902).
Habitat.—W. Australia.
On Eucalyptus tessellaris.

165. **Ascelis melaleucæ** Full.

Ascelis melaleucæ Full., Notes on Cocc. W. Austr., p. 12 (1897).
" " " Tr. Ent. Soc. Lond., p. 461 (1899).
Habitat.—W. Australia.
On Melaleuca.

166. **Ascelis præmollis** Schrad.

Ascelis præmollis Schrad., Tr. Ent. Soc. N. S. W., p. 10 (1862).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 599 (1876).
" " Frog., Pr. Linn. Soc. N. S. W., p. 211 (1893).
" " " Nat. Science, v, p. 113 (1894).
" " " Agr. Gaz. N. S. W., p. 15 (1898).
Habitat.—Australia.
On Eucalyptus corymbosa.

167. **Ascelis schraderi** Frog.

Ascelis schraderi Frog., Pr. Linn. Soc. N. S. W., p. 213 (1893).
" " " Agr. Gaz. N. S. W., p. 15 (1898).
Habitat.—N. S. Wales, Australia.
On Eucalyptus corymbosa.

Genus **ASTEROLECANIUM** Targ. Type, aureum.

Asterolecanium Targ., Intr. 2nd Mem. Studi Cocc.. Catalogue, p. 41 (1869): Sign.. Ann. Soc. Ent. Fr.. (4). x, p. 276 (1870): Targ.. Bull. Soc. Ent. Ital., p. 311 (1892): Ckll.. Bull. Bot. Dep. Jam.. p. 1 (1896): Ckll., Can. Ent., xxxi. p. 276 (1899).

Planchonia Sign., Ann. Soc. Ent. Fr.. (4). x. p. 282 (1870): Mask., N. Z. Trans., xiv, p. 223 (1881): Ins. Nox. Agr. N. Z.. p. 91 (1887); Ann. Mag. N. H.. (6). xvi, p. 134 (1895).

Asterodiaspis Sign.. Bull. Soc. Ent. Fr., (5). vi, p. ccix (1876): Comst.. Rep. U. S. Dep. Ag.. 1880. p. 329 (1881).

168. Asterolecanium algeriense (Newst.).

Planchonia algeriensis Newst.. Tr. Ent. Soc. Lond., p. 99 (1897).
Asterolecanium algeriense Ckll.. Check List. Suppl.. p. 393 (1899).
Habitat.—Algeria.
On Spartium junceum.

169. Asterolecanium arabidis (Licht.).

Planchonia arabidis "Licht.," Sign., Ann. Soc. Ent. Fr., (5), vi, p. 608 (1876).
" " Ckll.. Journ. Inst. Jam.. i, p. 79 (1892).
Asterolecanium " " Check List. p. 327 (1896).
Habitat.—France.
On Arabis stricta.

170. Asterolecanium aureum (Bdv.).

Coccus aureus Bdv.. Insectologie Agricole. ii. p. 301 (1868).
" " Targ.. Catalogue, p. 41 (1869).
Asterolecanium aureum Sign.. Ann. Soc. Ent. Fr., (4), x, p. 277 (1870).
" " " " " " " (5), vi. p. 614 (1876).
" " Ckll., Journ. Inst. Jam., i, p. 77 (1892).
" " Mask., The Entom., xxvii. p. 94 (1894).
" " Ckll., Bull. Bot. Dep. Jam.. p. 8 (1896).
Habitat.—West Indies: Europe. on imported plants.
On Calathea vittata: Oncidium.

171. Asterolecanium bambusæ Bdv.

Asterolecanium bambusæ Bdv., Insectologie Agricole (1869).
" " Sign.. Ann. Soc. Ent. Fr.. (4), x, p. 280 (1870).
" " Ckll.. Journ. Inst. Jam.. i. p. 77 (1892).
" " Mask.. The Entom.. xxvii. p. 94 (1894).
" " Ckll., Bull. Bot. Dep. Jam.. p. 9 (1896).
Planchonia (Asterolecanium) bambusæ Newst.. Ent. Mon. Mag., xxxiii, p. 75 (1897).
Planchonia bambusæ de Charm., Pr. Soc. Amic. Scien., p. 42 (1899).
" " Hemp.. Rev. Mus. Paul.. iv, p. 409 (1900).
Habitat.—Algeria: Ceylon: Mauritius: Brazil: Grenada: West Indies: Mexico.

Asterolecanium bambusæ bambusulæ Ckll.

Asterolecanium bambusæ var. bambusulæ Ckll., Am. Nat., xxxi. p. 590 (1897).
Habitat.—India.
On bamboo.

172. Asterolecanium bornmuelleri Rübs.

Asterolecanium bornmülleri Rübs., Zool. Jahrb., p. 316, pl. 15, fig. 34 (1902).
Habitat.—Persia.
On Quercus persica.

173. Asterolecanium delicatum (Green).

Planchonia delicata Green, Ind. Mus. Notes, iv. No. 1, p. 5 (1896).
Asterolecanium delicatum Ckll., Check List, p. 328 (1896).
Habitat.—Ceylon: Japan.
On Arundinaria: Bambusa tessellata.

174. Asterolecanium epacridis (Mask.).

Planchonia epacridis Mask., N. Z. Trans., xiv. p. 224 (1881).
" " " Ins. Nox. Ag. N. Z., p. 91 (1887).
" " Ckll., Journ. Inst. Jam., i. p. 79 (1892).
Asterolecanium " " Check List, p. 327 (1896).
Habitat.—New Zealand.
On Leucopogon Frazeri: Leptospermum scoparium.

175. Asterolecanium epidendri (Bouché).

Lecanium epidendri Bouché, Stett. Ent. Zeit., v. p. 300 (1844).
Planchonia oncidii Ckll., Journ. Inst. Jam., i. p. 78 (1892).
Asterolecanium aureum Targ., Bull. Soc. Ent. Ital., xxiv. pp. 304, 311 (1892).
Planchonia oncidii Ckll., Science Gossip, xxix. p. 78 (1893).
" " " Gard. Chron., (3), xiii, p. 548 (1893).
" " " Bull. Bot. Dep. Jam., p. 8 (1896).
Asterolecanium epidendri Ckll., Pr. Ac. N. Sci. Ph., p. 269 (1899).
Habitat.—Europe: Jamaica: Trinidad.
On Epidendrum: Oncidium tetrapetalum: Angræcum sesquipedalis: Broughtonia sanguinea.

176. Asterolecanium fimbriatum (Fonsc.).

Coccus fimbriatus Fonsc., Ann. Soc. Ent. Fr., iii. p. 209 (1834).
" " Sign., " " " " (4). viii. p. 515 (1868).
" " Kalt., Die Pflanz., p. 136 (1874).
Planchonia fimbriata Sign., Ann. Soc. Ent. Fr., (4). x. p. 283 (1870).
" " McIntire, Jn. Quekett Micr. Club, p. 25 (1889).
" " Ckll., Jn. Inst. Jam., i. p. 77 (1892).
" " Mask., N. Z. Trans., xxvi. p. 85 (1893).
" " " " " xxvii. p. 61 (1894).
Asterolecanium fimbriatum Ckll., Check List, p. 327 (1896).
Habitat.—Europe: Australia: Br. Guiana.
On Leptospermum flavescens: Coronilla glauca.

177. Asterolecanium grandis (Newst.).

Pollinia grandis Newst., Ent. Mon. Mag., xxx, p. 182 (1894).
Asterolecanium grande Ckll., Check List, p. 328 (1896).
Habitat.—India.
On "A grass-like plant."

178. Asterolecanium hakeæ (Full.).

Planchonia hakeæ Full., Notes on Cocc. W. Austr., p. 7 (1897).
Asterolecanium " " Tr. Ent. Soc. Lond., p. 456 (1899).
Habitat.—W. Australia.
On Hakea ilicifolia; Acacia.

179. Asterolecanium hederæ (Licht.).

Planchonia hederæ Licht., Bull. Soc. Ent. Fr., (5), x, p. xlv (1880).
" " " " " " " (6), ii, p. lxxv (1882).
" valloti " " " " " " " p. lxxv (1882).
" hederæ Ckll., Journ. Inst. Jam., i. p. 79 (1892).
Asterolecanium massalongianum Targ., Bull. Soc. Ent. Ital., xxiv, pp. 295. 312 (1892).
Asterolecanium hederæ Ckll., Ent. News, v, p. 211 (1894).
Habitat.—France; Italy.
On ivy (Hedera helix).

180. Asterolecanium ilicicola (Targ.).

Aonidia ilicicola Targ., Annali di Agr., p. 423 (1888).
" " " Bull. Soc. Ent. Ital., xxiv, p. 422 (1892).
Asterolecanium ilicicola Targ., Bull. Soc. Ent. Ital., xxv, pp. 286, 311 (1893).
" " Berl. e Leon., Cherm. Ital., Fasc. ii, No. 47 (1897).
Habitat.—Italy.
On Quercus ilex.

181. Asterolecanium ilicis (Newst.).

Planchonia ilicis Newst., Tr. Ent. Soc. Lond., p. 100 (1897).
Asterolecanium ilicis Ckll., Check List. Suppl., p. 393 (1899).
Habitat.—Algeria.
On "Scrub."

182. Asterolecanium miliaris Bdv.

Asterolecanium miliaris Bdv., Insectol. Agricole (1869).
" " Sign., Ann. Soc. Ent. Fr., (4), x, p. 281 (1870).
" " Ckll., Journ. Inst. Jam., i, p. 77 (1892).
" " " " " " i, p. 382 (1893).
" " Mask., The Entom., xxvii, p. 94 (1894).
" " deCharm., Pr. Soc. Amic. Scien., p. 42 (1899).
" " Hemp., Rev. Mus. Paul., iv, p. 409 (1900).
Habitat.—Algeria; Mauritius; Brazil; Jamaica; Trinidad.
On bamboo.

Asterolecanium miliaris longum (Green).

Planchonia miliaris var. longa Green, Ind. Mus. Notes. iv, p. 5 (1896).
Asterolecanium " " longum Ckll., Check List, p. 328 (1896).
Habitat.—Ceylon.
On bamboo.

183. Asterolecanium palmæ Ckll.

Asterolecanium palmæ Ckll., Journ. Inst. Jam., i. p. 76 (1892).
" " " Science Gossip, xxix, p. 77 (1893).
" " " Bull. Bot. Dep. Jam., p. 9 (1896).
Habitat.—Jamaica.
On Cocoanut-palm.

184. Asterolecanium petrophilæ (Full.).

Planchonia petrophilæ Full., Notes on Cocc. W. Austr., p. 7 (1897).
Asterolecanium " " Tr, Ent. Soc. Lond., p. 456 (1899).
Habitat.—W. Australia.
On Petrophila linearis.

185. Asterolecanium pustulans (Ckll.).

Asterodiaspis pustulans Ckll., Journ. Inst. Jam., i. p. 143 (1892).
Planchonia " " Science Gossip, xxix. p. 77 (1893).
Asterolecanium " " Bull. Bot. Dep. Jam., p. 8 (1893).
" " " Can. Ent., xxvii, p. 259 (1895).
" " " Jn. Trin. Nat. Club, ii, p. 306 (1896).
" " Quaint., Psyche, viii, p. 91 (1897).
" " Rolfs & Quaint., Cocc. Amer.. Dec. i-ii, No. 5 (1898).
" " Hemp., Rev. Mus. Paul., iv, p. 409 (1900).
" " Lefroy, Scale Ins. Less. Antil., p. 38 (1901).
Habitat.—Jamaica: Porto Rico; Antigua; Brazil: Br. Guiana; Grenada; Montserrat: Mexico: Florida.
On fig; oleander; mango; peach: custard-apple; Anona reticulata; pigeon-peas: mulberry; Hibiscus.

186. Asterolecanium quercicola (Bouché).

Lecanium quercicola Bouché. Stett. Ent. Zeit., xii, p. 112 (1851).
Asterolecanium " Sign., Ann. Soc. Ent. Fr., (4), x, p. 279 (1870).
Asterodiaspis " " " " " " (5), vi, p. 606 (1876).
" " " Bull. " " " " " p. ccix (1876).
" " Comst., Rep. U. S. Dep. Ag., 1880, p. 330 (1881).
" " Dougl., Ent. Mon. Mag., xxii, p. 250 (1886).
" " Pack., 5th Rep. U. S. Ent. Com., p. 102 (1890).
Planchonia " Ckll., Journ. Inst. Jam., i, p. 79 (1892).
Asterodiaspis " Rübs., Berl. Ent. Zeit., xxxix, p. 200 (1894).
Asterolecanium " Mask., The Entom., xxvii, p. 95 (1894).
Asterodiaspis " Sturgis, Rep. Conn. Exp. Sta., p. 193 (1895).
" " Newst., Ent. Mon. Mag., xxxi, p. 85 (1895).
Asterolecanium " Saccardo, Riv. Pat. Veg., iv. p. 49 (1895).

Planchonia (Asterolecanium) quercicola Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 43 (1896).
Planchonia quercicola Mask., N. Z. Trans., xxviii, p. 396 (1896).
Asterodiaspis " Newst., Ind. Mus. Notes, iv, No. 2, pp. 81, 82 (1897).
" " Lowe, Bull. 136, N. Y. Exp. Sta., p. 586 (1897).
Planchonia (Asterolecanium) quercicola Frog., Dep. Ag. N. S. W., No. 175, p. 6 (1897).
Asterodiaspis quercicola Marl., Bull. 20, n. s., Dep. Ag., p. 75 (1899).
Asterolecanium " de Charm., Pr. Soc. Amic. Scien., p. 42 (1899).
" " King, Can. Ent., xxxi, p. 112 (1899).
Asterodiaspis " Newst., Jn. Roy. Hor. Soc., xxiii, p. 20 (1900).
Habitat.—Europe; Australia; Mauritius; Jamaica; Conn.; N. Y.; D. C.; Mass.
On oak.

187. Asterolecanium solenophoroides (Green).

Planchonia solenophoroides Green, Ind. Mus. Notes, iv, No. 1, p. 6 (1896).
Asterolecanium " Ckll., Check List, p. 328 (1896).
Habitat.—Ceylon.
On Arundinaria.

188. Asterolecanium styphelIæ (Mask.).

Planchonia styphelIæ Mask., N, Z. Trans., xxiv, p. 24 (1891).
" " Ckll., Journ. Inst. Jam., i, p. 79 (1892).
" fimbriata var. styphelIæ Mask., N. Z. Trans., xxvi, p. 85 (1893).
" styphelIæ " " " xxvii, p. 62 (1894).
Asterolecanium styphelIæ Full., Tr. Ent. Soc. Lond., p. 457 (1899).
Habitat.—Australia; N. Tasmania.
On Styphelia richei: Leptospermum juniperinum.

189. Asterolecanium thesii (Dougl.).

Pollinia thesii Dougl., Ent. Mon. Mag., xxix, p. 55 (1893).
Asterolecanium thesii Ckll., Check List, p. 328 (1896).
Habitat.—Great Britain.

190. Asterolecanium townsendi Ckll.

Asterolecanium Townsendi Ckll., Ann. Mag. N. H., (7), x, p. 468 (1902).
Habitat.—Mexico.
On "Guasima."

191. Asterolecanium urichi Ckll.

Asterolecanium urichi Ckll., Jn. Trin. Nat. Club, i, p. 308 (1894).
" " " Bull. Bot. Dep. Jam., p. 9 (1896).
Habitat.—Trinidad; Grenada.
On palms; Bactris minor.

192. Asterolecanium variolosum (Ratz.).

Coccus variolosus Ratz., Tharander Jahrbuch, p. 187 (1870).

Lecanium quercus Altum, Forstzoologie, iii, pt. 2, p. 365 (1882).
Asterolecanium variolosum Hagen, Can. Ent., xix, p. 60 (1887).
Asterodiaspis quercicola Sign., Lehrb. der Mitth. Forstins., p. 1252 (1895).
" variolosum Dansk, Forstzoologie, p. 395 (1896).
Coccus quercicola Eckst., " p. 556 (1897).
Asterolecanium variolosum Ckll., Pr. Ac. N. Sci. Ph., p. 269 (1899).
" " King, Can. Ent., xxxiii, p. 193 (1901).
Habitat.—Eur.; Can.; Mass.; Conn.; N. Y.; D. C.; Ohio.
On Quercus glandulifera; Q. aurea.

Asterolecanium variolosum japonicum Ckll.

Asterolecanium variolosum var. japonicum Ckll., Psyche, ix, p. 71 (1900).
Habitat.—Japan.
On Quercus glandulifera.

193. Asterolecanium ventruosum (Mask.).

Planchonia ventruosa Mask., N. Z. Trans., xxvii, pp. 20, 63 (1894).
Asterolecanium ventruosum Ckll., Check List, p. 328 (1896).
Habitat.—Australia.
On Acacia.

194. Asterolecanium viridulum Ckll.

Asterolecanium viridulum Ckll., Can. Ent., xxxiv, p. 89 (1902).
Habitat.—Tucuman, Argentine Republic.

Genus **LECANIODIASPIS** Targ. Type, sardoa.

Lecaniodiaspis Targ., Bull. Soc. Ent. Ital., i, p. 261 (1869): Ckll., Can. Ent., xxxi, p. 276 (1899).
Prosopophora Dougl., Ent. Mon. Mag., xxviii, p. 207 (1892); xxx, p. 30 (1894): Ckll., Science, xxii, p. 151 (1896). Type, dendrobii.

195. Lecaniodiaspis acaciæ (Mask.).

Prosopophora acaciæ Mask., N. Z. Trans., xxv, p. 225 (1892).
" " " " " xxix, p. 105 (1896).
Lecaniodiaspis " Ckll., Check List, p. 327 (1896).
Habitat.—W. Australia.
On Acacia calamifolia; A. cyanophylla; A. microbotrya.

196. Lecaniodiaspis atherospermæ (Mask.).

Prosopophora atherospermæ Mask., N. Z. Trans., xxviii, p. 395 (1896).
Lecaniodiaspis " Ckll., Check List, Suppl., p. 392 (1899).
Habitat.—Australia.
On Atherosperma moschata.

197. Lecaniodiaspis celtidis Ckll.

Lecaniodiaspis (Prosopophora) celtidis Ckll., Psyche, vii, Supl., i. p. 19 (1896).
" " " The Entom., xxx, p. 12 (1897).
Habitat.—Texas; Ohio.
On Celtis occidentalis.

198. Lecaniodiaspis dendrobii (Dougl.).

Prosopophora dendrobii Dougl., Ent. Mon. Mag., xxviii, p. 207 (1892).
" " Newst., " " " xxix, p. 78 (1893).
" " Ckll., Gard. Chron., (3), xiii, p. 548 (1893).
" " Dougl., Ent. Mon. Mag., xxx, p. 30 (1894).
Lecaniodiaspis " Ckll., Check List, p. 327 (1896).
" (Prosopophora) dendrobii Green, Ent. Mon. Mag., xxxvii, p. 294 (1901).

Habitat.—Br. Guiana.
On Dendrobium calceolaria.

199. Lecaniodiaspis eucalypti (Mask.).

Prosopophora eucalypti Mask., N. Z. Trans., xxv, p. 226 (1892).
" " " Ent. Mon. Mag., xxix, p. 105 (1893).
Lecaniodiaspis " Ckll., Check List, p. 327 (1896).

Habitat.—Australia.
On Eucalyptus.

200. Lecaniodiaspis manihotis (Towns.).

Prosopophora manihotis Towns., Jn. N. Y. Ent. Soc., vi, p. 172 (1898).
Lecaniodiaspis " Ckll., Check List, Suppl., p. 392 (1899).
Prosopophora " " Ann. Mag. N. H., (7), x, p. 468 (1902).

Habitat.—Mexico.
On Manihot (nettle-tree).

201. Lecaniodiaspis melaleucæ (Full.).

Prosopophora melaleucæ Full., Notes on Cocc. W. Austr., p. 7 (1897).
Lecaniodiaspis " " Tr. Ent. Soc. Lond., p. 455 (1899).

Habitat.—W. Australia.
On Melaleuca leucadendron.

202. Lecaniodiaspis mimosæ (Mask.).

Prosopophora prosopidis var. mimosæ Mask., N.Z.Trans.,xxix,p. 316 (1897).
Lecaniodiaspis mimosæ Ckll., Check List, Suppl., p. 392 (1899).

Habitat.—S. Africa.
On Mimosa.

203. Lecaniodiaspis prosopidis (Mask.).

Prosopophora prosopidis Mask., N. Z. Trans., xxvii, p. 60 (1894).
Lecaniodiaspis " Ckll., Check List, p. 327 (1896).

Habitat.—Arizona.
On Prosopis julifera.

204. Lecaniodiaspis pruinosa Hunter.

Lecaniodiaspis celtidis subsp. pruinosus Hunter, Kan. Univ. Quar., viii, p. 77 (1899).
Lecaniodiaspis pruinosa Ckll., in litt. (1902).

Habitat.—Kansas.
On elm.

205. Lecaniodiaspis quercus Ckll.

Lecaniodiaspis (Prosopophora) quercus Ckll., Psyche, vii. Suppl., i. p. 19 (1896).
" " " " Bull. 4, T. s., Dep. Ag., p. 31 (1896).
Lecaniodiaspis quercus Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 45 (1902).
Habitat.—Japan.
On Quercus acuta; Quercus sessilifolia; Pasania glabra.

206. Lecaniodiaspis radiata Ckll.

Lecaniodiaspis (Prosopophora) radiata Ckll., Can. Ent., xxix. p. 269 (1897).
Habitat.—Mexico.

207. Lecaniodiaspis rufescens (Ckll.).

Prosopophora rufescens Ckll., Science, xxii. p. 151 (1893).
" yuccæ var. rufescens Ckll., Bull. 4, T. s., Dep. Ag., p. 30 (1896).
Lecaniodiaspis rufescens Ehrh., Can. Ent., xxxi. p. 104 (1899).
" " Ckll. " " " p. 267 (1899).
Habitat.—California; Arizona.
On Adenostoma oblongifolia; A. fasciculatum; Fouquiera splendens.

208. Lecaniodiaspis rugosa Hemp.

Lecaniodiaspis rugosus Hemp., Rev. Mus. Paul., iv. p. 407 (1900).
" " " Ann. Mag. N. H., (7), vii. p. 119 (1901).
Habitat.—Brazil.

209. Lecaniodiaspis sardoa Targ.

Lecaniodiaspis sardoa Targ., Bull. Soc. Ent. Ital., i. p. 262 (1869).
" " Sign., Ann. Soc. Ent. Fr., (4), x. p. 285 (1870).
" " Ckll., Journ. Inst. Jam., i. p. 76 (1892).
Habitat.—Europe; Mediterranean region.
On Ciste salviafolia.

210. Lecaniodiaspis tessellata Ckll.

Lecaniodiaspis (Prosopophora) tessellatus Ckll., Ent. News, viii. p. 161 (1897).
" " Quaint. & Scott, Cocc. Amer., Dec. iii-iv, No. 5 (1901).
Habitat.—Ga.; Fla.
On Diospyros Virginiana; hickory.

211. Lecaniodiaspis yuccæ Towns.

Lecaniodiaspis yuccæ Towns., Bull. 7, N. Mex. Exp. Sta., p. 13 (1892).
" " Ckll., Journ. Inst. Jam., i. p. 76 (1892).
" " " Am. Nat., xxix. p. 728 (1895).
" " " Bull. 4, T. s., Dep. Ag., p. 30 (1896).
" " Riley & How., Ins. Life, v. p. 65 (1896).
Habitat.—N. Mexico.
On Yucca macrocarpa; Dasylirion wheeleri; Parthenium incanum.

Genus **CEROCOCCUS** Comst. Type, quercus.

Cerococcus Comst., Rep. U. S. Dep. Ag., p. 213 (1882); Ckll., Can. Ent., xxxi, p. 276 (1899).

212. Cerococcus corticis Towns. & Ckll.

Cerococcus corticis Towns. & Ckll., Jn. N. Y. Ent. Soc., vi, p. 170 (1898).
" " Patt., Pr. Cal. Ac. Sci., (3), ii, p. 353 (1901).
Habitat.—Mexico.
On Quercus engelmanni.

213. Cerococcus ehrhorni Ckll.

Cerococcus ehrhorni Ckll., Psyche, vii, p. 255 (1895).
" " Patt., Pr. Cal. Ac. Sci., (3), ii, p. 357 (1901).
Habitat.—California.
On live oak.

214. Cerococcus ficoides Green.

Cerococcus ficoides Green, Ent. Mon. Mag., xxxv, p. 225 (1899).
Habitat.—India.
On Tea.

215. Cerococcus quercus Comst.

Cerococcus quercus Comst., Rep. U. S. Dep. Ag., p. 213 (1882).
" " Howard, Bull. 9, n. s., Dep. Ag., p. 32 (1897).
" " Patt., Pr. Cal. Ac. Sci., (3), ii, p. 352 (1901).
Habitat.—Arizona; California.
On Oak.

Genus **ANOMALOCOCCUS** Green. Type, cremastogastri.

Anomalococcus Green, Ent. Mon. Mag., xxxviii, p. 260 (1902).

216. Anomalococcus cremastogastri Green.

Anomalococcus cremastogastri Green, Ent. Mon. Mag., xxxviii, p. 261 (1902).
Habitat.—Ceylon.
In nests of Cremastogaster Dohrni, on Ficus.

Genus **AMORPHOCOCCUS** Green. Type, mesuæ.

Amorphococcus Green, Ent. Mon. Mag., xxxviii, p. 261 (1902).

217. Amorphococcus mesuæ Green.

Amorphococcus mesuæ Green, Ent. Mon. Mag., xxxviii, p. 261 (1902).
Habitat.—Ceylon.
On terminal twigs of Ironwood tree (Mesua ferrea).

Genus **ANTECEROCOCCUS** Green. Type, punctiferus.

Antecerococcus Green, Pr. Linn. Soc. N. S. W., p. 560 (1900).

218. Antecerococcus bryoides (Mask.).

Planchonia bryoides Mask., N. Z. Trans., xxvi, p. 84 (1893).
Asterolecanium " Ckll., Check List, p. 328 (1896).
Antecerococcus " Green. in litt. to Prof. Cockerell (1902).
Habitat.—Fiji; Australia.
On Exocarpus.

Antecerococcus bryoides stellatus (Mask.).

Planchonia bryoides var. stellata Mask., N. Z. Trans., xxix, p. 315 (1897).
Asterolecanium " " stellatum Ckll., Check List, Suppl., p. 393 (1899).
Habitat.—Australia.
On Exocarpus cupressiformis.

219. Antecerococcus punctiferus Green.

Antecerococcus punctiferus Green, Pr. Linn. Soc. N. S. W., p. 560 (1900).
Habitat.—N. S. Wales.
On Pittospermum eugenioides.

Genus **SOLENOCOCCUS** Ckll. Type, fagi.

||Solenophora Mask., N. Z. Trans., xxii, p. 139 (1889).
Solenococcus Ckll., Check List, Suppl., p. 392, note (1899); Can. Ent., xxxi, p. 276 (1899).

220. Solenococcus artemisiæ (Ckll.).

Lecaniodiaspis artemisiæ Ckll., Ann. Mag. N. H., (6), xx, p. 514 (1897).
Solenococcus " " in litt. (1902).
Habitat.—New Mexico.
On sage bush.

221. Solenococcus baccharidis Hemp.

Solenococcus baccharidis Hemp., Rev. Mus. Paul., iv. p. 392 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 112 (1901).
Habitat.—Brazil.
On Baccharis dracunculifolia.

222. Solenococcus coloradensis (Ckll.).

Solenophora coloradensis Ckll., Psyche, viii, p. 262 (1898).
Solenococcus " " Check List, Suppl., p. 392 (1899).
Habitat.—Colorado.
On Atriplex canescens.

223. Solenococcus corokiæ (Mask.).

Solenophora corokiæ Mask., N. Z. Trans., xxii, p. 141 (1889).
" " " " " xxiii, p. 139 (1890).
Habitat.—New Zealand.
On Corokia cotoneaster.

224. Solenococcus fagi (Mask.).

Solenophora fagi Mask., N. Z. Trans., xxii, p. 139 (1889).
Habitat.—New Zealand.
On Fagus.

225. Solenococcus koebelei (Ckll.).

Solenophora koebelei Ckll., Ann. Mag. N. H., (7), i, p. 429 (1898).
" " " Check List, Suppl., p. 392 (1899).
Habitat.—Mexico.
On Cratægus, Prunus demissa.

226. Solenococcus parrotti (Hunter).

Lecaniodiaspis parrotti Hunter, Kan. Univ. Quar., viii, p. 76 (1899).
Solenococcus " Ckll., in litt. (1901).
Habitat.—Kansas.
On Æsculus glabra.

227. Solenococcus tuberculus Hemp.

Solenococcus tuberculus Hemp., Rev. Mus. Paul., iv, p. 390 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 111 (1901).
Habitat.—Brazil.
On Baccharis.

228. Solenococcus zapotlana (Ckll.).

Solenophora zapotlana Ckll., Ann. Mag. N. H., (7), xi, p. 164 (1903).
Habitat.—Mexico.
On sage.

Genus **BIRCHIPPIA** Green. Type, anomala.

Birchippia Green, Ann. Mag. N. H., (7), vi, p. 450 (1900).

229. Birchippia anomala Green.

Birchippia anomala Green, Ann. Mag. N. H., (7), vi, p. 451 (1900).
Lecaniodiaspis " " Ent. Mon. Mag., xxxvii, p. 294 (1901).
Habitat.—Victoria, Australia.
On "a Leguminous plant."

Genus **POLLINIA** Targ. Type, costæ = pollini.

Pollinia Targ., Bull. Soc. Ent. Ital., i, p. 263 (1869); Catalogue, p. 41 (1869): Sign., Ann. Soc. Ent. Fr., (5), x, p. 274 (1870): Dougl., Ent. Mon. Mag., xxix, p. 55 (1893): Ckll., Can. Ent., xxxi, p. 276 (1899).
Cisticoccus A. Costa.

230. Pollinia ovoides Ckll.

Pollinia ovoides Ckll., The Entom., xxxiv, p. 225 (1901).
Habitat.—Natal.

231. Pollinia pollini (Costa).

Coccus pollini Costa, Atti del. R. Ist. d'Incorrag., iv, p. 202 (1828).
Pollinia costæ Targ., Bull. Soc. Ent. Ital., i, p. 264 (1869).
" " " Catalogue, p. 41 (1869).
" " Sign., Ann. Soc. Ent. Fr., (4), x, p. 275 (1870).
" " " " " " " (5), vi, p. 607 (1876).
" pollini Ckll., Journ. Inst. Jam., i, p. 76 (1892).
" " Dougl., Ent. Mon. Mag., xxix, p. 55 (1893).
" costæ " " " " " p. 55 (1893).
" " Craw, 4th Bien. Rep. Cal. Bd. Hort., p. 438 (1894).
" " " 5th " " " " " p. 43 (1896).
" pollini Leon., Lab. di Ent., Portici, p. 4 (1899).

Habitat.—Italy; California.

On olive.

Genus **KERMES** Boitard. Type, variegatus.

Kermes Boitard, Manual d' Entomologie, p. 171 (1828): Targ., Catalogue, p. 40 (1869): Sign., Ann. Soc. Ent. Fr., (5), iv, p. 547 (1874): Comst., Rep. U. S. Dep. Ag., 1880, p. 337 (1881): Ckll., Can. Ent., xxxi, p. 276 (1899).
Chermes Amy & Serv., Hist. Nat. Ins., Hem., p. 630 (1843).

232. Kermes acaciæ Mask.

Kermes acaciæ Mask., N. Z. Trans., xxvi, p. 83 (1893).
" " " The Entom., xxvii, p. 93 (1894).

Habitat.—Australia.

On Acacia.

233. Kermes andrei King.

Kermes andrei King, Psyche, ix, pp. 22, 78, 81 (1900).
" " " Can. Ent., xxxiv, p. 160 (1902).

Habitat.—Mass.; Ga.; Ohio.

On oak.

234. Kermes arizonensis King.

Kermes arizonensis King, Ent. News, xiv, p. 21 (1903).

Habitat.—Arizona.

On oak.

235. Kermes austini Ehrh.

Kermes austini Ehrh., Can. Ent., xxxi, p. 104 (1899).
" " Ckll., Psyche, ix, p. 44 (1900).
" " King, " " p. 81 (1900).

Habitat.—California.

On Quercus oblongifolius.

236. Kermes ballotæ Sign.

Kermes ballotæ Sign., Ann. Soc. Ent. Fr., (5), iv, p. 548 (1874).
Habitat.—Europe.
On Quercus ballota.

237. Kermes boguei Ckll.

Kermes boguei Ckll., Ent. News, viii, p. 94 (1897).
" " " Psyche, ix, p. 44 (1900).
" " King, " " p. 79 (1900).
Habitat.—Oklahoma.
On Quercus alba.

238. Kermes ceriferus Ehrh.

Kermes ceriferus Ehrh., Can. Ent., xxxi, p. 5 (1899).
" " Ckll., Psyche, ix, p. 44 (1900).
" " King, " " p. 81 (1900).
Habitat.—Arizona.
On oak.

239. Kermes cockerelli Ehrh.

Kermes cockerelli Ehrh., Ent. News, ix, p. 185 (1898).
" " Ckll., Psyche, ix, p. 44 (1900).
" " King, " " p. 80 (1900).
Habitat.—California.
On Quercus lobata.

240. Kermes concinnulus Ckll.

Kermes concinnulus Ckll., Can. Ent., xxx, p. 172 (1898).
" " " Psyche, ix, p. 44 (1900).
" " King, " " p. 80 (1900).
Habitat.—Kansas.
On oak.

241. Kermes fuscus (Sign.).

Lecanium fuscus Sign., Ann. Soc. Ent. Fr., (5), iii, p. 420 (1873).
Kermes " Ckll., Check List, p. 327 (1896).
Habitat.—Austria.
On oak.

242. Kermes galliformis Riley.

Kermes galliformis Riley, Am. Nat., xv, p. 482 (1881).
" " Comst., Rep. U. S. Dep. Ag., 1880, p. 337 (1881).
" " " 2nd Rep. Dep. Ent. Corn. Univ., p. 132 (1883).
" " Pack., 5th Rep. U. S. Ent. Com., p. 100 (1890).
" " Mask., N. Z. Trans., xxiv, p. 21 (1891).
" " Lint., 12th Rep. Ins. N. Y., p. 316 (1897).
" " Osborn, Contr. Ia. Ag. Coll., No. 3, p. 3 (1898).

Kermes galliformis King. Can. Ent., xxxi. p. 139 (1899).
" " Ckll., Psyche. ix. p. 44 (1900).
" " King. " " p. 79 (1900).
Habitat.—Mass.: Conn.: N. Y.: N. J.: D. C.: Fla.: Ala.: La.: Ohio: Ia.: Mo.: N. Mex.: Cal.
On oak.

Kermes galliformis cueroensis Ckll.

Kermes galliformis var. cueroensis Ckll., Psyche. ix. p. 79 (1900).
Habitat.—Texas.
On oak.

243. Kermes gibbosus Sign.

Kermes gibbosus Sign., Ann. Soc. Ent. Fr., (5), iv. p. 552 (1874).
Habitat.—Austria.
On oak.

244. Kermes gillettei Ckll.

Kermes gillettei Ckll., The Entom., xxviii. p. 103 (1895).
" " Gillette & Baker. Bull. 31. Col. Exp. Sta., p. 126 (1895).
" " Ckll., The Entom., xxx. p. 14 (1897).
" " " Psyche. ix. p. 44 (1900).
" " King. " " p. 78 (1900).
Habitat.—Colorado: New Mexico.
On Quercus undulata.

245. Kermes grandis Ckll.

Kermes grandis Ckll., Ann. Mag. N. H., (7), i. p. 431 (1898).
" " " Psyche. ix. p. 44 (1900).
" " King. " " p. 80 (1900).
Habitat.—Mexico.
On Quercus engelmanni.

246. Kermes ilicis (Linn.).

—— —— Reaum., Mem. Ins., iv. p. 45. pl. v. fig. 1 (1738).
Coccus ilicis Linn., Syst. Nat., Ed. x. i. p. 455 (1758).
" " Lederm., Mikrosk., p. 72 (1764).
" " Linn., Syst. Nat., Ed. xii. i. p. 740 (1766).
" " Cassals. Dissert. Kermes (1768).
" " Fab., Syst. Ent., p. 743 (1775).
" " Mod., Act. Goth., i. p. 24 (1778).
" " Fab., Spec. Ins., ii. p. 393 (1781).
" " " Mant. Ins., ii. p. 318 (1787).
" " Gmel., Syst. Nat., Ed. xiii. p. 2216 (1789).
Chermes " Oliv., Ency. Meth., vii. p. 440 (1792).
Coccus " Fab., Ent. Syst., iv. p. 225 (1794).
" " Turton. Syst. Nat., ii. p. 712 (1801).
" " Fab., Syst. Rhyng., p. 308 (1803).

Coccus ilicis Truchet. Traité complet de Kermes (1811).
" " Kirby & Spence. Intr. Ent., 5th Ed., p. 319 (1828).
" " Ratz., Mediz. Zool., ii. p. 223 (1833).
" " Fonsc., Ann. Soc. Ent. Fr., iii. p. 210 (1834).
" " Burm., Handb. Ent., ii. p. 71 (1835).
Lecanium ilicis Blanch.! Hist. Nat. Ins., p. 214 (1840).
Coccus " Westw., Intr. Ent., ii. p. 447 (1840).
" " Amy. & Serv., Suites de Buffon. Hem., p. 633 (1843).
" " Amyot. Monom., No. 550 (1848).
" " Landerer. Journ. de Pharm., xi. (1852).
Chermes bauhini Planch., Le Chermes du Chêne. p. 2 (1864).
Coccus " Targ., Studii sul. Coccin., p. 45 (1867).
Kermes " " Catalogue. p. 40 (1869).
Lecanium bauhinii Licht., Bull. Soc. Ent. Fr., (4). x. p. xxxvii (1870).
Kermes " Sign., Ann. " " " (5). iv. pp. 88, 549 (1874).
Lecanium ilicis Kalt., Die Pflanz., p. 676 (1874).
Kermes bauhinii Sign., Ann. Soc. Ent. Fr., (5). v. p. 18 (1875).
Lecanium ilicis Eckst., Forst. Zool., p. 559 (1897).
Kermes " Ckll., Pr. Ac. N. Sci. Ph., p. 270 (1899).
Habitat.—Europe.
On oak.

247. **Kermes kingii** Ckll.

Kermes kingii Ckll., Ann. Mag. N. H., (7). ii. p. 330 (1898).
" " " Can. Ent., xxxi. p. 139 (1899).
" " " Psyche. ix. p. 44 (1900).
" " King. " " pp. 80, 83 (1900).
Habitat.—Mass.; Del.
On red oak.

248. **Kermes nakagawæ** Kuwana.

Kermes nakagawæ Kuw., Pr. Cal. Ac. Sci., (3). iii. p. 49 (1902).
Habitat.—Japan.
On Quercus serrata; Q. glandulifera.

249. **Kermes nawæ** Kuwana.

Kermes nawæ Kuw., Pr. Cal. Ac. Sci., (3). iii. p. 49 (1902).
Habitat.—Japan.
On Quercus glandulifera; Rhamnus japonica genuina.

250. **Kermes nigropunctatus** Ehrh. & Ckll.

Kermes nigropunctatus Ehrh. & Ckll., Ent. News. ix. p. 186 (1898).
" " Ckll., Biol. Centr. Amer., ii. pt. 2. p. 10 (1899).
" " " Psyche. ix. p. 45 (1900).
" " King. " " p. 80 (1900).
Habitat.—Cal.; Mex.
On oak.

251. Kermes nivalis King & Ckll.

Kermes nivalis King & Ckll., Ann. Mag. N. H., (7), ii, p. 330 (1898).
" " Ckll., Can. Ent., xxxi, p. 139 (1899).
" " " Psyche, ix, p. 44 (1900).
" " King, " " pp. 78, 80 (1900).
" " Hunter, Studies Ins. Life, p. 187 (1902).
Habitat.—Mass.
On Quercus alba.

252. Kermes pallidus Sign.

Kermes pallidus Sign., Ann. Soc. Ent. Fr., (5), iv, p. 553 (1874).
Habitat.—Europe.
On oak.

253. Kermes perryi King.

Kermes perryi King, Psyché, ix, p. 81 (1900).
" " " Can. Ent., xxxiv, p. 60 (1902).
Habitat.—Mass.
On oak.

254. Kermes pettiti Ehrh.

Kermes pettiti Ehrh., Can. Ent., xxxi, p. 7 (1899).
" " Ckll., Psyche, ix, p. 45 (1900).
" " King, " " p. 81 (1900).
" " " Can. Ent., xxxiii, p. 193 (1901).
" " " " " xxxiv, p. 59 (1902).
Habitat.—Can.; Mass.; N. Y.
On oak.

255. Kermes pubescens Bogue.

Kermes pubescens Bogue, Can. Ent., xxx, p. 172 (1898).
" " King, " " xxxi, p. 139 (1899).
" " Ckll., Psyche, ix, p. 44 (1900).
" " King, " " pp. 80, 83 (1900).
" " Hunter, Studies Ins. Life, p. 188 (1902).
Habitat.—Mass.; Kans.; Ohio.
On oak.

256. Kermes quercus (Linn.).

—— —— Reaum., Mem. Ins., iv, pl. 6, figs. 1-4 (1738).
Coccus quercus Linn., Syst. Nat., Ed. x, i, p. 455 (1758).
" " " Faun. Suec., p. 265 (1761).
Chermes " reniformis Geoff., Abr. Ins., p. 508 (1762).
" reniformis Fourc., Ent. Paris, i, p. 230 (1785).
Coccus quercus Fab., Mant. Ins., ii, p. 318 (1787).
" " Gmel., Syst. Nat., Ed. xiii, p. 2216 (1789).
Chermes reniformis Oliv., Ency. Meth., vii, p. 441 (1792).

Coccus quercus Fab., Ent. Syst., iv, p. 225 (1794).
" " " Syst. Rhyng., p. 307 (1803).
" " Bechst., Forstins., pt. i, p. 284 (1804).
" dryoceris Amy., Monom., No. 552 (1848).
Physokermes reniformis Targ., Catalogue, p. 41 (1869).
?Lecanium quercus Sign., Ann. Soc. Ent. Fr., (5), iii, p. 427 (1873).
Kermes reniformis " " " " " " iv, pp. 89, 553 (1874).
?Lecanium quercus Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 135 (1883).
? " " Ckll., Can. Ent., xxvii, p. 35 (1895).
" " Henschel, Schädl. Forst. & Obst. Ins., p. 513 (1895).
Kermes " Ckll., Pr. Ac. N. Sci. Ph., p. 270 (1899).
" " King, Psyche, ix, p. 259 (1901).

Habitat.—Europe; U. S.

On oak.

257. **Kermes roboris** (Fourc.).

—— —— Reaum., Mem. Ins., iv, pl. 5, figs. 3, 4 (1738).
Chermes quercus rotundus, etc., Geoff., Abr. Ins., p. 508 (1762).
" roboris Fourc., Ent. Paris, p. 228 (1785).
Coccus variegatus Gmel., Syst. Nat., Ed. xiii, p. 2221 (1789).
" " DeVillers, " " p. 559 (1789).
Chermes " Oliv., Ency. Meth., vii, p. 440 (1792).
Coccus " Turton, Syst. Nat., p. 715 (1801).
" " Bechst., Forstins., i, p. 288 (1804).
" " Fonsc., Ann. Soc. Ent. Fr., iii, p. 210 (1834).
Lecanium quercus Burm., Handb. Ent., ii, p. 71 (1835).
Chermes variegatus Amy. & Serv., Hist. Nat. Ins., p. 635 (1843).
Lecanium quercus Bouché, Stett. Ent. Zeit., xii, p. 112 (1851).
Kermes variegatus Targ., Catalogue, p. 40 (1869).
" " Sign., Ann. Soc. Ent. Fr., (5), iv, pp. 89, 554 (1874).
" " Newst., Ent. Mon. Mag., xxxiii, p. 267 (1897).

Habitat.—Europe.

On oak.

258. **Kermes trinotatus** Bogue.

Kermes trinotatus Bogue, Can. Ent., xxxii, p. 205 (1900).
" " Quaint. & Scott, Cocc. Amer., Dec. iii-iv, No. 4 (1901).

Habitat.—N. Y.; N. J.; Ga.; Ohio; Oklahoma.

On Quercus nigra.

259. **Kermes vermilio** Planch.

Kermes vermilio Planch., Le Kermes du Chêne, p. 19 (1864).
" " Targ., Catalogue, p. 40 (1869).
" " Sign., Ann. Soc. Ent. Fr., (5), iv, pp. 89, 549, 555 (1874).
" " Blanch., Les Coccides utiles, p. 54 (1883).
" " Ckll., Pr. Ac. N. Sci. Ph., p. 270 (1899).

Habitat.—Italy; Spain.

On Quercus coccifera.

Genus **NIDULARIA** Targ. Type, pulvinata.

Nidularia Targ., Catalogue. p. 34 (1869): Sign., Ann. Soc. Ent. Fr., (5), v, p. 17 (1875): Ckll., Can. Ent., xxxi, p. 276 (1899).

260. Nidularia pulvinata (Planch.).

Coccus pulvinatus Planch., Le Chermes du Chêne, p. 25 (1864).
Nidularia pulvinatus Sign., Ann. Soc. Ent. Fr., (5). v, p. 17 (1875).
Habitat.—Europe.

Genus **RHIZOCOCCUS** Sign. Type, gnidii.

Rhizococcus Sign.. Ann. Soc. Ent. Fr., (5). v, p. 36 (1875): Comst., Rep. U. S. Dep. Ag., 1880. p. 339 (1881): Mask., Ins. Nox. Agr. N. Z., p. 96 (1887): Ckll., Can. Ent.. xxxi. p. 276 (1899).

261. Rhizococcus casuarinæ Mask.

Rhizococcus casuarinæ Mask.. N. Z. Trans., xxv. p. 230 (1892).
" " " The Entom., xxvii, p. 46 (1894).
Habitat.—Australia.
On Casuarina suberosa.

Rhizococcus casuarinæ mancus Mask.

Rhizococcus casuarinæ var. mancus Mask., N. Z. Trans., xxix, p. 316 (1897).
Habitat.—Australia.
On Casuarina distyla.

262. Rhizococcus celmisiæ Mask.

Rhizococcus celmisiæ Mask., N. Z. Trans., xvi, p. 135 (1883).
" " " Ins. Nox. Agr. N. Z., p. 96 (1887).
Habitat.—N. Zealand.
On Celmisia.

263. Rhizococcus fossor Mask.

Rhizococcus fossor Mask., N. Z. Trans., xvi. p. 136 (1883).
" " " " " xix, p. 42 (1886).
" " " Ins. Nox. Agr. N. Z., p. 97 (1887).
" " " Ent. Mon. Mag., xxvi, p. 278 (1890).
Habitat.—N. Zealand.
On Santalum cunninghamii.

264. Rhizococcus gnidii Sign.

Rhizococcus gnidii Sign., Ann. Soc. Ent. Fr., (5). v. p. 37 (1875).
Habitat.—France.
On Roots of Daphne gnidium.

265. Rhizococcus grandis Mask.

Rhizococcus grandis Mask., N. Z. Trans., xxiv, p. 29 (1891).
" " Lidg., The Wombat, iii, p. 87 (1898).
Habitat.—Australia.
On Acacia longifolia.

Rhizococcus grandis spinosior Mask.

Rhizococcus grandis var. spinosior Mask., N. Z. Trans., xxv, p. 230 (1892).
" " " " Lidg., The Wombat, iii, p. 89 (1898).
Habitat.—Australia.
On Acacia implexa.

266. Rhizococcus intermedius Mask.

Rhizococcus intermedius Mask., N. Z. Trans., xxiii, p. 19 (1890).
Habitat.—New Zealand.
On Fagus menziesii.

267. Rhizococcus lidgetti Ckll.

Rhizococcus lidgetti Ckll., Victorian Naturalist, xvi, p. 88 (1899).
Habitat.—Australia.

268. Rhizococcus maculatus Mask.

Rhizococcus maculatus Mask., N. Z. Trans., xxii, p. 144 (1889).
Habitat.—New Zealand.
On Fagus cliffortioides.

269. Rhizococcus pulchellus Mask.

Rhizococcus pulchellus Mask., N. Z. Trans., xxii, p. 143 (1889).
Habitat.—New Zealand.
On Fagus fusca; F. menziesii; F. cliffortioides.

270. Rhizococcus pustulatus Mask.

Rhizococcus pustulatus Mask., N. Z. Trans., xxv, p. 231 (1892).
Habitat.—Australia.
On Casuarina.

271. Rhizococcus texanus (King).

Eriococcus texanus King, Can. Ent., xxxiv, p. 286 (1902).
Rhizococcus " Ckll., in litt. (1902).
Habitat.—Texas.
In nests of Cremastogaster punctulata.

272. Rhizococcus totaræ Mask.

Rhizococcus totaræ Mask., N. Z. Trans., xxii, p. 231 (1892).
" " " " " xxiii, p. 19 (1893).
Habitat.—New Zealand.
On Podocarpus totara; Fagus menziesii.

273. Rhizococcus tripartitus Full.

Rhizococcus tripartitus Full., Notes on Cocc. W. Austr., p. 8 (1897).
" " " Tr. Ent. Soc. Lond., p, 443 (1899).
Habitat.—W. Australia.
On Casuarina.

274. Rhizococcus viridis Green.

Rhizococcus viridis Green, Pr. Linn. Soc. N. S. W., p. 559 (1900).
" " Frog., Ag. Gaz. N. S. W., p. 20 (1902).
Habitat.—N. S. Wales.
On Acacia decurrens (wattle).

Genus **GOSSYPARIA** Sign. Type, spuria.

Gossyparia Sign., Ann. Soc. Ent. Fr., (5), v, p. 20 (1875): Ckll., Can. Ent., xxxi, p. 276 (1899).

275. Gossyparia casuarinæ Mask.

Gossyparia casuarinæ Mask., N. Z. Trans., xxv, p. 227 (1892).
Habitat.—Australia.
On Casuarina.

276. Gossyparia cavellei Mask.

Gossyparia cavellei Mask., N. Z. Trans., xxii, p. 147 (1889).
Habitat.—N. Zealand.
On Fagus menziesii.

277. Gossyparia confluens Mask.

Gossyparia confluens Mask., N. Z. Trans., xxv, p. 227 (1892).
Habitat.—Australia.
On Eucalyptus.

278. Gossyparia mannifera (Hardw.).

Chermes mannifer Hardw., Asiatic Researches, xiv, pp. 182-186 (1822).
Coccus manniparus Ehrenb., Symb. Phys., Dec. i, tab. 10 (1829).
" " Burm., Handb. Ent., ii, p. 74 (1835).
" " Chav., Ann. Soc. Ent. Fr., (2), vi, p. 144 (1848).
Gossyparia " Sign., " " " " (5), v, p. 24 (1875).
" " Blanch., Les Coccides utiles, pp. 65, 111 (1883).
" mannipara Uhler, St. Nat. Hist., ii, p. 218 (1884).
Gossyparia mannifera Giard, Bull. Soc. Ent. Fr., (6), ii, p. cclxxiii (1892).
" " Riley & How., Ins. Life, v, p. 286 (1893).
Coccus manniparus Theobald, Ins. Life, (London), p. 185 (1896).
" " Eckst., Forst. Zool., p. 557 (1897).
" " Teesdale, Science Gossip, n. s., iii, p. 229 (1897).
Habitat.—Algeria; Egypt; Asia Minor; Arabia; Russia.
On Tamarix mannifera.

279. Gossyparia spuria (Modeer).

—— —— Reaum., Mem. Ins., iv, p. 82, pl. 7, figs. 1-10 (1734).
||Coccus ulmi Linn., Faun Suec., p. 265 (1761) [non Linn., Syst. Nat., x, 1758].
" " Geoff., Hist. Abr. Ins., i, p. 512 (1762).
" " Linn., Syst. Nat., Ed. xii, i, p. 740 (1766).

Coccus ulmi Fab., Syst. Ent., p. 743 (1775).
" spurius Mod., Act. Goth., i, p. 43 (1778).
" ulmi Fab., Spec. Ins., ii, p. 393 (1781) in part.
" " Fourc., Ent. Paris, p. 231 (1785).
" " Fab., Mant. Ins., ii, p. 319 (1787).
" laniger Gmel., Syst. Nat., Ed. xiii, p. 2221 (1789).
" spurius " " " " " p. 2222 (1789).
" ulmi Oliv., Ency. Meth., vi, p. 97 (1791).
" " Fab., Ent. Syst., iv, p. 225 (1794) in part.
" " Schr., Fauna Boica, ii, pt. 1, p. 145 (1801).
Chermes " Latr., Hist. Nat. des Fourmis, p. 330 (1802).
Coccus " Fab., Syst. Rhyng., p. 308 (1803) in part.
" " Bechst., Forstins., i, p. 286 (1804).
" " Fonsc., Ann. Soc. Ent. Fr., iii, p. 215 (1834).
" spurius Baer., D'Alton, Zeit. für Zool., p. 173 (1849).
? " gramuntii Planch., Le Chermes du Chêne, p. 24 (1864).
Nidularia lanigera Targ., Catalogue, p. 34 (1869).
? " gramuntii " " p. 34 (1869).
Gossyparia ulmi Sign., Ann. Soc. Ent. Fr., (5), v, p. 21 (1875).
? " gramuntii " " " " " " " p. 23 (1875).
Coccus ulmi Licht., Bull. " " " " " p. lxxvi (1875).
Gossyparia " " " " " " (6), ii, p. xxxvii (1882).
" " Loew, Wien. Ent. Zeit., ii, p. 6 (1883).
" " How., Ins. Life, ii, p. 35 (1889).
" " Lint., 6th Rep. Ins. N. Y., 1890, p. 189 (1891).
" " Dougl., Ent. Mon. Mag., xxviii, p. 161 (1892).
" " Craw, Rep. Cal. Bd. Hort., p. 90 (1894).
" " Ckll., Ent. News, vi, p. 325 (1895).
" " Lounsb., Bull. 28, Mass. Exp. Sta., p. 23 (1895).
" " Lint., 12th Rep. Ins. N. Y., 1896, pp. 292, 317 (1897).
" " Hillman, Bull. 36, Nev. Exp. Sta., p. 36 (1897).
" " Kirkland, Mass. Crop Rep., June, p. 35 (1897).
" " Britton, Rep. Conn. Exp. Sta., p. 273 (1898).
" " Felt, Bull. 27, N. Y. St. Mus., p. 46 (1899).
" " How., Can. Ent., xxxi, p. 96 (1899).
" spuria Ckll., Pr. Ac. N. Sci. Ph., p. 268 (1899).
" ulmi Britton, 24th Rep. Conn. Exp. Sta., pp. 319, 336 (1900).
" " Felt, 5th Rep. Com. Fish, Game, etc., p. 375 (1900).
" " Quaint. & Scott, Cocc. Amer., Dec. iii-iv, No. 3 (1901).
" " Felt, Bull. 57, N. Y. St. Mus., p. 17 (1902).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 52 (1902).

Habitat.—Europe; Mass.; N. Y.; N. J.; Md.; D. C.; Ohio; Mich.; Nev.; Cal.

On various species of elm.

Genus **POROCOCCUS** Ckll. Type, tinctorius.

Porococcus Ckll., Ann. Mag. N. H., (7), i, p. 426 (1898).

280. Porococcus pergandei Ckll.

Porococcus pergandei Ckll., Ann. Mag. N. H., (7), i, p. 427 (1898).
Habitat.—Mexico.
On mistletoe on lime-tree.

281. Porococcus tinctorius Ckll.

Porococcus tinctorius Ckll., Ann. Mag. N. H., (7), i, p. 427 (1898).
Habitat.—Mexico.
On mistletoe on oak.

Genus **OLLIFFIELLA** Ckll. Type, cristicola.

Olliffiella Ckll., Science, n. s., iv, p. 299 (1896).

282. Olliffiella cristicola Ckll.

Olliffiella cristicola Ckll., Science, n. s., iv, p. 299 (1896).
" " How., Bull. 7, n. s., Dep. Ag., p. 77 (1897).
" cristata Frog., Agr. Gaz., N. S. W., p. 8 (1898).
Habitat.—New Mexico.
On Quercus Wrightii.

Genus **ERIOCOCCUS** Targ. Type, crispus.

Eriococcus Targ., Catalogue, p. 33 (1869): Sign., Ann. Soc. Ent. Fr., (5), v, p. 29 (1875): Comst., Rep. U. S. Dep. Ag., 1880, p. 337 (1881): Mask., N. Z. Trans., xix, p. 104 (1886): Tr. Roy. Soc. S. Austr., p. 104 (1888): Ckll., Can. Ent. xxxi, p. 276 (1899).
Acanthococcus Sign., Ann. Soc. Ent. Fr., (5), v, p. 34 (1875).
Uhleria Cooke, Treat. Ins. Inj. Fruit & For. Trees, Cal., p. 41 (1881).
s. g. Thekes "Crawf.," Mask., N. Z. Trans., xxiv, p. 28 (1891): Ckll., Am. Nat., xxxi, p. 589 (1897). Type, eucalypti.

283. Eriococcus aceris (Sign.).

Acanthococcus aceris Sign., Ann. Soc. Ent. Fr., (5), v, p. 35 (1875).
" " " Bull. " " " (6), ii, p. xxxvii (1882).
" " Loew, Wien. Ent. Zeit., i, p. 60 (1882).
" " " " " " ii, p. 7 (1883).
Eriococcus " Ckll., Check List, p. 323 (1896).
Habitat.—Austria.
On Acer campestris.

284. Eriococcus adenostomæ Ehrh.

Eriococcus adenostomæ Ehrh., Can. Ent., xxx, p. 244 (1898).
" " Ckll., " " " p. 246 (1898).
Habitat.—Cal.
On Adenostoma fasciculatum.

285. Eriococcus agonis Full.

Eriococcus agonis Full., Notes on Cocc. W. Austr., p. 8 (1897).
" " " Tr. Ent. Soc. Lond., p. 439 (1899).

Habitat.—W. Australia.

On Agonis flexuosa.

286. Eriococcus apiomorphæ Full.

Eriococcus apiomorphæ Full., Notes on Cocc. W. Austr., p. 8 (1897).
" " " Tr. Ent. Soc. Lond., p. 439 (1899).

Habitat.—W. Australia.

"In empty chambers of female galls of Apiomorpha maliformis and in galleries formed by boring beetles; invariably associated with ants."

287. Eriococcus araucariæ Mask.

Eriococcus araucariæ		Mask., N. Z. Trans., xi. p. 218 (1878).
Rhizococcus	"	Comst., Rep. U. S. Dep. Ag., 1880, p. 339 (1881).
Uhleria	"	Cooke, Treat. Ins. Inj. Fruit & For. Trees, Cal., p. 41 (1881).
Rhizococcus	"	Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 137 (1883).
Eriococcus	"	Mask., Ins. Nox. Agr. N. Z., p. 93 (1887).
Rhizococcus	"	Comst., Intr. Ent., p. 140 (1888).
"	"	Pack., 5th Rep. U. S. Ent. Com., p. 808 (1890).
Eriococcus	"	Berl. e Leon., Cherm. Ital., Fasc. i, No. 9 (1895).
"	"	Green, Ind. Mus. Notes, iv, p. 7 (1896).
"	"	Lounsb., Rep. Ent. Cape Good Hope, p. 19 (1897).
"	"	Leon., Boll. Ent. Agrar., vi, pp. 53, 81, 103, 219 (1899).
"	"	Frog., Agr. Gaz. N. S. W., xi, p. 2 (1900).

Habitat.—N. Zealand; Ceylon; Sandwich Islands; S. Africa; S. Cal.

On Araucaria excelsa.

Eriococcus araucariæ minor Mask.

Eriococcus araucariæ var. minor Mask., N. Z. Trans., xxvii, pp. 21, 64 (1894).
" " " " Frog., Agr. Gaz. N. S. W., xi, p. 3 (1900).

Habitat.—Australia.

On Kunzea.

288. Eriococcus arenosus Ckll.

Eriococcus arenosus Ckll., Ann. Mag. N. H., (6), xx, p. 514 (1897).

Habitat.—New Mexico.

289. Eriococcus armatus Hemp.

Eriococcus armatus Hemp., Rev. Mus. Paul., iv, p. 383 (1900).
" " " Ann. Mag. N. H., (7), vi, p. 394 (1900).

Habitat.—Brazil.

On Baccharis.

290. Eriococcus artemisiæ Kuwana.

Eriococcus artemisiæ Kuw., Pr. Cal. Ac. Sci., (3), ii, p. 399 (1901).

Habitat.—California.

On Artemisia.

291. **Eriococcus aurescens** Ckll.

Eriococcus aurescens Ckll., Ann. Mag. N. H., (7), x, p. 469 (1902.).
Habitat.—Mexico.
On twigs of "Guasima."

292. **Eriococcus azaleæ** Comst. (*The Azalea bark scale.*)

Eriococcus azaleæ Comst., Rep. U. S. Dep. Ag., 1880, p. 338 (1881).
" " " 2nd Rep. Dep. Ent. Corn. Univ., p. 132 (1883).
" " Howard, Ins. Life, ii, p. 35 (1889).
" " " " " vii, p. 52 (1894).
" " Davis, " " " p. 173 (1894).
" " " Spec. Bull. 2, Mich. Exp. Sta., p. 29 (1896).
" " King, Can. Ent., xxxi, p. 110 (1899).
" " Ckll., Ent. News, xi, p. 595 (1900).
" " King, " " xii, p. 232 (1901).
Habitat.—Mass.; N. Y.; D. C.; Ohio; Mich.
On Azalea; Cratægus coccinea; Rhododendron catawbiense.

293. **Eriococcus borealis** Ckll.

Eriococcus borealis Ckll., Can. Ent., xxxi, p. 369 (1899).
Habitat.—Alaska.
On willow.

294. **Eriococcus brasiliensis** Ckll.

Eriococcus brasiliensis Ckll., Rev. Mus. Paul., iv, p. 363 (1900).
" " Hemp., " " " " p. 380 (1900).
" " " Ann. Mag. N. H., (7), vi, p. 393 (1900).
Habitat.—Brazil.
On Baccharis dracunculifolia.

295. **Eriococcus buxi** (Fonsc.).

Coccus buxi Fonsc., Ann. Soc. Ent. Fr., iii, p. 218 (1834).
Eriococcus buxi Targ., Catalogue, p. 33 (1869).
" " Sign., Ann. Soc. Ent. Fr., (5), v, p. 30 (1875).
" " " Bull. " " " " x, p. xliv (1880).
Habitat.—France.
On Buxus sempervirens.

Eriococcus buxi australis Mask.

Eriococcus buxi var. australis Mask., N. Z. Trans., xxvii, p. 65 (1894).
" " " " " " " xxviii, p. 399 (1896).
Habitat.—Australia.
On Trachymene billardieri.

296. **Eriococcus coccineus** Ckll.

Eriococcus coccineus Ckll., Ent. News, v, p. 204 (1894).
Habitat.—Nebraska.
On Cactus.

Eriococcus coccineus lutescens Ckll.

Eriococcus coccineus var. lutescens Ckll., Ent. News, v, p. 204 (1894).
Habitat.—Nebraska.
On Cactus.

297. Eriococcus confusus Mask.

Eriococcus confusus Mask., N. Z. Trans., xxiv, p. 26 (1891).
" " Frog., Ag. Gaz., N. S. W., xi, p. 4 (1900).
Habitat.—Australia.
On Eucalyptus viminalis.

298. Eriococcus conspersus Mask.

Eriococcus conspersus Mask., N. Z. Trans., xxv, p. 229 (1892).
" " Frog., Ag. Gaz. N. S. W., xi, p. 3 (1900).
Habitat.—N. S. Wales, Australia.
On Casuarina.

299. Eriococcus coriaceus Mask.

Eriococcus coriaceus Mask., N. Z. Trans., xxv, p. 229 (1892).
" " Gurney, Rep. 7th Meet. Austr. Assoc. Adv. Sci., p. 273 (1898).
Eriococcus coriaceus Frog., Ag. Gaz. N. S. W., xi, p. 3 (1900).
Habitat.—Australia.
On Eucalyptus.

300. Eriococcus crispus (Fonsc.).

Coccus crispus Fonsc., Ann. Soc. Ent. Fr., iv, p. 204 (1834).
" " Sign., " " " " (5), vi, p. 613 (1876).
Eriococcus " Targ., Catalogue. p. 33 (1869).
Habitat.—France.
On fig.

301. Eriococcus cypraeæformis Full.

Eriococcus cyprææformis Full., Notes on Cocc. W. Austr., p. 8 (1897).
" " " Tr. Ent. Soc. Lond., p. 440 (1899).
Habitat.—W. Australia.
On Casuarina.

302. Eriococcus danthoniæ Mask.

Eriococcus danthoniæ Mask., N. Z. Trans., xxiii, p. 21 (1890).
Habitat.—New Zealand.
On Danthonia cunninghamii.

303. Eriococcus dearnessi King.

Eriococcus dearnessi King, Can. Ent., xxxiii, p. 180 (1901).
Habitat.—Canada.
On hawthorn.

304. Eriococcus devoniensis (Green).

Rhizococcus devoniensis Green, Ent. Record, viii, p. 260 (1896).
" " Ckll., Am. Nat., xxxi, p. 588 (1897).
Eriococcus " " Check List, Suppl., p. 391 (1899).
Habitat.—England.
On Erica cinerea.

305. Eriococcus dubius Ckll.

Eriococcus dubius Ckll., Psyche, vii, Suppl., i, p. 18 (1896).
" " " Bull. 4, T. s., Dep. Ag., p. 37 (1896).
Habitat.—Mexico.

306. Eriococcus elegans Full.

Eriococcus elegans Full., Notes on Cocc. W. Austr., p. 8 (1897).
" " " Tr. Ent. Soc. Lond., p. 440 (1899).
Habitat.—W. Australia.
On Casuarina humilis?

307. Eriococcus ericæ Sign.

Eriococcus ericæ Sign., Ann. Soc. Ent. Fr., (5), v, p. 31 (1875).
" " Ckll., Pr. Ac. N. Sci. Ph., p. 269 (1899).
Habitat.—France.
On Erica.

308. Eriococcus eucalypti Mask.

Eriococcus eucalypti Mask., N. Z. Trans., xxiv, p. 27 (1881).
" " Koebele, Bull. 21, Div. Ent. Dep. Ag., p. 14 (1890).
" " Lidg., The Wombat, iii, p. 92 (1898).
" " Frog., Ag. Gaz. N. S. W., xi, p. 5 (1900).
Habitat.—Australia; Tasmania.
On Eucalyptus diversicolor; Bursaria spinosa.

309. Eriococcus exiguus Mask.

Eriococcus exiguus Mask., Ent. Mon. Mag., xxxiii, p. 243 (1897).
Habitat.—China; Formosa.

310. Eriococcus fagicorticis Mask.

Eriococcus fagicorticis Mask., N. Z. Trans., xxiv, p. 27 (1891).
Habitat.—New Zealand.
On Fagus fusca.

311. Eriococcus formicola Newst.

Eriococcus formicola Newst., Tr. Ent. Soc. Lond., p. 102 (1897).
Habitat.—Algeria.
On Cynodon dactylon.

312. Eriococcus gillettei Tins.

Eriococcus gillettei Tins., Can. Ent., xxxi, p. 46 (1899).
Habitat.—Colorado.
On Juniperus virginiana.

313. Eriococcus graminis Mask.

Eriococcus graminis Mask., Ent. Mon. Mag., xxxiii, p. 243 (1897).
Habitat.—China; Japan.
On grass; bamboo.

314. Eriococcus greeni Newst.

Eriococcus greeni Newst., Ent. Mon. Mag., xxxiv, p. 96 (1898).
Habitat.—England.
On grass.

315. Eriococcus gurneyi Full.

Eriococcus gurneyi Full., Tr. Ent. Soc. Lond., p. 441 (1899).
Habitat.—W. Australia.
On Rhamnaceæ.

316. Eriococcus hakeæ Full.

Eriococcus hakeæ Full., Notes on Cocc. W. Austr., p. 8 (1897).
" " " Tr. Ent. Soc. Lond., p. 441 (1899).
Habitat.—W. Australia.
On Hakea ilicifolia.

317. Eriococcus hoheriæ Mask.

Eriococcus hoheriæ Mask., N. Z. Trans., xii, p. 298 (1879).
" " " Ins. Nox. Agr. N. Z., p. 93 (1887).
" " " N. Z. Trans., xxiii, p. 20 (1890.)
" " " " " xxiv, p. 26 (1891).
Habitat.—New Zealand.
On Hoheria angustifolia.

318. Eriococcus imperfectus Full.

Eriococcus imperfectus Full., Notes on Cocc. W. Austr., p. 8 (1897).
" " " Tr. Ent. Soc. Lond., p. 442 (1899).
Habitat.—W. Australia.
On Melaleuca.

319. Eriococcus insignis Newst.

Eriococcus insignis Newst., Ent. Mon. Mag., xxvii, p. 164 (1891).
Habitat.—England.
On Agrostis vulgaris; Rumex; Pteris; Ulex.

320. Eriococcus japonicus Kuwana.

Eriococcus japonicus Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 50 (1902).
Habitat.—Japan.
On Symplocos myrtacea.

321. Eriococcus kemptoni Parr.

Eriococcus kemptoni Parr., Bull. 98, Kan. Exp. Sta., p. 144 (1900).
Habitat.—Kansas.
On Andropogon scoparius.

322. Eriococcus larreæ Parr. & Ckll.

Eriococcus larreæ Parr. & Ckll., The Industrialist, p. 231 (1899).
Habitat.—New Mexico.
On "crowns of Larrea tridentata underground."

323. Eriococcus leptospermi Mask.

Eriococcus leptospermi Mask., N. Z. Trans., xxiii, p. 22 (1890).
" " Frog., Ag. Gaz. N. S. W., xi, p. 5 (1900).
Habitat.—Australia.
On Leptospermum lævigatum; L. scoparium.

324. Eriococcus multispinosus (Kuhlgatz).

Rhizococcus multispinosus Kuhlgatz, Monats. Kakteenkunde, viii, p. 166 (1898).
Eriococcus " Ckll., Ent. News, xi, p. 595 (1900).
Habitat.—S. America.
On Cactus.

325. Eriococcus multispinus (Mask.).

Acanthococcus multispinus Mask., N. Z. Trans., xi, p. 217 (1878).
" " " " " xii, p. 292 (1879).
" " " " " xvii, p. 29 (1884).
Eriococcus " " Ins. Nox. Agr. N. Z., p. 94 (1887).
" " Ckll., Nature, lxi, p. 368 (1900).
Habitat.—New Zealand.
On Rubus australis; Knightia excelsa; Cyathodes acerosa.

Eriococcus multispinus lævigatus Mask.

Eriococcus multispinus var. lævigatus Mask., N. Z. Trans., xxiii, p. 20 (1890).
" " " " Frog., Ag. Gaz. N. S. W., xi, p. 6 (1900).
Habitat.—New South Wales.
On Acacia armata; Epacris longifolia.

326. Eriococcus neglectus Ckll.

Eriococcus neglectus Ckll., Psyche, vii, Suppl., i, p. 8 (1895).
Habitat.—New Mexico.
On Atriplex canescens.

327. Eriococcus onukii Kuwana.

Eriococcus onukii Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 51 (1902).
Habitat.—Japan.
On Arundinaria hindsii var. graminæ.

328. Eriococcus pallidus Mask.

Eriococcus pallidus Mask., N. Z. Trans., xvii, p. 29 (1884).
" " " Ins. Nox. Agr. N. Z., p. 95 (1887).
" " " N. Z. Trans., xxiii, p. 21 (1890).
" " Newst., Ent. Mon. Mag., xxvii, p. 166 (1891).
" " Mask., N. Z. Trans., xxvii, p. 64 (1894).
Habitat.—New Zealand.

On Myoporum lætum: Elæocarpus dentatus; Metrosideros robusta; Fagus menziesii.

329. Eriococcus palmeri Ckll.

Eriococcus palmeri Ckll., Pr. Ac. N. Sci. Ph., p. 268 (1899).
Habitat.—Carmen Island, Lower California.
On Bourreria sonoræ.

Eriococcus palmeri var. A, Ckll.

Eriococcus palmeri var. A, Ckll., Ann. Mag. N. H., (7), ix, p. 23 (1902).
Habitat.—California.
On Eriogonum fasciculatum.

330. Eriococcus paradoxus Mask.

Eriococcus paradoxus Mask., Tr. Roy. Soc. S. Austr., p. 104 (1888).
" " " N. Z. Trans., xxiii, p. 22 (1889).
" " " " " xxviii, p. 399 (1896).
" " " " " xxix, p. 318 (1897).
" " Barlow, Ind. Mus. Notes, iv, No. 4, p. 210 (1898).
Eriococcus paradoxus Frog., Ag. Gaz. N. S. W., xi, p. 6 (1900).
Habitat.—S. Australia; India.
On Pittosporum undulatum; P. bicolor.

Eriococcus paradoxus simplex Mask.

Eriococcus paradoxus var. simplex Mask., N. Z. Trans., xxix, p. 244 (1897).
Habitat.—S. Australia.
On Pittosporum undulatum.

Eriococcus paradoxus indicus Mask.

Eriococcus paradoxus var. indicus Mask., N. Z. Trans., xxix, p. 318 (1897).
" " " " Barlow, Ind. Mus. Notes, iv, No. 4, p. 210 (1897).
Habitat.—India.
On Helicteres isora.

331. Eriococcus perplexus Hemp.

Eriococcus perplexus Hemp., Rev. Mus. Paul., iv, p. 381 (1900).
" " " Ann. Mag. N. H., (7), vi, p. 393 (1900).
Habitat.—Brazil.
On Myrtaceæ.

332. Eriococcus phyllocladi Mask.

Eriococcus phyllocladi Mask., N. Z. Trans., xxiv, p. 25 (1891).
Habitat.—New Zealand.
On Phyllocladus trichomanoides.

333. **Eriococcus quercus** (Comst.).

Rhizococcus quercus Comst., Rep. U. S. Dep. Ag., 1880, p. 340 (1881).
" " " 2nd Rep. Dep. Ent. Corn. Univ., p. 137 (1883).
" " Pack., 5th Rep. U. S. Ent. Com., p. 103 (1890).
Eriococcus " King, Can. Ent., xxxi, p. 110 (1899).
" " Ckll., Jn. N. Y. Ent. Soc., vii, p. 257 (1899).
Habitat.—Mass.; Fla.; New Mexico; Mexico.
On oak; gall-berry: Vaccinium corymbosum; grass.

Eriococcus quercus toumeyi Ckll.

Eriococcus quercus toumeyi Ckll., Ent. News, xi, p. 594 (1900).
Habitat.—Arizona.
On Prosopis velutina.

334. **Eriococcus raithbyi** Mask.

Eriococcus raithbyi Mask., N. Z. Trans., xxii, p. 145 (1889).
" " Newst., Ent. Mon. Mag., xxvii, p. 165 (1891).
Habitat.—New Zealand.
On Fagus menziesii.

335. **Eriococcus rorismarinus** (Fonsc.).

Coccus rorismarinus Fonsc., Ann. Soc. Ent. Fr., iii, p. 217, pl. 4 (1834).
Eriococcus " Sign., " " " " (5), v, p. 33 (1875).
Coccus " Licht., " " " " (5), ix, p. 44 (1879).
Habitat.—France.
On Rosmarinus.

336. **Eriococcus simplex** Mask.

Eriococcus simplex Mask., N. Z. Trans., xxix, p. 317 (1897).
" simplexa Lidg., The Wombat, iv, p. 53 (1899).
Habitat.—Australia.
On Eucalyptus.

Eriococcus simplex dealbata Mask.

Eriococcus simplex var. dealbata Mask., N. Z. Trans., xxix, p. 317 (1897).
" " " " Full., Tr. Ent. Soc. Lond., p. 442 (1899).
" tricarinatus Full., Notes on Cocc. W. Austr., p. 8 (1897).
" " " Tr. Ent. Soc. Lond., p. 442 (1899).
Habitat.—W. Australia.
On Eucalyptus gomphocephala.

337. **Eriococcus spiniger** Mask.

Eriococcus spiniger Mask., N. Z. Trans., xxviii, p. 398 (1896).
" " Frog., Ag. Gaz. N. S. W., xi, p. 7 (1900).
Habitat.—Australia.
On Eucalyptus.

338. **Eriococcus tepperi** Mask.

Eriococcus tepperi Mask., N. Z. Trans., xxiv, p. 29 (1891).
" " Lidg., The Wombat, iii, p. 92 (1898).
" " Frog., Ag. Gaz. N. S. W., xi, p. 8 (1900).
Habitat.—Australia; Tasmania.
On Eucalyptus globulus; Bursaria spinosa.

339. **Eriococcus thymelææ** Newst.

Eriococcus thymelææ Newst., Tr. Ent. Soc. Lond., p. 102 (1897).
Habitat.—Algeria.
On Thymelæa hirsuta.

340. **Eriococcus thymi** (Schr.).

Coccus thymi Schr., Faun. Boica, p. 146 (1801).
Eriococcus " Sign., Ann. Soc. Ent. Fr., (5), v, p. 32 (1875).
Habitat.—Europe.

341. **Eriococcus tinsleyi** Ckll.

Eriococcus tinsleyi Ckll., Can. Ent., xxx, pp. 247, 317 (1898).
Habitat.—N. Mexico.
On Atriplex canescens; Malvastrum coccineum.

Eriococcus tinsleyi cryptus Ckll.

Eriococcus tinsleyi var. cryptus Ckll., Can. Ent., xxxiii, p. 210 (1891).
Habitat.—N. Mexico.
On roots of Gutierrezia.
Prof. Cockerell thinks *cryptus* may be a distinct species.

Genus **GYMNOCOCCUS** Dougl. Type, agavium.

Gymnococcus Dougl., Ent. Mon. Mag., xxv, p. 150 (1888): Ckll. & Parr., The Industrialist, p. 162 (1899): Ckll., Can. Ent., xxxi, p. 277 (1899).

342. **Gymnococcus agavium** (Dougl.).

Coccus agavium Dougl., Ent. Mon. Mag., xxv, p. 150 (1888).
Gymnococcus " Ckll., Check List, p. 323 (1896).
Coccus (Gymnococcus) agavium Dougl., Ent. Mon. Mag., xxxiii, p. 12 (1897).
Gymnococcus " Parr., Bull. 98, Kan. Exp. Sta., p. 141 (1900).
Habitat.—Europe.
On Agave.

343. **Gymnococcus nativus** Parr.

Gymnococcus nativus Parr., Bull. 98, Kan. Exp. Sta., p. 143 (1900).
Habitat.—Kansas.
On grass.

344. Gymnococcus ruber Parr. & Ckll.

Gymnococcus ruber Parr. & Ckll., The Industrialist, p. 162 (1899).
" " " Bull. 98, Kan. Exp. Sta., p. 142 (1900).

Habitat.—New Mexico.

On grass.

Genus **TECTOCOCCUS** Hemp. Type, ovatus.

Tectococcus Hemp., Rev. Mus. Paul., iv, p. 406 (1900); Ann. Mag. N. H., (7), vii, p. 69 (1901).

345. Tectococcus ovatus Hemp.

Tectococcus ovatus Hemp., Rev. Mus. Paul., iv, p. 406 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 119 (1901).

Habitat.—Brazil.

On Myrtaceæ.

Genus **DACTYLOPIUS** Costa. Type, coccus.

‖Coccus Ratz., Mediz. Zool., ii, p. 215 (1833): Burm., Handb. Ent., ii, pt. 1, p. 72 (1835): Amy. & Serv., Ins., Hem., p. 626 (1843): Sign., Ann. Soc. Ent. Fr., (5), v, p. 346 (1875): Comst., Rep. U. S. Dep. Ag., 1880, p. 345 (1881).

Dactylopius Costa, Faun. Regn. Nap., Cocc., p. 15 (1835): Ckll., Ann. Mag. N. H., (7), ix, p. 453 (1902).

346. Dactylopius coccus Costa. (*Cochineal insect.*)

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Die Cochenille Zimm., Taschenb. der Reisen, p. 134 (1806).
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" " Newst., Ent. Mon. Mag., xxxiii, p. 76 (1897).
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Coccus cacti Howard, Bull. 9, n. s., Dep. Ag., p. 38 (1897).
" " Ckll., Pr. Ac. N. Sci. Ph., p. 260 (1899).
Pseudococcus cacti Hemp., Rev. Mus. Paul., iv, p. 380 (1900).
" signoreti Ckll., Science, n. s., ix, p. 992 (1900).
Dactylopius coccus " Ann. Mag. N. H., (7), ix, p. 454 (1902).
" " Fern. M. E., Can. Ent., xxxiv, p. 233 (1902).

Habitat.—Mexico; West Indies; Madeira; Canary Islands; Peru; India; S. Spain and other European countries; Florida; California.

On Opuntia coccinelliferi and other species.

347. Dactylopius confusus (Ckll.).

Coccus confusus Ckll., Tr. Am. Ent. Soc., xx, p. 366 (1893).
" " " Am. Nat., xxvii, p. 1043 (1893).
" " " " " xxix, p. 728 (1895).
" cacti subsp. confusus Ckll., Bull. 4, T. s., Dep. Ag., pp. 34, 35 (1896).
Coccus confusus Newst., Ent. Mon. Mag., xxiii, p. 76 (1897).
Pseudococcus confusus Ckll., Biol. Centr. Amer., ii, pt. 2, p. 6 (1899).

Habitat.—Ariz.; N. Mex.; Mex.

On Opuntia spp.

Dactylopius confusus newsteadi (Ckll.).

Coccus confusus subsp. newsteadi Ckll., Science, n. s., viii, p. 675 (1898).
" " " " " Bull. 32, Ariz. Exp. Sta., p. 284 (1899).

Habitat.—Ariz.; Colorado; Tex.

On Opuntia.

348. Dactylopius tomentosus (Lam.).

Coccus tomentosus Lam., Hist. Nat. Anim., Ed. ii, iv, p. 115 (1835).
" " Sign., Ann. Soc. Ent. Fr., (5), v, p. 349 (1875).
" " Licht., Bull. " " " (6), iv, p. cvi (1884).
" " Ckll., Bull. 4, T. s., Dep. Ag., p. 35 (1896).
" cacti var. opuntiæ " Licht." Ckll., Bull. 4, T. s., Dep. Ag., p. 35 (1896).
Coccus tomentosus Newst., Ent. Mon. Mag., xxxiii, pp. 75, 76 (1897).
Pseudococcus " Ckll., Biol. Centr. Amer., ii, pt. 2, p. 5 (1899).

Habitat.—England; New Mexico; Arizona; Mexico.

On Opuntia fulgida.

Genus **CARPOCHLOROIDES** Ckll. Type, viridis.

Carpochloroides Ckll., The Entom., xxxii, p. 12 (1899); Can. Ent., xxxi, p. 277 (1899).

349. Carpochloroides viridis Ckll.

Carpochloroides viridis Ckll., The Entom., xxxii, p. 12 (1899).
" " Hemp., Rev. Mus. Paul., iv, p. 393 (1900).

Habitat.—Brazil.

On Eugenia; Myrtaceæ.

Genus **APIOCOCCUS** Hemp. Type, gregarius.

Apiococcus Hemp., Rev. Mus. Paul., iv, p. 401 (1900); Ann. Mag. N. H. (7), vii, p. 110 (1901).

350. Apiococcus asperatus Hemp.

Apiococcus asperatus Hemp., Rev. Mus. Paul., iv, p. 404 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 117 (1901).
Habitat.—Brazil.
On Myrtaceæ.

351. Apiococcus globosus Hemp.

Apiococcus globosus Hemp., Rev. Mus. Paul, iv, p. 405 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 118 (1901).
Habitat.—Brazil.
On Myrtaceæ.

352. Apiococcus gregarius Hemp.

Apiococcus gregarius Hemp., Rev. Mus. Paul., iv, p. 402 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 116 (1901).
Habitat.—Brazil.
On Myrtaceæ.

353. Apiococcus singularis Hemp.

Apiococcus singularis Hemp., Rev. Mus. Paul., iv, p. 403 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 117 (1901).
Habitat.—Brazil.
On Myrtaceæ.

Genus **CAPULINIA** Sign. Type, sallei.

Capulinia Sign., Ann. Soc. Ent. Fr., (5), v, p. 27 (1875): Ckll., Can. Ent., xxxi, p. 277 (1899).

354. Capulinia crateraformans Hemp.

Capulinia crateraformans Hemp., Rev. Mus. Paul., iv, p. 395 (1900).
" crateraformis " Can. Ent., xxxii, p. 3 (1900).
Habitat.—Brazil.
On Eugenia jaboticaba.

355. Capulinia jaboticabæ von Iher.

Capulinia jaboticabæ Iher., Revista Agricola, p. 188 (1898).
" " Towns. & Ckll., Jn. N. Y. Ent. Soc., vi, p. 174 (1898).
" " Hemp., Rev. Mus. Paul., iii, p. 51 (1898).
" " " " " " iv, p. 394 (1900).
" " " Can. Ent., xxxii, p. 4 (1900).
Habitat.—Brazil.
On Eugenia jaboticaba; Myrciaria cauliflora.

356. Capulinia sallei Sign.

Capulinia sallei Sign., Ann. Soc. Ent. Fr., (5), v, p. 28 (1875).
" " Towns. & Ckll., Jn. N. Y. Ent. Soc., vi, p. 173 (1898).
" " Hemp., Can. Ent., xxxii, p. 4 (1900).
Habitat.—Mexico.
On " Capulino "; " Escobillo."

Genus **CYLINDROCOCCUS** Mask. Type, casuarinæ.

Cylindrococcus Mask., N. Z. Trans., xxiv, p. 41 (1891): Ckll., Can. Ent., xxxi, p. 277 (1899).
Crocidocysta Rübs., Berl. Ent. Zeit., xxxix, p. 218 (1894).

357. Cylindrococcus amplior Mask.

Cylindrococcus sp. (?) Mask., N. Z. Trans., xxiv, p. 44 (1891).
" amplior " " " xxv, p. 240 (1892).
Crocidocysta froggatti Rübs., Berl. Ent. Zeit., xxxix, p. 219 (1894).
" " Ckll., Check List, Suppl., p. 392 (1899).
Habitat.—Australia.
On Casuarina quadrivalvis.

358. Cylindrococcus casuarinæ Mask.

Cylindrococcus casuarinæ Mask., N. Z. Trans., xxiv, p. 41 (1891).
" " Rübs., Berl. Ent. Zeit., xxxix, p. 217 (1894).
" " Mask., Ent. Mon. Mag., xxxii, p. 226 (1896).
Habitat.—Australia.
On Casuarina quadrivalvis.

359. Cylindrococcus gracilis Full.

Cylindrococcus gracilis Full., Notes on Cocc. W. Austr., p. 10 (1897).
" " " Tr. Ent. Soc. Lond., p. 451 (1899).
Habitat.—W. Australia.
On Casuarina humilis?

360. Cylindrococcus spiniferus Mask.

Cylindrococcus spiniferus Mask., N. Z. Trans., xxiv, p. 43 (1891).
" " Frog., Ag. Gaz. N. S. W., p. 18 (1898).
Habitat.—Australia.
On Casuarina quadrivalvis.

Genus **CISSOCOCCUS** Ckll. Type, fulleri.

Cissococcus Ckll., Ann. Mag. N. H., (7), ix, p. 23 (1902).

361. Cissococcus fulleri Ckll.

Cissococcus fulleri Ckll., Ann. Mag. N. H., (7), ix, p. 23 (1902).
Habitat.—S. Africa.
On Cissus cuneifolia.

Genus **OLLIFFIA** Full. Type, eucalypti.

Olliffia Full., Tr. Ent. Soc. Lond., p. 442 (1899).

362. Olliffia eucalypti Full.

Olliffia eucalypti Full., Notes on Cocc. W. Austr., p. 8 (1897).
" " " Tr. Ent. Soc. Lond., p. 443 (1899).
Habitat.—W. Australia.
On Eucalyptus.

Genus **SPHÆROCOCOPSIS** Ckll. Type, inflatipes.

Sphærococopsis Ckll., Pr. Ac. N. Sci. Ph., p. 262 (1899); Can. Ent., xxxi, p. 277 (1899).

363. Sphærococopsis inflatipes (Mask.).

Sphærococcus inflatipes Mask., N. Z. Trans., xxv, p. 238 (1892).
Sphærococopsis " Ckll., Pr. Ac. N. Sci. Ph., p. 262 (1899).
Habitat.—Australia.
On Eucalyptus.

Sphærococopsis inflatipes simplicior (Mask.).

Sphærococcus inflatipes var. simplicior Mask., N. Z. Trans., xxviii, p. 403 (1895).
Habitat.—Australia.
On Eucalyptus viminalis.

Genus **SPHÆROCOCCUS** Mask. Type, casuarinæ.

Sphærococcus Mask., N. Z. Trans., xxiv, p. 39 (1891) no desc.; xxv, p. 237 (1892): Ckll., Can. Ent., xxxi, p. 277 (1899).

364. Sphærococcus acaciæ Mask.

Sphærococcus acaciæ Mask., N. Z. Trans., xxv, p. 237 (1892).
Habitat.—Australia.
On Acacia.

Sphærococcus acaciæ melaleucæ Ckll.

Sphærococcus melaleucæ Mask., N. Z. Trans., xxvi, p. 94 (1893).
" acaciæ var. melaleucæ Ckll., Check List, Suppl., p. 392 (1899).
Habitat.—N. S. Wales, Australia.
On Melaleuca linariifolia.

365. Sphærococcus casuarinæ Mask.

Sphærococcus casuarinæ Mask., N. Z. Trans., xxiv, p. 39 (1891).
Habitat.—Australia.
On Casuarina quadrivalvis.

366. Sphærococcus disticlium (Kuwana).

Pseudolecanium disticlium Kuw., Ent. News, xiii, p. 134 (1902).
Habitat.—Palo Alto, Cal.
On Distichlis maritima.

367. Sphærococcus elevans Mask.

Sphærococcus elevans Mask., N. Z. Trans., xxvii, p. 68 (1894).
Habitat.—Australia.
On Eucalyptus dumosa.

368. Sphærococcus ethelæ Full.

Sphærococcus ethelæ Full., Notes on Cocc. W. Austr., p. 9 (1897).
" " " Tr. Ent. Soc. Lond., p. 449 (1899).
Habitat.—W. Australia.
On Casuarina.

369. Sphærococcus ferrugineus Frog.

Sphærococcus ferrugineus Frog., Pr. Linn. Soc. N. S. W., p. 378 (1898).
" " Mask., N. Z. Trans., xxx, p. 378 (1898).
Habitat.—Queensland.
On Melaleuca.

370. Sphærococcus froggatti Mask.

Sphærococcus froggatti Mask., N. Z. Trans., xxvi, p. 94 (1893).
" " Frog., Ag. Gaz. N. S. W., p. 19 (1898).
Habitat.—Australia.
On Melaleuca linariifolia.

371. Sphærococcus leaii Full.

Sphærococcus leaii Full., Notes on Cocc. W. Austr., p. 9 (1897).
" " " Tr. Ent. Soc. Lond., p. 448 (1899).
Habitat.—W. Australia.
On Casuarina.

372. Sphærococcus leptospermi Mask.

Sphærococcus leptospermi Mask., N. Z. Trans., xxvi, p. 92 (1893).
" " " " " xxvii, p. 68 (1894).
Habitat.—N. S. Wales.
On Leptospermum lævigatum.

373. Sphærococcus morrisoni Full.

Sphærococcus morrisoni Full., Notes on Cocc. W. Austr., p. 9 (1897).
" " " Tr. Ent. Soc. Lond., p. 450 (1899).
Habitat.—W. Australia.
On Melaleuca.

Sphærococcus morrisoni elongatus Full.

Sphærococcus morrisoni var. elongata Full., Tr. Ent. Soc. Lond., p. 450 (1899).
Habitat.—W. Australia.

374. Sphærococcus obscuratus Mask.

Sphærococcus obscuratus Mask., N. Z. Trans., xxviii, p. 403 (1895).
Habitat.—Australia.
On Acacia longifolia; Eucalyptus obtusiflora.

375. Sphærococcus pirogallis Mask.

Sphærococcus pirogallis Mask., N. Z. Trans., xxvi, p. 95 (1893).
" " Frog., Agr. Gaz. N. S. W., p. 18 (1898).
Habitat.—Australia.
On Leptospermum flavescens.

376. Sphærococcus populi Mask.

Sphærococcus populi Mask., N. Z. Trans., xxx, p. 248 (1898).
Habitat.—Japan.

377. Sphærococcus pulchellus Mask.

Sphærococcus pulchellus Mask., N. Z. Trans., xxix, p. 324 (1896).
" " Full., Notes on Cocc. W. Austr., p. 9 (1897).
" " " Tr. Ent. Soc. Lond., p. 448 (1899).
Habitat.—W. Australia.
On Hypocalymma angustifolium; Melaleuca.

378. Sphærococcus rugosus Mask.

Sphærococcus rugosus Mask., N. Z. Trans., xxix, p. 322 (1896).
Habitat.—W. Australia.
On Leptospermum; Agonis linearifolia.

Sphærococcus rugosus elongatus Mask.

Sphærococcus rugosus var. elongatus Mask., N.Z. Trans.,xxix, p. 323 (1896).
" " " " Full., Notes on Cocc. W. Austr., p. 9 (1897).
Habitat.—W. Australia.
On Agonis linearifolia.

379. Sphærococcus socialis Mask.

Sphærococcus socialis Mask., N. Z. Trans., xxix, p. 325 (1896).
Habitat.—W. Australia.
On "A Myrtaceous plant."

380. Sphærococcus styphelıæ Mask.

Sphærococcus styphelıæ Mask., N. Z. Trans., xxvii, p. 67 (1894).
Habitat.—N. S. Wales, Australia.
On Styphelia elliptica.

381. Sphærococcus sylvestris Ckll. & King.

Sphærococcus sylvestris Ckll. & King, Can. Ent., xxx, p. 326 (1898).
" " " " " " xxxi, p. 112 (1899).
Habitat.—Mass.
On white oak.

382. Sphærococcus tepperi Full.

Sphærococcus tepperi Full., Notes on Cocc. W. Austr., p. 9 (1897).
" " " Tr. Ent. Soc. Lond., p. 449 (1899).
Habitat.—W. Australia.
On Melaleuca.

Genus **CRYPTOKERMES** Hemp. Type, brasiliensis.

Cryptokermes Hemp., Rev. Mus. Paul., iv, p. 398 (1900); Ann. Mag. N. H., (7), vii, p. 113 (1901).

383. Cryptokermes brasiliensis Hemp.

Cryptokermes brasiliensis Hemp., Rev. Mus. Paul., iv, p. 398 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 113 (1901).
" " Ckll., " " " " x, p. 469 (1902).
Habitat.—Brazil; Mexico.
On Schinus; Mimosa.

Genus **OUROCOCCUS** Full. Type, eucalypti.

Ourococcus Full., Tr. Ent. Soc. Lond., p. 452 (1899).

384. Ourococcus casuarinæ Full.

Ourococcus casuarinæ Full., Notes on Cocc. W. Austr., p. 10 (1897).
" " " Tr. Ent. Soc. Lond., p. 453 (1899).
Habitat.—W. Australia.
On Casuarina.

385. Ourococcus cobbii Full.

Ourococcus cobbii Full., Notes on Cocc. W. Austr., p. 10 (1897).
" " " Tr. Ent. Soc. Lond., p. 453 (1899).
Habitat.—W. Australia.
On Eucalyptus.

386. Ourococcus eucalypti Full.

Ourococcus eucalypti Full., Notes on Cocc. W. Austr., p. 10 (1897).
" " " Tr. Ent. Soc. Lond., p. 452 (1899).
Habitat.—W. Australia.
On Eucalyptus.

Genus **PHŒNICOCOCCUS** Ckll. Type, marlatti.

Phœnicococcus Ckll., Pr. Ac. N. Sci. Ph., p. 262 (1899).

387. Phœnicococcus marlatti Ckll.

Phœnicococcus marlatti Ckll., Pr. Ac. N. Sci. Ph., p. 262 (1899); Can. Ent., xxxi, p. 277 (1899).
Habitat.—Algeria.
On date-palm.

Genus **EPICOCCUS** Ckll. Type, acaciæ.

Epicoccus Ckll., Ann. Mag. N. H., (7), ix, p. 24 (1902).

388. Epicoccus acaciæ (Mask.).

Coccus acaciæ Mask., N. Z. Trans., xxix, p. 319 (1896).
" " Full., Tr. Ent. Soc. Lond., p. 439 (1899).
Epicoccus " Ckll., Ann. Mag. N. H., (7)., ix, p. 24 (1902).
Habitat.—W. Australia.
On Acacia pulchella.

Genus **HALIMOCOCCUS** Ckll. Type, lampas.

Halimococcus Ckll., The Entom., xxxv, p. 15 (1902).

389. Halimococcus lampas Ckll.

Halimococcus lampas Ckll., The Entom., xxxv, p. 15 (1902).
Habitat.—Natal.
On leaves of palm.

Genus **PUTO** Sign. Type, antennata.

||Putonia Sign., Ann. Soc. Ent. Fr., (5), v, p. 341 (1875).
Puto " " " " " " " p. 394 (1875).

390. Puto antennata (Sign.).

Putonia antennata Sign., Ann. Soc. Ent. Fr., (5), v, p. 341 (1875).
Puto " Ckll., Check List, p. 324 (1896).
Habitat.—France.
On pine.

Genus **PHENACOCCUS** Ckll. Type, aceris.

||Pseudococcus Sign. (non Westw.), Ann. Soc. Ent. Fr., (5), v, p. 328 (1875): Comst., Rep. U. S. Dep. Ag., 1880, p. 345 (1881).
Phenacoccus Ckll., Ent. News, iv, p. 318 (1893); Can. Ent., xxxi, p. 278 (1899).
s. g. Paroudablis Ckll., The Entom., xxxiii, p. 87 (1900). Type, piceæ.

391. Phenacoccus acericola (King).

Pseudococcus aceris Smith, E. A., N. Am. Ent., p. 73 (1880).
" " Comst., Rep. U. S. Dep. Ag., 1880, p. 345 (1881).
" " " 2nd Rep. Dep. Ent. Corn. Univ., p. 136 (1883).
" " Pack., 5th Rep. U. S. Ent. Com., p. 418 (1890).
" " How., Ins. Life, vii, p. 235 (1894).
Phenacoccus " Ckll., Check List, p. 324 (1896).
Pseudococcus " Cooley, Bull. 36, Mass. Exp. Sta., p. 8 (1896).
" " " " 17, n. s., Dep. Ag., p. 61 (1898).
Phenacoccus " Lugger, 6th Rep. Ent. Minn. Exp. Sta., p. 213 (1900).
" " Felt, Bull. N. Y. St. Mus., ix, p. 355 (1901).
" acericola King, Can. Ent., xxxiv, p. 211 (1902).
Habitat.—Mass.; R. I.; N. Y.; N. J.; Pa.; Md.; Ohio: Ill.: Minn.
On maple; hornbeam; lime; horse chestnut.

392. Phenacoccus aceris (Sign.).

Pseudococcus aceris Sign., Ann. Soc. Ent. Fr., (5), v, p. 329 (1875).
" " Dougl., Ent. Mon. Mag., xxvi, p. 153 (1890).
" " Sulc, " " " xxx, p. 87 (1894).

Habitat.—Europe.

On maple.

393. Phenacoccus æsculi (Sign.).

Pseudococcus æsculi Sign., Ann. Soc. Ent. Fr., (5), v, p. 330 (1875).
Phenacoccus " Ckll., Check List, p. 324 (1896).

Habitat.—Europe.

On "Les marronniers."

394. Phenacoccus americanæ King & Ckll.

Phenacoccus americanæ King & Ckll., Can Ent., xxix, p. 91 (1897).
" " " Can. Ent., xxxi, p. 112 (1899).

Habitat.—Mass.

In nests of Lasius americanus.

395. Phenacoccus artemisiæ Ehrh.

Phenacoccus artemisiæ Ehrh., Can. Ent., xxxii, p. 313 (1900).

Habitat.—California.

On Artemisia californica.

396. Phenacoccus asteliæ (Mask.).

Pseudococcus asteliæ Mask., N. Z. Trans., xvi, p. 139 (1883).
" " " Ins. Nox. Ag. N. Z., p. 102 (1887).
" " " The Entom., xxvii, p. 46 (1894).
Phenacoccus " Ckll., Check List, p. 325 (1896).

Habitat.—New Zealand.

On Astelia.

397. Phenacoccus brunnitarsis (Sign.).

Pseudococcus brunnitarsis Sign., Ann. Soc. Ent. Fr., (5), v, p. 332 (1875).
Phenacoccus " Ckll., Check List, p. 324 (1896).

Habitat.—The Maritime Alps.

On Borage.

398. Phenacoccus casuarinæ (Mask.).

Pseudococcus casuarinæ Mask., N. Z. Trans., xxv, p. 235 (1892).
Phenacoccus " Ckll., Check List, p. 325 (1896).

Habitat.—Australia.

On Casuarina.

399. Phenacoccus cevalliæ Ckll.

Phenacoccus cevalliæ Ckll., Can. Ent., xxxiv, p. 325 (1902).

Habitat.—New Mexico.

On Cevallia sinuata.

400. Phenacoccus comari (Künow).

Coccus comari Künow, Ent. Nach., vi, p. 46 (1880).
" " Dougl., Ent. Mon. Mag., xvii, p. 90 (1880).
Phenacoccus comari Ckll., Am. Nat., xxxi, p. 589 (1897).
Habitat.—Germany.
On Comarum palustre.

401. Phenacoccus dearnessi King.

Phenacoccus dearnessi King, Can. Ent., xxxiii, p. 180 (1901).
Habitat.—Ontario, Can.
On hawthorn.

402. Phenacoccus(?) farinosus (Mod.).

Coccus (farinosus alni) De G., Mem. Ins., vi, p. 442, pl. 28, figs. 16, 17 (1776).
" " Mod., Act. Goth., p. 23 (1778).
" " Gmel., Syst. Nat., Ed. xiii, p. 2220 (1789).
" " Oliv., Ency. Meth., vi, p. 98 (1791).
" " Turton, Syst. Nat., p. 715 (1801).
?Phenacoccus " Ckll., Pr. Ac. N. Sci. Ph., p. 264 (1899).
Habitat.—Europe.
On alder.

403. Phenacoccus glacialis (Newst.).

Dactylopius glacialis Newst., Ent. Mon. Mag., xxxvi, p. 248 (1900).
Phenacoccus " Ckll., in litt. (1902).
Habitat.—Italy.—"Associated with ants."

404. Phenacoccus gossypii Towns. & Ckll.

Phenacoccus gossypii Towns. & Ckll., Jn. N. Y. Ent. Soc., vi, p. 170 (1898).
" helianthi var. gossypii Ckll., Check List, Suppl., p. 391 (1899).
Habitat.—Mexico.
"On cotton and other Malvaceous plants."

Phenacoccus gossypii psidiarum Ckll.

Phenacoccus gossypii psidiarum Ckll., Ann. Mag. N. H., (7), xi, p. 164 (1903).
Habitat.—Mexico.
On wild guava.

405. Phenacoccus hederæ (Sign.).

Pseudococcus hederæ Sign., Ann. Soc. Ent. Fr., (5), v, p. 332 (1875).
Phenacoccus " Ckll., Ent. News, v, p. 210 (1894).
Habitat.—France; England.
On Hedera.

406. Phenacoccus helianthi (Ckll.).

Pseudococcus helianthi Ckll., The Entom., xxvi, p. 352 (1893).
Phenacoccus " " Can. Ent., xxvi, p. 285 (1894).
" " " The Entom., xxxiii, p. 86 (1900).
Habitat.—N. Mexico; Arizona.
On Helianthus.

407. **Phenacoccus mangiferæ** (Green).

Pseudococcus mangiferæ Green, Ind. Mus. Notes, iv, p. 6 (1896).
Phenacoccus " Ckll., Check List, p. 325 (1896).
Habitat.—Ceylon; India.
On Mangifera indica.

408. **Phenacoccus mespili** (Sign.).

Pseudococcus mespili Sign., Ann. Soc. Ent. Fr., (5), v, p. 333 (1875).
Phenacoccus " Ckll., Pr. Ac. N. Sci. Ph., p. 264 (1899).
Habitat.—Europe.
On Medlar.

409. **Phenacoccus minimus** Tins.

Phenacoccus minimus Tins., Can. Ent., xxx, p. 223 (1898).
Habitat.—Colorado.
On silver-spruce (Picea pungens).

410. **Phenacoccus nivalis** (Mask.).

Pseudococcus nivalis Mask., N. Z. Trans., xxv, p. 234 (1892).
Phenacoccus " Ckll., Check List, p. 325 (1896).
? " " de Charm., Pr. Soc. Amic. Scien., p. 42 (1899).
" " Ckll., The Entom., xxxiii, p. 86 (1900).
Habitat.—Australia; Mauritius.
On Acacia; Solanum.

411. **Phenacoccus osborni** Sanders.

Phenacoccus osborni Sanders., Ohio Nat., ii, p. 284 (1902).
Habitat.—Ohio.
On Platanus occidentalis.

412. **Phenacoccus pergandei** Ckll.

Phenacoccus pergandei Ckll., Psyche, vii, Suppl., i, p. 18 (1896).
" " " Bull. 4, T. s., Dep. Ag., p. 55 (1896).
" " " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 56 (1902).
Habitat.—Japan.
On "Gumi;" Diospyros kaki.

413. **Phenacoccus piceæ** (Loew).

Boisduvallia piceæ Loew, Wien. Ent. Zeit., ii, p. 267 (1883).
Oudablis " Ckll., Check List, p. 325 (1896).
Phenacoccus " " The Entom., xxxiii, pp. 86, 87 (1900).
Habitat.—Austria.
On Abies excelsa.

414. **Phenacoccus platani** (Sign.).

Pseudococcus platani Sign., Ann. Soc. Ent. Fr., (5), v, p. 334 (1875).
Phenacoccus " Ckll., Check List, p. 324 (1896).
Habitat.—France.
On Platanus.

415. Phenacoccus quercus (Dougl.).

Pseudococcus quercus Dougl., Ent. Mon. Mag., xxvi, p. 154 (1890).
Phenacoccus " Ckll., Check List, p. 324 (1896).
Habitat.—England.
On Quercus robur.

416. Phenacoccus rubivorus Ckll.

Phenacoccus rubivorus Ckll., Psyche, ix, p. 215 (1901).
Habitat.—New Mexico.
On roots of Rubus strigosus.

417. Phenacoccus simplex King.

Phenacoccus simplex King, Ent. News, xiii, p. 42 (1902).
Habitat.—California.
On Atriplex.

418. Phenacoccus socius (Newst.).

Pseudococcus socius Newst., Ent. Mon. Mag., xxviii, p. 144 (1892).
Phenacoccus " Ckll., The Entom., xxxiii, p. 87 (1900).
Pulvinaria ribesiae Dougl. (non Sign.), Ent. Mon. Mag., xxvi, p. 238 (1890).
" " " " " " " " xxviii, p. 219 (1892).
Habitat.—England.
On black currant.

419. Phenacoccus solenopsis Tins.

Phenacoccus solenopsis Tins., Can. Ent., xxx, pp. 47, 319 (1898).
Habitat.—New Mexico.
In nests of Solenopsis geminata Fab.

420. Phenacoccus spiniferus Hemp.

Phenacoccus spiniferus Hemp., Rev. Mus. Paul., iv, p. 389 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 110 (1901).
Habitat.—Brazil.

421. Phenacoccus stachyos Ehrh.

Phenacoccus stachyos Ehrh., Can. Ent., xxxii, p. 314 (1900).
Habitat.—California.
On Stachyos bullata.

422. Phenacoccus ulicis (Dougl.).

Pseudococcus ulicis Dougl., Ent. Mon. Mag., xxv, p. 88 (1888).
Phenacoccus " Ckll., Check List, p. 325 (1896).
Pseudococcus " Newst., Jn. Roy. Hor. Soc., xxiii, p. 29 (1900).
Habitat.—Europe.
On Furze; Laburnum.

423. Phenacoccus ulmi (Dougl.).

Pseudococcus ulmi Dougl., Ent. Mon. Mag., xxv, p. 124 (1888).
Phenacoccus " Ckll., Check List, p. 325 (1896).
Habitat.—Europe.
On Ulmus campestris.

424. Phenacoccus wilmattæ Ckll.

Phenacoccus wilmattæ Ckll., Ann. Mag. N. H., (7), viii, p. 57 (1901).
Habitat.—New Mexico.
On "Viola aff. pedatifida."

Genus **TETRURA** Licht. Type, rubi.

Tetrura Licht., Ent. Mon. Mag., xviii, p. 275 (1882); Wien. Ent. Zeit., i, p. 124 (1882); Bull. Soc. Ent. Fr., (6), ii, p. lxxv (1882).

425. Tetrura rubi Licht.

Tetrura rubi Licht., Ent. Mon. Mag., xviii, p. 275 (1882).
" " " Wien. Ent. Zeit., i, p. 124 (1882).
Oudablis " Ckll., Check List, p. 325 (1896).
Tetrura " " The Entom., xxxiii, p. 86 (1900).
Habitat.—Europe.
On Rubus discolor.

Genus **CEROPUTO** Sulc. Type, pilosellæ.

Ceroputo Sulc, Sitzb. K. Bohm. Ges. Wiss., No. lxvi (1897): Ckll., Can. Ent., xxxi, p. 278 (1899).

426. Ceroputo bahiæ (Ehrh.).

Phenacoccus bahiæ Ehrh., Can. Ent., xxxii, p. 315 (1900).
Ceroputo " Ckll., Pr. Biol. Soc. Wash., xiv, p. 166 (1901).
Habitat.—California.
On Bahia.

427. Ceroputo barberi (Ckll.).

Phenacoccus yuccæ var. barberi Ckll., Ann. Mag. N. H., (6), xvi, p. 61 (1895).
" " " " " Bull. 4, T. s., Dep. Ag., p. 39 (1896).
Ceroputo barberi Ckll., Pr. Biol. Soc. Wash., xiv, p. 166 (1901).
Habitat.—Antigua; New Mexico.
On Thunbergia grandiflora; Allamanda; Coleus; Croton.

428. Ceroputo calcitectus (Ckll.).

Phenacoccus calcitectus Ckll., Ann. Mag. N. H., (7), vii, p. 334 (1901).
Ceroputo " " Pr. Biol. Soc. Wash., xiv, p. 166 (1901).
Habitat.—New Mexico.
On grass.

429. Ceroputo lasiorum Ckll.

Ceroputo lasiorum Ckll., Pr. Biol. Soc. Wash., xiv, p. 166 (1901).
Habitat.—New Mexico.
In nests of Lasius interjectus under rocks.

430. Ceroputo orthezioides Ckll.

Ceroputo orthezioides Ckll., Ann. Mag. N. H., (7), xi, p. 163 (1903).
Habitat.—Mexico.
"On roots of dockweed."

431. Ceroputo pilosellæ (Sulc).

Dactylopius pilosellæ Sulc, Sitzb. K. Böhm. Ges. Wiss., pp. 1, 16, 18 (1897).
Ceroputo " Ckll., Check List, Suppl., p. 392 (1899).
Habitat.—Europe.

432. Ceroputo yuccæ (Coq.).

Pseudococcus yuccæ Coq., West Amer. Scientist, vii, p. 44 (1890).
" " Riley & How., Ins. Life, vi, p. 40 (1893).
" " Towns., Bull. 4, T. s., Dep. Ag., p. 12 (1896).
Phenacoccus " Ckll., Check List, p. 325 (1896).
Ceroputo " " Pr. Biol. Soc. Wash., xiv, p. 166 (1901).
Habitat.—Mexico; California; Antigua.
On Yucca whipplei; Y. filifera; Y. australis; Lantana; Mimulus glutinosus; Ceanothus oliganthus; banana; orange; lime. Full list in Bull. 4, T. s., Div. Ent. Dep. Ag., p. 12 (1896).

Ceroputo yuccæ mexicanus (Ckll.).

Dactylopius yuccæ var. mexicanus Ckll., Ann. Mag. N. H., (6), xii, p. 49 (1893).
Ceroputo yuccæ mexicanus Ckll., Pr. Biol. Soc. Wash., xiv, p. 166 (1901).
Habitat.—Mexico.

Ceroputo yuccæ ceanothi Ckll.

Ceroputo yuccæ var. ceanothi Ckll., Ann. Mag. N. H., (7), xi, p. 163 (1903).
Habitat.—California.
On Ceanothus oliganthus.

Genus **TYLOCOCCUS** Newst. Type, madagascariensis.

Tylococcus Newst., Ent. Mon. Mag., xxxiii, p. 165 (1897): Ckll., Can. Ent., xxxi, p. 278 (1899).

433. Tylococcus madagascariensis Newst.

Tylococcus madagascariensis Newst., Ent. Mon. Mag., xxxiii, p. 166 (1897).
Habitat.—Madagascar.
In nests of Cremastogaster schencki For.

Genus **LACHNODIUS** Mask. Type, eucalypti.

Lachnodius Mask., N. Z. Trans., xxviii, p. 400 (1896): Ckll., Can. Ent., xxxi, p. 278 (1899).

434. Lachnodius eucalypti (Mask.).

Dactylopius eucalypti Mask., N. Z. Trans., xxiv, p. 35 (1891).
" " " " " xxv, p. 233 (1892).
" " " " " xxvii, p. 65 (1894).
Lachnodius " " " " xxviii, p. 400 (1896).
Habitat.—Australia.
On Eucalyptus robusta; E. rostrata; E. siderophloia.

435. Lachnodius hirtus Mask.

Lachnodius hirtus Mask., N. Z. Trans., xxviii, p. 402 (1896).
Habitat.—Australia.
On Acacia.

436. Lachnodius lectularius Mask.

Lachnodius lectularius Mask., N. Z. Trans., xxviii, p. 400 (1896).
Habitat.—Australia.
On Eucalyptus rostrata.

Genus **TRIONYMUS** Berg. Type, perrisii.

‖Westwoodia Sign., Ann. Soc. Ent. Fr., (5), v, p. 337 (1875).
‖Signoretia Kraatz, Deutsch. Ent. Zeit., p. 176 (1888).
‖Bergrothia " " " " p. 360 (1888).
‖Bergrothiella Reitter, Wien. Ent. Zeit., xvii, p. 54 (1898).
Trionymus Berg, Commun. Mus. Buen. Aires, May 24 (1899): Ckll., Ent. News, xii, p. 89 (1901).
Pergandiella Ckll., Pr. Ac. N. Sci. Ph., p. 266 (1899).

437. Trionymus americanus (Ckll.).

Pergandiella americana Ckll., Pr. Ac. N. Sci. Ph., p. 266 (1899).
Habitat.—Washington, D. C.
On ash.

438. Trionymus perrisii (Sign.).

Westwoodia perrisii Sign., Ann. Soc. Ent. Fr., (5), v, p. 337 (1875).
Dactylopius " Ckll., Check List, p. 325 (1896).
Pergandiella " " Pr. Ac. N. Sci. Ph., p. 266 (1899).
Habitat.—France.
On Sphagnum; Agropyrum; Calamagrostis arundinacea.

Genus **PSEUDOCOCCUS** Westw. Type, longispinus.

Pseudococcus Westw., Synop. Gen. Br. Ins., p. 118 (1839); Arc. Ent.,i, p. 21 (1841): Ckll. Can., Ent., xxxi, p. 277 (1899); Ann. Mag. N. H., (7), ix, p. 454 (1902).
Trechocorys Curt., Gard. Chron., p. 444 (1843).
Cocconidia Amy., Ann. Soc. Ent. Fr., (2), v, p. 494 (1847).
Dactylopius Targ., Mem. Soc. Ent. Ital., (1867); Intr. 2nd Mem. sul. Cocc. (1869): Sign., Ann. Soc. Ent. Fr., (5), v, p. 308 (1875): Comst., Rep. U. S. Dep. Ag., 1880, p. 341 (1881): Mask., Ins. Nox. Agr. N. Z., p. 99 1887): Targ., Coccin. deg. Agr. Ital., p. 6 (1891): Mask., Ann. Mag. N. H., (6), xvi, p. 129 (1895): Ckll., Can. Ent., xxxi, p. 278 (1899).
‖Boisduvallia Sign., Ann. Soc. Ent. Fr., (5), v, p. 338 (1875).
Oudablis Sign., Bull. Soc. Ent. Fr., (6), i, p. clvii (1881).

439. Pseudococcus acaciæ (Mask.).

Dactylopius acaciæ Mask., N. Z. Trans., xxiv, p. 33 (1891).
Habitat.—Australia.
On Acacia linearis: A. lophantha.

440. Pseudococcus affinis (Mask.).

Dactylopius affinis Mask., N. Z. Trans., xxvi, p. 90 (1893).
" " Lidg., The Wombat, iii, p. 90 (1898).
Habitat.—Australia.
On tubers of Dahlia and potato.

441. Pseudococcus alaterni (Sign.).

Dactylopius alaterni Sign., Ann. Soc. Ent. Fr., (5), v, p. 309 (1875).
Habitat.—Europe.
On Rhamnus alaternus.

442. Pseudococcus albizziæ (Mask.).

Dactylopius albizziæ Mask., N. Z. Trans., xxiv, p. 31 (1891).
" " Lidg., The Wombat, iii, p. 89 (1898).
" " Frog., Ag. Gaz. N. S. W., July, p. 19 (1902).
Pseudococcus " Kirkaldy, Fauna Haw., iii, pt. 2, p. 103 (1902).
Habitat.—Australia; Sandwich Islands.
On Albizzia lophantha; Acacia dealbata; A discolor; A. baileyana; orange.

443. Pseudococcus alpinus (Mask.).

Dactylopius alpinus Mask., N. Z. Trans., xvi, p. 138 (1883).
" " " Ins. Nox. Agr. N. Z., p. 99 (1887).
Habitat.—New Zealand; Southern Alps.
On Veronica.

444. Pseudococcus aphyllonis (Ckll.).

Dactylopius aphyllonis Ckll., Psyche, vii, Suppl., i, p. 8 (1895).
Habitat.—Washington.
On Aphyllon fasciculatum.

445. Pseudococcus arecæ (Mask.).

Dactylopius arecæ Mask., N. Z. Trans., xxii, p. 150 (1889).
" " " " " xxv, p. 231 (1892).
" " Ckll., Can. Ent., xxvi, p. 287 (1894).
Habitat.—New Zealand.
On Areca sapida; grass; red clover; gooseberry; dock; palm.

446. Pseudococcus aurilanatus (Mask.).

Dactylopius aurilanatus Mask., N. Z. Trans., xxii, p. 151 (1889).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 45 (1896).
" " Mask., N. Z. Trans., xxix, p. 320 (1896).
" " Frog., Dep. Ag. N. S. W., No. 175, p. 4 (1897).

Dactylopius aurilanatus Full., 1st Rep. Ent. Natal, p. 105 (1901).
Habitat.—New Zealand; Australia; Auckland; Natal; California.
On Araucaria bidwillii; A. excelsa; Dammara ovata; D. vitiensis.

447. Pseudococcus australiensis (Green & Lidg.).

Dactylopius australiensis Green & Lidg., Victorian Naturalist, xvii, p. 13 (1900).
Habitat.—Australia.

448. Pseudococcus azaleæ (Tins.).

Dactylopius azaleæ Tins., Can. Ent., xxx, p. 319 (1898).
Habitat.—California.
On Azalea, in Japanese nursery.

449. Pseudococcus brevipes (Ckll.).

Dactylopius brevipes Ckll., The Entom., xxvi, p. 267 (1893).
" " " Bull. Bot. Dep. Jam., No. 46, p. 3 (1893).
Habitat.—Jamaica.
On pineapple.

450. Pseudococcus bromeliæ (Bouché).

Lecanium bromeliæ Bouché, Schädl. Gart. Ins., p. 49 (1833).
" " " Naturg. Ins., p. 20 (1834).
" " Burm., Handb. Ent., i, p. 70 (1835).
" " Curt., Gard. Chron., p. 131 (1841).
Aspidiotus " Bouché, Stett. Ent. Zeit., v, p. 295 (1844).
Dactylopius " Sign., Ann. Soc. Ent. Fr., (5), v, p. 310 (1875).
Lecanium " " " " " " " vi, p. 610 (1876).
Dactylopius " Mask., N. Z. Trans., xxvi, p. 88 (1893).
" " Cotes, Ind. Mus. Notes, iii, No. 5, p. 51 (1894).
" " Tryon, Queensland Agr. Journ., viii, p. 297 (1901).
Habitat.—India; S. Africa; Zanzibar; S. America?; Mass.
On mulberry; Canna; Hibiscus; pine-apple.

451. Pseudococcus calceolariæ (Mask.).

Dactylopius calceolariæ Mask., N. Z. Trans., xi, p. 218 (1878).
" " " " " xvi, p. 138 (1883).
" " " Ins. Nox. Agr. N. Z., p. 100 (1887).
" " Ckll., Bull. Bot. Dep. Jam., No. 46, p. 3 (1893).
" " Mask., N. Z. Trans., xxvi, p. 89 (1893).
" " " The Entom., xxvii, p. 46 (1894).
" " Ckll., Pr. Ac. Nat. Sci. Ph., p. 265 (1899).
Pseudococcus " Kirkaldy, Fauna Haw., iii, pt. 2, p. 103 (1902).
Habitat.—New Zealand; Sandwich Islands; Fiji Islands; Jamaica; Florida.
On Calceolaria; Danthonia; Phormium tenax; Cordyline australis; sugar-cane.

Pseudococcus calceolariæ minor (Mask.).

Dactylopius calceolariæ var. minor Mask., N. Z. Trans., xxix, p. 332 (1896).
" " " " de Charm., Pr. Soc. Amic. Scien., p. 44 (1899).
Habitat.—Mauritius.
On "roots of onion grass."

452. Pseudococcus caricus (Genn.).

Dactylopius caricus Genn.. Ann. Soc. Ent. Fr., (6), iii, p. 31 (1883).
Habitat.—Asia Minor.
On Pinus taurica.

453. Pseudococcus ceratoniæ (Sign.).

Dactylopius ceratoniæ Sign., Ann. Soc. Ent. Fr., (5), v, p. 311 (1875).
Habitat.—Maritime Alps.
On bark of Carob tree.

454. Pseudococcus citri (Risso).

(*Common Mealy bug.*)

Dorthesia citri Risso, Essai, Hist. Nat. des Oranges (1813).
Coccus " Bdv., Ent. Hort., p. 348 (1867).
Dactylopius" Sign., Ann. Soc. Ent. Fr., (5), v, p. 312 (1875).
Lecanium phyllococcus Ashm., Can. Ent., xi, p. 160 (1879).
Dactylopius brevispinus Targ., Annali di Agr., p. 137 (1881).
" destructor Comst., Rep. U. S. Dep. Ag., 1880, p. 342 (1881).
" " " 2nd Rep. Dep. Ent.Corn. Univ.,p.131 (1883).
" " Saund., Ins. Inj. to Fruits, p. 411 (1883).
" citri Sign., Bull. Soc. Ent. Fr., (6), iv, pp. cl, cli (1884).
" destructor Dougl., Ent. Mon. Mag., xxiii, p. 154 (1886).
" " Comst., Intr. Ent., p. 138 (1888).
" citri Riley, Ins. Life, i, p. 118 (1888).
" " Berl., Riv. Pat. Veg., i, pp. 60, 65 (1892).
" " " " " " ii, pp. 74, 75 (1893).
" " Ckll., The Entom., xxvi, p. 267 (1893).
" " " Journ. Inst. Jam., i, p. 309 (1893).
" " " Bull. Bot. Dep. Jam., No. 46, p. 3 (1893).
" destructor Morg., Spec. Bull. La. Exp. Sta., p. 69 (1893).
" " " Ins. Life, vii, p. 168 (1894).
" citri Visart, Riv. Pat. Veg., iii, p. 40 (1894).
" " Saccardo," " " iv, p. 46 (1895).
" " Lugger, Bull. 43, Minn. Exp. Sta., p. 221 (1895).
" " " Rep. Minn. Exp. Sta., p. 25 (1895).
" " Comst., Man. Ins., p. 167 (1895).
" destructor Dougl., Ent. Mon. Mag., xxxi, p. 138 (1895).
" " Lounsb., Rep. Ent. Cape Good Hope, p. 7 (1896).
" citri Davis, Spec. Bull. 2, Mich. Exp. Sta., p. 25 (1896).
" " Lounsb., Rep. Ent. Cape Good Hope, p. 99 (1896).

Dactylopius citri Green, Ent. Mon. Mag., xxxiii, p. 73 (1897).
" " Osborn, Contr. Ia. Ag. Coll., No. 3, p. 2 (1898).
" " Berl. e Leon., Annali di Agr., p. 46 (1898).
" " " " Riv. Pat. Veg., vi, p. 324 (1898).
" " How., Yearbook U. S. Dep. Ag., p. 143 (1898).
" " Rolfs & Quaint., Cocc. Amer., Dec. i-ii, No. 1 (1898).
" " King, Can. Ent., xxxi, p. 111, (1899).
" " de Charm., Pr. Soc. Amic. Scien., p. 45 (1899).
" " Ckll., Bull. 32, Ariz. Exp. Sta., p. 285 (1899).
" destructor Newell, Bull. 43, Ia. Exp. Sta., p. 172 (1899).
" " Lugger, 6th Rep. Ent. Minn. Exp. Sta., p. 211 (1900).
" citri Gossard, Bull. 51, Fla. Exp. Sta., p. 120 (1900).
" " Lugger, 6th Rep. Ent. Minn. Exp. Sta., p. 212 (1900).
" " Hemp., Rev. Mus. Paul., iv, p. 384 (1900).
" " Marlatt, Yearbook U. S. Dep. Ag., p. 282 (1900).
" " Newst., Jn. Roy. Hor. Soc., xxiii, p. 27 (1900).

Habitat.—Europe; Sandwich Islands; Mauritius; Brazil; Jamaica; Can.; Mass.; N. Y.; N. J.; La.; Fla.

On orange; lemon; citron; coffee; tobacco; cotton; ivy; peony; Ipomœa; Solanum jasminoides; Callistemon lanceolatus; Habrothamnus and many other plants.

455. **Pseudococcus claviger** (King & Tins.).

Dactylopius claviger King & Tins., Psyche, viii, p. 150 (1897).
" " " Can. Ent., xxxi, p. 111 (1899).

Habitat.—Mass.

In nests of Lasius claviger and L. americanus.

456. **Pseudococcus cockerelli** (King & Tins.).

Dactylopius cockerelli King & Tins., Psyche, viii, p. 297 (1898).
" " King, Can. Ent., xxxi, p. 112 (1899).

Habitat.—Andover, Mass.

In nests of ants.

457. **Pseudococcus cocotis** (Mask.).

Dactylopius cocotis Mask., N. Z. Trans., xxii, p. 149 (1889).
" " " " " xxiv, p. 34 (1891).
" " Cotes, Ind. Mus. Notes, ii, p. 169 (1893).
" " Mask., " " " iii, No. i, p. 66 (1893).
" " " Ent. Mon. Mag., xxxiii, p. 244 (1897).

Habitat.—China; Fiji; Laccadive Islands.

On Cocoanut; Hibiscus.

458. **Pseudococcus comstocki** (Kuwana).

Dactylopius comstocki Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 52 (1902).

Habitat.—Japan.

On mulberry-tree; maple.

459. **Pseudococcus crawii** (Coq.).

Dactylopius crawii Coq., West Amer. Scientist, vi, p. 123 (1889).
Habitat.—California.
On wild sage.

460. **Pseudococcus cualatensis** Ckll.

Pseudococcus cualatensis Ckll., The Entom., xxxvi, p. 47 (1903).
Habitat.—Mexico.

461. **Pseudococcus cyperi** (Sign.).

Dactylopius cyperi Sign., Ann. Soc. Ent. Fr., (5), v, p. 314 (1875).
Habitat.—France.

462. **Pseudococcus dasylirii** (Ckll.).

Dactylopius dasylirii Ckll., Jn. N. Y. Ent. Soc., iv, p. 202 (1896).
Habitat.—N. Mexico.
On Dasylirion wheeleri.

463. **Pseudococcus edgeworthiæ** (Ckll.).

Dactylopius edgeworthiæ Ckll., Am. Nat., xxxi, p. 589 (1897).
Habitat.—Japan.
On Edgeworthia papyrifera.

464. **Pseudococcus ephedræ** (Coq.).

Dactylopius ephedræ Coq., West Amer. Scientist, vii, p. 43 (1890).
Habitat.—California.
On Ephedra californica.

465. **Pseudococcus ericicola** (Mask.).

Dactylopius ericicola Mask., N. Z. Trans., xxv, p. 232 (1892).
Habitat.—Australia.
On Erica autumnalis.

466. **Pseudococcus farnesianæ** (Targ.).

Dactylopius farnesianæ Targ., Annali di Agr., p. 436 (1888).
" " Tins., Can. Ent., xxxii, p. 66 (1900).
Habitat.—Italy.
On Acacia farnesiana.

467. **Pseudococcus ficus** (Sign.).

Dactylopius ficus Sign., Ann. Soc. Ent. Fr., (5), v, p. 315 (1875).
Habitat.—France.
On fig.

468. **Pseudococcus filamentosus** (Ckll.).

Dactylopius filamentosus Ckll., The Entom., xxvi, p. 268 (1893).
" " " Bull. Bot. Dep. Jam., No. 46, p. 4 (1893).
" vastator Mask., N. Z. Trans., xxvii, p. 74 (1894).
" " Ckll., Ann. Mag. N. H., (6), xvi, p. 133 (1895).

Dactylopius vastator Newst., Ent. Mon. Mag., xxxi, p. 236 (1895).
" " de Charm., Pr. Soc. Amic. Scien., p. 45 (1899).
" filamentosus Ckll., Can. Ent., xxxi, p. 267 (1899).
" " Tins., " " xxxii, p. 64 (1900).
Pseudococcus vastator Kirkaldy, Fauna Haw., iii, pt. 2, p. 103 (1902).
Habitat.—S. Caicos Island; Jamaica; Mauritius; Sandwich Islands Japan.
On "a plant allied to Vaccinium"; Citrus.

469. Pseudococcus formicarii (Ehrh.).

Dactylopius formicarii Ehrh., Can. Ent., xxxi, p. 6 (1899).
Habitat.—Arizona.
In nests of ants on roots of Artemisia.

470. Pseudococcus formiceticola (Newst.).

||Dactylopius formicarius Newst., Ent. Mon. Mag., xxxvi, p. 249 (1900).
" formiceticola " " " " xxxvii, p. 86 (1901).
Habitat.—Konkan, India.
In nests of Cremastogaster.

471. Pseudococcus glaucus (Mask.).

Dactylopius glaucus Mask., N. Z. Trans., xi, p. 219 (1878).
" " " " " xvi, p. 134 (1883).
" " " " " xvii, p. 30 (1884).
" " " Ins. Nox. Ag. N. Z., p. 100 (1887).
" " Ckll., Gard. Chron., (3), xiii, p. 548 (1893).
Habitat.—New Zealand.
On Panax; Rubus; Coprosma; Pittosporum; Piper excelsum.

472. Pseudococcus graminis (Mask.).

Dactylopius graminis Mask., N. Z. Trans., xxiv, p. 36 (1891).
" " Newst., Ent. Mon. Mag., xxxi, p. 167 (1895).
Habitat.—South Africa.
On grass.

Pseudococcus graminis orientalis (Mask.).

Dactylopius graminis var. orientalis Mask., N. Z. Trans., xxx, p. 245 (1897).
Habitat.—China.

473. Pseudococcus grandis (Hemp.).

Dactylopius grandis Hemp., Rev. Mus. Paul., iv, p. 384 (1900).
" " " Ann. Mag. N. H., (7), vi, p. 395 (1900).
Habitat.—Brazil.
On Myrtaceæ.

474. Pseudococcus grevilleæ (Full.).

Dactylopius grevilleæ Full., Tr. Ent. Soc. Lond., p. 454 (1899).
Habitat.—W. Australia.
On Grevillea bipinnatifida.

475. Pseudococcus gutierreziæ (Ckll.).

Dactylopius gutierreziæ Ckll., Jn. N. Y. Ent. Soc., iv, p. 203 (1896).
Habitat.—New Mexico.
On Gutierrezia sarothræ var.

476. Pseudococcus herbicola (Mask.).

Dactylopius herbicola Mask., Agr. Gaz. N. S. W., ii, p. 352 (1891).
" " " N. Z. Trans., xxiv, p. 36 (1891).
" " Ckll., Ann. Mag. N. H., (6), xvi, p. 134 (1895).
Habitat.—Australia.
On grass.

477. Pseudococcus hibbertiæ (Mask.).

Dactylopius hibbertiæ Mask., N. Z. Trans., xxiv, p. 32 (1891).
" " Ckll., Ann. Mag. N. H., (6), xvi, p. 134 (1895).
Habitat.—Australia.
On Hibbertia linearis ; H. virgata.

478. Pseudococcus hibernicus (Newst.).

Dactylopius hibernicus Newst., Ent. Mon. Mag., xxxi, p. 167 (1895).
Habitat.—Ireland.
On grass.

479. Pseudococcus hirsutus (Newst.).

Dactylopius hirsutus Newst., Ent. Mon. Mag., xxxiii, p. 166 (1897).
Habitat.—India.
In nests of Cremastogaster.

480. Pseudococcus hoyæ (Sign.).

Dactylopius hoyæ Sign., Ann. Soc. Ent. Fr., (5), v, p. 317 (1875).
Habitat.—France.
On Hoya carnosa from Western Asia.

481. Pseudococcus hymenocleæ (Ckll.).

Dactylopius hymenocleæ Ckll., Can. Ent., xxxi, p. 267 (1899).
Habitat.—Arizona.
On Hymenoclea monogyra.

482. Pseudococcus iceryoides (Mask.).

Dactylopius iceryoides Mask., N. Z. Trans., xxiv, p. 33 (1891).
" " Riley & How., Ins. Life, v, p. 282 (1893).
" " Ckll., Can. Ent., xxvi, p. 34 (1894).
Habitat.—New Zealand ; California from Australia.
On Fagus fusca.

483. Pseudococcus indicus (Sign.).

Dactylopius indicus Sign., Ann. Soc. Ent. Fr., (5), v, p. 317 (1875).
Habitat.—France.
On Laurus indicus.

484. Pseudococcus kraunhiæ (Kuwana).

Dactylopius kraunhiæ Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 55 (1902).
Habitat.—Japan.
On Kraunhia floribunda.

485. Pseudococcus lanigerus (Full.).

Dactylopius lanigerus Full., Notes on Cocc. W. Austr., p. 10 (1897).
" " " Tr. Ent. Soc. Lond., p. 454 (1899).
Habitat.—West Australia.
On Acacia pulchella.

486. Pseudococcus laurinus (Bdv.).

Coccus laurinus Bdv., Ent. Hort., p. 353 (1869).
Boisduvalia lauri Sign., Ann. Soc. Ent. Fr., (5), v, p. 338 (1875).
Oudablis " Ckll., Check List, p. 325 (1896).
" " " The Entom., xxxiii, p. 85 (1900).
Habitat.—France.
On laurel.

487. Pseudococcus lavandulae (Sign.).

Dactylopius lavandulæ Sign., Ann. Soc. Ent. Fr., (5), v, p. 318 (1875).
" " Ckll., Can. Ent., xxvi, p. 287 (1894).
Habitat.—Europe.
On Lavandula stœchas.

488. Pseudococcus liliacearum (Bouché).

Coccus liliacearum Bouché, Stett. Ent. Zeit. p. 300 (1844).
Dactylopius " Sign., Ann. Soc. Ent. Fr., (5), v, p. 319 (1875).
Habitat.—S. America.
On Liliaceæ.

489. Pseudococcus lobulatus (Mask.).

Dactylopius lobulatus Mask., N. Z. Trans., xxvi, p. 91 (1893).
" " Ckll., Ann. Mag. N. H., (6), xvi, p. 133 (1895).
Habitat.—Australia.
On bark of Eucalyptus globulus.

490. Pseudococcus longispinus (Targ.).

(*Mealy bug.*)

Coccus adonidum corpore roseo, etc., Geoff., Abr. Ins., i, p. 511 (1762).
‖ " " Fourc., Ent. Paris., p. 231 (1785).
" " Oliv., Ency. Meth., vi, p. 94 (1791).
" " Major, Treat. Ins.,pp.120,144, 240, 241 (1829) (Mealy-bug).
" " Burm., Handb. Ent., ii, p. 74 (1835).
Pseudococcus adonidum Westw., Mod. Class. Ins., i, Synop., p. 118 (1839).
Coccus " Blanch., Hist. Nat. Ins., iii, p. 213 (1840).
" " Koll., Inj. Ins., p. 178 (1840).
" " Targ., Studii sul. Cocc., pp. 18, 19, 58 (1867).

Dactylopius longispinus Targ., Catalogue, p. 32 (1869).
" adonidum " " p. 32 (1869).
Coccus " Riley, 3rd Rep. Ins. Mo., p. 96 (1871).
" " " 5th " " " p. 80 (1873).
Dactylopius longispinus " 6th " " " p. 63 (1874).
" adonidum Sign., Ann. Soc. Ent. Fr., (5), v, p. 306 (1875).
" pteridis " " " " " " " p. 321 (1875).
" adonidum Licht., Bull. " " " " vi, p. lxiv (1876).
" " Comst., Rep. U. S. Dep. Ag., 1880, p. 341 (1881).
" longifilis " " " " " " p. 344 (1881).
" longispinus Targ., Annali di Agr., p. 136 (1881).
" adonidum Comst., 2nd Rep. Dep. Ent.Corn.Univ., p. 131 (1883).
" longifilis Saund., Ins. Inj. to Fruits, p. 412 (1883).
" " Targ., Annali di Agr., p. 401 (1884).
" " Lint., 2nd Rep. Ins. N. Y., p. 56 (1885).
" " Comst., Intr. to Ent., p. 138 (1888).
" adonidum Dougl., Ent. Mon. Mag., xxv, p. 314 (1889).
" " Atk., Ind. Mus. Notes, i, p. 6 (1889).
Pseudococcus " Cotes, " " " ii, p. 168 (1893).
Dactylopius longispinus Berl., Riv. Pat. Veg., ii, p. 130 (1893).
" longifilis Ckll., Bull. Bot. Dep. Jam., No. 46, p. 3 (1893).
" " " The Entom., xxvi, p. 266 (1893).
" " Davis, Ins. Life, vii, p. 170 (1894).
" adonidum Mask., The Entom., xxvii, p. 46 (1894).
" " Craw, 4th Bien. Rep. Cal. Bd. Hort., p. 97 (1894).
" " Mask., N.Z. Trans., xxviii, p. 399 (1895).
" longispinus Ckll., Ann. Mag. N. H., (6), xvi, p. 61 (1895).
" " Davis, Spec. Bull. 2, Mich. Exp. Sta., p. 27 (1896).
" longifilis Barlow, Ind. Mus. Notes, iv, p. 75 (1897).
" longispinus Green, Ent. Mon. Mag., xxxiii, p. 73 (1897).
" " Berl. e Leon., Cherm. Ital., Fasc., iii, No. 75 (1898).
" " Osborn, Contr. Ia. Ag. Coll., p. 2 (1898).
" longifilis Newst., Ent. Mon. Mag., xxxiv, p. 98 (1898).
" " Newell, Bull. 43, Ia. Exp. Sta., p. 172 (1899).
" adonidum de Charm., Pr. Soc. Amic. Scien., p. 46 (1899).
" pteridis " " " " " " p. 46 (1899).
" longispinus Ckll., Am. Nat., xxxiii, p. 900 (1899).
" adonidum " Pr. Ac. N. Sci. Ph., p. 261 (1899).
" longifilis Lugger, 6th Rep. Minn. Exp. Sta., p. 211 (1900).
" longispinus Newst., Jn. Roy. Hor. Soc., xxiii, p. 29 (1900).
Pseudococcus adonidum Kirkaldy, Fauna Haw., iii, pt. 2, p. 103 (1902).

Habitat.—Europe; New Zealand; Mauritius; Chili; Jamaica; U. S. On ferns; mango; guava; fig; plum; Croton; Cycas revoluta; Flacourtia sepiaria; Nephrodium amplum; Stangeria schizodon.

491. Pseudococcus luffi (Newst.).

Dactylopius luffi Newst., Ent. Mon. Mag., xxxvii, p. 85 (1901).
Habitat.—England.
On roots of Lepigonum rupestre.

492. Pseudococcus macrozamiæ (Full.).

Dactylopius macrozamiæ Full., Notes on Cocc. W. Austr., p. 10 (1897).
" " " Tr. Ent. Soc. Lond., p. 454 (1899).
Habitat.—W. Australia.
On Macrozamia frazeri.

493. Pseudococcus magnolicida ("von Iher.," King).

Dactylopius magnolicida "von Iher.," King, Rev. Mus. Paul., v, p. 616 (1902).
Habitat.—Brazil.

494. Pseudococcus mamillariæ (Bouché).

Coccus mamillariæ Bouché, Stett. Ent. Zeit., v, p. 302 (1844).
" " Bdv., Ent. Hort., p. 353 (1867).
Dactylopius " Sign., Ann. Soc. Ent. Fr., (5), v, p. 320 (1875).
Habitat.—France ; Central America.
On Mamillaria ; Cactus.

495. Pseudococcus maritimus (Ehrh.).

Dactylopius maritimus Ehrh., Can. Ent., xxxii, p. 315 (1900).
Habitat.—California.
On Eriogonum latifolium.

496. Pseudococcus neomexicanus (Tins.).

Dactylopius kingii var. neomexicanus Tins., Can. Ent., xxx, p. 318 (1898).
" neomexicanus Ckll., Ann. Mag. N. H., (7), vii, p. 334 (1901).
Habitat.—New Mexico.
On roots of Gutierrezia sarothræ.

Pseudococcus neomexicanus alkalinus Ckll.

Pseudococcus neomexicanus var. alkalinus Ckll., Can. Ent., xxxiv, p. 315 (1902).
Habitat.—New Mexico.
On grass.

Pseudococcus neomexicanus indecisus (Ckll.).

Dactylopius neomexicanus var. indecisus Ckll., Can. Ent., xxxiii, p. 209 (1901).
Habitat.—New Mexico.
In nests of Lasius americanus.

Pseudococcus neomexicanus var. B. (Ckll.).

Dactylopius neomexicanus var. B. Ckll., Ann. Mag. N. H., (7), ix, p. 22 (1902).
Habitat.—New Mexico.
On Erigeron.

497. Pseudococcus nipæ (Mask.).

Dactylopius nipæ Mask., N. Z. Trans., xxv, p. 232 (1892).
" " Newst., Ent. Mon. Mag., xxix, p. 187 (1893).
" " Mask., N. Z. Trans., xxvi, p. 88 (1893).
" " " The Entom., xxvii, p. 45 (1894).
" " King, Can. Ent., xxxiv, p. 59 (1902).
Habitat.—Demerara; Mexico; Mass.
On Nipa fruticans; palms.

498. Pseudococcus nubicola (Mask.).

Dactylopius nubicola Mask., Ag. Gaz. N. S. W., ii, p. 352 (1891).
Habitat.—N. S. Wales.
On grass.

499. Pseudococcus obtectus (Mask.).

Dactylopius obtectus Mask., N. Z. Trans., xxii, p. 152 (1889).
" " Ckll., Ann. Mag. N. H., (6), xvi, p. 134 (1895).
Habitat.—New Zealand.
On Fagus fusca.

500. Pseudococcus olivaceus (Ckll.).

Dactylopius olivaceus Ckll., Psyche, vii, Suppl., i, p. 18 (1896).
" " " Bull. 4, T. s., Dep. Ag., p. 36 (1896).
Habitat.—Mexico.
On Yucca australis.

501. Pseudococcus pandani (Ckll.).

Dactylopius pandani Ckll., Psyche, vii, Suppl., i, p. 16 (1895).
Habitat.—Washington Islands, Marquesas Group.
On Pandanus.

502. Pseudococcus parietariæ (Licht.).

Boisduvalia parietariæ Licht., Bull. Soc. Ent. Fr., (6), i, p. cxv (1881).
Oudablis " Ckll., Pr. Ac. N. Sci. Ph., p. 265 (1899).
" " " The Entom., xxxiii, p. 85 (1900).
Habitat.—Europe.
On Parietaria diffusa.

503. Pseudococcus pini (Kuwana).

Dactylopius pini Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 54 (1902).
Habitat.—Japan.
On pine.

504. Pseudococcus poæ (Mask.).

Dactylopius poæ Mask., N. Z. Trans., xi, p. 220 (1878).
" " " Ins. Nox. Agr. N. Z., p. 101 (1887).
" " " N. Z. Trans., xxii, p. 150 (1889).
" " " " " xxiii, p. 23 (1890).
" " " " " xxvi, p. 89 (1893).

Dactylopius poæ Ckll., Can. Ent., xxvi, p. 287 (1894).
" " Lidg., The Wombat, iii, p. 91 (1898).
Habitat.—New Zealand.
On roots of grass.

505. Pseudococcus prosopidis (Ckll.).

Dactylopius prosopidis Ckll., Can. Ent., xxviii, p. 224 (1896).
Habitat.—New Mexico.
On Mesquite.

506. Pseudococcus pseudonipæ (Ckll.).

‖Dactylopius nipæ Davis, Spec. Bull. 2, Mich. Exp. Sta., p. 28 (1896).
" pseudonipæ Ckll., Science Gossip, n. s., iii, pp. 189, 302 (1897).
" " King, Can. Ent., xxxi, p. 112 (1899).
Habitat.—Mass.; Mich.; Cal.; Mexico.
On cocoanut-palm.

507. Pseudococcus quadricaudata (Sign.).

Boisduvalia quadricaudata Sign., Ann. Soc. Ent. Fr., (5), v, p. 339 (1875).
Oudablis " Ckll., Check List, p. 325 (1896).
" " " The Entom., xxxiii, p. 85 (1900).
Habitat.—France.

508. Pseudococcus quaintancii (Tins.).

Dactylopius quaintancii Tins., Can. Ent., xxx, p. 220 (1898).
Habitat.—Florida.
On Rhus copallina.

509. Pseudococcus quercus (Ehrh.).

Dactylopius quercus Ehrh., Can. Ent., xxxii, p. 315 (1900).
Habitat.—California.
On Quercus chrysolepis.

510. Pseudococcus robiniæ (Sign.).

Dactylopius robiniæ Sign., Ann. Soc. Ent. Fr., (5), v, p. 322 (1875).
" " Targ., Annali di Agr., p. 26 (1879).
" " " " " " p. 140 (1881).
Habitat.—The Maritime Alps.
On Acacia.

511. Pseudococcus roseotinctus (T. & W. Ckll.).

Dactylopius roseotinctus T. & W. Ckll., Can. Ent., xxxiii, p. 336 (1901).
Habitat.—New Mexico.
On roots of grass.

512. Pseudococcus ryani (Coq.).

Dactylopius ryani Coq., West Amer. Scientist, vi, pp. 122, 123 (1889).
Habitat.—California.
On Cupressus macrocarpa; Thuja orientalis; Araucaria excelsior.

513. Pseudococcus sacchari (Ckll.).

Dactylopius sacchari Ckll., Jn. Trin. Nat. Club., ii, p. 195 (1895).
" " Berl., Riv. Pat. Veg., iv, p. 384 (1896).
" " Ckll., Pr. Ac. N. Sci. Ph., p. 266 (1899).
" " de Charm., Pr. Soc. Amic. Scien., p. 45 (1899).
Habitat.—Trinidad; Barbados; Porto Rico; Mauritius; Mexico.
On sugar-cane.

514. Pseudococcus salinus (Ckll.).

Dactylopius salinus Ckll., Ann. Mag. N. H., (7), ix, p. 21 (1902).
Habitat.—California.
On grass.

515. Pseudococcus scrobicularum (Green).

Dactylopius scrobicularum Green, Ind. Mus. Notes, iv, No. 1, p. 8 (1896).
Habitat.—Ceylon.
On leaves of Elæocarpus.

516. Pseudococcus secretus (Hemp.).

Dactylopius secretus Hemp., Rev. Mus. Paul., iv, p. 387 (1900).
" " " Ann. Mag. N. H., (7), vi, p. 397 (1900).
Habitat.—Brazil.
On Solanaceæ.

517. Pseudococcus segregatus (Ckll.).

Dactylopius segregatus Ckll., Journ. Inst. Jam., i, p. 254 (1893).
Habitat.—Jamaica.
On grass.

518. Pseudococcus sequoiæ (Coleman).

Dactylopius sequoiæ Coleman, Pr. Cal. Ac. Sci., (3), ii, p. 410 (1901).
Habitat.—California.
On red-wood.

519. Pseudococcus setosus (Hemp.).

Dactylopius setosus Hemp., Rev. Mus. Paul., iv, p. 386 (1900).
" " " Ann. Mag. N. H., (7), vi, p. 396 (1900).
Habitat.—Brazil.
On Ficus.

520. Pseudococcus similans (Lidg.).

Dactylopius similans Lidg., The Wombat, iii, p. 91 (1898).
Habitat.—Victoria.
On roots of Daphne.

521. Pseudococcus simplex (Ckll.).

Dactylopius simplex Ckll., The Entom., xxvi, p. 267 (1893).
" " " Bull. Bot. Dep. Jam., No. 46, p. 3 (1893).
" " " Ann. Mag. N. H., (6), xvi, p. 133 (1895).
Habitat.—Jamaica.
On Pancratium; " Liliaceous plants."

522. Pseudococcus solani (Ckll.).

Dactylopius solani Ckll., Can. Ent., xxvi, p. 286 (1894).
Habitat.—New Mexico.
On potato.

Pseudococcus solani atriplicis (Ckll.).

Dactylopius solani var. atriplicis Ckll., Am. Nat., xxix, p. 729 (1895).
Habitat.—New Mexico.
On Atriplex canescens.

523. Pseudococcus sorghiellus (Forbes).

Coccus sorghiellus Forbes, 14th Rep. Ins. Ill., p. 71 (1885).
" " " 18th " " " p. 106 (1894).
Dactylopius " Tins., Can. Ent., xxxi, pp. 45, 111 (1899).
Habitat.—Illinois; Mass.
On sorghum; in nests of Lasius claviger, L. flavus, L. americanus.

Pseudococcus sorghiellus kingii (Ckll.).

Dactylopius kingii Ckll., Science Gossip, n. s., iii, p. 240 (1899).
" sorghiellus var. kingii King, Can. Ent., xxxi, p. 111 (1899).
Habitat.—New Mexico; Mass.
On roots of corn, sorghum and grass, and in nests of ants.

524. Pseudococcus subterraneus (Hemp.).

Dactylopius subterraneus Hemp., Ann. Mag. N. H., (7), viii, p. 388 (1901).
Habitat.—Argentine Republic.
"On the roots of cultivated grapes."

525. Pseudococcus syringæ (Mask.).

Dactylopius syringæ Mask., N. Z. Trans., xxx, p. 246 (1898).
Habitat.—Japan.
On Syringa.

526. Pseudococcus texensis (Tins.).

Dactylopius texensis Tins., Can. Ent., xxxii, p. 65 (1900).
Habitat.—Texas.
On Acacia Farnesiana.

527. Pseudococcus theobromæ (Dougl.).

Dactylopius theobromæ Dougl., Ent. Mon. Mag., xxv, p. 317 (1889).
" " Ckll., Ann. Mag. N. H., (6), xvi, p. 133 (1895).
Habitat.—England.
On Theobroma cacao.

528. Pseudococcus townsendi (Ckll.).

Bergrothia townsendi Ckll., Ann. Mag. N. H., (6), xii, p. 404 (1893).
Dactylopius (Bergrothia) townsendi Newst., Ent. Mon. Mag., xxxi, p. 236 (1895).
Habitat.—New Mexico.

529. Pseudococcus trifolii (Forbes).

(*Clover-root Mealy bug.*)

Coccus trifolii Forbes, 14th Rep. Ins. Ill., p. 72 (1885).
" " Davis, Can. Ent., xxvi, p. 271 (1894).
Dactylopius trifolii " Bull. 116, Mich. Exp. Sta., p. 58 (1894).
" " " Ins. Life, vii, p. 172 (1894.)
" " Osborn, Contr. Ia. Ag. Coll., p. 2 (1898).
" " Pettit, Bull. 200, Mich. Exp. Sta., p. 193 (1902).
Habitat.—Ill.; Mich.; Ia.; N. Y.
On clover.

530. Pseudococcus tuliparum (Bouché).

Coccus tuliparum Bouché, Stett. Ent. Zeit., v, p. 301 (1844).
Dactylopius " Sign., Ann. Soc. Ent. Fr., (5), v, p. 323 (1875).
Habitat.—S. America.

531. Pseudococcus viburni (Sign.).

Dactylopius viburni Sign., Ann. Soc. Ent. Fr., (5), p. 323 (1875).
Habitat.—France; Maritime Alps.
On Viburnum.

532. Pseudococcus virgatus (Ckll.).

Dactylopius virgatus Ckll., The Entom., xxvi, p. 178 (1893).
" " " Ins. Life, v, pp. 246, 247 (1893).
" " " Bull. Bot. Dep. Jam., No. 46, p. 2 (1893).
" ceriferus Newst., Ind. Mus. Notes, iii, No. 5, p. 24 (1895).
" virgatus Ckll., Can. Ent., xxvii, p. 259 (1895).
" " How., Ins. Life, vii, p. 430 (1895).
" talini Green, Ind. Mus. Notes, iv, No. 1, p. 7 (1896).
" ceriferus Mask., N. Z. Trans., xxix, p. 320 (1897).
" virgatus Tins., Can. Ent., xxx, p. 22 (1898).
" " de Charm., Pr. Soc. Amic. Scien., p. 44 (1899).
Pseudococcus " Kirkaldy, Fauna Haw., iii, pt. 2, p. 103 (1902).
Habitat.—Jamaica; Sandwich Islands; Mauritius; Mexico; Texas.
On Cactus; cocoanut-palm; cotton; violets; Acalypha.

Pseudococcus virgatus farinosus (Ckll.).

Dactylopius virgatus var. farinosus Ckll., The Entom., xxvi, p. 178 (1893).
Habitat.—Jamaica.
On Prosopis juliflora.

Pseudococcus virgatus humilis (Ckll.).

Dactylopius virgatus var. humilis Ckll., The Entom., xxvi, p. 179 (1893).
Habitat.—Jamaica.
On Tribulus cistoides.

533. Pseudococcus viridis (Newst.).

Dactylopius viridis Newst., Ind. Mus. Notes, iii, No. 5, p. 25 (1894).
Habitat.—Madras, India.
On Hygrophila spinosa.

534. Pseudococcus vitis (Niediel.).

Coccus vitis Niediel., Bull. Soc. d' Acclim., (2), vii, p. 328 (1870).
Dactylopius vitis Licht., Bull. Soc. Ent. Fr., (5), ii, pp. lxxiii, lxxiv (1872).
" " " " " " " " iii, p. xiii (1873).
" " Sign., Ann. " " " " v, p. 324 (1875).
" " Goethe, Jahrb. Nass. Ver. Nat., pp. 126, 129 (1884).
" " Lataste, Actes Soc. Sci. Chili, (5), i, p. 24 (1896).
" " Mangin & Viala, Nature, p. 384 (1903).
Habitat.—Europe ; Palestine.
On grape vine.

535. Pseudococcus walkeri (Newst.).

Dactylopius walkeri Newst., Ent. Mon. Mag., xxvii, p. 164 (1891).
" " " Jn. Roy. Hor. Soc., xxiii, p. 27 (1900).
Habitat.—England.
On Agrostis vulgaris ; Dactylus glomeratus.

536. Pseudococcus wheeleri (King).

Dactylopius wheeleri King, Can. Ent., xxxiv, p. 285 (1902).
Habitat.—Texas.
In nests of Camponotus maculatus var. sansabeanus Buckley.

537. Pseudococcus zamiæ (Lucas).

Coccus zamiæ Lucas, Bull. Soc. Ent. Fr., (3), v, p. cvii (1855).
" " Bdv., Ent. Hort., p. 357 (1867).
Dactylopius " Sign., Ann. Soc. Ent. Fr., (5), v, p. 328 (1875).
Habitat.—Europe ; Australia.
On Zamia spiralis.

Genus **ERIUM** Crawf. Type, globosum.

Erium "Crawf.," Mask., N. Z. Trans., xxiv, p. 35 (1891): Ckll., Am. Nat., xxxi, p. 590 (1897); Can. Ent., xxxi, p. 278 (1899).

538. Erium armatum Hemp.

Erium armatum Hemp., Rev. Chil. Hist. Nat., p. 180 (1901).
Habitat.—South America.

539. Erium eriogoni (Ehrh.).

Dactylopius eriogoni Ehrh., Can. Ent., xxxi, p. 103 (1899).
Erium " Ckll., Ann. Mag. N. H., (7), x, p. 465 (1902).
Habitat.—California.
On roots of Eriogonum.

540. **Erium globosum** (Mask.).

Dactylopius globosus Mask., N. Z. Trans., xxiv, p. 34 (1891).
" " Newst., Ent. Mon. Mag., xxxi, p. 167 (1895).
Erium " Ckll., Am. Nat., xxxi, p. 590 (1897).
" " " Can. Ent., xxxi, p. 278 (1899).
Habitat.—Australia.
On Acacia armata; A. decurrens.

541. **Erium irishi** (Ckll.).

Dactylopius Irishi Ckll., Can. Ent., xxxii, p. 129 (1900).
Erium " " Ann. Mag. N. H., (7), x, p. 466 (1902).
Habitat.—Arizona.
On Larrea tridentata.

542. **Erium lichtensioides** (Ckll.).

Dactylopius lichtensioides Ckll., Science Gossip, n. s., iii, p. 199 (1897).
Erium " " Ann. Mag. N. H., (7), x, p. 466 (1902).
Habitat.—Colorado.
On Artemisia frigida.

543. **Erium steelii** (Ckll. & Towns.).

Bergrothia steelii Ckll. & Towns., Ent. News, v, p. 263 (1894).
" townsendi var. steelii Ckll., Ent. News, v, p. 282 (1894).
Erium steelii Ckll.. Ann. Mag. N. H., (7), x, p. 466 (1902).
Habitat.—New Mexico; Mexico.
On Larrea mexicana.

544. **Erium zapotlanum** Ckll.

Erium zapotlanum Ckll., Ann. Mag. N. H., (7), x, p. 465 (1902).
Habitat.—Mexico.
On "Huele de Noche."

Genus **RHIZŒCUS** Künck. Type, falcifer.

Rhizœcus Künck., Ann. Soc. Ent. Fr., (5), viii, p. 163 (1878): Ckll., Can. Ent., xxxi, p. 278 (1899).

545. **Rhizœcus eloti** Giard.

Rhizœcus eloti Giard, C. R. Soc. Biol., Paris, iv, pp. 583, 585 (1897).
Habitat.—Guadeloupe.
On roots of coffee-tree.

546. **Rhizœcus falcifer** Künck.

Rhizœcus falcifer Künck., Ann. Soc. Ent. Fr., (5), viii, p. 164 (1878).
Rhyzæcus " Sign., Bull. " " " (6), ii, p. xxxv (1882).
Rhizœcus " Künck. & Saliba, Bull. Soc. Ent. Fr., (7), i, p. cxvi (1891).
Habitat.—France; Algeria.
On roots of palms and vines.

547. Rhizœcus(?) targionii (Ckll.) in litt., new name.

Dactylopius mammillariæ Targ., Annali di Agr., p. 17 (1884).
Westwoodia sp. n. " " " " p. 402 (1884).
Rhizæcus (?) mammillariæ Ckll., Pr. Ac. N. Sci. Ph., p. 265 (1899).
Habitat.—Italy.
On Mammillaria.

548. Rhizœcus(?) terrestris (Newst.).

Ripersia terrestris Newst., Ent. Mon. Mag., xxxi, pp. 213, 236 (1895).
Rhizæcus " Ckll., Pr. Ac. N. Sci. Ph., p. 265 (1899).
Ripersia " Newst., Jn. Roy. Hor. Soc., xxiii, p. 31 (1900).
" " " " " " " xxvi, p. 745 (1902).
Habitat.—England.
On roots of Stephanotis.

Genus **FONSCOLOMBIA** Licht. Type, radicum-graminis.

Fonscolombia Licht., Bull. Soc. Ent. Fr., (5), vii, p. cviii (1877): Ckll., Can. Ent., xxxi, p. 278 (1899).
Pseudochermes Nitsche, Lehrb. der Mittel., Forstins. (1895).
s. g. Apterococcus Newst., Ent. Mon. Mag., xxxiv, p. 97 (1898). Type. fraxini.

549. Fonscolombia fraxini (Kalt.).

Chermes(?) fraxini Kalt., Die Pflanz., p. 433 (1874).
Eriococcus " Newst., Ent. Mon. Mag., xxvii, p. 165 (1891).
Ripersia " " " " " xxviii, p. 147 (1892).
" " " " " " xxxii, p. 57 (1896).
Coccus " Eckst., Forst. Zool., p. 556 (1897).
Fonscolombia fraxini Ckll., Pr. Ac. N. Sci. Ph., p. 264 (1899).
Apterococcus " Newst., Jn. Roy. Hor. Soc., xxiii, p. 32 (1900).
Habitat.—Europe.
On Fraxinus excelsior.

550. Fonscolombia radicum-graminis (Fonsc.).

?Coccus fragariæ Gmel., Syst. Nat., Ed. xiii, p. 2219 (1789).
" " Oliv., Ency. Meth., vi, p. 97 (1791).
" " Turton, Syst. Nat., p. 715 (1801).
" radicum-graminis Fonsc., Ann. Soc. Ent. Fr., iii, p. 212 (1834).
Porphyrophora " " Baer., D'Alton, Zeit. für Zool., p. 175 (1848).
Lecanopsis? " " Sign., Ann. Soc. Ent. Fr., (5), iv, p. 95 (1874).
Porphyrophora " " " " " " " " v, p. 384 (1875).
Fonscolombia graminis Licht., Bull. " " " " vii, p. cviii (1877).
" " " Ent. Mon. Mag., xiv, p. 35 (1877).
Coccus radicum-graminis " Stett. Ent. Zeit., xxxviii, p. 491 (1877).
Porphyrophora radicum-graminis Newst., Ent. Mon. Mag., xxix, p. 205 (1893).
Fonscolombia " " Ckll., Pr. Ac. N. Sci. Ph., p. 264 (1899).
Habitat.—Europe.
On roots of grass and grain.

Genus **PSEUDORIPERSIA** Ckll. Type, turgipes.

s. g. Pseudoripersia Ckll.. Check List, Suppl., p. 392, footnote (1899); g. Can. Ent., xxxi, p. 278 (1899).

551. **Pseudoripersia turgipes** (Mask.).

Eriococcus turgipes Mask., N. Z. Trans., xxv, p. 228 (1892).
Ripersia " " " " xxix, p. 318 (1896).
Eriococcus " Frog., Agr. Gaz. N. S. W., p. 8 (1900).
Habitat.—Australia.
On Casuarina suberosa.

Genus **RIPERSIELLA** Tins. Type, rumicis.

Ripersiella Tins., Can. Ent., xxxi, p. 278 (1899): Ckll., Pr. Biol. Soc. Wash., xiv, p. 165 (1901).

552. **Ripersiella kelloggi** Ehrh. & Ckll.

Ripersiella kelloggi Ehrh. & Ckll., Pr. Biol. Soc. Wash., xiv, p. 166 (1901).
Habitat.—California.
On roots of bunch-grass.

553. **Ripersiella leucosoma** Ckll.

Ripersiella leucosoma Ckll., Pr. Biol. Soc. Wash., xiv, p. 165 (1901).
Habitat.—New Mexico.
In nests of Lasius americanus, under rocks.

554. **Ripersiella maritima** (Ckll.).

Ripersia maritima Ckll., Ins. Life, vii, p. 42 (1894).
Ripersiella " " Pr. Biol. Soc. Wash., xiv, p. 165 (1901).
Habitat.—Long Island, N. Y.
On roots of Spartina.

555. **Ripersiella rumicis** (Mask.).

Ripersia rumicis Mask., N. Z. Trans., xxiv, p. 37 (1891).
Ripersiella " Ckll., Pr. Biol. Soc. Wash., xiv, p. 165 (1901).
Habitat.—New Zealand.
On Rumex acetosella.

Genus **GEOCOCCUS** Green. Type, radicum.

Geococcus Green, Ent. Mon. Mag., xxxviii, p. 262 (1902).

556. **Geococcus radicum** Green.

Geococcus radicum Green, Ent. Mon. Mag., xxxviii, p. 262 (1902).
Habitat.—Ceylon.
On roots of grass.

Genus **RIPERSIA** Sign. Type, corynephori.

Ripersia Sign., Ann. Soc. Ent. Fr., (5), v, p. 335 (1875): Mask., N. Z. Trans., xix, p. 106 (1886) & xxiv, p. 37 (1891).

s. g. Cryptoripersia Ckll., Can. Ent., xxxi, pp. 5, 278 (1899). Type, arizonensis.

557. **Ripersia arizonensis** Ehrh.

Ripersia arizonensis Ehrh., Can. Ent., xxxi, p. 5 (1899).
Habitat.—Arizona.
In nests of ants.

558. **Ripersia aurantia** Ckll.

Ripersia aurantia Ckll., Ann. Mag. N. H., (7), viii, p. 51 (1901).
Habitat.—New Mexico.
In nests of Lasius americanus.

559. **Ripersia blanchardii** King & Ckll.

Ripersia blanchardii King & Ckll., Can. Ent., xxix, p. 92 (1897).
" " Tins., " " xxxi, p. 46 (1899).
" " King, " " " p. 111 (1899).
Habitat.—Mass.
In nests of Lasius claviger.

560. **Ripersia cockerellæ** King.

Ripersia cockerellæ Ckll., Ann. Mag. N. H., (7), viii, p. 52 (1901) no descr.
" " King, Ent. News, xiii, p. 42 (1902).
Habitat.—New Mexico.
In nests of Lasius neoniger.

561. **Ripersia confusella** Ckll.

Ripersia confusella Ckll., Ann. Mag. N. H., (7), viii, p. 52 (1901).
Habitat.—New Mexico.
In nests of Lasius americanus.

562. **Ripersia corynephori** Sign.

Ripersia corynephori Sign., Ann. Soc. Ent. Fr., (5), v, p. 335 (1875).
Habitat.—France.
On Corynephorus canescens.

563. **Ripersia europæa** Newst.

Ripersia europæa Newst., Ent. Mon. Mag., xxxiii, p. 167 (1897).
Habitat.—Europe.
In nests of ants.

564. **Ripersia fagi** Mask.

Ripersia fagi Mask., N. Z. Trans., xxiii, p. 24 (1890).
" " " The Entom., xxvii, p. 46 (1894).
Habitat.—New Zealand.
On Fagus menziesii.

565. Ripersia festucæ Kuwana.

Ripersia festucæ Kuw., Pr. Cal. Ac. Sci., (3), ii, p. 401 (1901).
" " Ckll., Ann. Mag. N. H., (7), ix, p. 21 (1902).
Habitat.—California.
On Festuca scabrella.

566. Ripersia filicicola Newst.

Ripersia filicicola Newst., Ent. Mon. Mag., xxxiv, p. 96 (1898).
Habitat.—England.
On Trichomanes spicatum.

567. Ripersia fimbriatula Ckll. & King.

Ripersia fimbriatula Ckll., Ann. Mag. N. H., (7), viii, p. 53 (1901).
" " King, Ent. News, xiii, p. 41 (1902).
Habitat.—New Mexico.
In nests of Lasius americanus.

568. Ripersia flaveola Ckll.

Ripersia flaveola Ckll., Can. Ent., xxviii, p. 224 (1896).
" " King, Ent. News, viii, p. 127 (1897).
" " Tins., Can. Ent., xxxi, p. 46 (1899).
" " King, " " " p. 110 (1899).
" " Ckll., Ann. Mag. N. H., (7), viii, p. 53 (1901).
Habitat.—Mass.; New Mexico.
In nests of Lasius interjectus; L. claviger.

569. Ripersia formicicola Mask.

Ripersia formicicola Mask., N. Z. Trans., xxiv, p. 38 (1891).
" " Newst., Ent. Mon. Mag., xxviii, p. 147 (1892).
" " Smith, W. W., Ent. Mon. Mag., xxviii, p. 307 (1892).
" " Newst., Ent. Mon. Mag., xxxiii, p. 167 (1897).
Habitat.—New Zealand.
In nests of Tetramorium striatum; T. nitidum.

570. Ripersia halophila (Hardy).

Coccus halophilus Hardy, Cochenille in Algeria (1860).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 616 (1876).
" " Ckll., Ins. Life, vii, p. 43 (1894).
Dactylopius radicum Newst., Ent. Mon. Mag., xxxi, p. 235 (1895).
Ripersia halophila Ckll., Check List, p. 325, footnote (1896).
Habitat.—Algeria; France; England; Wales.
On Ligusticum scoticum; Radiola rosea; Statice armeria; grass.

571. Ripersia kingii Ckll.

Ripersia kingii Ckll., Can. Ent., xxviii, p. 222 (1896).
" " King, Ent. News, viii, p. 126 (1897).
" " " Can. Ent., xxxi, p. 110 (1899).
Habitat.—Mass.
In nests of ants.

572. Ripersia lasii Ckll.

Ripersia lasii Ckll., Can. Ent., xxviii, p. 223 (1896).
" " King, Ent. News, viii, p. 126 (1897).
" " " Psyche, viii, p. 312 (1899).
" " " Can. Ent., xxxi, p. 110 (1899).
" basi (error) King, Can. Ent., xxxiv, p. 159 (1902).
Habitat.—Can.; Mass.
On roots of Asters; in nests of ants.

573. Ripersia leptospermi Mask.

Ripersia leptospermi Mask., Tr. Roy. Soc. S. Austr., p. 106 (1888).
" " " N. Z. Trans., xxv, p. 235 (1892).
" " Newst., Ent. Mon. Mag., xxviii, p. 147 (1892).
Habitat.—S. Australia.
On Leptospermum lævigatum.

574. Ripersia magna T. & W. Ckll.

Ripersia magna T. & W. Ckll., Ann. Mag. N. H., (7), viii, p. 56 (1901).
Habitat.—New Mexico.

575. Ripersia minima Tins. & King.

Ripersia minima Tins. & King, Ent. News, x, p. 57 (1899).
" " King, Can. Ent., xxxi, p. 111 (1899).
Habitat.—Mass.
In nests of Lasius americanus.

576. Ripersia montana Newst.

Ripersia montana Newst., Ent. Mon. Mag., xxxiv, p. 97 (1898).
" " " " " " xxxvi, p. 249 (1900).
Habitat.—France; Italy.
On roots of grass and Compositæ; in nests of ants.

577. Ripersia myrmecophila Mask.

Ripersia myrmecophila Mask., N. Z. Trans., xxx, p. 244 (1897).
Habitat.—Michigan.

578. Ripersia porteræ Ckll.

Ripersia porteræ Ckll., Ann. Mag. N. H., (7), viii, p. 53 (1901).
Habitat.—New Mexico.
On roots of grass.

579. Ripersia pulveraria Newst.

Ripersia pulveraria Newst., Ent. Mon. Mag., xxviii, p. 145 (1892).
" " " " " " xxix, p. 78 (1893).
Habitat.—England.
On Agrostis vulgaris.

580. Ripersia pupifera (Licht.).

Ritsemia pupifera Licht., Stett. Ent. Zeit., xl, p. 387 (1879).
" " " C. R. Acad. Sci., Paris, p. 870 (1879).
" " Sign., Bull. Soc. Ent. Fr., (5), ix, p. lxvi (1879).
" " Ckll., Ann. Mag. N. H., (5), iii, p. 456 (1879).
" " Licht., Am. Nat., xvii, p. 977 (1883).
Ripersia " Ckll., in litt. (1902).
Habitat.—France.
On elm.

581. Ripersia sacchari Green.

Ripersia sacchari Green, Ind. Mus. Notes, v, p. 37 (1900).
Habitat.—India.
On sugar cane.

582. Ripersia salmonacea Ckll.

Ripersia salmonacea Ckll., Ann. Mag. N. H., (7), viii, p. 54 (1901).
Habitat.—New Mexico.
On roots of grass.

583. Ripersia serrata Tins.

Ripersia serrata Tins., Can. Ent., xxxii, p. 66 (1900).
Habitat.—Trinidad.

584. Ripersia sporoboli Ckll.

Ripersia sporoboli Ckll., Ann. Mag. N. H., (7), ix, p. 20 (1902).
Habitat.—New Mexico.
On stems of Sporobolus depauperatus.

585. Ripersia subterranea Newst.

Ripersia subterranea Newst., Ent. Mon. Mag., xxix, p. 79 (1893).
Habitat.—England.
On roots of Nardus stricta; in nests of Formica flava.

586. Ripersia tenuipes Ckll.

Ripersia tenuipes Ckll., Ann. Mag. N. H., (7), viii, p. 54 (1901).
Habitat.—New Mexico.
On roots of grass.

587. Ripersia tomlinii Newst.

Ripersia tomlinii Newst., Ent. Mon. Mag., xxviii, p. 146 (1892).
" " " " " " xxix, pp. 77, 207 (1893).
" " " " " " xxxiii, p. 168 (1897).
Habitat.—England.
On grass roots; in nests of ants.

588. Ripersia trichura Ckll.

Ripersia trichura Ckll., Ann., Mag. N. H., (7), viii, p. 55 (1901).
Habitat.—New Mexico.
On roots of grass.

589. **Ripersia trivittata** Ckll.

Ripersia trivittata Ckll., Ann. Mag. N. H., (7), viii, p. 55 (1901).
Habitat.—New Mexico.
In nests of Lasius americanus.

590. **Ripersia tumida** Newst.

Ripersia tumida Newst., Ent. Mon. Mag., xxxiii, p. 168 (1897).
Habitat.—Algeria.
In nests of Camponotus.

591. **Ripersia villosa** Ehrh.

Ripersia villosa Ehrh., Can. Ent., xxxi, p. 6 (1899).
Habitat.—California.
On Quercus agrifolia.

592. **Ripersia viridula** Ckll.

Ripersia viridula Ckll., Ann. Mag. N. H., (7), viii, p. 56 (1901).
Habitat.—New Mexico.
In nests of Lasius americanus.

593. **Ripersia wasmanni** Newst.

Ripersia wasmanni Newst., Ent. Mon. Mag., xxxvi, p. 249 (1900).
Habitat.—France; Germany.
In nests of Lasius alienus.

Genus **CHÆTOCOCCUS** Mask. Type, bambusæ.

Chætococcus Mask., N. Z. Trans., xxx, p. 249 (1898): Ckll., Can. Ent., xxxi, p. 278 (1899).

594. **Chætococcus bambusæ** (Mask.).

Sphærococcus bambusæ Mask., N. Z. Trans., xxv, p. 237 (1892).
Chætococcus " Ckll., Rev. Mus. Paul., iii, p. 501 (1898).
Kermicus " " The Entom., xxxii, p. 93 (1899).
Sphærococcus " de Charm., Pr. Soc. Amic. Scien., p. 48 (1899).
Chætococcus " Hemp., Rev. Mus. Paul., iv, p. 397 (1900).
Habitat.—Sandwich Islands; Mauritius; Ceylon; Brazil.
On bamboo (Bambusa).

Genus **CRYPTOCOCCUS** Dougl. Type, fagi.

Cryptococcus Dougl., Ent. Mon. Mag., xxvi, p. 155 (1890): Sulc, Sitzb. K. Bohm. Ges. Wiss., No. xlix, pp. 13, 22 (1895): Ckll., Can. Ent., xxxi, p. 279 (1899).

595. **Cryptococcus fagi** (Baer.).

Coccus fagi Baer., D'Alton, Zeit. für Zool., p. 174 (1849).
" " Walk., Cat. Br. Mus., Hom., p. 1086 (1852).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 615 (1876).

Pseudococcus fagi Dougl., Ent. Mon. Mag., xxiii, p. 152 (1886).
Cryptococcus " " " " " xxvi, p. 155 (1890).
Coccus " Eckst., Forst. Zool., p. 556 (1897).
Cryptococcus " Ormerod, Rep. Inj. Ins., p. 139 (1900).
" " Newst., Jn. Roy. Hor. Soc., xxiii, p. 31 (1900).
Habitat.—Europe.
On beech (Fagus).

Genus **KUWANINA** Ckll. Type, parvus.

Kuwanina Ckll., [" Kuwanina differs from Antonina by the larva having 3 or 4 jointed antennae." Ckll. 1902].

596. Kuwanina parvus (Mask.).

Sphærococcus parvus Mask., Ent. Mon. Mag., xxxiii, p. 244 (1897).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 56 (1902).
Kuwanina " Ckll., in litt. (1902).
Habitat.—Japan.
On cherry.

Genus **ANTONINA** Sign. Type, purpurea.

Antonina Sign., Ann. Soc. Ent. Fr., (5), v, p. 24 (1875): Ckll., Can. Ent., xxxi, p. 279 (1899).
Laboulbenia Licht., Mittheil. Schw. Ent. Ges., v, p. 229 (1878).

597. Antonina boutelouæ Parr.

Antonina boutelouæ Parr., Bull. 98, Kan. Exp. Sta., p. 138 (1900).
Habitat.—Kansas.
On Bouteloua hirsuta.

598. Antonina crawi Ckll.

Antonina crawi Ckll., Psyche, ix, p. 70 (1900).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 57 (1902).
Habitat.—Japan ; California.
On bamboo.

599. Antonina graminis (Mask.).

Sphærococcus graminis Mask., Ent. Mon. Mag., xxxiii, p. 244 (1897).
Kermicus " Ckll., Check List, Suppl., p. 392 (1899).
Antonina " " in litt. (1902).
Habitat.—China.
On grass.

600. Antonina nortoni Parr. & Ckll.

Antonina nortoni Parr. & Ckll., Can. Ent., xxxi, p. 280 (1899).
" " " Bull. 98, Kan. Exp. Sta., p. 140 (1900).
Habitat.—Kansas.
On Bouteloua racemosa.

601. Antonina parrotti Ckll. new name.

‖Antonina graminis Parr., Bull. 98, Kan. Exp. Sta., p. 140 (1900).
" parrotti Ckll., in litt. (1902).
Habitat.—Kansas.
On grasses.

602. Antonina purpurea Sign.

Antonina purpurea Sign., Ann. Soc. Ent. Fr., (5), v, p. 25 (1875).
Laboulbenia brachypodii Licht., Mitth. Schw. Ent. Ges., v, p. 299 (1878).
Antonina purpurea Licht., Ann. Soc. Ent. Fr., (5), ix, p. 45 (1879).
" brachypodii Ckll., Check List, p. 324 (1896).
" purpurea Parr., Bull. 98, Kan. Exp. Sta., p. 138 (1900).
Habitat.—France.
On grass.

603. Antonina socialis Newst.

Antonina socialis Newst., Ent. Mon. Mag., xxxvii, p. 85 (1901).
Habitat.—England, in greenhouses.
On Arundinaria japonica.

Genus **KERMICUS** Newst. Type, wroughtoni.

Kermicus Newst., Ent. Mon. Mag., xxxiii, p. 170 (1897): Ckll., Can. Ent., xxxi, p. 279 (1899).

604. Kermicus wroughtoni Newst.

Kermicus wroughtoni Newst., Ent. Mon. Mag., xxxiii, p. 170 (1897).
Habitat.—India.

Genus **TERMITOCOCCUS** Silv.

Termitococcus Silv.,Boll.Mus.Torino,xvi, No. 395, p. 4 (1901). Type, aster.
The location of this genus is uncertain.

605. Termitococcus aster Silv.

Termitococcus aster Silv., Boll. Mus. Torino, xvi, No. 395, p. 4 (1901).
Habitat.—Paraguay.
In ants' nests.

606. Termitococcus brevicornis Silv.

Termitococcus brevicornis Silv., Boll. Mus. Torino, xvi, No. 395, p. 4 (1901).
Habitat.—Cuyabà, Brazil.
In ants' nests.

Subfamily TACHARDIINÆ.

Genus **TACHARDIA** R. Blanchard. Type, lacca.

‖Carteria Sign., Ann. Soc. Ent. Fr., (5), iv, p. 101 (1874): Comst., Rep. U. S. Dep. Ag., 1881-2, p. 209 (1882): Mask., N. Z. Trans., xxiv, p. 54 (1891).
Tachardia R. Blanch., Zoologie Medicale, i, p. ? (1886): Sign., Bull. Soc. Ent. Fr., (6), vi, p. lxii (1886): Mask., N. Z. Trans., xxix, p. 330 (1897).
s. g. Tachardiella Ckll., The Entom., xxxiv, p. 249 (1891). Type, cornuta.
s. g. Tachardina " " " " p. 249 (1891). Type, albida.

607. Tachardia acaciæ (Mask.).

Carteria acaciæ Mask., N. Z. Trans., xxiv, p. 56 (1891).
" " Targ., Contr. l'etude Gom. laques, p. 121 (1893).
Tachardia " " " On species of Lacca," p. 31 (1893).
" " Frog., Scale Ins. Lac, p. 5 (1900).
Habitat.—Australia.
On Acacia greggii.

608. Tachardia actinella Ckll. & King.

Tachardia actinella Ckll. & King, The Entom., xxxiv, p. 342 (1901).
Habitat.—Natal.

609. Tachardia albida Ckll.

Tachardia albida Ckll., The Entom., xxxiv, p. 249 (1901).
Habitat.—Natal.
On Mimosa.

610. Tachardia australis Frog.

Tachardia australis Frog., Scale Ins. Lac, p. 3 (1900).
Habitat.—Australia.
On Beyeria viscosa.

611. Tachardia convexa Full.

Tachardia convexa Full., Tr. Ent. Soc. Lond., p. 457 (1899).
Habitat.—W. Australia.
On Hypocalymma.

612. Tachardia cornuta Ckll.

Tachardia cornuta Ckll., Can. Ent., xxvi, p. 284 (1894).
" " " The Entom., xxxv, p. 178 (1902).
Habitat.—New Mexico; Mexico.
On Parthenium incanum.

613. Tachardia cydoniæ Hemp.

Tachardia cydoniæ Hemp., Rev. Mus. Paul., iv, p. 410 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 120 (1901).
Habitat.—Brazil.
On Cydonia.

614. Tachardia decorella (Mask.).

Carteria decorella Mask., N. Z. Trans., xxv, p. 247 (1892).
Tachardia " " " " xxvii, p. 70 (1894).
" " " " " xxviii, p. 408 (1896).
Carteria " Barlow, Ind. Mus. Notes, iv, No. 2, p. 58 (1896).
Tachardia " Frog., Scale Ins. Lac, p. 4 (1900).
Habitat.—Australia; India; China.
On Myrica cerifera; Gardenia florida; Eugenia Smithii; Leucopogon microphyllus; Monotoca elliptica; tea plant.

615. Tachardia fulgens Ckll.

Tachardia fulgens Ckll., Psyche, vii, Suppl., i, p. 1 (1895).
" " " Pr. Ent. Soc. Lond., p. xxi (1895).
Habitat.—Arizona; Mexico.
On Mimosa; Prosopis; Coursetia glandulosa.

616. Tachardia fulvoradiata Ckll.

Tachardia fulvoradiata Ckll., Ann. Mag. N. H., (7), i, p. 431 (1898).
Habitat.—Mexico.
On "Palo de gusano."

617. Tachardia gemmifera Ckll.

Tachardia gemmifera Ckll., Can. Ent., xxv, p. 181 (1893).
" " Targ., Contr. l'etude Gom. laques, p. 121 (1893).
" " " "On Species of Lacca," p. 32 (1893).
Habitat.—Jamaica.
On Chrysobalanus icaco.

618. Tachardia ingæ Hemp.

Tachardia ingæ Hemp., Rev. Mus. Paul., iv, p. 415 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 124 (1901).
Habitat.—Brazil.
On Inga.

619. Tachardia lacca (Kerr).

Coccus lacca Kerr, Philos. Trans., lxxi, p. 374 (1782).
" ficus Fab., Mant. Ins., ii, p. 319 (1787).
" " Gmel., Syst. Nat., Ed. xiii, p. 2218 (1789).
" " Oliv., Ency. Meth., vi, p. 96 (1791).
" " Fab., Ent. Syst., iv, p. 225 (1794).
" " Turton, Syst. Nat., p. 713 (1801).
" " Fab., Syst. Rhyng., p. 308 (1803).

Coccus lacca Ratz., Mediz. Zool., ii, p. 226 (1833).
" " Blanch., Hist. Nat. Ins., iii, p. 213 (1840).
" " Carter, Ann. Mag. N. H., (3), vii, pp. 1, 10 (1861).
Carteria " Sign., Ann. Soc. Ent. Fr., (5), iv, p. 102 (1874).
" " Comst., Rep. U. S. Dep. Ag., 1881, p. 209 (1882).
" " " 2nd Rep. Dep. Ent. Corn. Univ., p. 130 (1883).
" " Blanch., Les Coccides utiles. p. 36 (1883).
" " Uhler, St. Nat. Hist., ii, p. 216 (1884).
" " Comst., Intr. Ent., p. 136 (1888).
" " Riley, Ins. Life, i, p. 345 (1889).
" " Targ., Contr. l'etude Gom. laques, pp. 104, 119 (1893).
" " " "On Species of Lacca," pp. 15, 29 (1893).
" " Comst., Man. Ins., p. 166 (1895).
" " Lint., 11th Rep. Ins. N. Y., p. 201 (1896).
Tachardia" Green, Cocc. Ceylon, pt. i, p. 3 (1896).
" " Ckll., Check List, p. 328 (1896).
" " How., Bull. 9. n. s., Dep. Ag., p. 38 (1897).
" " Newst., Jn. Roy. Hor. Soc., xxiii, p. 1 (1900).

Habitat.—British Guiana; India; Ceylon.

On banyan; fig; Rhamnus; Mimosa; Anona, etc.

620. Tachardia larreæ (Comst.).

Carteria larreæ Comst., Rep. U. S. Dep. Ag., 1881, p. 211 (1882).
" " Blanch., Les Coccides utiles, p. 50 (1883).
" " Sign., Bull. Soc. Ent. Fr., (6), vi, p. lxii (1886).
" " Riley, Ins. Life, i, p. 345 (1889).
" " Targ., Contr. l'etude Gom. laques, p. 119 (1893).
Tachardia" Ckll., Can. Ent., xxvi, p. 31 (1894).
" " How., Ins. Life, Vol. vii, p. 369 (1895).
" " " Bull. 9, n. s., Dep. Ag., p. 38 (1897).
" " Ckll., Bull. 32, Ariz. Exp. Sta., p. 285 (1899).

Habitat.—Southwestern United States; Mexico.

On Larrea mexicana.

621. Tachardia melaleucæ (Mask.).

Carteria melaleucæ Mask., N. Z. Trans., xxiv, p. 54 (1891).
" " " " " xxv, p. 249 (1892).
" " Targ., Contr. l'etude Gom. laques, p. 120 (1893).
" " " "On Species of Lacca, p. 31 (1893).
Tachardia " Mask., N. Z. Trans., xxvii, p. 31 (1894).
" " " " " xxviii, p. 381 (1895).
" " Full., Tr. Ent. Soc. Lond., p. 457 (1899).
" " Frog., Scale Ins. Lac, p. 4 (1900).

Habitat.—Australia.

On Melaleuca uncinata; M. pustulata; Eucalyptus; Leptospermum; Aster axillaris.

622. Tachardia mexicana (Comst.).

Carteria mexicana Comst., Rep. U. S. Dep. Ag.. 1881. p. 212 (1882).
" " Blanch., Les Coccides utiles. p. 51 (1883).
" " Sign., Bull. Soc. Ent. Fr., (6). vi. p. lxii (1886).
" " Targ., Contr. l'etude Gom. laques, p. 120 (1893).
" " " "On Species of Lacca," p. 31 (1893).
Tachardia " Towns. & Ckll., Jn. N. Y. Ent. Soc., vi. p. 173 (1898).
Habitat.—Mexico.
On Mimosa.

623. Tachardia nigra Towns. & Ckll.

Tachardia nigra Towns. & Ckll., Jn. N. Y. Ent. Soc., vi, p. 172 (1898).
Habitat.—Mexico.
On Acacia.

624. Tachardia parva Hemp.

Tachardia parva Hemp., Rev. Mus. Paul.. iv, p. 413 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 122 (1901).
Habitat.—Brazil.
On Myrtaceæ.

625. Tachardia pustulata Ckll.

Tachardia pustulata Ckll., Psyche, vii, Suppl., i, p. 2 (1895).
" " " Pr. Ent. Soc. Lond., p. xxi (1895).
Habitat.—Arizona.

626. Tachardia rosæ Hemp.

Tachardia rosæ Hemp.. Rev. Mus. Paul., iv. p. 414 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 123 (1901).
Habitat.—Brazil.
On cultivated roses.

627. Tachardia rotundata T. & W. Ckll.

Tachardia rotundata T. & W. Ckll., Ann. Mag. N. H., (7), xi, p. 165 (1903).
Habitat.—Mexico.
On "Zicna;" "Guasima."

628. Tachardia rubra Hemp.

Tachardia rubra Hemp., Rev. Mus. Paul.. iv. p. 411 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 121 (1901).
Habitat.—Brazil.
On Cydonia: Croton.

Genus GASCARDIA Targ. Type. madagascariensis.

Gascardia Targ., Contr. à l'Etude Gommes Laques, Indes, Madagascar, p. 88 (1893); Bull. Soc. Ent. Ital., xxvi, p. 456 (1894).

629. Gascardia madagascariensis Targ.

Gascardia madagascariensis Targ., Contr. à l'Etude Gom. Laques. p. 88 (1893).
" " " Bull. Soc. Ent. Ital., xxvi, p. 456 (1894).
Habitat.—Madagascar.
On laurel.

Subfamily COCCINÆ.

Genus CERONEMA Mask. Type, banksiæ.

Ceronema Mask., N. Z. Trans., xxvii, p. 55 (1894): Ckll., Can. Ent., xxxi, p. 330 (1899).

630. Ceronema banksiæ Mask.

Ceronema banksiæ Mask., N. Z. Trans., xxvii, p. 56 (1894).
" " Full., Tr. Ent. Soc. Lond., p. 460 (1899).
Habitat.—Australia.
On Banksia serrata: B. ilicifolia: B. attenuata: B. menziesii.

631. Ceronema dryandræ Full.

Ceronema dryandræ Full., Notes on Cocc. W. Austr., p. 6 (1897).
" " " Tr. Ent. Soc. Lond., p. 460 (1899).
Habitat.—W. Australia.
On Dryandra floribunda: D. nivea.

632. Ceronema japonica Mask.

Ceronema japonica Mask., Ent. Mon. Mag., xxxiii, p. 243 (1897).
" " Green, Ind. Mus. Notes, v, No. 1, p. 11 (1900).
Habitat.—Japan: India.
On Ilex crenata: tea-plant.

Genus ERIOCHITON Mask. Type, hispidus.

Eriochiton Mask., N. Z. Trans., xix, p. 46 (1886): Ins. Nox. Agr. N. Z., p. 84 (1887): Ckll., Can. Ent., xxxi, p. 330 (1899).

633. Eriochiton hispidus Mask.

Eriochiton hispidus Mask., N. Z. Trans., xix, p. 47 (1886).
" " " Ins. Nox. Agr. N. Z., p. 84 (1887).
Habitat.—New Zealand.
On Olearia haastii.

634. Eriochiton spinosus (Mask.).

Ctenochiton spinosus Mask., N. Z. Trans., xi, p. 212 (1878).
" " " " " xii, p. 292 (1879).
" " " " " xiv, p. 218 (1881).
" " " " " xvii, p. 25 (1884).

Eriochiton spinosus Mask., Ins. Nox. Agr. N. Z., p. 86 (1887).
Habitat.—New Zealand.
On Atherosperma Novæ-Zelandiæ; Melicope ternata; Elæocarpus dentatus; Muhlenbeckia adpressa.

635. Eriochiton theæ Green.

Eriochiton theæ Green, Ind. Mus. Notes, v, No. 1, p. 10 (1900).
Habitat.—India.
On tea-plant.

Genus **TAKAHASHIA** Ckll. Type, japonica.

s. g. Takahashia Ckll., Bull. 4, T. s., Dep. Ag., p. 47 (1896); g. Can. Ent., xxxi, p. 331 (1899).

636. Takahashia jaliscensis T. & W. Ckll.

Takahashia jaliscensis T. & W. Ckll., Ann. Mag. N. H., (7), x, p. 466 (1902).
Habitat.—Mexico.
On Rhus?

637. Takahashia japonica (Ckll.).

Pulvinaria (Takahashia) japonica Ckll., Psyche, vii, Suppl., i, p. 20 (1896).
" " " " Bull. 4, T. s., Dep. Ag., p. 47 (1896).
Takahashia japonica Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 61 (1902).
Habitat.—Japan.
On mulberry.

Genus **PULVINARIA** Targ. Type, vitis.

Pulvinaria Targ., Catalogue, p. 34 (1869): Sign., Ann. Soc. Ent. Fr., (5), iii, p. 29 (1873): Ckll., Can. Ent., xxxi, p. 331 (1899).
s. g. Protopulvinaria Ckll., Jn. Trin.Nat.Club,i, p.309 (1894). Type,convexa.
Pulvinella Hemp., Rev. Mus. Paul., iv, p. 480 (1900). Type, pulchella.

638. Pulvinaria acericola (Walsh & Riley).

Lecanium acericola Walsh & Riley, Am. Ent., i, p. 14 (1868).
" " Putn., Tr. Ia. Hor. Soc., p. 318 (1877).
" " Thom., 7th Rep. Ins. Ill., pp. 5, 120 (1878).
Pulvinaria " Ckll., Check List, p. 329 (1896).
" " Howard, Bull. 22, n. s., Dep. Ag., p. 16 (1900).
" " Quaint. & Scott, Cocc. Amer., Dec. iii-iv, No. 6 (1901).
" " King, Can. Ent., xxxiv, p. 61 (1902).
Habitat.—Mass.; N. Y.; N. J.; D. C.; Tenn.; W. States.
On maple.

639. Pulvinaria amygdali Ckll.

Pulvinaria amygdali Ckll., Can. Ent., xxviii, p. 225 (1896).
" " Ckll. & Parr., The Industrialist, p. 281 (1899).
" " Quaint. & Scott, Cocc. Amer., Dec. iii-iv, No. 7 (1901).
Habitat.—New Mexico; Georgia.
On peach; apple; plum.

640. **Pulvinaria artemisiæ** Sign.

Pulvinaria artemisiæ Sign., Ann. Soc. Ent. Fr., (5), iii, p. 31 (1873).
Habitat.—France.
On Artemisia.

641. **Pulvinaria aurantii** Ckll.

Pulvinaria aurantii Ckll., Bull. 4, T. s., Dep. Ag., p. 48 (1896).
" " " Psyche, vii, Suppl., i, p. 19 (1896).
" " " Annali di Agr., p. 103 (1898).
" " " Pr. Ac. N. Sci. Ph., p. 272 (1899).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 58 (1902).
Habitat.—Japan.
On orange; tea-plant; Eurya ochnacea.

642. **Pulvinaria betulæ** (Linn.).

Coccus betulæ Linn., Syst. Nat., Ed. x, i, p. 455 (1758).
" " " Faun. Suec., Ed. ii, p. 265 (1761).
" " " Syst. Nat., Ed. xii, i, p. 740 (1766).
" " Fab., Gen. Ins., p. 304 (1776).
" " Mod., Act. Goth., i, p. 23 (1778).
" " Fab., Spec. Ins., ii, p. 394 (1781).
" " " Mant. Ins., ii, p. 319 (1787).
" " Gmel., Syst. Nat., p. 2216 (1789).
" " DeVillers, Syst. Nat., p. 560 (1789).
Chermes " Oliv., Ency. Meth., vii, p. 442 (1792).
Coccus " Fab., Ent. Syst., iv, p. 226 (1794).
" " Turton, Syst. Nat., p. 713 (1801).
" " Fab., Syst. Rhyng., p. 308 (1803).
" " Bechst., Forstins., i, p. 285 (1804).
Pulvinaria " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 31 (1873).
Lecanium " Kalt., Die Pflanz., p. 610 (1874).
Pulvinaria " Dougl., Ent. Mon. Mag., xxvii, p. 98 (1891).
" " Ckll., The Entom., xxxiv, p. 91 (1901).
Habitat.—Europe.
On Betula alba.

Pulvinaria betulæ alni Dougl.

Pulvinaria betulæ var. alni Dougl., Ent. Mon. Mag., xxvii, p. 100 (1891).
Habitat.—England.
On Alnus glutinosa.

643. **Pulvinaria bigeloviæ** Ckll.

Pulvinaria bigeloviæ Ckll., Tr. Am. Ent. Soc., xx, p. 366 (1893).
" " " Pr. U. S. Nat. Mus., xvii, p. 623, note (1895).
" " " Pr. Ac. N. Sci. Ph., pp. 272, 273 (1899).
Habitat.—California; Colorado.
On Bigelovia.

Pulvinaria bigeloviæ marmorata Ckll.

Pulvinaria marmorata Ckll., The Entom., xxxi, p. 130 (1898).
" bigeloviæ var. marmorata Ckll., Check List, Suppl., p. 394 (1899).
Habitat.—New Mexico.

644. **Pulvinaria broadwayi** Ckll.

Pulvinaria broadwayi Ckll., Jn. Trin. Field Nat. Club, ii. p. 306 (1896).
" " " Psyche, vii, Suppl., i, p. 19 (1896).
Habitat.—Grenada.

645. **Pulvinaria camelicola** Sign.

Pulvinaria camelicola Sign., Ann. Soc. Ent. Fr., (5), iii, p. 32 (1873).
" camellicola Mask., N. Z. Trans., xi, p. 207 (1878).
" " Dougl., Ent. Mon. Mag., xxii, p. 159 (1885).
" " " " " " xxiii, p. 81 (1886).
" " " " " " " p. 243 (1887).
" " Mask., Ins. Nox. Agr. N. Z., p. 83 (1887).
" " Riley & How., Ins. Life, v, p. 282 (1893).
" " Ckll., Can. Ent., xxvii, p. 258 (1895).
" " Green, Ent. Mon. Mag., xxxiii, p. 73 (1897).
" camelicola Berl. e Leon., Riv. Pat. Veg., vi,pp.319,321,326 (1898).
" " " " Annali di Agr., p. 47 (1898).
" " " " Cherm. Ital., Fasc. iii, No. 70 (1898).
" camellicola Ckll., Pr. Ac. N. Sci. Ph., pp. 272, 273 (1899).
" " Green, Ind. Mus. Notes, v, p. 7 (1900).
Habitat.—Southern States; Europe; Australia; New Zealand; Japan.
On Camellia; Euonymus; Oncidium papilio; Calanthe natalensis.

646. **Pulvinaria cariei** deCharm.

Pulvinaria cariei de Charm., Pr. Soc. Amic. Scien., p. 41 (1899).
Habitat.—Mauritius.

647. **Pulvinaria carpini** (Linn.).

Coccus carpini Linn., Syst. Nat., Ed. x, i, p. 455 (1758).
" " " Faun. Suec., Ed. ii, p. 265 (1761).
Chermes " serico albo Geoff., Abr. Ins., i, p. 508 (1762).
? " mespili " " " " " " p. 508 (1762).
Coccus carpini Linn., Syst. Nat., Ed. xii, i, p. 740 (1766).
" " Fab., Gen. Ins., p. 304 (1776).
" " Mod., Act. Goth., p. 29 (1778).
" " Fab., Spec. Ins., ii, p. 394 (1781).
Chermes " Fourc., Ent. Par., i, p. 230 (1785).
? " mespili " " " " p. 230 (1885).
Coccus carpini Fab., Mant. Ins., ii, p. 319 (1787).
" " Gmel., Syst. Nat., Ed. xiii, p. 2216 (1789).
" " DeVillers, Syst. Nat., p. 560 (1789).
Chermes " Oliv., Ency. Meth., vii, p. 441 (1792).
? " mespili " " " " p. 441 (1792).

Coccus carpini Fab., Ent. Syst., iv, p. 226 (1794).
" " Turton, Syst. Nat., p. 713 (1801).
" " Fab., Syst. Rhyng., p. 309 (1803).
" " Bechst., Forstins., i, p. 285 (1804).
" " Leunis, Stett. Ent. Zeit., iii, p. 190 (1842).
?Lecanium " Ratz., Forstins., iii, p. 194 (1844).
Pulvinaria " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 34 (1873).
? " mespili Ckll., The Entom., xxxiv, p. 90 (1901).
" carpini " " " " p. 91 (1901).
Habitat.—Europe.
On Carpinus; Mespilus.

648. Pulvinaria cestri (Bouché).

Lecanium cestri Bouché, Schädl. Gart. Ins., p. 50 (1833).
Chermes " Bdv., Ent. Hort., p. 336 (1867).
Pulvinaria " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 34 (1873).
Habitat.—France?
On Cestrus; Hibiscus and other Malvaceæ.

649. Pulvinaria cockerelli King.

Pulvinaria cockerelli King, Psyche, viii, p. 417 (1899).
" " " Can. Ent., xxxiv, p. 61 (1902).
Habitat.—Mass.
On Spiræa salicifolia; Prinos verticillatus.

650. Pulvinaria convexa (Hemp.).

Protopulvinaria convexa Hemp., Rev. Mus. Paul., iv, p. 485 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 71 (1901).
Habitat.—Brazil.
On stems of Smilax.

651. Pulvinaria cupaniæ Ckll.

Pulvinaria cupaniæ Ckll., Tr. Ent. Soc. Lond., p. 159 (1893).
" " " Ins. Life, v, p. 159 (1893).
" " " Bull. Bot. Dep. Jam., ii, p. 101 (1895).
" " " Pr. Ac. N. Sci. Ph., pp. 272, 273 (1899).
Habitat.—Jamaica.
On Cupania edulis; Bignonia magnifica; guava, etc.

652. Pulvinaria dendrophthoræ (Ckll.).

Lecanium dendrophthoræ Ckll., Ins. Life, iv, p. 333 (1892).
Pulvinaria " " Tr. Ent. Soc. Lond., p. 162 (1893).
" " " Bull. Bot. Dep. Jam., ii, p. 102 (1895).
Habitat.—Jamaica.
On Dendrophthora cupressoides.

653. Pulvinaria depressa Hemp.

Pulvinaria depressa Hemp., Rev. Mus. Paul., iv, p. 490 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 102 (1901).
Habitat.—Brazil.
On Miconia.

654. Pulvinaria dodonææ Mask.

Pulvinaria dodonææ Mask., N. Z. Trans., xxv, p. 222 (1892).
Habitat.—Australia.
On Dodonæa bursarifolia; Myoporum.

655. Pulvinaria ehrhorni King.

Pulvinaria ehrhorni King, Can. Ent., xxxiii, p. 145 (1901).
Habitat.—California.
On willow; alder.

656. Pulvinaria ericæ Loew.

Pulvinaria ericæ Loew, Wien. Ent. Zeit., ii, p. 115 (1883).
Habitat.—Austria.
On Erica carnea.

657. Pulvinaria eugeniæ Hemp.

Pulvinaria eugeniæ Hemp., Rev. Mus. Paul., iv, p. 488 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 101 (1901).
Habitat.—Brazil.
On Eugenia jaboticaba.

658. Pulvinaria evonymi Gour.

Pulvinaria evonymi Gour., Ins. Inj. to Trees, p. 47 (1869).
" " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 35 (1873).
Habitat.—Europe.
On Euonymus.

659. Pulvinaria ficus Hemp.

Pulvinaria ficus Hemp., Rev. Mus. Paul., iv, p. 486 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 100 (1901).
Habitat.—Brazil.
On Ficus; Psidium; Mangifera; Ixora coccinea.

660. Pulvinaria flavicans Mask.

Pulvinaria flavicans Mask., Tr. Roy. Soc. S. Austr., p. 103 (1888).
" " Ckll., Pr. Ac. N. Sci. Ph., p. 272 (1899).
Habitat.—Australia.

661. Pulvinaria floccifera (Westw.).

Coccus floccifera Westw., Gard. Chron., p. 308 (1870).
Pulvinaria brassiæ Ckll., Can. Ent., xxvii, p. 135 (1895).
" floccifera Green, Ent. Mon. Mag., xxxiii, p. 72 (1897).
" " " Rep. Roy. Bot. Gard., Ceylon, p. 14 (1899).

Pulvinaria phaiæ Lull, Ent. News, x, p. 237 (1899).
" " Ckll., " " xi, p. 596 (1900).
" floccosa Newst., Jn. Roy. Hor. Soc., xxiii, p. 26 (1900).
" floccifera King, Can. Ent., xxxiii, p. 197 (1901).
" brassiæ King, Can. Ent., xxxiii, p. 197 (1901).
" " " Ent. News, xii, p. 311 (1901).
" phaiæ " Can. Ent., xxxiv, p. 61 (1902).

Habitat.—England; India; Trinidad; Canada; Mass.

On Auguloa clowesii; Lycaste skinneri; Camellia; Acalypha; Brassia verrucosa (in greenhouses); Phaius maculatus.

662. **Pulvinaria fraxini** Sign.

Pulvinaria fraxini Sign., Ann. Soc. Ent. Fr., (5), iii, p. 36 (1873).

Habitat.—Europe.

On Fraxinus excelsior.

663. **Pulvinaria grandis** Hemp.

Pulvinaria grandis Hemp., Rev. Mus. Paul., iv, p. 491 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 103 (1901).

Habitat.—Brazil.

On Myrtaceæ.

664. **Pulvinaria hazeæ** Kuwana.

Pulvinaria hazeæ Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 61 (1902).

Habitat.—Japan.

On Rhus succedanea.

665. **Pulvinaria horii** Kuwana.

Pulvinaria horii Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 59 (1902).

Habitat.—Japan.

On Acer trifidum; Æsculus turbinata; Kœlreuteria paniculata.

666. **Pulvinaria hunteri** King.

Pulvinaria hunteri King, Can. Ent., xxxiii, p. 144 (1901).

Habitat.—Kansas.

On maple; honey-locust.

667. **Pulvinaria iceryi** (Guér.).

Le Pou á poche blanche Berg, Soc. d'Acclim., ix, p. 939 (1862) in part.
Gasteralphe Icery, Mem. sur le Poche blanche (1864) the female only.
Coccus iceryi Guér., Soc. d'Acclim. (1867).
Lecanium iceryi Sign., Ann. Soc. Ent. Fr., (4), viii, p. 857 (1868).
" " Guér., " " " " " ix, p. 92 (1869).
" " Sign., " " " " " " p. 95 (1869).
" " " Bull. " " " " " p. xx (1869).
Pulvinaria gasteralphe Sign., Ann. Soc. Ent. Fr., (4), ix, p. 101 (1869).
" gasteralpha " " " " " (5), iii, p. 37 (1873).
" " Ckll., Check List, p. 330 (1896).

Habitat.—Mauritius; Reunion Islands.

On sugar cane.

668. Pulvinaria innumerabilis (Rathvon).

(*Cottony maple scale.*)

Coccus innumerabilis Rath., Penn. Farm Journ., p. 256 (1854).
Lecanium acericorticis Fitch. 6th Rep. Ins. N. Y., p. 775 (1859).
" acerella Rath., Lancaster Farmer, p. 101 (1876).
" acericorticis Glover, Rep. U. S. Dep. Ag., 1876, p. 44 (1877).
" " Smith, E. A., Can. Ent., x, p. 176 (1878).
" " " " Am. Nat., xii, p. 655 (1878).
" " Thom., 7th Rep. Ins. Ill., p. 121 (1878).
" " " Tr. Ill. Hor. Soc., p. 47 (1878).
" " Lint., Coun. Gent., xlii, p. 471 (1878).
Pulvinaria innumerabilis Putn., Pr. Dav. Ac. N. Sci., p. 339 (1879).
" " Riley, Am. Ent., iii, p. 149 (1880).
" " Lint., 1st Rep. Ins. N. Y., pp. 301, 309, 310 (1882).
" " Saund., Ins. Inj. to Fruits, p. 241 (1883).
" " Comst., 2nd Rep. Dep.Ent.Corn.Univ.,p.137 (1883).
" " Lint., Coun. Gent., xlvii, p. 541 (1883).
" " " " " xlviii, pp. 318, 556 (1884).
" " Riley, Rep. U. S. Dep. Ag., p. 350 (1884).
" " Osborn, Tr. Ia. Hor. Soc., p. 243 (1884).
" " Uhler, St. Nat. Hist., ii, p. 217 (1884).
" " Saund., Can. Ent., xvi, pp. 141, 210 (1884).
" " Forbes, 13th Rep. Ins. Ill., p. 98 (1884).
" " Lint., 2nd Rep. Ins. N. Y., p. 22 (1885).
" " Saund., Rep. Ent. Soc. Ont., p. 27 (1885).
" " Forbes, 14th Rep. Ins. Ill., p. 103 (1885).
" " " 15th " " " p. 6 (1889).
" " Lint., 6th " " N. Y., p. 141 (1890).
" " Pack., 5th Rep. U. S. Ent. Com.,pp.247,412 (1890).
Lecanium acericorticis " " " " " " p. 425 (1890).
" " Lint., 6th Rep. Ins. N. Y., p. 142 (1890).
" " " 7th " " " p. 370 (1891).
Pulvinaria innumerabilis Murtf., Bull. 26, Div. Ent. Dep. Ag., p. 39 (1892).
" " Garman, Bull. 40, Ky. Exp. Sta., p. 41 (1892).
" " Lint., 8th Rep. Ins. N. Y., p. 110 (1893).
" " Bruner, Rep. Neb. St. Hor. Soc., p. 225 (1893).
" " Garman, Bull. 47, Ky. Exp. Sta., p. 52 (1893).
" " Craw, 4th Bien. Rep. Cal. Bd. Hort., p. 97 (1894).
" " Smith, Rep. N. J. Exp. Sta., p. 505 (1894).
" " Lint., Bull. 13, N. Y. St. Mus., p. 272 (1895).
" " Lugger, Bull. 43, Minn. Exp. Sta., p. 223 (1895).
" " " Rep. Minn. Exp. Sta., p. 127 (1895).
" " Comst., Man. Ins., p. 169 (1895).
" " Smith, Econ. Ent., p. 111 (1896).
" " Lint., 11th Rep. Ins. N. Y., p. 204 (1896).
" " Hillman, Bull. 36, Nev. Exp. Sta., p. 35 (1897).

Pulvinaria innumerabilis Osborn, Contr. Ia. Ag. Coll., No. 3, p. 3 (1898).
" " Gillette, Bull. 47, Col. Exp. Sta., p. 33 (1898).
" " Felt, 14th Rep. Ins. N. Y., p. 239 (1898).
" " Chambliss, Bull. 4, Tenn. Exp. Sta., p. 148 (1898).
" " Felt, Bull. 17, n. s., Dep. Ag., p. 22 (1898).
" " " Rep. Com. Fish, Game & Forests, N. Y., p. 29 (1898).
" " " Bull. 27, N. Y. State Mus., p. 152 (1899).
" " Newell, " 43, Ia. Exp. Sta., p. 170 (1899).
" " Ckll., The Industrialist, p. 281 (1899).
" " King, Can. Ent., xxxi, p. 142 (1899).
" " Lugger, 6th Rep. Minn. Exp. Sta., p. 219 (1900).
" " Howard, Bull. 22, n. s., Dep. Ag., p. 7 (1900).
" " Frank & Kruger, Schildlausbuch, p. 113 (1900).

Habitat.—Canada; U. S.

On maple; silver maple; linden; sycamore; locust; sumac; beech; elm; oak; apple; pear; orange; Æsculus flava; box-elder; spindle-tree; mulberry; alder; hawthorn; lilac; hackberry; Aralia japonica; Viburnum dentatum; grape; willow; etc.

669. **Pulvinaria linearis** Targ.

Pulvinaria linearis Targ., Annali di Agr., p. 398 (1884).
" " Karsch, Ent. Nach., xi, p. 381 (1885).

Habitat.—Italy.

On Camellia japonica.

670. **Pulvinaria macluræ** ("Kenn.," Fitch).

Lecanium macluræ "Kenn.," Fitch, Coun. Gent., v, p. 38 (1855).
" " Walsh & Riley, Am. Ent., i, p. 14 (1868).
" " Pack., Guide to Study of Insects, p. 528 (1872).
" " Thom., 7th Rep. Ins. Ill., p. 121 (1878).
" " Putn., Pr. Dav. Ac. N. Sci., p. 340 (1879).
" " Lint., 1st Rep. Ins. N, Y., p. 301 (1882).
" " " 6th " " " p. 142 (1890).
Pulvinaria " Ckll., Can. Ent., xxvi, p. 32 (1894).
Lecanium " Lint., 11th Rep. Ins. N. Y., p. 205 (1896).
Pulvinaria " King, Can. Ent., xxxi, p. 143 (1899).

Habitat.—Mass.; N. Y.; Pa.; Ohio; Ill.; New Mexico.

On osage-orange (Maclura aurantiaca); sumac.

671. **Pulvinaria mammeæ** Mask.

Pulvinaria mammeæ Mask., N. Z. Trans., xxvii, p. 59 (1894).

Habitat.—Hawaiian Islands; N. America.

On Mammea americana; ferns; orange; coffee; plum.

672. **Pulvinaria maskelli** Olliff.

Pulvinaria maskelli Olliff, Agr. Gaz. N. S. W., ii, p. 667 (1891).
" " Riley & How., Ins. Life, iv, pp. 294, 408 (1891).

Signoretia atriplicis Mask., N. Z. Trans., xxiv, p. 23 (1891).
Pulvinaria maskelli " " " xxvi, p. 76 (1893).
Signoretia atriplicis " " " " p. 80 (1893).
Habitat.—Australia.
On Rhagodia hastata; Atriplex vesicaria; Atriplex nummularia.

Pulvinaria maskelli viminariæ Full.

Pulvinaria maskelli var. viminariæ Full., Notes on Cocc. W. Austr., p. 7 (1897).
" " " " " Tr. Ent. Soc. Lond., p. 458 (1899).
Habitat.—W. Australia.
On Viminaria denudata; Hakea ilicifolia.

Pulvinaria maskelli nuytsiæ Mask.

Pulvinaria nuytsiæ Mask., N. Z. Trans., xxix, p. 313 (1897).
Ctenochiton? " Full., Notes on Cocc. W. Austr., p. 6 (1897) male.
" maskelli var. nuytisiæ Ckll., Check List, Suppl., p. 394 (1899).
Pulvinaria nutysiæ Full., Tr. Ent. Soc. Lond., p. 458 (1899).
Habitat.—W. Australia.
On Nuytsia floribunda.

673. Pulvinaria mesembrianthemi (Vall.).

—— mesembrianthemi Vall., Bull. de Ferussac, xxii, p. 469 (1830).
Calypticus " Costa, Ann. Acad. Asp., Naples, p. 273 (1844).
Pulvinaria biplicata Targ., Catalogue, p. 34 (1869).
" mesembrianthemi Sign., Ann. Soc. Ent. Fr., (5), iii, p. 39 (1873).
" " Dougl., Ent. Mon. Mag., xxiv, p. 24 (1887).
" " Berl. e Leon., Annali di Agr., p. 325 (1898).
" " " " Riv. Pat. Veg., vi, p. 325 (1898).
" " " " Cherm. Ital., Fasc. iii, No. 71 (1898).
Habitat.—Spain; Italy; France.
On Mesembrianthemum.

674. Pulvinaria obscura Newst.

Pulvinaria obscura Newst., Ind. Mus. Notes, iii, No. 5, p. 23 (1894).
Habitat.—Madras, India.
On Hygrophila spinosa.

675. Pulvinaria occidentalis Ckll.

(*Western Pulvinaria.*)

Pulvinaria innumerabilis var. occidentalis Ckll., The Entom., xxx, p. 13 (1897).
" occidentalis King, Can. Ent., xxxiii, p. 197 (1901).
Habitat.—Washington; Br. Columbia; Nova Scotia.
On currant; gooseberry; hawthorn; plum; pear; mountain ash; willow; poplar; alder.

676. Pulvinaria oxyacanthæ (Linn.).

Coccus oxyacanthæ Linn., Syst. Nat., Ed. x, i, 456 (1758).
" " " " " " xii, i, p. 742 (1766).
" cratægi " " " " " " p. 742 (1766).

Coccus cratægi Fab., Syst. Ent., p. 744 (1775).
" oxyacanthæ Mod., Act. Goth., p. 20 (1778).
" cratægi Fab., Spec. Ins., ii, p. 395 (1781).
" " " Mant. Ins., ii, p. 319 (1787).
" oxyacanthæ Gmel., Syst. Nat., Ed. xiii, p. 2219 (1889).
Chermes cratægi Oliv., Ency. Meth., vii, p. 442 (1792).
Coccus " Fab., Ent. Syst., iv, p. 227 (1794).
" " Turton. Syst. Nat., p. 714 (1801).
" " Fab., Syst. Rhyng., p. 310 (1803).
" oxyacanthæ Bechst., Forstins., i, p. 228 (1804).
" " " " iii, p. 891 (1806).
" cratægi Fonsc., Ann. Soc. Ent. Fr., iii, p. 214 (1834).
Pulvinaria oxyacanthæ Sign., Ann. Soc. Ent. Fr., (5), iii, p. 40 (1873).
Coccus cratægi Kalt., Die Pflanz., p. 204 (1874).
Lecanium oxyacanthæ Kalt., Die Pflanz., p. 213 (1874).
Coccus cratægi Sign., Ann. Soc. Ent. Fr., (5), vi, p. 613 (1876).
Pulvinaria oxyacanthæ Dougl., Ent. Mon. Mag., xxii, p. 158 (1885).
" " " " " " xxvii, p. 307 (1891).
Habitat.—Europe.
On Cratægus oxyacantha.

677. **Pulvinaria oyamæ** Kuwana.

Pulvinaria oyamæ Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 60 (1902).
Habitat.—Japan.

678. **Pulvinaria paradelpha** Ckll. & Lidg.

Pulvinaria paradelpha Ckll. & Lidg., Victorian Naturalist, xvi, p. 15 (1899).
Habitat.—Victoria.
On Acacia melanoxylon.

679. **Pulvinaria populi** Sign.

Pulvinaria populi Sign., Ann. Soc. Ent. Fr., (5), iii, p. 42 (1873).
Habitat.—France.

680. **Pulvinaria pruni** Hunter.

Pulvinaria pruni Hunter, Kan. Univ. Quar., ix, p. 104 (1900).
Habitat.—Kansas.
On plum; white elm.

681. **Pulvinaria psidii** Mask.

Pulvinaria psidii Mask., N. Z. Trans., xxv, p. 223 (1892).
" " Howard, Ins. Life, vii, p. 426 (1895).
" " Green, Ind. Mus. Notes, iv, No. 1, p. 8 (1896).
" " Ckll., Bull. 4, T. s., Dep. Ag. p. 48 (1896).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 47 (1896).
" " Berl. e Leon., Annali di Agr., p. 103 (1898).
" " Ckll., Pr. Ac. N. Sci. Ph., pp. 272, 273 (1899).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 58 (1902).

Habitat.—New Zealand; Hawaiian Islands; Formosa; Ceylon; China; Japan; California.

On guava; tea; plum; coffee; ferns; Cinchona; Citrus; Pittosporum; Eurya japonica.

682. **Pulvinaria pulchella** Hemp.

Pulvinaria (Pulvinella) pulchella Hemp., Can. Ent., xxxi, p. 132 (1899).
Pulvinella " " Rev. Mus. Paul., iv, p. 481 (1900).
Habitat.—Brazil.
On Baccharis dracunculifolia.

683. **Pulvinaria pyriformis** Ckll.

Pulvinaria (Protopulvinaria) pyriformis Ckll., Jn. Trin. Nat. Club, i, p. 309 (1894).
" " " " " " " ii, p. 307 (1896).
" newsteadi Leon., Riv. Pat. Veg., vi. p. 279 (1898).
" pyriformis Ckll., Psyche, viii, p. 311 (1899).
Protopulvinaria " Lefroy, Scale Ins. Less. Antil., p. 42 (1901).
Habitat.—Trinidad; Jamaica; Grenada; Madeira.
On guava; cinnamon; Caprifolia; Cordea, etc.

684. **Pulvinaria rhois** Ehrh.

Pulvinaria rhois Ehrh., Ent. News, ix, p. 186 (1898).
Habitat.—California.
On Rhus diversiloba.

685. **Pulvinaria sericea** (Fourc.).

Chermes quercus oblongus serico albo Geoff., Abr. Ins., p. 508 (1762).
" sericea Fourc., Ent. Paris., p. 230 (1785).
Coccus lanatus Gmel., Syst. Nat., Ed. xiii, p. 2221 (1789).
Chermes sericeus Oliv., Ency. Meth., vii, p. 441 (1792).
Coccus lanatus Bechst., Forstins., i, p. 289 (1804).
Pulvinaria marginata Targ., Catalogue, p. 34 (1869).
" lanatus Sign., Ann. Soc. Ent. Fr., (5), iii, p. 38 (1873).
" sericea Ckll., The Entom., xxxiv, p. 90 (1901).
Habitat.—Europe.
On oak.

686. **Pulvinaria simplex** King.

Pulvinaria simplex King, Mitth. Schw. Ent. Ges., (10), x, p. 475 (1902).
Habitat.—Switzerland.
On vines.

687. **Pulvinaria simulans** Ckll.

Pulvinaria simulans Ckll., Jn. Trin. Nat. Club, i, p. 310 (1894).
" " " Bull. Bot. Dep. Jam., p. 102 (1895).
Habitat.—Trinidad: Mexico.

688. Pulvinaria tecta Mask.

Pulvinaria tecta Mask., N. Z. Trans., xxvi, p. 79 (1893).
" " " " " xxviii, p. 393 (1896).
" " Ckll., Bull. 4, T. s., Dep. Agr., p. 49 (1896).
Habitat.—Australia.
On orange; Acacia; Daviesia corymbosa; D. ulicina.

689. Pulvinaria tessellata Green.

Pulvinaria tessellata Green, Ind. Mus. Notes, iv, p. 8 (1896).
Habitat.—Ceylon.
On Ophiorrhiza pectinata.

690. Pulvinaria thompsoni Mask.

Pulvinaria thompsoni Mask., N. Z. Trans., xxviii, p. 393 (1896).
Habitat.—Tasmania.
On Dodonæa viscosa.

691. Pulvinaria tiliæ King & Ckll.

Pulvinaria innumerabilis var. tiliæ King & Ckll., Psyche, viii, p. 286 (1898).
" " " " " Can. Ent., xxxi, p. 143 (1899).
" tiliæ King, Can. Ent., xxxiii, p. 314 (1901).
Habitat.—Mass.
On Tilia americana.

692. Pulvinaria tinsleyi King.

Pulvinaria tinsleyi King, Can. Ent., xxxii, p. 360 (1900).
Habitat.—New Mexico.
On Celtis.

693. Pulvinaria tomentosa Green.

Pulvinaria tomentosa Green, Ind. Mus. Notes, iv, p. 8 (1896).
Habitat.—Ceylon.

694. Pulvinaria tremulæ Sign.

Pulvinaria tremulæ Sign., Ann. Soc. Ent. Fr., (5), iii, p. 45 (1873).
Habitat.—France.
On aspen.

695. Pulvinaria(?) tuberculatus (Bouché).

Coccus tuberculatus Bouché, Naturg. Ins., p. 18 (1834).
" " Burm., Handb. Ent., ii, p. 64 (1835).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 626 (1876).
" " Ckll., The Entom., xxxiv, p. 93 (1901).
Habitat.—South America?
On Malvaceæ.

696. **Pulvinaria urbicola** Ckll.

Pulvinaria urbicola Ckll., Tr. Ent. Soc. Lond., p. 160 (1893).
" " " Bull. Bot. Dep. Jam., p. 102 (1895).
" " " The Industrialist, p. 281 (1899).
Habitat.—Jamaica; Barbados; Trinidad.
On Capsicum.

697. **Pulvinaria viburni** King.

Pulvinaria viburni King, Can. Ent., xxxiii, p. 333 (1901).
Habitat.—Quebec, Canada.
On Viburnum pubescens.

698. **Pulvinaria vinifera** King.

Pulvinaria vinifera King, Mitth. Schw. Ent. Ges., (10), x, p. 481 (1903).
Habitat.—Switzerland.
On grape vine.

699. **Pulvinaria vitis** (Linn.).

—— —— Reaum., Mem. Ins., iv, p. 62, pl. vi, figs. 5-7 (1734).
Coccus vitis Linn., Syst. Nat., Ed. x, i. p. 456 (1758).
Chermes " oblongus Geoff., Abr. Ins., i, p. 506 (1762).
Coccus " Linn., Syst. Nat., Ed. xii, i, p. 741 (1766).
" " Fab., Syst. Ent., p. 744 (1775).
" " Mod., Act. Goth., iii, p. 20 (1778).
" " Schr., Enum. Ins. Austr., pp. 275, 584 (1781).
" " Fab., Spec. Ins., ii, p. 395 (1781).
Chermes " Fourc., Ent. Paris., p. 228 (1785).
Coccus " Fab., Mant. Ins., ii, p. 319 (1787).
" " Gmel., Syst. Nat., Ed. xiii, p. 2218 (1789).
Chermes " Oliv., Ency. Meth., vii, p. 439 (1792).
Coccus " Fab., Ent. Syst., iv, p. 227 (1794).
" " Turton, Syst. Nat., p. 714 (1801).
" " Schr., Faun. Boica, p. 144 (1801).
" " Fab., Syst. Rhyng., p. 310 (1803).
" " Haw., Tr. Ent. Soc. Lond., p. 297 (1812).
" " Major, Treat. Ins., pp. 110, 120, 240, 241 (1829).
" " Newm., Ent. Mag., i, p. 312 (1833).
" " Fonsc., Ann. Soc. Ent. Fr., iii, p. 214 (1834).
Calypticus spumosus Costa, Faun. Reg. Nap., Cocc., p. 10 (1835).
Coccus of the vine Curt., Ent. Mag., ii, p. 510 (1835).
" vitis Koll., Inj. Ins., p. 175 (1840).
Calypticus spumosus Harr., N. E. Farmer, xxiii, p. 4 (1843).
Lecanium vitis Fitch, 3rd Rep. Ins. N. Y., p. 387 (1856).
Calypticus spumosus Fauvel, Bull. Soc. Linn. Norm., viii, p. 290 (1864).
Coccus vitis Targ., Studii sul. Cocc., pp. 26, 30 (1867).
Lecanium vitis Walsh, Am. Ent., i, p. 14 (1868).
Pulvinaria " Targ., Catalogue, p. 34 (1869).

Lecanium vitis Riley, Am. Ent., ii, p. 276 (1870).
Pulvinaria " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 45 (1873).
Coccus (Lecanium) vitis Kalt., Die Pflanz., p. 95 (1874).
Lecanium vitis Lint., Coun. Gent., xliv, p. 455 (1879).
Pulvinaria " Putn., Pr. Dav. Ac. Sci., p. 340 (1879).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 137 (1883).
" " Goethe, Jahrb. Nass. Ver. Nat., pp. 120, 129 (1884).
" persicæ Newst., Ent. Mon. Mag., xxviii, p. 142 (1892).
" vitis Dougl., " " " xxix, p. 263 (1893).
" " Saccardo, Riv. Pat. Veg., iv, p. 48 (1895).
" " Berl. e Leon., Riv. Pat. Veg., vi, pp. 321, 326 (1898).
" " " " Annali di Agr., p. 47 (1898).
" " Newst., Jn. Roy. Hor. Soc., xxiii, p. 26 (1900).
" " Frank & Kruger, Schildlausbuch, p. 111 (1900).
" " Ormerod, 24th Rep. Inj. Ins., p. 51 (1901).
" " Hofer, Mitth. Schw. Ent. Ges., (10), x, p. 482 (1903).
Habitat.—Europe; U. S.
On grape vine.

Pulvinaria vitis ribesiæ Sign.

Pulvinaria ribesiæ Sign., Ann. Soc. Ent. Fr., (5), iii, p. 43 (1873).
" " Goethe, Jahrb. Nass. Ver. Nat., p. 120 (1884).
" " Dougl., Ent. Mon. Mag., xxvi, p. 238 (1890).
" " Theobald, Ins. Life, London, p. 185 (1896).
" " Ckll., Pr. Ac. N. Sci. Ph., pp. 272, 273 (1899).
" " Newst., Jn. Roy. Hor. Soc., xxiii, p. 24 (1900).
" " Frank & Kruger, Schildlausbuch, p. 112 (1900).
" " Ormerod, 24th Rep. Inj. Ins., p. 48 (1901).
" vitis var. ribesiæ Newst. in litt. to Ckll. (1902).
Habitat.—France: England; Germany.
On currant.

Genus **TECTOPULVINARIA** Hemp. Type, albata.

Tectopulvinaria Hemp., Rev. Mus. Paul., iv, p. 482 (1900); Ann. Mag. N.H., (7), viii, p. 69 (1901).

700. Tectopulvinaria albata Hemp.

Tectopulvinaria albata Hemp., Rev. Mus. Paul., iv, p. 483 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 69 (1901).
Habitat.—Brazil.
On Vernonia polyantha: Trichogonia salviæfolia.

Genus **PSEUDOPULVINARIA** Atk. Type, sikkimensis.

Pseudopulvinaria Atk., Jn. Asiatic Soc. Bengal. pt. ii, No. 1, p. 58 (1889): Ckll., Can. Ent., xxxi, p. 331 (1899).

701. Pseudopulvinaria sikkimensis Atk.

Pseudopulvinaria sikkimensis Atk., Jn. Asiatic Soc. Bengal, pt. ii, No. 1, p. 58 (1889).
Pseudopulvinaria sikkimensis Atk., Ind. Mus. Notes, i, p. 6 (1889).
" " Cotes, " " " ii, p. 169 (1893).
Habitat.—India.
On Cinchona.

Genus **PSEUDOPHILIPPIA** Ckll. Type, quaintancii.

Pseudophilippia Ckll., Psyche, viii, p. 89 (1898); Can. Ent., xxxi, p. 331 (1899).

702. Pseudophilippia quaintancii Ckll.

Pseudophilippia quaintancii Ckll., Psyche, viii, p. 90 (1898).
" " Quaint., " " p. 91 (1898).
Habitat.—Florida.
On pine.

Genus **MALLOCOCCUS** Mask. Type, sinensis.

‖Mallophora Mask., N. Z. Trans., xxix, p. 314 (1897).
Mallococcus " " " xxx, p. 242 (1898): Ckll., Can. Ent., xxxi, p. 331 (1899).

703. Mallococcus(?) lanigerus (Hemp.).

Lecanium lanigerum Hemp., Rev. Mus. Paul., iv, p. 446 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 217 (1901).
Mallococcus lanigerus Ckll., " " " " ix, p. 452 (1902).
Habitat.—Brazil.

704. Mallococcus sinensis (Mask.).

Mallophora sinensis Mask., N. Z. Trans., xxix, p. 314 (1897).
Mallococcus " Ckll., Check List, Suppl., p. 392 (1899).
Habitat.—China.
On Callicarpa tomentosa.

Genus **AUSTROLICHTENSIA** Ckll. Type, hakearum.

Austrolichtensia Ckll., Ann. Mag. N. H., (7), ix, p. 451 (1902).

705. Austrolichtensia hakearum (Full.).

Lecaniodiaspis(?) hakearum Full., Notes on Cocc. W. Austr., p. 7 (1897).
Lichtensia hakearum Ckll., Check List, Suppl., p. 395 (1899).
" " Full., Tr. Ent. Soc. Lond., p. 457 (1899).
Austrolichtensia hakearum Ckll., Ann. Mag. N. H., (7), ix, p. 451 (1902).
Habitat.—W. Australia.
On Hakea media.

Genus **LUZULASPIS** Ckll. Type, luzulæ.

||Signoretia Targ., Catalogue, p. 34 (1869): Sign., Ann. Soc. Ent. Fr., (5), i, p. 426 (1871): Mask., N. Z. Trans., xxiv, p. 23 (1891): Ckll., Can. Ent., xxxi, p. 331 (1899).
Luzulaspis Ckll., Ann. Mag. N. H., (7), ix, p. 25 (1902).

706. Luzulaspis luzulæ (Dufour).

Aspidiotus(?) luzulæ Dufour, Ann. Soc. Ent. Fr., (4), iv, pp. 207, 208 (1864).
Signoretia clypeata Targ., Catalogue, p. 34 (1869).
" luzulæ Sign., Ann. Soc. Ent. Fr., (5), i, p. 427 (1871).
Aspidiotus " Kalt., Die Pflanz., p. 726 (1874).
Signoretia " Sign., Bull. Soc. Ent. Fr., (5), viii, p. cxviii (1878).
" " Newst., Ent. Mon. Mag., xxviii, p. 142 (1892).
" " Dougl., " " " xxx, p. 17 (1894).
Habitat.—England; Scotland; France; Australia.
On Luzula maxima; L. campestris.

Luzulaspis luzulæ australis (Mask.).

Signoretia luzulæ var. Mask., N. Z. Trans., xxv, p. 223 (1892).
" " " australis Mask., N. Z. Trans., xxvi, p. 80 (1893).
" " " " Full., Tr. Ent. Soc. Lond., p. 457 (1899).
Habitat.—Australia.
On grasses and sedges.

Genus **EXÆRETOPUS** Newst. Type, formiceticola.

Exæretopus Newst., Ent. Mon. Mag., xxx, p. 204 (1894): Ckll., Can. Ent., xxxi, p. 331 (1899).

707. Exæretopus caricis Ehrh.

Exæretopus caricis Ehrh., Can. Ent., xxxiv, p. 193 (1902).
Habitat.—Mt. Shasta, Cal.
On Carex breweri; Trisetum subspicatum.

708. Exæretopus formiceticola Newst.

Exæretopus formiceticola Newst., Ent. Mon. Mag., xxx, p. 204 (1894).
Habitat.—England.
In nests of ants.

Genus **SPERMOCOCCUS** Giard. Type, fallax.

Spermococcus Giard, Bull. Soc. Ent. Fr., (7), iii, p. cxcix (1893): Ckll., Can. Ent., xxxi, p. 331 (1899).

709. Spermococcus fallax Giard.

Spermococcus fallax Giard, Bull. Soc. Ent. Fr., (7), iii, p. cxcix (1893).
" " Berl., Riv. Pat. Veg., iii, p. 365 (1895).
Habitat.—France.
On roots of grass.

Genus **LICHTENSIA** Sign. Type, viburni.

Lichtensia Sign., Ann. Soc. Ent. Fr., (5), iii, p. 27 (1873): Ckll., Can. Ent., xxxi, p. 331 (1899).

710. Lichtensia argentata Hemp.

Lichtensia argentata Hemp., Rev. Mus. Paul., iv, p. 492 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 104 (1901).
Habitat.—Brazil.

711. Lichtensia colimensis Ckll.

Lichtensia colimensis Ckll., Ann. Mag. N. H., (7), x, p. 467 (1902).
Habitat.—Mexico.
On Celtis?

712. Lichtensia crescentiæ Ckll.

Lichtensia crescentiæ Ckll., Ann. Mag. N. H., (7), i, p. 435 (1898).
Habitat.—Mexico.
On "Guanabano."

713. Lichtensia eatoni Newst.

Lichtensia eatoni Newst., Ent. Mon. Mag., xxxi, p. 166 (1895).
Habitat.—Algeria.
On olive; Phillyrea media.

714. Lichtensia ephedræ Newst.

Lichtensia ephedræ Newst., Ent. Mon. Mag., xxxvii, p. 83 (1901).
Habitat.—Egypt.
On Ephedra alte.

715. Lichtensia lutea (Ckll.).

Pulvinaria lutea Ckll., Ann. Mag. N. H., (6), xii, pp. 51, 160 (1893).
Lichtensia " " Psyche, vii, p. 255 (1895).
Habitat.—Mexico.
On wild fig; Croton.

716. Lichtensia lycii Ckll.

Lichtensia lycii Ckll., Psyche, vii. p. 254 (1895).
Habitat.—New Mexico.
On "Lycium bush."

717. Lichtensia mimosæ Towns. & Ckll.

Lichtensia mimosæ Towns. & Ckll., Jn. N. Y. Ent. Soc., vi, p. 175 (1898).
Habitat.—Mexico.
On Mimosa.

718. Lichtensia parvula (Ckll.).

Pulvinaria parvula Ckll., Biol. Centr. Amer., ii, pt. 2, p. 19 (1899).
Habitat.—Mexico.
On Mimosa.

719. Lichtensia simillima Ckll.

Lichtensia simillima Ckll., Can. Ent., xxxiv, p. 90 (1902).
Habitat.—Paraguay.

720. Lichtensia viburni Sign.

Lichtensia viburni Sign., Ann. Soc. Ent. Fr., (5), iii, p. 28 (1873).
" " Dougl., Ent. Mon. Mag., xxiv, p. 167 (1887).
" " Newst., " " " xxxi, p. 165 (1895).
" " Ckll., Psyche, vii, p. 255 (1895).
" " Berl. e Leon., Cherm. Ital., Fasc. iii, No. 62 (1898).
" " King, Can. Ent., xxxi, p. 143 (1899).
Habitat.—France; England; Wales; Mass.
On Viburnum Tinus; Spiræa salicifolia; Prinos verticillatus; Hedera helix.

721. Lichtensia zapotlana Ckll.

Lichtensia zapotlana Ckll., Ann. Mag. N. H., (7), x, p. 467 (1902).
Habitat.—Mexico.

Lichtensia zapotlana townsendi Ckll.

Lichtensia zapotlana var. Townsendi Ckll., Ann. Mag. N. H., (7), xi, p. 162 (1903).
Habitat.—Mexico.
On copal.

Genus **PHILEPHEDRA** Ckll. Type, ephedræ.

Philephedra Ckll., Can. Ent., xxxi, p. 331 (1899); Ann. Mag. N. H., (7), ix, p. 451 (1902).

722. Philephedra ephedræ (Ckll.).

Pulvinaria ephedræ Ckll., Ann. Mag. N. H., (7), ii, p. 24 (1898).
Philephedra " " " " " " ix, p. 451 (1902).
Habitat.—New Mexico.
On Ephedra.

Genus **ERIOPELTIS** Sign. Type, lichtensteinii.

Eriopeltis Sign., Ann. Soc. Ent. Fr., (5), i, p. 429 (1871): Ckll., Can. Ent., xxxi, p. 332 (1899).

723. Eriopeltis brachypodii Giard.

Eriopeltis brachypodii Giard, Bull. Soc. Ent. Fr., (7), iii, p. cxcix (1893).
" " Butler, "Knowledge," p. 148 (1894).
" " Fletcher, Rep. Can. Exp. Farms, p. 146 (1896).
Habitat.—France.
On Brachypodium pinnatum.

724. Eriopeltis festucæ (Fonsc.).

Coccus festucæ Fonsc., Ann. Soc. Ent. Fr., iv, p. 216 (1834).
" " Kalt., De Pflanz., p. 747 (1874).
Eriopeltis " Sign., Ann. Soc. Ent. Fr., (5), ix, p. 46 (1879).
" " King, Can. Ent., xxxiii, p. 197 (1901).
Habitat.—Europe; Nova Scotia; Canada; Illinois; Indiana; Dakota.
On Festuca cæspitosa; F. phœnicioides.

725. Eriopeltis lichtensteinii Sign.

||Eriopeltis festucæ Sign. (non Fonsc.). Ann. Soc. Ent. Fr., (5), i, p. 430 (1871).
" lichtensteinii Sign., Ann. Soc. Ent. Fr., (5), vi, p. 607 (1876).
" " " Bull. " " " " vii, p. xxxvi (1877).
" festucæ " " " " " " " " " (1877).
" " Bignell, The Entom., xviii, p. 286 (1885).
" lichtensteinii Dougl., Ent. Mon. Mag., xxiv, p. 166 (1887).
" " Newst., " " " xxvii, p. 165 (1891).
" festucæ Butler, "Knowledge," p. 148 (1894).
" " Fletcher, Rep. Can. Exp. Farms, p. 146 (1896).
Habitat.—France; Holland; England; Scotland.
On Festuca spp. and other grasses.

Genus **FILIPPIA** Targ. Type, oleæ.

||Philippia Targ., Studii sul. Cocc., p. 13 (1867): Sign., Ann. Soc. Ent. Fr., (4), viii, p. 854 (1868); ix, p. 101 (1869); (5), i, p. 433 (1871).
Filippia Targ., Catalogue, p. 33 (1869): Ckll., Check List, p. 329 (1896); Can. Ent., xxxi, p. 332 (1899).

726. Filippia oleæ (Costa).

Coccus oleæ Costa, Degli Ins. del. Olivo, p. 71, pl. 4, fig. 1 (1828).
Philippia follicularis Targ., Studii sul. Cocc., p. 23 (1867).
Filippia " " Catalogue, p. 33 (1869).
Philippia oleæ Sign., Ann. Soc. Ent. Fr., (5), i, p. 433 (1871).
" " Licht., Bull. " " " (6), i, p. cxiv (1881).
" " Ckll., Check List, p. 329 (1896).
Habitat.—Italy.
On olive.

Genus **ERICERUS** Guérin. Type, pe-là.

Ericerus Guér., Bull. Soc. Ent. Fr., (3), vi, p. lxvii (1858): Sign., Ann. Soc. Ent. Fr., (5), iv, p. 90 (1874).
Pela Targ., Studii sul. Cocc., p. 19 (1867).

727. Ericerus pe-la (Chav.).

Coccus pe-là Chav., Ann. Soc. Ent. Fr., (2), vi, p. 144 (1848).
Ceroplastes cereus Walk., Cat. Br. Mus., Hom., p. 1087 (1852).

Coccus pe-là Westw., Gard. Chron., pp. 484, 532 (1853).
Ericerus " Guér., Bull. Soc. Ent. Fr., (3), vi, p. lxvii (1858).
" " Sign., Ann. " " " (4), ix, p. 102 (1869).
Coccus " Silliman, Am. Nat., v, p. 683 (1871).
Ericerus " Sign., Ann. Soc. Ent. Fr., (5), iv, p. 91 (1874).
" " Blanch., Les Coccides utiles, p. 28 (1883).
" " Comst., Intr. Ent., p. 136 (1888).
" " Cotes, Ind. Mus. Notes, ii, p. 91 (1891).
" " Comst., Man. Ins., p. 166 (1895).
" " Green, Cocc. Ceylon, pt. i, p. 3 (1896).
" " Howard, Bull. 9, n. s., Dep. Ag., p. 39 (1897).
" " Smithers, Pharmaceutical Era, No. 8 (1897).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 62 (1902).

Habitat.—Europe; China; Japan.

On Rhus succedanea; Ligustrum glabrum; Hibiscus syriacus; Fraxinus.

Genus **LECANOCHITON** Mask. Type, metrosideri.

Lecanochiton Mask., N. Z. Trans., xiv, p. 222 (1881); Ins. Nox. Agr. N. Z., p. 67 (1887): Ckll., Can. Ent., xxxi, p. 332 (1899).

728. **Lecanochiton metrosideri** Mask.

Lecanochiton metrosideri Mask., N. Z. Trans., xiv, p. 222 (1881).
" " " " " xvi, p. 129 (1883).
" " " Ins. Nox. Agr. N. Z., p. 64 (1887).

Habitat.—New Zealand.

On Metrosideros robusta; M. tomentosa.

729. **Lecanochiton minor** Mask.

Lecanochiton minor Mask., N. Z. Trans., xxiii, p. 12 (1890).

Habitat.—New Zealand.

On Metrosideros robusta.

Genus **CEROPLASTES** Gray. Type, janeirensis.

Ceroplastes Gray, Spicilegia Zoologica, p. 7, pl. 3, figs. 6-7 (1830): Sign., Ann. Soc. Ent. Fr., (5), ii, p. 35 (1872): Comst., Rep. U. S. Dep. Ag., 1880, p. 330 (1881): Mask., N. Z. Trans., xxv, p. 214 (1892): Ckll., Can. Ent., xxxi, p. 332 (1899): Hemp., Rev. Mus. Paul., iv, p. 450 (1900).

Columnea Targ., Studii sul. Cocc., p. 11 (1867); Catalogue, p. 35 (1869); Coccin. deg. Agrumi in Ital., p. 12 (1891).

730. **Ceroplastes actiniformis** Green.

Ceroplastes actiniformis Green, Ind. Mus. Notes, iv, p. 8 (1896).

Habitat.—Ceylon.

On cocoanut palm.

731. Ceroplastes africanus Green.

Ceroplastes africanus Green, Ann. Mag. N. H., (7), iv, p. 188 (1899).
Habitat.—Cape Colony; Natal.
On Acacia.

732. Ceroplastes albolineatus Ckll.

Ceroplastes albolineatus Ckll., Ent. News, v, p. 157 (1894).
" " " Bull. Bot. Dep. Jam., pp. 7, 100 (1895).
" " " Rev. Mus. Paul., ii, p. 70 (1897).
" " Hemp., " " " iv, p. 474 (1900).
Habitat.—Jamaica; Mexico; Brazil.
On Baccharis; Schinus; Fuchsia; Maytenus.

Ceroplastes albolineatus vulcanicus Ckll.

Ceroplastes albolineatus var. vulcanicus Ckll., Ann. Mag. N. H., (7), xi, p. 160 (1903).
Habitat.—Mexico.

733. Ceroplastes amazonicus Hemp.

Ceroplastes amazonicus Hemp., Rev. Mus. Paul., iv, p. 454 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 556 (1901).
Habitat.—Brazil.

734. Ceroplastes angulatus Ckll.

Ceroplastes angulatus Ckll., Ann. Mag. N. H., (7), i, p. 434 (1898).
Habitat.—Mexico.

735. Ceroplastes australiæ Walk.

Ceroplastes australiæ Walk., Cat. Br. Mus., Hom., iv, p. 1087 (1852).
" australasiæ Sign., Ann. Soc. Ent. Fr., (5), ii, p. 45 (1872).
" " Ckll., Ann. Mag. N. H., (7), iv, p. 191 (1899).
Habitat.—Australia.

736. Ceroplastes bergi Ckll.

Ceroplastes bergi Ckll., Commun. Mus. Buen. Aires, i, No. 8, p. 288 (1901).
Habitat.—Buenos Ayres.

737. Ceroplastes bernardensis Ckll.

Ceroplastes bernardensis Ckll., Can. Ent., xxxiv, p. 93 (1902).
Habitat.—Paraguay.

738. Ceroplastes bicolor Hemp.

Ceroplastes bicolor Hemp., Ann. Mag. N. H., (7). viii, p. 390 (1901).
Habitat.—Brazil.

739. Ceroplastes brachyurus Ckll.

Ceroplastes brachyurus Ckll., Ann. Mag. N. H., (7), xi, p. 157 (1903).
Habitat.—Mexico.
"On branches of shrub with small pinnate leaves like Rhus."

740. **Ceroplastes bruneri** Ckll.

Ceroplastes bruneri Ckll., Can. Ent., xxxiv, p. 91 (1902).
Habitat.—Paraguay.

741. **Ceroplastes campinensis** Hemp.

Ceroplastes campinensis Hemp., Ann. Mag. N. H., (7), viii, p. 389 (1901).
Habitat.—Brazil.
On guava (*Psidium*).

742. **Ceroplastes candela** Ckll. & King.

Ceroplastes candela Ckll. & King, The Entom., xxxv, p. 113 (1902).
Habitat.—Natal.

743. **Ceroplastes cassiæ** (Chav.).

Coccus cassiæ Chav., Ann. Soc. Ent. Fr., (2), vi, p. 141 (1848).
Ceroplastes Gray Targ., Catalogue, p. 35 (1869).
" cassiæ Sign., Ann. Soc. Ent. Fr., (5), ii, p. 43 (1872).
" " Ckll., The Entom., xxvi, p. 80 (1893).
" " " Rev. Mus. Paul., ii, p. 70 (1897).
" " Hemp., " " " iv, p. 452 (1900).
Habitat.—Europe; Antigua; Brazil.
On Cassia; Bursera gummifera.

744. **Ceroplastes ceriferus** (Anderson).

Coccus ceriferus Anderson, Mon. Cocci ceriferi (1791).
" " Fab., Ent. Syst., Suppl., p. 546 (1798).
" " " Syst. Rhyng., p. 311 (1803).
Ceroplastes chilensis Gray, Spicilegia Zoologica, p. 7 (1830).
" " A. White, Ann. Mag. N. H., xvii, p. 333 (1846).
Coccus ceriferus Chav., Ann. Soc. Ent. Fr., (2), vi, p. 144 (1848).
" " Westw., Gard. Chron., p. 484 (1853).
Ceroplastes " Sign., Ann. Soc. Ent. Fr., (5), ii, p. 40 (1872).
" chilensis " " " " " " " p. 44 (1872).
" ceriferus Blanch., Les Coccides utiles, p. 26 (1883).
" " Atk., Ind. Mus. Notes, i, p. 189 (1890).
" " Cotes, " " " ii, No. 3, pp. 91, 93 (1891).
" " Mask., N. Z. Trans., xxv, p. 216 (1892).
" " Ckll., Bull. Bot. Dep. Jam., p. 7 (1895).
" " Newst., Ind. Mus. Notes, iii, No. 5, p. 21 (1896).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 44 (1896).
" " Green, Cocc. Ceylon, pt. 1, p. 3 (1896).
" " Howard, Bull. 9, n. s., Dep. Ag., p. 39 (1897).
" " Frog., Rep. Dep. Ag. N. S. W., No. 175, p. 2 (1897).
" " Ckll., Ann. Mag. N. H., (7), iv, p. 190 (1899).
" chilensis " " " " " " p. 191 (1899).
" ceriferus Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 62 (1902).

Habitat.—India; Australia; Ceylon; Japan; Hawaiian Islands; Chili; Mexico: Antigua; Jamaica.

On Myrica cerifera; Melaleuca; Hibiscus; Camellia; Gardenia; tea; mango: orange, etc.

745. **Ceroplastes cirripediformis** Comst.

(*Barnacle scale.*)

Ceroplastes cirripediformis Comst., Rep. U. S. Dep. Ag., 1880, p.333 (1881).
" " " 2dRep.Dep.Ent.Corn.Univ.,p.130(1883).
" " Saund., Ins. Inj. to Fruits, p. 402 (1883).
" " Hubbard, Ins. Aff. Orange, p. 59 (1885).
" " Comst., Intr. Ent., pp. 143, 144 (1888).
" " Morg., Spec. Bull. La. Exp. Sta., p. 78 (1893).
" " Ckll., The Entom., xxvi, p. 81 (1893).
" " Howard, Ins. Life, vii, p. 280 (1894).
" " Ckll., Bull. Bot. Dep. Jam., p. 5 (1895).
" " Marl., Yearbook U. S. Dep. Ag., p. 278 (1900).

Habitat.—Florida; Louisiana; Mexico; West Indies.

On orange; quince; myrtle; persimmon; Solanum; Lignum-vitæ; Eupatorium, etc.

746. **Ceroplastes cistudiformis** Towns. & Ckll.

Ceroplastes psidii subsp. cistudiformis Ckll., Zoe, iii, p. 256 (1892).
" cistudiformis Ckll., Zoe, iv, p. 104 (1893).
" " " The Entom., xxxi, pp. 119, 141 (1898).

Habitat.—Mexico; California.

On Chysis aurea; Bignonia; Chrysanthemum; Cordia boissieri; "Avocado pear;" "pepper-tree."

747. **Ceroplastes coloratus** Ckll.

Ceroplastes coloratus Ckll., Ann. Mag. N. H., (7), i, p. 435 (1898).

Habitat.—Mexico.

On "Crucetilla."

748. **Ceroplastes communis** Hemp.

Ceroplastes communis Hemp., Rev. Mus. Paul., iv, p. 459 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 560 (1901).

Habitat.—Brazil.

On Maytenus.

749. **Ceroplastes confluens** Ckll. & Tins.

Ceroplastes confluens Ckll. & Tins., Jn. Inst. Jam., ii, p. 468 (1897).
" " Hemp., Rev. Mus. Paul., iv, p. 460 (1900).

Habitat.—Jamaica; Brazil.

On Ingaseiro; Mimosa.

750. Ceroplastes cultus Hemp.

Ceroplastes cultus Hemp., Rev. Mus. Paul., iv, p. 470 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 65 (1901).
Habitat.—Brazil.
On Erigeron canadensis.

751. Ceroplastes cuneatus Hemp.

Ceroplastes cuneatus Hemp., Rev. Mus. Paul., iv, p. 471 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 66 (1901).
Habitat.—Brazil.
On Erigeron canadensis.

752. Ceroplastes denudatus Ckll.

Ceroplastes denudatus Ckll., The Entom., xxvi, p. 82 (1893).
" " " Bull. Bot. Dep. Jam., p. 6 (1895).
Habitat.—Antigua; Demerara.
On Anona muricata; Croton?

753. Ceroplastes depressus Ckll.

Ceroplastes sp.? Ckll., Journ. Inst. Jam., i, p. 179 (1893).
" depressus " The Entom., xxvi, p. 81 (1893).
" " " Bull. Bot. Dep. Jam., p. 6 (1895).
Habitat.—Jamaica.
On Lignum-vitæ.

754. Ceroplastes dugesii "Licht.," Towns.

Ceroplastes dugesii Licht., Bull. Soc. Ent. Fr., (6), v, p. cxli (1885) no desc.
" " Towns., Zoe, iii, p. 255 (1892).
" " Ckll., Biol. Centr. Amer., ii, pt. 2, p. 18 (1899).
Habitat.—Mexico; Lesser Antilles.
On Malvaviscus arboreus; M. acerifolius: Hibiscus; Laurel rose.

755. Ceroplastes egbarum Ckll.

Ceroplastes egbarum Ckll., The Entom., xxxii, p. 127 (1899).
" cristatus Green, Ann. Mag. N. H., (7), iv, p. 190 (1899).
" egbarum Ckll., " " " " v, pp. 158, 159 (1900).
Habitat.—W. Africa.
On Mimosa.

Ceroplastes egbarum fulleri T. & W. Ckll.

Ceroplastes egbarum subsp. fulleri T. & W. Ckll., The Entom., xxxv, p. 113 (1902).
Habitat.—Natal.
On Mimosa; Acacia.

756. Ceroplastes euphorbiæ Ckll.

Ceroplastes euphorbiæ Ckll., Psyche, vii, Suppl., i, p. 17 (1896).
Habitat.—Jamaica.
On Euphorbia hypericifolia.

757. **Ceroplastes fairmairii** Targ.

Ceroplastes fairmairii Targ., Catalogue, p. 25 (1869).
" " Sign., Ann. Soc. Ent. Fr., (5), ii, p. 43 (1872).
" " Ckll., Ann. Mag. N. H., (7), iii, p. 170 (1899).
" " " " " " " ix, p. 455 (1902).

Habitat.—Europe; Brazil.

On clove-tree.

758. **Ceroplastes floridensis** Comst.

(*Florida wax scale.*)

Ceroplastes floridensis Comst., Rep. U. S. Dep. Ag., 1880, p. 331 (1881).
" rusci Ashm. (non Linn.), Can. Ent., xii, p. 252 (1880).
" floridensis Voyle, Bull. 1, Div. Ent. Dep. Ag., p. 20 (1883).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 131 (1883).
" " Saund., Ins. Inj. to Fruits, p. 402 (1883).
" rusci Uhler, St. Nat. Hist., ii, p. 216 (1884).
" floridensis Hubbard, Ins. Aff. the Orange, p. 56 (1885).
" " Comst., Intr. Ent., pp. 143, 144 (1888).
" " Riley, Ins. Life, i, p. 326 (1889).
" " Riley & How., Ins. Life, ii, pp. 55, 316 (1889-90).
" " Morg., Spec. Bull. La. Exp. Sta., p. 66 (1893).
" " Ckll., The Entom., xxvi, p. 80 (1893).
" " Riley & How., Ins. Life, vi, p. 347 (1894).
" " Ckll., Bull. Bot. Dep. Jam., p. 5 (1895).
" " Howard, Bull. 9, n. s., Dep. Ag., p. 39 (1897).
" " Rolfs & Quaint., Cocc. Amer., Dec. i-ii, No. 7 (1898).
" " Ckll., Ann. Mag. N. H., (7), iv, p. 191 (1899).
" " Marl., Yearbook U. S. Dep. Ag., p. 277 (1900).
" " Gossard, Bull. 51, Fla. Exp. Sta., p. 117 (1900).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 62 (1902).

Habitat.—Fla.; La.; Cal.; Mex.; West Indies; Hawaiian Islands; Ceylon; India; Brazil; Darjeeling; Assam; Japan; Australia.

On Oleander; Citrus; quince; red bay; myrtle; lignum-vitæ; pomegranate; mango; guava; fig; tea; Ilex glabra; Anona reticulata; Andromeda; Anthurium; etc.

759. **Ceroplastes formicarius** Hemp.

Ceroplastes formicarius Hemp., Rev. Mus. Paul., iv, p. 472 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 67 (1901).

Habitat.—Brazil.

On Maytenus.

760. **Ceroplastes formosus** Hemp.

Ceroplastes formosus Hemp., Rev. Mus. Paul., iv, p. 468 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 64 (1901).

Habitat.—Brazil.

On Eugenia.

761. Ceroplastes grandis Hemp.

Ceroplastes grandis Hemp., Rev. Mus. Paul., iv, p. 455 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 557 (1901).
Habitat.—Brazil.
On Zanthoxylum; Baccharis; Ilex; Psidium.

762. Ceroplastes iheringi Ckll.

Ceroplastes iheringi Ckll., The Entom., xxviii, p. 100 (1895).
" " " Rev. Mus. Paul., ii, p. 70 (1897).
" " Hemp., " " " iv, p. 452 (1900).
Habitat.—Brazil.
On Baccharis platensis; B. dracunculifolia.

763. Ceroplastes irregularis Ckll.

Ceroplastes irregularis Ckll., The Entom., xxvi, p. 351 (1893).
" " " Science, xxii, p. 151 (1893).
" artemisiarum " Ann. Mag. N. H., (6), xii, p. 160 (1893) no desc.
" irregularis " " " " " xv, p. 209 (1895).
" " " The Entom., xxxiii, p. 201 (1900).
Habitat.—Mexico; New Mexico; California; Texas.
On Atriplex confertifolia; A. canescens.

Ceroplastes irregularis rubidus Ckll.

Ceroplastes irregularis var. rubidus Ckll., Jn. N. Y. Ent. Soc., iv, p. 203 (1896).
Habitat.—New Mexico.
On Atriplex canescens.

764. Ceroplastes jamaicensis A. White.

Ceroplastes jamaicensis A. White, Ann. Mag. N. H., xvii, p. 333 (1846).
" " Westw., Gard. Chron., p. 484 (1853).
" " Sign., Ann. Soc. Ent. Fr., (5), ii, p. 45 (1872).
" " McIntire, Jn. Quekett Micr. Club, p. 24 (1889).
" " Ckll., The Entom., xxvi, p. 81 (1893).
" " " Bull. Bot. Dep. Jam., p. 6 (1895).
Habitat.—Jamaica; Br. Guiana.
On lance-wood.

765. Ceroplastes janeirensis Gray.

Ceroplastes janeirensis Gray, Spicilegia Zoologica, p. 7, pl. 3, fig. 6 (1830).
" " A. White, Ann. Mag. N. H., xvii, p. 333 (1846).
" " Westw., Gard. Chron., p. 484 (1853).
" " Targ., Atti dei Georgofili, n. s., xiii, p. 33 (1866).
" " " Studii sul. Cocc., p. 28 (1867).
" " Sign., Ann. Soc. Ent. Fr., (5), ii, p. 42 (1872).
" " Hemp., Rev. Mus. Paul., iv, p. 451 (1900).
Habitat.—Europe; Brazil.
On Myrtaceæ.

766. Ceroplastes lucidus Hemp.

Ceroplastes lucidus Hemp., Rev. Mus. Paul., iv, p. 465 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 62 (1901).
Habitat.—Brazil.
On Baccharis dracunculifolia.

767. Ceroplastes marmoreus Ckll.

Ceroplastes marmoreus Ckll., Ann. Mag. N. H., (7), xi, p. 158 (1903).
Habitat.—Mexico.
On sage: Catalpa; "A Composite near Parthenium."

768. Ceroplastes mexicanus Ckll.

Ceroplastes mexicanus Ckll., Psyche, vii, Suppl., i, p. 20 (1896).
" " " Bull. 4, T. s., Dep. Ag., p. 34 (1896).
" " " Ann. Mag. N. H., (7), xi, p. 156 (1903).
Habitat.—Mexico.
On Catalpa.

769. Ceroplastes mimosæ Sign.

Ceroplastes mimosæ Sign., Ann. Soc. Ent. Fr., (5), ii, p. 46 (1872).
" " " Bull. " " " " " p. xlvii (1872).
Habitat.—Egypt.
On Mimosa nilotica.

770. Ceroplastes minutus Ckll.

Ceroplastes minutus Ckll., Ann. Mag. N. H., (7), i, p. 434 (1898).
Habitat.—Mexico.
On "Escobillo."

771. Ceroplastes myricæ (Linn.).

Coccus myricæ Linn., Syst. Nat., Ed. xii, i, p. 741 (1766).
" " Mod., Act. Goth., p. 31 (1778).
" " Gmel., Syst. Nat., Ed. xiii, p. 2217 (1789).
" " Oliv., Ency. Meth., vi, p. 96 (1791).
" " Fab., Ent. Syst., iv, p. 226 (1794).
" " Turton, Syst. Nat., p. 713 (1801).
" " Fab., Syst. Rhyng., p. 309 (1803).
Columnea " Targ., Catalogue, p. 35 (1869).
Ceroplastes " Sign., Ann. Soc. Ent. Fr., (5), ii, p. 39 (1872).
" " Green, Ind. Mus. Notes, v, No. 1, p. 8 (1900).
Habitat.—Cape of Good Hope; India; Europe.
On Myrica quercifolia; Cycas revoluta; tea.

772. Ceroplastes nerii Newst.

Ceroplastes nerii Newst., Tr. Ent. Soc. Lond., p. 101 (1897).
Habitat.—Algeria.
On Nerium oleander.

773. Ceroplastes novaesi Hemp.

Ceroplastes novaesi Hemp., Rev. Mus. Paul., iv, pp. 457, 459 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 559 (1901).
Habitat.—Brazil.
On Abutilon; Baccharis dracunculifolia; Vernonia riedelii.

Ceroplastes novaesi mendozæ Ckll.

Ceroplastes novaesi mendozæ Ckll., Can. Ent., xxxiv, p. 92 (1902).
Habitat.—Argentine Republic.

774. Ceroplastes personatus Newst.

Ceroplastes personatus Newst., Ent. Mon. Mag., xxxiv, p. 94 (1898).
Habitat.—W. Africa.

775. Ceroplastes plumbaginis Ckll.

Ceroplastes plumbaginis Ckll., The Entom., xxvi, p. 82 (1893).
" " " Bull. Bot. Dep. Jam., p. 6 (1895).
Habitat.—Antigua.
On Plumbago capensis.

776. Ceroplastes psidii (Chav.).

Coccus psidii Chav., Ann. Soc. Ent. Fr., (2), vi, p. 139 (1848).
" " Targ., Atti dei Georgofili, n. s., xiii, p. 33 (1866).
" " " Studii sul. Cocc., p. 28 (1867).
" " " Catalogue, p. 35 (1869).
" Chavannesii Targ., " p. 35 (1869).
Ceroplastes " Sign., Ann. Soc. Ent. Fr., ii, p. 40 (1872).
Habitat.—Europe; Brazil.
On Psidium.

777. Ceroplastes purpurellus Ckll.

Ceroplastes purpurellus Ckll., Ann. Mag. N. H., (7), xi, p. 159 (1903).
Habitat.—Mexico.

778. Ceroplastes purpureus Hemp.

Ceroplastes purpureus Hemp., Rev. Mus. Paul., iv, p. 466 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 63 (1901).
Habitat.—Brazil.
On Miconia.

779. Ceroplastes rarus Hemp.

Ceroplastes rarus Hemp., Rev. Mus. Paul., iv, p. 469 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 65 (1901).
Habitat.—Brazil.

780. Ceroplastes roseatus Towns. & Ckll.

Ceroplastes roseatus Towns. & Ckll., Jn. N. Y. Ent. Soc., vi, p. 176 (1898).
" " Ckll., Ann. Mag. N. H., (7), iii, p. 167 (1899).
" " Dolby-Tyler, Tr. Ent. Soc. Lond., p. 277 (1899).
Habitat.—Mexico; Panama.
On "Cojon de venado."

Ceroplastes roseatus var. B. Towns. & Ckll.

Ceroplastes roseatus var. B., Towns. & Ckll., Ann. Mag. N. H.,(7), xi, p. 157 (1903).

Habitat.—Mexico.

781. Ceroplastes rotundus Hemp.

Ceroplastes rotundus Hemp., Rev. Mus. Paul., iv, p. 473 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 68 (1901).

Habitat.—Brazil.

On Maytenus.

782. Ceroplastes rubens Mask.

Ceroplastes rubens Mask., N. Z. Trans., xxv, p. 214 (1892).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 44 (1896).
" " Frog., Rep. Dep. Ag. N. S. W., No. 175, p. 3 (1897).
" " Mask., N. Z. Trans., xxix, p. 309 (1897).
" " Gurney, Rep. 7th Meet. Austr. Assoc. Adv. Sci., p. 273 (1898).
" " Green, Ind. Mus. Notes, v, No. 1, p. 9 (1900).

Habitat.—Australia; Hawaiian Islands; Japan.

On Mangifera indica; Ficus macrophylla; Eugenia Smithii; Magnolia purpurea; Ilex latifolia; ferns; orange; pear, etc. List in Rep. Dep. Ag. N. S. W., No. 175, p. 4 (1897).

Ceroplastes rubens minor Mask.

Ceroplastes rubens var. minor Mask., N. Z. Trans., xxix, p. 309 (1897).

Habitat.—China.

On Pinus sinensis; P. thunbergii.

783. Ceroplastes rusci (Linn.).

Coccus rusci Linn., Syst. Nat., Ed. x, i, p. 456 (1758).
" " " " " " xii, i, p. 741 (1766).
" caricæ Bern., Mem. Acad. Marseille, p. 89 (1773).
" rusci Fab., Syst. Ent., p. 743 (1775).
" " Mod., Act. Goth., i, p. 31 (1778).
" " Fab., Spec. Ins., ii, p. 394 (1781).
" " " Mant. Ins., ii, p. 319 (1787).
" " Gmel., Syst. Nat., Ed. xiii, p. 2217 (1789).
" caricæ Oliv., Ency. Meth., vi, p. 93 (1791).
" rusci " " " " p. 95 (1791).
" artemisiæ Rossi, Mant. Ins., ii, pp. 56, 514 (1794).
" caricæ Fab., Ent. Syst., iv, p. 225 (1794).
" rusci " " " " p. 226 (1794).
" " Turton, Syst. Nat., p. 713 (1801).
" caricæ " " " p. 713 (1801).
" " Fab., Syst. Rhyng., p. 308 (1803).
" rusci " " " p. 309 (1803).
" caricæ Fonsc., Ann. Soc. Ent. Fr., iii, p. 205 (1834).

Calypticus radiatus Costa, Faun. Reg. Nap., Cocc., p. 12 (1835).
" testudineus " " " " " p. 12 (1835).
" hydatis " " " " " p. 14 (1835).
Columnea testudinata Targ., Atti dei Georgofili, n. s., xiii, p. 31 (1866).
" " " Studii sul. Cocc., p. 8 (1867).
Coccus caricæ " " " " pp. 4, 8, 12 (1867).
" hydatis " " " " p. 12 (1867).
Columnea testudiniformis " " " " pp. 8, 11, 12 (1867).
Chermes caricæ Bdv., Ent. Hort., p. 320 (1867).
Columnea testudinata Targ., Catalogue, p. 35 (1869).
Ceroplastes rusci Sign., Ann. Soc. Ent. Fr., (5), ii, p. 35 (1872).
Lecanium artemisiæ Sign., " " " " " ii, p. 37 (1872).
Coccus rusci Sign., Bull. " " " " vi, p. lxxvi (1876).
Ceroplastes rusci Colvée, Estud. sob. Ins., Cocc., p. 9 (1881).
" " " Bull. Soc. Ent. Fr., (6), i, p. xii (1881).
" " Blanch., Les Coccides utiles, p. 23 (1883).
" " Targ., Annali di Agr., pp. 400, 409 (1884).
" " McIntire, Jn. Quekett Micr. Club, p. 23 (1889).
Lecanium artemisiæ Targ., Cocc. deg. Agr. Ital., p. 13, note (1891).
Columnea testudiniformis Targ., Cocc. deg. Agr. Ital., pp. 13, 28 (1891).
" rusci Berl., Riv. Pat. Veg., i, p. 62 (1892).
Ceroplastes " Visart, " " " iii, p. 44 (1894).
" " Saccardo, Riv. Pat. Veg., iv, p. 47 (1895).
" " Berl. e Leon., Cherm. Ital., Fasc. ii, No. 50 (1897).
" " Newst., Tr. Ent. Soc. Lond., p. 101 (1897).
" " Leon., Lab. di Ent. Agr. Portici, p. 3 (1899).
" " Trabut, Bul. Agr. Algérie et Tunisie, No. 7, pp. 161-167 (1902).

Habitat.—Europe; British Guiana; Algeria; Australia; Japan.
On fig; holly; myrtle; wormwood.

784. **Ceroplastes scutigera** Ckll.

Ceroplastes scutigera Ckll., Can. Ent., xxxiv, p. 92 (1902).
Habitat.—Argentine Republic.

785. **Ceroplastes simplex** Hemp.

Ceroplastes simplex Hemp., Rev. Mus. Paul., iv, p. 475 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 68 (1901).
Habitat.—Brazil.
On Myrtaceæ.

786. **Ceroplastes sinensis** Del Guercio.

Ceroplastes sinensis Del Guer., Science, n. s., xiii, p. 469 (1901).
Habitat.—Italy.
On lemon trees.

787. **Ceroplastes speciosus** Hemp.

Ceroplastes speciosus Hemp., Rev. Mus. Paul., iv, p. 464 (1900).
Habitat.—Brazil.
On Myrtaceæ.

788. **Ceroplastes townsendi** Ckll.

Ceroplastes townsendi Ckll., Biol. Centr. Am., ii, pt. 2, p. 18 (1899).
Habitat.—Mexico.

Ceroplastes townsendi percrassus Ckll.

Ceroplastes townsendi var. percrassus Ckll., Ann. Mag. N. H., (7), xi, p. 159 (1903).
Habitat.—Mexico.
On Oleander; Ficus.

789. **Ceroplastes utilis** Ckll.

Ceroplastes utilis Riley & How.. Ins. Life, v, p. 139 (1892) no desc.
" " Ckll., The Entom., xxvi, p. 83 (1893).
" " " Bull. Bot. Dep. Jam., p. 7 (1895).
Habitat.—Grand Turk Island, Bahamas.

790. **Ceroplastes variegatus** Hemp.

Ceroplastes variegatus Hemp., Rev. Mus. Paul., iv, p. 462 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 560 (1901).
Habitat.—Brazil.
On Myrtaceæ.

791. **Ceroplastes vinsonii** Sign.

Ceroplastes vinsonii Sign.. Ann. Soc. Ent. Fr., (5), ii, p. 38 (1872).
" " de Charm., Pr. Soc. Amic. Scien., p. 38 (1899).
Habitat.—Mauritius; Reunion Island.
On Eriobotrya japonica; guava.

Genus **CHELONICOCCUS** A. Costa. Type, luteus.

Chelonicoccus A. Costa, Atti del. R. Acad. Sci., Napoli, iii, p. 10 (1866).
" Doubtful genus, only known from external characters; perhaps a synonym of Ceroplastes" (T. D. A. Cockerell).

792. **Chelonicoccus luteus** A. Costa.

Chelonicoccus luteus A. Costa, Atti del. R. Acad. Sci., Napoli, iii, p. 12 (1866).
Habitat.—Italy.

Genus **VINSONIA** Sign. Type, stellifera.

Vinsonia Sign., Ann. Soc. Ent. Fr., (5), ii, p. 33 (1872): Ckll., Can. Ent., xxxi, p. 332 (1899).

793. Vinsonia stellifera (Westw.).

Coccus stellifera Westw., Pr. Ent. Soc. Lond., pp. 3, 111 (1871).
Vinsonia pulchella Sign., Ann. Soc. Ent. Fr., (5), ii, p. 34 (1872).
Coccus stellifer " " " " " " vi, p. 608 (1876).
Vinsonia stellifera Dougl., Ent. Mon. Mag., xxv, p. 152 (1888).
" " Ckll., Gard. Chron., (3), xiii. p. 548 (1893).
" " " Jn. Trin. Nat. Club, i, p. 307 (1894).
" " " Bull. Bot. Dep. Jam.. p. 100 (1895).
" " " Jn. Trin. Nat. Club, ii, p. 307 (1896).
" " " Check List, p. 330 (1896).
" " Green, Ind. Mus. Notes, iv, p. 8 (1896).
" " de Charm., Pr. Soc. Amic. Scien., p. 38 (1899).
" " Hemp., Rev. Mus. Paul., iv, p. 477 (1900).
" " Lefroy, Scale Ins. Less. Antil., p. 41 (1901).

Habitat.—Trinidad; Jamaica; Antigua; Barbados; Demerara; Grenada; Brazil; Central America; California; Ceylon.

On orchids; ferns; guava; mango; nutmeg; cocoanut-palm, etc.

Genus **CTENOCHITON** Mask. Type, viridis.

Ctenochiton Mask., N. Z. Trans., xi, p. 208 (1878); Ins. Nox. Agr. N. Z., p. 65 (1887): Ckll., Can. Ent., xxxi, p. 332 (1899).

794. Ctenochiton araucariæ Green.

Ctenochiton(?) araucariæ Green, Ann. Mag. N. H., (7), vi, p. 449 (1900).

Habitat.—Australia.

On Araucaria.

795. Ctenochiton aztecus Towns. & Ckll.

Ctenochiton aztecus Towns. & Ckll., Jn. N. Y. Ent. Soc., vi, p. 176 (1898).

Habitat.—Mexico.

On "Cafetilla cimarron."

796. Ctenochiton cellulosus Ckll.

Ctenochiton cellulosus Ckll., Victorian Naturalist, xvi, p. 88 (1899).

Habitat.—Australia.

797. Ctenochiton dacrydii Mask.

Ctenochiton dacrydii Mask., N. Z. Trans., xxiv, p. 18 (1891).

Habitat.—New Zealand.

On Dacrydium cupressinum.

798. Ctenochiton depressus Mask.

Ctenochiton depressus Mask., N. Z. Trans., xvi, p. 132 (1883).
" " " Ins. Nox. Agr. N. Z., p. 66 (1887).
" " " N. Z. Trans., xxiv, p. 19 (1891).

Habitat.—New Zealand.

On Plagianthus; Cyathea, etc.

Ctenochiton depressus minor Mask.

Ctenochiton depressus, small form, Mask., N. Z. Trans., xxiv, p. 19 (1891).
" " forma minor, " " " xxvii, p. 12 (1894).
Habitat.—New Zealand.
On Coprosma.

799. Ctenochiton elæocarpi Mask.

Ctenochiton elæocarpi Mask., N. Z. Trans., xvii, p. 26 (1884).
" " " " " xix, pp. 41, 42 (1886).
" " " Ins. Nox. Agr. N. Z., p. 67 (1887).
Habitat.—New Zealand.
On Elæocarpus dentatus.

800. Ctenochiton elongatus Mask.

Ctenochiton elongatus Mask., N. Z. Trans., xi, p. 212 (1878).
" " " Ins. Nox. Agr. N. Z., p. 68 (1887).
" " Ckll., Gard. Chron., (3), xiii, p. 548 (1893).
Habitat.—New Zealand.
On Geniostoma ligustrifolium ; Dendrobium ; Earina.

801. Ctenochiton eucalypti Mask.

Ctenochiton eucalypti Mask., N. Z. Trans., xxvii, p. 52 (1894).
Habitat.—Australia.
On Eucalyptus siderophloia.

802. Ctenochiton flavus Mask.

Ctenochiton flavus Mask., N. Z. Trans., xvi, p. 130 (1883).
" " " " " xvii, p. 26 (1884).
" " " Ins. Nox. Agr. N. Z., p. 68 (1887).
Habitat.—Brazil.
On Brachyglottis repanda ; Panax arboreum ; Leptospermum scoparium ; Elæocarpus dentatus.

803. Ctenochiton fuscus Mask.

Ctenochiton fuscus Mask., N. Z. Trans., xvi, p. 131 (1883).
" " " Ins. Nox. Agr. N. Z., p. 70 (1887).
Habitat.—New Zealand.
On Brachyglottis repanda : Panax arboreum.

804. Ctenochiton hymenantheræ Mask.

Ctenochiton hymenantheræ Mask., N. Z. Trans., xvii, p. 25 (1885).
" " " Ins. Nox. Agr. N. Z., p. 71 (1887).
Habitat.—New Zealand.
On Hymenanthera crassifolia.

805. Ctenochiton perforatus Mask.

Ctenochiton perforatus Mask., N. Z. Trans., xi, p. 280 (1878).
" " " " " xvi, p. 130 (1883).
" " " " " xix, p. 41 (1886).
" " " Ins. Nox. Agr. N. Z., p. 72 (1887).
" " Ckll., Can. Ent., xxvi, p. 34 (1894).

Habitat.—New Zealand.

On Pittosporum eugenioides; P. tenuifolium; Panax arboreum; Coprosma lucida; Rubus.

806. Ctenochiton piperis Mask.

Ctenochiton piperis Mask., N. Z. Trans., xiv, p. 218 (1881).
" " " " " xvii, p. 25 (1884).
" " " Ins. Nox. Agr. N. Z., p. 73 (1887).

Habitat.—New Zealand.

On Piper excelsum.

807. Ctenochiton rhizophoræ Mask.

Ctenochiton rhizophoræ Mask., N. Z. Trans., xxvii, pp. 51, 54, 55 (1894).

Habitat.—Australia.

On Rhizophora mangle (mangrove).

808. Ctenochiton viridis Mask.

Ctenochiton viridis Mask., N. Z. Trans., xi, p. 211 (1878).
" " " " " xvii, p. 24 (1884).
" " " Ins. Nox. Agr. N. Z., p. 74 (1887).
" " " Ent. Mon. Mag., xxvi, p. 278 (1890).

Habitat.—New Zealand.

On Panax arboreum; Coprosma lucida; Hedycarya dentata; Rubus australis; Atherosperma Novæ-zælandiæ.

Genus **CARDIOCOCCUS** Ckll. Type, umbonatus.

Cardiococcus Ckll., Ann. Mag. N. H., (7), xi, p. 155 (1903).

809. Cardiococcus foraminifer (Mask.).

Inglisia foraminifer Mask., N. Z. Trans., xxv. p. 213 (1892).
Cardiococcus " Ckll., Ann. Mag. N. H., (7), xi, p. 156 (1903).

Habitat.—Australia.

On Santalum acuminatum.

Cardiococcus foraminifer loranthi (Full.).

Inglisia foraminifer var. loranthi Full., Notes on Cocc. W. Austr., p.6 (1897).
" " " " " Tr. Ent. Soc. Lond., p. 460 (1899).

Habitat.—W. Australia.

On Loranthus quandang (misletoe) on Santalum.

810. **Cardiococcus fossilis** (Mask.).

Inglisia fossilis Mask., N. Z. Trans., xxix, p. 308 (1897).
Cardiococcus fossilis Ckll., Ann. Mag. N. H., (7), xi, p. 156 (1903).
Habitat.—W. Australia.
On Acacia; Templetonia.

811. **Cardiococcus umbonatus** Ckll.

Cardiococcus umbonatus Ckll., Ann. Mag. N. H., (7), xi, p. 155 (1903).
Habitat.—Mexico.
On wild guava.

Genus **INGLISIA** Mask. Type, patelia.

Inglisia Mask., N. Z. Trans., xi, p. 213 (1878); Ins. Nox. Agr. N. Z., p. 75 (1887): Ckll., Can. Ent., xxxi, p. 332 (1899).

812. **Inglisia bivalvata** Green.

Inglisia bivalvata Green, Ind. Mus. Notes, v, p. 93 (1903).
Habitat.—S. India.
On Thespesia populnea.

813. **Inglisia fagi** Mask.

Inglisia fagi Mask., N. Z. Trans., xxiii, p. 13 (1890).
Habitat.—New Zealand.
On Fagus.

814. **Inglisia inconspicua** Mask.

Inglisia inconspicua Mask., N. Z. Trans., xxiv, p. 19 (1891).
Habitat.—New Zealand.
On Corokia Cotoneaster.

815. **Inglisia leptospermi** Mask.

Inglisia leptospermi Mask., N. Z. Trans., xiv, p. 220 (1881).
" " " " " xvii, p. 27 (1884).
" " " Ins. Nox. Agr. N. Z., p. 75 (1887).
Habitat.—New Zealand.
On Leptospermum scoparium.

816. **Inglisia malvacearum** Ckll.

Inglisia malvacearum Ckll., Ann. Mag. N. H., (7), i, p. 432 (1898).
Habitat.—Mexico.
On Malva; Hibiscus; cotton.

817. **Inglisia ornata** Mask.

Inglisia ornata Mask., N. Z. Trans., xvii, p. 27 (1884).
" " " Ins. Nox. Agr. N. Z., p. 76 (1887).
Habitat.—New Zealand.
On Elæocarpus dentatus; Leptospermum scoparium.

818. Inglisia patella Mask.

Inglisia patella Mask., N. Z. Trans., xi, p. 213 (1878).
" " " " " xiv, p. 219 (1881).
" " " Ins. Nox. Agr. N. Z.. p. 78 (1887).
Habitat.—New Zealand.
On Coprosma lucida; Drimys colorata; Atherosperma.

819. Inglisia vitrea Ckll.

Inglisia vitrea Ckll., Jn. Trin. Nat. Club, i, p. 308 (1894).
" " " Bull. Bot. Dep. Jam.. p. 100 (1895).
Habitat.—Trinidad.
On Acacia.

Genus **PARAFAIRMAIRIA** Ckll. Type, bipartita.

||Fairmairia Sign., Ann. Soc. Ent. Fr., (5), iv, p. 98 (1874).
Parafairmairia Ckll., Can. Ent., xxxi, p. 332 (1899).

820. Parafairmairia bipartita (Sign.).

Fairmairia bipartita Sign.. Bull. Soc. Ent. Fr., (5), ii, p. xxxvi (1872) no desc.
" " " Ann. " " " " iv, p. 99 (1874).
Habitat.—France.
On Agropyrum campestre: Mesembrianthemum.

Genus **LAGOSINIA** Ckll. Type, strachani.

Lagosinia Ckll., Can. Ent., xxxi, p. 332 (1899).

821. Lagosinia strachani (Ckll.).

Lecanium strachani Ckll., The Entom.. xxxi, p. 259 (1898).
Lagosinia " " Can. Ent., xxxi, p. 332 (1899).
Habitat.—W. Africa.
On Anona squamosa.

Genus **ALICHTENSIA** Ckll. Type, attenuata.

Alichtensia Ckll., Ann. Mag. N. H., (7), ix, p. 451 (1902).

822. Alichtensia attenuata (Hemp.).

Lichtensia(?) attenuata Hemp., Rev. Mus. Paul., iv, p. 494 (1900).
" " Ckll., Ann. Mag. N. H., (7), viii, p. 105 (1901).
Alichtensia " " " " " " ix, p. 451 (1902).
Habitat.—Brazil.
On Baccharis genistelloides.

Genus **EDWALLIA** Hemp. Type, rugosa.

Edwallia Hemp., Can. Ent., xxxi, p. 131 (1899); Rev. Mus. Paul., iv, p. 478 (1900).

823. Edwallia rugosa Hemp.

Edwallia rugosa Hemp., Can. Ent., xxxi, p. 131 (1899).
" " " Rev. Mus. Paul., iv, p. 478 (1900).
Habitat.—Brazil.
On Eugenia jaboticaba.

Genus **CEROPLASTODES** Ckll. Type, dugesii.

Ceroplastodes Ckll., The Entom., xxvi, p. 350 (1893); Can. Ent., xxxi,p. 333 (1899).

824. Ceroplastodes acaciæ Ckll.

Ceroplastodes acaciæ Ckll., Psyche, vii, Suppl., i, p. 2 (1895).
Habitat.—Arizona; New Mexico.
On Acacia constricta.

825. Ceroplastodes cajani (Mask.).

Eriochiton cajani Mask., Ind. Mus. Notes, ii, p. 61 (1891).
" " " N. Z. Trans., xxiv, p. 24 (1891).
" " " " " xxix, p. 314 (1897).
Ceroplastodes cajani Ckll., Nature, lxi, p. 368 (1900).
Habitat.—India; China.
On Cajanus indicus (pigeon-pea); Mallotus cochinchinensis.

826. Ceroplastodes daleæ Ckll.

Ceroplastodes daleæ Ckll., Ann. Mag. N. H., (6), xiv, p. 13 (1894).
Habitat.—New Mexico.
On Dalea formosa.

827. Ceroplastodes dugesii ("Licht.," Sign.).

Lecanopsis dugesii "Licht.," Sign., Bull. Soc. Ent. Fr., (6),vi,p.xxxix (1886).
Fairmairia (Ceroplastodes) nivea Ckll., The Entom., xxvi, p. 350 (1893).
Inglisia nivea Ckll., Ann. Mag. N. H., (6), xii, p. 160 (1893).
Ceroplastodes nivea Ckll., Ann. Mag. N. H., (6), xv, p. 209 (1895).
Lecanopsis dugesi " Biol. Centr. Amer., ii, pt. 2, p. 15 (1899).
Ceroplastodes niveus " " " " " " " p. 15 (1899).
" dugesi " The Entom., xxxv, p. 194 (1902).
Habitat.—Mexico.
On Mimosa.

828. Ceroplastodes melaleucæ (Green).

Eriochiton(?) melaleucæ Green, Victorian Naturalist, xvii, p. 12 (1900).
Ceroplastodes " Ckll., in litt. (1902).
Habitat.—Australia.
On Melaleuca.

Genus **PLATINGLISIA** Ckll. Type, noacki.

Platinglisia Ckll., The Entom., xxxii, p.12 (1899); Can.Ent.,xxxi,p.333 (1899).

829. Platinglisia noacki Ckll.

Platinglisia noacki Ckll., The Entom., xxxii, p. 12 (1899).
" " Hemp., Rev. Mus. Paul., iv, p. 477 (1900).
Habitat.—Brazil.
On "A myrtaceous shrub"; Laurus.

Genus **SCHIZOCHLAMIDIA** Ckll. Type, mexicana.

Schizochlamidia Ckll., Biol. Centr. Amer., ii, pt. 2, p. 15 (1899); Can. Ent., xxxi, p. 333 (1899).

830. Schizochlamidia mexicana Ckll. & Parr.

Schizochlamidia mexicana Ckll.& Parr.,Biol.Centr.Amer.,ii,pt.2, p. 15 (1899).
Habitat.—Mexico.
On Mimosa.

Genus **PSEUDOKERMES** Ckll. Type, nitens.

Pseudokermes Ckll.. Can. Ent., xxvii, p. 203 (1895); xxxi, p. 333 (1899).

831. Pseudokermes armatus (Ckll.).

Lecanium (Pseudokermes) armatus Ckll., Ann. Mag. N. H.,(7),i,p.436 (1898).
Pseudokermes armatus Ckll., Pr. Ac. N. Sci. Ph., p. 270 (1899).
Habitat.—Mexico.
On "Palo de gusano."

832. Pseudokermes nitens (Hemp.).

Lecanium (Pseudokermes) nitens Ckll., Can. Ent., xxvii, p. 203 (1895).
Pseudokermes nitens Hemp., Rev. Mus. Paul., iv, p. 448 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 219 (1901).
Habitat.—Brazil.
On Myrtus Tweedii; Psidium, etc.

Genus **CRYPTINGLISIA** Ckll. Type, lounsburyi.

Cryptinglisia lounsburyi Ckll., The Entom., xxxiii, p. 173 (1900).

833. Cryptinglisia lounsburyi Ckll.

Cryptinglisia lounsburyi Ckll., The Entom., xxxiii, p. 173 (1900).
" " Lounsb., Rep. Ent. Cape Good Hope, p. 54 (1900).
Habitat.—Cape Colony, S. Africa.
On roots of Vitis vinifera.

Genus **EUCALYMNATUS** Ckll. Type, tessellatus.

s. g. Eucalymnatus Ckll., Can. Ent., xxxiii, p. 57 (1901); g. Ann. Mag. N. H., (7), ix, p. 453 (1902).

834. Eucalymnatus brunfelsiæ (Hemp.).

Lecanium brunfelsia Hemp., Rev. Mus. Paul., iv, p. 418 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 206 (1901).
Eucalymnatus brunfelsiæ Ckll., " " " " ix, p. 453 (1902).

Habitat.—Brazil.

On Brunfelsia; Laurus.

The specific name *brunfelsia* is undoubtedly a misprint for brunfelsiæ as Mr. Hempel sent specimens under the latter name to Prof. Cockerell.

835. Eucalymnatus gracilis (Hemp.).

Lecanium gracile Hemp., Rev. Mus. Paul., iv, p. 419 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 208 (1901).
Eucalymnatus gracilis Ckll., " " " " ix, p. 453 (1902).

Habitat.—Brazil.

On Sapindaceæ.

836. Eucalymnatus perforatus (Newst.).

Lecanium perforatum Newst., Ent. Mon. Mag., xxx, p. 233 (1894).
" " Ckll., Can. Ent., xxvii, p. 257 (1895).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 46 (1896).
" " Newst., Ent. Mon. Mag., xxxiii, p. 75 (1897).
" tessellatum var. perforatum Ckll., Psyche, viii, p. 90 (1897).
" " " " Quaint., " " p. 91 (1897).
" " " " Ckll. & Parr., The Industrialist, pp. 229, 276 (1899).
" perforatum Newell, Bull. 43, Ia. Exp. Sta., p. 170 (1899).
" " Newst., Journ. Roy. Hor. Soc., xxiii, p. 24 (1900).
" " King, Ent. News, xii, p. 312 (1901).
" " Kirkaldy, Fauna Haw., iii, pt. 2, p. 106 (1902).
" " Thro, Bull. 209, Corn. Univ. Exp. Sta., p. 212 (1903).
Eucalymnatus " Ckll., in litt. (1902).

Habitat.—England; Hawaii; Australia; Fla.; Ia.; Col.; Cal.

On Caryota cumingii; Eugenia jambos; Howea Belmoreana; Trachycarpus excelsus; various hothouse plants.

837. Eucalymnatus tessellatus (Sign.).

Lecanium tessellatum Sign., Ann. Soc. Ent. Fr., (5), iii, p. 401 (1873).
" " Dougl., Ent. Mon. Mag., xxiv, p. 25 (1887).
" " Mask., N. Z. Trans., xxv, p. 219 (1892).
" " Ckll., Tr. Am. Ent. Soc., xx, p. 51 (1893).
" " Mask., N. Z. Trans., xxvii, p. 59 (1894).
" " Ckll., Bull. Bot. Dep. Jam., p. 19 (1894).
" " Tyr., Rep. Cal. Exp. Sta., 1894-95, pp. 256, 264 (1896).
" " Green, Ind. Mus. Notes, iv, p. 9 (1896).
" " Davis, Spec. Bull. 2, Mich. Exp. Sta., p. 33 (1896).
" " Frog., Rep. Dep. Ag. N. S. W., No. 175, p. 6 (1897).
" " de Charm., Pr. Soc. Amic. Scien., p. 40 (1899).

Lecanium tessellatum Ckll. & Parr., The Industrialist, p. 229 (1899).
" " King, Ent. News, xii, p. 312 (1901).
Coccus " Kirkaldy, Faun. Haw., iii, pt. 2, p. 106 (1902).
Eucalymnatus " Ckll., Ann. Mag. N. H., (7), ix, p. 453 (1902).

Habitat.—France: England; Australia; Mauritius; Hawaiian Islands Ceylon: Jamaica.

On Laurus nobilis: Sapindus saponaria: lignum-vitæ; palms; ferns, etc.

Eucalymnatus tessellatus swainsonæ (Ckll.).

Lecanium tessellatum var. swainsonæ Ckll., Bull. Bot. Dep. Jam., iv, p. 109 (1897).
" " " " " Psyche, viii, p. 90 (1897).
" " " " " & Parr., The Industrialist, p. 229 (1899).

Habitat.—Jamaica.

On lignum-vitæ.

Genus **STICTOLECANIUM** Ckll. Type, ornatum.

Stictolecanium Ckll., Ann. Mag. N. H., (7), ix, p. 452 (1902).

838. Stictolecanium ornatum (Hemp.).

Lecanium ornatum Hemp., Rev. Mus. Paul., iv, p. 421 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 209 (1901).
Stictolecanium ornatum Ckll., " " " " ix, p. 452 (1902).

Habitat.—Brazil.

On Eugenia jaboticaba.

Genus **COCCUS** Linn. Type, hesperidum.

Coccus Linn., Syst. Nat., Ed. x, i, p. 455 (1758): Syst. Nat., Ed. xii, i, p. 739 (1766): Fab., Syst. Ent., p. 742 (1775); Gen. Ins., p. 186 (1776): Gmel., Syst. Nat., Ed. xiii, p. 2215 (1789): Fab., Ent. Syst., iv, p. 224 (1794); Syst. Rhyng., p. 306 (1803): Ckll., Pr. Ac. N. Sci. Ph., p. 260 (1899): Fern. M. E., Can. Ent., xxxiv, p. 232 (1902).
Calymmata Costa, Prospetto di una Div. Metod. gen. Coccus, p. 5 (1828).
Calypticus Costa, Faun. Reg. Nap., Cocciniglie, p. 8 (1835).
Lecanium Burm., Handb. Ent., ii. p. 69 (1835): Walk., Cat. Br. Mus., Hom., p. 1068 (1852): Sign., Ann. Soc. Ent. Fr., (5), iii, p. 395 (1873): Comst., Rep. U. S. Dep. Ag., 1880, p. 334 (1881): Mask., Ins. Nox. Agr. N. Z., p. 79 (1887): Targ., Coccin. deg. Agrumi in Ital., p. 9 (1891).

839. Coccus acuminatus (Sign.).

Lecanium acuminatum Sign., Ann. Soc. Ent. Fr., (5), iii, p. 397 (1873).
" " Atk., Ind. Mus. Notes, i, p. 8 (1889).
" " Mask., N. Z. Trans., xxv, p. 219 (1892).
" " Cotes, Ind. Mus. Notes, ii. p. 168 (1893).
" " Ckll., Gard. Chron., (3), xiii. p. 548 (1893).
Coccus " Kirkaldy, Fauna Haw., iii, pt. 2, p. 105 (1902).

Habitat.—Hawaiian Islands: Ceylon; France

On guava; mango; hothouse orchids.

840. Coccus acutissimus (Green).

Lecanium acutissimum Green, Ind. Mus. Notes, iv, p. 10 (1896).
Habitat.—Ceylon.
On leaves of cocoanut and other palms.

841. Coccus angustatus (Sign.).

Lecanium angustatum Sign., Ann. Soc. Ent. Fr., (5), iii, p. 398 (1873).
" " Dougl., Ent. Mon. Mag., xxiv, p. 25 (1887).
Habitat.—England.
On Anthurium Scherzerianum from Costa Rica; Cyperus papyrus.

842. Coccus antidesmæ (Green).

Lecanium antidesmæ Green, Ind. Mus. Notes, iv, p. 10 (1896).
Habitat.—Ceylon.
On Antidesma Bunius.

843. Coccus caudatus (Green).

Lecanium caudatum Green, Ind. Mus. Notes, iv, p. 10 (1896).
Habitat.—Ceylon.
On Passiflora; coffee.

844. Coccus(?) **elongatus** (Sign.).

Lecanium elongatum Sign., Ann. Soc. Ent. Fr., (5), iii, p. 404 (1873).
Habitat.—France.
On "cherry-laurel."

845. Coccus ficus (Mask.).

Lecanium ficus Mask., Ent. Mon. Mag., xxxiii, p. 243 (1897).
" " Ckll. & Parr., The Industrialist, p. 229 (1899).
Habitat.—China.
On fig.

846. Coccus flaveolus (Ckll.).

Lecanium flaveolum Ckll., Psyche, viii, pp. 52, 53 (1897).
" " Ckll. & Parr., The Industrialist, p. 230 (1899).
Habitat.—New Mexico (in greenhouses); Col.
On Pilea microphylla.

847. Coccus genistæ (Sign.).

Lecanium genistæ Sign., Ann. Soc. Ent. Fr., (5), iii, p. 405 (1873).
Habitat.—France; Maritime Alps.
On Genista; pine.

848. Coccus hesperidum (Linn.).

(*The Soft Scale.*)

Coccus hesperidum Linn., Syst. Nat., Ed. x, i, p. 455 (1758).
" " " Faun. Suec., p. 264 (1761).
Chermes " Geoff., Abr. Ins., i, p. 505 (1762).

Coccus hesperidum Linn., Syst. Nat., Ed. xii, i, p. 730 (1766).
" " Fab., Syst. Ent., p. 742 (1775).
" " Mod., Act. Goth., i, p. 19 (1778).
" " Fab., Spec. Ins., ii, p. 393 (1781).
Chermes " Fourc., Ent. Paris., p. 228 (1785).
Coccus " Fab., Mant. Ins., ii, p. 318 (1787).
" " Gmel., Syst. Nat., Ed. xiii, p. 2215 (1789).
" " Oliv., Ency. Meth., vi, p. 93 (1791).
" " Fab., Ent. Syst., iv, p. 224 (1794).
" " Schr., Faun. Boica, p. 143 (1801).
" " Fab., Syst. Rhyng., p. 306 (1803).
" " Panz., Syst. Nom. Schäf. Abbild. Regensb. Ins., p. 119 (1804).
" " Major, Treatise on Ins., p. 240 (1829).
" " Fonsc., Ann. Soc. Ent. Fr., iii, p. 208 (1834).
Calypticus " Costa, Faun. Reg. Nap., Cocc., p. 8 (1835).
" lævis " " " " " p. 11 (1835).
Calymmatus hesperidum Costa, Nuov. Osserv., p. 22 (1835).
Coccus " Lam., Hist. Nat. Anim., iv, p. 115 (1835).
Lecanium " Burm., Handb. Ent., ii, p. 69 (1835).
" " Blanch., Hist. Nat. Ins., iii, p. 213 (1840).
Coccus " Koll., Inj. Ins., p. 177 (1840).
" patelliformis Curt., Gard. Chron., p. 517 (1843).
Lecanium hesperidum Först., Ueber Schildlause, p. 562 (1851).
Calypticus " Lubbock, Pr. Roy. Soc. Lond., ix, p. 480 (1858).
Coccus " " Ann. Mag. N. H., (3), iii, p. 306 (1859).
Calypticus " Beck, Tr. Micr. Soc. Lond., n. s., p. 47 (1861).
Chermes " Bdv., Ent. Hort., p. 331 (1867).
Lecanium " Targ., Studii sul. Cocc., pp. 8, 29, 38, 43, 47, 58 (1867).
" " " Catalogue, p. 37 (1869).
" " Sign., Ann. Soc. Ent. Fr., (4), ix, p. 101 (1869).
" " " " " " " (5), iii, p. 399 (1873).
Chermes aurantii Alf., Trat. Col. deg. Agr., p. 431 (1875).
Lecanium hesperidum Glover, Rep. U. S. Dep. Ag., p. 44 (1876).
" " Mark, Anat. Coccidæ, pp. 21, 26, 30, 52 (1876).
" " Mask., N. Z. Trans., xi, p. 205 (1878).
" " Putn., Pr. Dav. Ac. N. Sci., p. 319 (1879).
" " Comst., Rep. U. S. Dep. Ag., 1880, p. 358 (1881).
" " Osborn, Tr. Ia. Hor. Soc., p. 213 (1882).
" " Saund., Ins. Inj. to Fruits, p. 404 (1883).
" " Neal, Bull. 1, Div. Ent. Dep. Ag., p. 31 (1883).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 134 (1883).
" " Uhler, St. Nat. Hist., ii, p. 215 (1884).
" " Targ., Annali di Agr., p. 318 (1884).
" " Hubbard, Ins. Aff. Orange, p. 49 (1885).

Lecanium hesperidum Dougl., Ent. Mon. Mag., xxii, p. 159 (1885).
" " " " " " xxiv, p. 25 (1887).
" " Mask., Ins. Nox. Agr. N. Z., p. 80 (1887).
" " Karsch, Ent. Nach., p. 95 (1887).
" " Comst., Intr. Ent., p. 141 (1888).
" " Riley & How., Ins. Life, ii, p. 370 (1890).
" " Targ., Cocc. deg. Agr. Ital., p. 10 (1891).
" " Mask., N. Z. Trans., xxv, p. 218 (1892).
" " Coq., Bull. 26, Div. Ent. Dep. Ag., p. 26 (1892).
" " Berl., Riv. Pat. Veg., i, p. 61 (1892).
" " Riley & How., Ins. Life, vi, p. 57 (1893).
" " Mask., Ent. Mon. Mag., xxix, p. 103 (1893).
" " Morg., Spec. Bull. La. Exp. Sta., p. 68 (1893).
" " Ckll., Tr. Am Ent. Soc., xx, p. 49 (1893).
" " " Gard. Chron., (3), xiii, p. 543 (1893).
" " Craw, 4th Bien. Rep. Cal. Bd. Hort., p. 96 (1894).
" " Ckll., Bull. Bot. Dep. Jam., p. 18 (1894).
" " Lounsb., Rep. Ent. Cape Good Hope, p. 46 (1895).
" " Comst., Man. Ins., p. 170 (1895).
? " ceratoniæ Genn., Bull. Soc. Ent. Fr., (7), v, p. cclxxvii (1895).
" hesperidum Tyr., Rep. Cal. Exp. Sta., 1894-5, p. 267 (1896).
" " Lounsb., Rep. Ent. Cape Good Hope, p. 83 (1896).
" " Davis, Spec. Bull. 2, Mich. Exp. Sta., p. 32 (1896).
? " ceratoniæ Ckll., Am. Nat., xxxi, p. 590 (1897).
" hesperidum Osborn, Contr. Ia. Ag. Coll., p. 3 (1898).
" " Rolfs & Quaint., Cocc. Amer., Dec. i-ii, No. 3 (1898).
" " Berl. e Leon., Cherm. Ital., iii, No. 64 (1898).
" " Ckll., Bull. 32, Ariz. Exp. Sta., p. 285 (1899).
" " Newell, Bull. 43, Ia. Exp. Sta., p. 170 (1899).
" " Green, Rep. Roy. Bot. Gard. Ceylon, p. 14 (1899).
" " Hemp., Rev. Mus. Paul., iv, p. 436 (1900).
" " Gossard, Bull. 51, Fla. Exp. Sta., p. 113 (1900).
" " Marlatt, Yearbook U. S. Dep. Ag., p. 275 (1900).
" " Lugger, 6th Rep. Minn. Exp. Sta., p. 217 (1900).
" " Newst., Jn. Roy. Hor. Soc., xxiii, p. 24 (1900).
" " Full., 1st Rep. Ent. Natal, p. 103 (1901).
" " Lefroy, Scale Ins. Less. Antil., p. 46 (1901).
" " King, Ent. News, xii, p. 312 (1901).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 64 (1902).
" " Thro, Bull. 209, Corn. Univ. Exp. Sta., pp. 206, 211 (1903).

Habitat.—Europe; Australia; New Zealand; South Africa; Hawaiian Islands; Japan; Chili; Algeria; West Indies; Mexico; U. S.; Canada.

On oleander; Camellia; orange; lemon; Clematis flammula; Convolvulus tricolor; Mimosa; holly; ivy; laurel; box; myrtle; Abutilon; jasmine; Morus nigra; Cycas revoluta; Phlox, and various other trees and plants.

Coccus hesperidum alienus (Dougl.).

Lecanium alienum Dougl., Ent. Mon. Mag., xxiii, p. 77 (1886).
" hesperidum var. alienum Ckll., Check List, p. 393 (1899).
Habitat.—England.
On Asplenium bulbiferum.

Coccus hesperidum lauri (Bdv.).

Chermes lauri Bdv., Ent. Hort., p. 340 (1867).
Lecanium " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 400 (1873).
" " Dougl., Ent. Mon. Mag., xxv, p. 57 (1888).
" " " " " " xxvii, p 244 (1891).
" " Mask., " " " xxix, p. 103 (1893).
" " Dougl., " " " xxx, p. 29 (1894).
" hesperidum var. lauri Ckll.. Check List, p. 331 (1896).
Habitat.—Europe: Australia; Mass.
On Laurel; ivy; holly; Citrus.

Coccus hesperidum pacificus (Kuwana.)

Lecanium (Calymnatus) hesperidum pacificum Kuw., Jn. N. Y. Ent. Soc., x, p. 30 (1902).
Habitat.—Galapagos Islands.
On Achrostichum caudatum; Hibiscus tiliaceus; Adiantum; Polypodium; Psychotria; Alsophila and several other plants.

849. **Coccus hoferi** (King).

Lecanium hoferi King, Mitth. Schw. Ent. Ges., (10), x, pp. 478, 483 (1903).
Habitat.—Switzerland.
On pear; apple; plum.

850. **Coccus longulus** (Dougl.).

Lecanium longulum Dougl., Ent. Mon. Mag., xxiv, p. 97 (1887).
" chirimoliæ Mask., N. Z. Trans., xxii, p. 137 (1889).
" " " " " xxiii, p. 16 (1890).
" longulum " " " " p. 16 (1890).
" " " " " xxv, p. 221 (1892).
" " Ckll., Tr. Am. Ent. Soc., xx, p. 50 (1893).
" " " Tr. Ent. Soc. Lond., p. 162 (1893).
" chirimoliæ " Tr. Am. Ent. Soc., xx, p. 51 (1893).
" longulum " Bull. Bot. Dep. Jam., p. 18 (1894).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 46 (1896).
" " Green, Ind. Mus. Notes, iv, p. 8 (1896).
" " var. chirimoliæ Ckll., Check List, p. 331 (1896).
" " Mask., N. Z. Trans., xxix, p. 310 (1897).
" " Dolby-Tyler, Ent. Mon. Mag., xxxiii, p. 85 (1899).
" " deCharm., Pr. Soc. Amic. Scien., p. 40 (1899).
" " Ckll. & Parr., The Industrialist, p. 229 (1899).
" " Lefroy, Scale Ins. Less. Antil., p. 45 (1901).
Coccus " Kirkaldy, Fauna Haw., iii, pt. 2, p. 106 (1902).
Lecanium " Thro, Bull. 209. Corn. Univ. Exp. Sta., p. 214 (1903).

Habitat.—Hawaiian Islands; New Zealand: Fiji; India; China; Mauritius; England; Mexico; Mass.: N. Y.: Ga.; Grenada; Barbados; Antigua; Jamaica.

On Psidium; Bambusa; Acacia; Citrus; Myrica: Ficus; Averrhoa; Carica Papaya; Anona tripetala; Monstera deliciosa; Cassia fistula; Euphorbia; Albizzia; palms; Grevillea; ferns.

851. **Coccus maculatus** (Sign.).

Lecanium maculatum Sign., Ann. Soc. Ent. Fr., (5), iii, p. 400 (1873).
" " Mask., N. Z. Trans., xi, p. 207 (1878).
" " " Ins. Nox. Agr. N. Z., p. 81 (1887).

Habitat.—Europe; New Zealand.

On Bavardia: ivy.

852. **Coccus mangiferæ** (Green).

Lecanium mangiferæ Green, Ent. Mon. Mag., xxv, p. 249 (1889).
" " " Ins. Life, ii, p. 48 (1889).
" " Ckll., Tr. Am. Ent. Soc., xx, p. 49 (1893).
" " " Bull. Bot. Dep. Jam., p. 19 (1894).
" " Green, Ind. Mus. Notes, iv, p. 9 (1896).
" " Ckll. & Parr., The Industrialist, p. 228 (1899).
" " Lefroy, Scale Ins. Less. Antil., p. 47 (1901).

Habitat.—Ceylon; Grenada: Jamaica; Trinidad; Barbados; Antigua.

On mango; cinnamon; nutmeg; bread-fruit: jasmine: Allamanda; Sapodilla; Ixora.

853. **Coccus melaleucæ** (Mask.).

Lecanium melaleucæ Mask., N. Z. Trans., xxx, p. 239 (1898).
" " King, Can. Ent., xxxiv, p. 60 (1902).

Habitat.—Australia; China; Mass. (Harvard Bot. Gardens).

On Melaleuca; Monstera deliciosa.

854. **Coccus minimus** (Newst.).

Lecanium minimum Newst., Ent. Mon. Mag., xxviii, p. 141 (1892).
" " Ckll., Journ. Inst. Jam., i. p. 278 (1893).
" " Mask., Ent. Mon. Mag., xxxii, p. 225 (1896).
" " Lounsb., Rep. Ent. Cape Good Hope, p. 19 (1897).
Coccus (Lecanium) minimus Ckll., Ann. Mag. N. H., (7), xi, p. 162 (1903).

Habitat.—England: Mexico.

On Areca; Abutilon; "fan-palm."

Coccus minimus pinicola (Mask.).

Lecanium minimum var. pinicola Mask., N. Z. Trans., xxix, p. 310 (1897).
" Calymnatus " Ckll. & Parr., The Industrialist, p. 230 (1899).

Habitat.—Cape of Good Hope.

On Pinus insignis.

855. **Coccus nanus** (Ckll.).

Lecanium nanum Ckll., Psyche, vii, Suppl., i, p. 19 (1896).

Habitat.—Trinidad.

On "Balata."

856. Coccus notatus (Mask.).

Lecanium notatum Mask., Ent. Mon. Mag., xxxiii, p. 243 (1897).
Habitat.—Japan.
On Pittosporum: Thea: Ilex cornuta.

857. Coccus ophiorrhizæ (Green).

Lecanium ophiorrhizæ Green, Ind. Mus. Notes, iv, p. 10 (1896).
" " Ckll. & Parr., The Industrialist, p. 164 (1899).
Habitat.—Ceylon.
On Ophiorrhiza pectinata.

858. Coccus perlatus (Ckll.).

Lecanium perlatum Ckll., The Entom., xxxi, p. 65 (1898).
Habitat.—Azores.
On orange.

859. Coccus piperis (Green).

Lecanium piperis Green, Ind. Mus. Notes, iv, p. 10 (1896).
" " Ckll. & Parr., The Industrialist, p. 164 (1899).
Habitat.—Ceylon.
On wild pepper.

860. Coccus pseudohesperidum (Ckll.).

Lecanium pseudohesperidum Ckll., Am. Nat., xxix, p. 380 (1895).
Habitat.—Canada.
On Cattleya.

861. Coccus rubellus (Ckll.).

Lecanium rubellum Ckll., Journ. Inst. Jam., i, p. 398 (1893).
" " " Bull. Bot. Dep. Jam., p. 19 (1894).
Habitat.—Jamaica.

862. Coccus schini (Ckll.).

Lecanium schini Ckll., La Naturaleza, (2), ii, p. 304 (1893).
" " " Mem. Revist. Soc. Cien., vi, p. 325 (1893).
" " " Bull. Soc. Zool. Fr., xviii, p. 167 (1893).
" " " & Parr., The Industrialist, p. 228 (1899).
" " " Biol. Centr. Amer., ii, pt. 2, p. 10 (1899).
Habitat.—Mexico.
On "Nancem;" "a Hibiscus-like shrub."

863. Coccus terminaliæ (Ckll.).

Lecanium terminaliæ Ckll., Journ. Inst. Jam., i, p. 254 (1893).
" " " Ann. Mag. N. H., (6), xii, p. 52 (1893).
" " " Bull. Bot. Dep. Jam., i, n. s., p. 18 (1894).
" " Mask., Ent. Mon. Mag., xxxiii. p. 243 (1897).
" " Ckll. & Parr., The Industrialist, p. 230 (1899).
Habitat.—Jamaica: Mexico.
On Terminalia (almond).

864. Coccus ventralis (Ehrh.).

Lecanium ventrale Ehrh., Can. Ent., xxx, p. 245 (1898).
" " Ckll. & Parr., The Industrialist, p. 230 (1899).
Habitat.—California (in Japanese nursery): Japan?

865. Coccus viridis (Green).

Lecanium viride Green, Ent. Mon. Mag., xxv, p. 248 (1889).
" " Cotes, Ind. Mus. Notes, i, pp. 49, 117 (1889).
" " " Ins. Life, ii, p. 17 (1889).
" " " Ind. Mus. Notes, ii, p. 168 (1893).
" " " " " " iii, No. 6, p. 18 (1894).
" " Ckll., Pr. U. S. Nat. Mus., xvii, p. 619 (1895).
" " Green, Cocc. Ceylon, pt. i, pp. 1, 2, 7 (1896).
" " " Rep. Roy. Bot. Gard., Ceylon, p. 14 (1899).
" " deCharm., Pr. Soc. Amic. Scien., p. 41 (1899).
" " Hemp., Rev. Mus. Paul., iv, p. 434 (1900).
" " Zimm., Bull. Inst. Bot. Buitenzorg, No. 10, p. 25 (1901).
Habitat.—Ceylon; Brazil; Mauritius.
On Cinchona; Citrus; Gardenia; guava; tea; coffee.

Coccus viridis africanus (Newst.).

Lecanium viride var. africanum Newst., Ent. Mon. Mag., xxxiv, p. 95 (1898).
Habitat.—West Africa.
On coffee leaves.

866. Coccus watti (Green).

Lecanium watti Green, Ind. Mus. Notes, v, p. 6 (1900).
Habitat.—Assam.
On tea plant.

Genus MESOLECANIUM Ckll. Type, nocturnum.

Mesolecanium Ckll., Ann. Mag. N. H., (7), ix, p. 451 (1902).

867. Mesolecanium baccharidis (Ckll.).

Lecanium baccharidis Ckll., Am. Nat., xxix, p. 174 (1895).
" " Berl., Riv. Pat. Veg., iv, p. 379 (1896).
" " Iher., Rev. Mus. Paul., ii, p. 408 (1897).
" " Hemp., " " " iv, p. 435 (1900).
Mesolecanium " Ckll., Ann. Mag. N. H., (7), ix, p. 452 (1902).
Habitat.—Brazil.
On Baccharis dracunculifolia.

868. Mesolecanium batatæ (Ckll.).

Lecanium batatæ Ckll., Ann. Mag. N. H., (6), xvi, p. 61 (1895).
Mesolecanium " " " " " (7), ix, p. 452 (1902).
Habitat.—Antigua.
On roots of Ipomœa batatas (sweet potato).

869. Mesolecanium(?) **campomanesiæ** (Hemp.).

Lecanium campomanesiæ Hemp., Rev. Mus. Paul., iv, p. 447 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 218 (1901).
Mesolecanium(?) " Ckll., " " " " ix, p. 452 (1902).
Habitat.—Brazil.
On Campomanesia.

870. Mesolecanium impar (Ckll.).

Lecanium impar Ckll., The Entom., xxxi, p. 131 (1898).
Mesolecanium impar Ckll., in litt. (1902).
Habitat.—Mexico.
On " Escobillo."

871. Mesolecanium(?) **jaboticabæ** (Hemp.).

Lecanium jaboticabæ Hemp., Rev. Mus. Paul., iv, p. 443 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 216 (1901).
Mesolecanium(?)" Ckll., " " " " ix, p. 452 (1902).
Habitat.—Brazil.
On Eugenia jaboticaba.

872. Mesolecanium mayteni (Hemp.).

Lecanium mayteni Hemp., Rev. Mus. Paul., iv, p. 438 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 214 (1901).
Mesolecanium" Ckll., " " " " ix, p. 452 (1902).
Habitat.—Brazil.
On Maytenus.

873. Mesolecanium nocturnum (Ckll. & Parr.).

Lecanium nocturnum Ckll. & Parr., Biol. Centr. Amer., ii, pt. 2, p. 13 (1899).
Mesolecanium " " Ann. Mag. N. H., (7), ix, p. 451 (1902).
Lecanium " Thro, Bull. 209, Corn. Univ. Exp. Sta., p. 211 (1903).
Habitat.—Mexico.
On " huele de noche."

874. Mesolecanium(?) **obscurum** (Hemp.).

Lecanium obscurum Hemp., Can. Ent., xxxii, p. 5 (1900).
" " " Rev. Mus. Paul., iv, p. 441 (1900).
Mesolecanium(?) " Ckll., Ann. Mag. N. H., (7), ix, p. 452 (1902).
Habitat.—Brazil.
On Maytenus associated with ants.

875. Mesolecanium perditum (Ckll.).

Lecanium (Eulecanium) perditum Ckll., Can. Ent., xxix, p. 267 (1897).
Mesolecanium " " in litt. (1902).
Habitat.—Mexico.

876. Mesolecanium phoradendri (Ckll.).

Lecanium phoradendri Ckll., Ann. Mag. N. H., (6), xiv, p. 13 (1894).
Mesolecanium " " " " " (7), ix, p. 452 (1902).
Habitat.—Arizona.
On Phoradendron.

877. Mesolecanium pseudosemen (Ckll.).

Lecanium pseudosemen Ckll., Can. Ent., xxvii, p. 202 (1895).
" " " Rev. Mus. Paul., ii. p. 70 (1897).
" " Hemp., " " " iv, p. 444 (1900).
Mesolecanium " Ckll., Ann. Mag. N. H., (7), ix, p. 452 (1902).
Habitat.—Brazil.
On Solanum paniculatum.

878. Mesolecanium rhizophoræ (Ckll.).

Lecanium rhizophoræ Ckll., Rev. Mus. Paul., iii, p. 501 (1898).
" " Hemp., " " " iv, p. 437 (1900).
Mesolecanium " Ckll., in litt. (1902).
Habitat.—Brazil.
On Rhizophora mangle.

Genus **NEOLECANIUM** Parr. Type, imbricatum.

s. g. Neolecanium Parr., Can. Ent., xxxiii, p. 58 (1901): g. Ckll., Ann. Mag. N. H., (7), ix, p. 451 (1902).

879. Neolecanium chilaspidis (Ckll.).

Lecanium chilaspidis Ckll., Can. Ent., xxix, p. 268 (1897).
" " " Biol. Centr. Amer., ii, pt. 2, p. 11 (1899).
Neolecanium " " Ann. Mag. N. H., (7), ix, p. 451 (1902).
Habitat.—Mexico.
On Chilopsis linearis?

880. Neolecanium cornuparvum (Thro).

Lecanium cornuparvum Thro, Bull. 209, Corn. Univ. Exp. Sta., p. 216 (1903).
Neolecanium " Ckll., in litt. (1903).
Habitat.—New York.
On Magnolia.

881. Neolecanium herreræ Ckll.

Neolecanium herreræ Ckll., Bol. Com. Paras. Agric., i, p. 338 (1902).
Habitat.—Mexico.
On Agave.

882. Neolecanium imbricatum (Ckll.).

Lecanium imbricatum Ckll., Psyche, vii, Suppl., i, p. 19 (1896).
" " " Bull. 4, T. s., Dep. Ag., p. 38 (1896).
" " " Biol. Centr. Amer., ii, pt. 2, p. 11 (1899).
Neolecanium " " Ann. Mag. N. H., (7), ix, p. 451 (1902).
Habitat.—Mexico: New Mexico.
On Mimosa.

883. Neolecanium leucænæ Ckll.

Neolecanium leucænæ Ckll., The Entom., xxxvi, p. 46 (1903).
" " " Ann. Mag. N. H., (7), xi, p. 162 (1903).
Habitat.—Mexico.
On Leucæna; Mimosa.

884. Neolecanium manzanillense Ckll.

Neolecanium manzanillense Ckll., Ann. Mag. N. H., (7), xi, p. 161 (1903).
Habitat.—Mexico.

885. Neolecanium perconvexum (Ckll.).

Lecanium perconvexum Ckll., The Entom., xxxi, p. 132 (1898).
" " " Rev. Mus. Paul., iii, p. 41 (1898).
" " Hemp., " " " iv, p. 422 (1900).
Neolecanium " Ckll., Ann. Mag. N. H., (7), ix, p. 451 (1902).
Habitat.—Brazil.
On Nectandra.

886. Neolecanium plebeium Ckll.

Neolecanium plebeium Ckll., Ann. Mag. N. H., (7), xi, p. 161 (1903).
Habitat.—Mexico.
On bark of "Higuerra" (Ficus sp.).

887. Neolecanium(?) sallei (Sign.).

Lecanium sallei Sign., Ann. Soc. Ent. Fr., (5), iii, p. 410 (1873).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 135 (1883).
Neolecanium(?) sallei Ckll., Ann. Mag. N. H., (7), ix, p. 451 (1902).
Habitat.—Mexico.

888. Neolecanium silveirai (Hemp.).

Lecanium silveirai Hemp., Can. Ent., xxxii, p. 5 (1900).
" " " Rev. Mus. Paul., iv, p. 424 (1900).
Neolecanium " Ckll., Ann. Mag. N. H., (7), ix, p. 451 (1902).
Habitat.—Brazil.
On roots of grape vine.

889. Neolecanium tuberculatum (Towns. & Ckll.).

Lecanium tuberculatum Towns. & Ckll., Jn. N. Y. Ent. Soc., vi, p. 177 (1898).
Neolecanium " Ckll., Ann. Mag. N. H., (7), ix, p. 451 (1902).
Habitat.—Mexico.
On "Cafetillo."

890. Neolecanium urichi (Ckll.).

Lecanium urichi Ckll., Ent. News, v, p. 203 (1894).
" " " Bull. Bot. Dep. Jam., p. 69 (1894).
" " " Jn. Trin. Nat. Club, ii, p. 306 (1896).
" " " Rev. Mus. Paul., iv, p. 423 (1900).
Neolecanium " " Ann. Mag. N. H., (7), ix, p. 451 (1902).
Habitat.—Trinidad; Grenada; Brazil.
On Smilax campestris; In nests of Cremastogaster brevispinosa.

Genus **AKERMES** Ckll. Type, bruneri.

Akermes Ckll., Can. Ent., xxxiv, pp. 89, 90 (1902).

891. Akermes bruneri Ckll.

Akermes bruneri Ckll., Can. Ent., xxxiv, p. 89 (1902).
Habitat.—Paraguay.

892. Akermes colimæ Ckll.

Akermes colimæ Ckll., The Entom., xxxvi, p. 47 (1903).
Habitat.—Mexico.

893. Akermes levis (Mask.).

Lecanium scrobiculatum var. leve Mask., N. Z. Trans., xxviii, p. 392 (1896).
Akermes levis Ckll., Ann. Mag. N. H., (7), ix, p. 453 (1902).
Habitat.—Manly, Australia.
On Acacia longifolia.

894. Akermes monilis (Ckll.).

Lecanium monile Ckll., Can. Ent., xxvii, p. 203 (1895).
" " " Rev. Mus. Paul., ii, p. 70 (1897).
" " Hemp., " " " iv, p. 446 (1900).
Akermes monilis Ckll., Ann. Mag. N. H., (7), ix, p. 453 (1902).
Habitat.—Brazil.

895. Akermes pinguis (Mask.).

Lecanium pingue Mask., N. Z. Trans., xxvii, p. 58 (1894).
" scrobiculatum var. pingue Mask., N. Z.Trans.,xxviii,p. 392 (1896).
Akermes pinguis Ckll., Ann. Mag. N. H., (7), ix, p. 453 (1902).
Habitat.—Australia.
On Dillwynia juniperina.

896. Akermes punctatus (Ckll.).

Lecanium punctatum Ckll., Jn. Trin. Nat. Club, ii, p. 194 (1895).
Akermes punctatus " Ann. Mag. N. H., (7), ix, p. 453 (1902).
Habitat.—Grenada.
On Citrus medica var. acida.

897. Akermes scrobiculatus (Mask.).

Lecanium scrobiculatum Mask., N. Z. Trans., xxv, p. 221 (1892).
" " " " " xxvii, p. 58 (1894).
" " " " " xxviii, p. 391 (1896).
Habitat.—Australia.
On Acacia.

898. Akermes townsendi (Ckll.).

Lecanium townsendi Ckll., Ann. Mag. N. H., (7), i, p. 433 (1898).
Akermes " " " " " " ix, p. 453 (1902).
Habitat.—Mexico.
On orange.

899. Akermes verrucosus (Sign.).

Lecanium verrucosum Sign., Ann. Soc. Ent. Fr., (5), iii, p. 442 (1873).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 136 (1883).
Saissetia verrucosa Ckll., The Ent. Student, ii, p. 33 (1901).
Akermes verrucosus " Can. Ent., xxxiv, p. 90 (1902).
Habitat.—Montevideo.

Genus **TOUMEYELLA** Ckll. Type, mirabilis.

s. g. Toumeyella Ckll., Psyche, vii, Suppl., i, p. 2 (1895); g. Can. Ent., xxxiii, p. 58 (1901).

900. Toumeyella mirabilis (Ckll.).

Lecanium mirabile Ckll., Psyche, vii, Suppl., i, p. 3 (1895).
Toumeyella mirabilis " Pr. Ent. Soc. Wash., iv, p. 297 (1896).
" " " Ann. Mag. N. H., (7), ix, p. 452 (1902).
Habitat.—Arizona; Mexico.
On Mesquite.

901. Toumeyella parvicornis (Ckll.).

Lecanium parvicorne Ckll., Psyche, viii, pp. 90, 91 (1897).
Toumeyella parvicornis " Ann. Mag. N. H., (7), ix, p. 452 (1902).
Habitat.—Florida.
On pine.

902. Toumeyella(?) pini (King).

Lecanium pini King, Can. Ent., xxxiii, p. 334 (1901).
Toumeyella(?) pini Ckll., Ann. Mag. N. H., (7), ix, p. 452 (1902).
Lecanium corrugatum Thro, Bull. 209, Corn. Univ. Exp. Sta., p. 216 (1903).
Toumeyella " Ckll., in litt. (1903).
Habitat.—Ontario, Canada; New York.
On Pinus Austriaca.

903. Toumeyella quadrifasciata (Ckll.).

Lecanium quadrifasciatum Ckll., Psyche, vii, Suppl., i, p. 3 (1895).
" " " Am. Nat., xxxi, p. 591 (1897).
Toumeyella quadrifasciata " Ann. Mag. N. H., (7), ix, p. 452 (1902).
Habitat.—Organ Mts., New Mexico.
On Robinia neomexicana.

904. Toumeyella(?) sonorensis (Ckll. & Parr.).

Lecanium sonorense Ckll. & Parr., The Industrialist, p. 161 (1899).
Toumeyella (?) sonorensis Ckll., Ann. Mag. N. H., (7), ix, p. 452 (1902).
Habitat.—Mexico.
On Beloperone californica.

905. Toumeyella turgida (Ckll.).

Lecanium turgidum Ckll., Psyche, viii, p. 152 (1897).
" " Rolfs & Quaint., Cocc. Amer., Dec. i-ii, No. 4 (1898).

Toumeyella turgida Ckll., Ann. Mag. N. H., (7), ix. p. 452 (1902).
Habitat.—Florida.
On Magnolia glauca: M. grandiflora.

Genus **EULECANIUM** Ckll. Type, tiliæ.

s. g. Eulecanium Ckll., Check List, Coccidæ, p. 332 (1896); g. Can. Ent., xxxiii. p. 58 (1901); The Entom., xxxiv, p. 91 (1901): King, Can. Ent., xxxiii, p. 314, note (1901).

906. **Eulecanium aceris** (Curt.).

Coccus aceris campestris Schr., Faun. Boica, ii, pt. 1. p. 147 (1801).
" " Curt., Brit. Ent., p. 717 (1838) male.
Lecanium " Bouché, Stett. Ent. Zeit., v, p. 299 (1844).
" " Baer., D'Alton, Zeit. für Zool., p. 169 (1849).
" " Sign., Ann. Soc. Ent. Fr., (4), viii, p. 842 (1868).
" " " " " " " (5), iii, p. 410 (1873).
" " Altum, Forstzoologie, iii, pt. ii, p. 368 (1881).
" " Dougl., Ent. Mon. Mag., xxi, p. 38 (1884).
" (Eulecanium) aceris Ckll., Check List, p. 332 (1896).
Habitat.—Europe.
On maple; sycamore; elm.

907. **Eulecanium**(?) **adenostomæ** (Kuw.).

Lecanium adenostomæ Kuw., Pr. Cal. Ac. Sci., (3), ii, p. 402 (1901).
Eulecanium(?) " Ckll., in litt. (1902).
Habitat.—California.
On Adenostoma fasciculatum.

908. **Eulecanium æsculi** (Kollar).

Coccus æsculi Koll., Sitz. Akad. Wiss. Wien, i, pt. 2, p. 15 (1848).
Lecanium " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 412 (1873).
" " Dougl., Ent. Mon. Mag., xxi, p. 38 (1884).
" (Eulecanium) æsculi Ckll., Check List, p. 332 (1896).
Habitat.—Europe.
On horse-chestnut?

909. **Eulecanium alni** (Mod.).

Coccus alni Mod., Act. Goth., p. 23 (1778).
" " Gmel., Syst. Nat., Ed. xiii, p. 2221 (1789).
" " Turton. " " p. 716 (1801).
" " Schr., Faun. Boica, ii, pt. i, p. 144 (1801).
Lecanium alni Sign., Ann. Soc. Ent. Fr., (4), viii, p. 843 (1868).
" " Dougl., Ent. Mon. Mag., xxiii, p. 80 (1886).
Eulecanium " Ckll., The Entom., xxxiv, p. 92 (1901).
Habitat.—England.
On Alnus glutinosa.

Eulecanium alni rufulum Ckll.

Eulecanium alni var. rufulum Ckll.. Psyche, x, p. 21 (1903).
Habitat.—France.
On Carpinus.

910. Eulecanium antennatum (Sign.).

Lecanium antennatum Sign., Ann. Soc. Ent. Fr., (5), iii, p. 413 (1873).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 132 (1883).
" " Ckll., Can. Ent., xxvii, p. 35 (1895).
" (Eulecanium) antennatum Ckll., Check List, p. 332 (1896).
Habitat.—Canada; Mass.; N. Y.
On oak.

911. Eulecanium armeniacum (Craw).

(*Apricot scale.*)

Lecanium armeniacum Craw, Rep. Cal. Bd. Hort., p. 12 (1891).
" " Mask., N. Z. Trans.. xxvii, p. 59 (1894).
" " Craw, 4th Bien. Rep. Cal. Bd. Hort., p. 97 (1894).
" " " Rep. Cal. Exp. Sta., p. 268 (1896).
" " Felt, Bull. 17, n. s., Dep. Ag., p. 22 (1898).
" " " " 23, N. Y. St. Mus., p. 240 (1898).
" " " 14th Rep. Ins. N. Y., p. 240 (1898).
" " Webster, Can. Ent., xxx, p. 81 (1898).
" (Eulecanium) armeniacum Ckll. & Parr., The Industrialist, p. 233 (1899).
" armeniacum Ckll., Jn. N. Y. Ent. Soc., vii, p. 257 (1899).
" " Hunter, Kan. Univ. Quar., viii, p. 71 (1899).
" " King, Psyche, ix, p. 117 (1900).
" " Pettit, Bull. 200, Mich. Exp. Sta., p. 181 (1902).
Eulecanium " King, Can. Ent., xxxiv, p. 60 (1902).
Habitat.—Can.; Mass.; N. Y.; Ohio; Kans.; Cal.; Mexico.
On apricot; pear; plum; cherry; grape; gooseberry; peach; Spanish chestnut; prune.

912. Eulecanium(?) **assimile** (Newst.).

Lecanium assimile Newst., Ent. Mon. Mag., xxviii, p. 141 (1892).
" " Ckll., Tr. Am. Ent. Soc., xx, p. 53 (1893).
" " King & Reh, Jahrb. Hamb. Wiss. Anst., xviii, p. 3 (1900).
Eulecanium(?) " Ckll., in litt. (1902).
Habitat.—Europe.
On Grindelia hirsuta.

Eulecanium(?) assimile amaryllidis (Ckll.).

Lecanium assimile var. amaryllidis Ckll., Tr. Am. Ent. Soc., xx, p. 53 (1893).
" " " " " Journ. Inst. Jam., i, p. 254 (1893).
" " " " " Bull. Bot. Dep. Jam., p. 19 (1894).
Habitat.—Antigua.
On Amaryllis.

913. Eulecanium aurantiacum (Hunter).

‖ Lecanium macluræ Hunter, Kan. Univ. Quar., viii, p. 67 (1899).
" aurantiacum " " " " ix, p. 107 (1900).
" " " Studies in Ins. Life, p. 187 (1902).
" (Eulecanium) aurantiacum Ckll. & Parr., The Industrialist, p. 237 (1899).
Habitat.—Kansas.
On osage-orange.

914. Eulecanium berberidis (Schr.).

Coccus berberidis Schr., Faun. Boica. ii, pt. i, p. 146 (1801).
" " Loew, Verh. z. b. Ges., Wien, xii, p. 110 (1872).
Lecanium " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 403 (1873).
" " Kalt., Die Pflanz., p. 19 (1874).
? " " Mask., N. Z. Trans., xxix, p. 311 (1897).
" " Berl. e Leon., Cherm. Ital., Fasc. ii, No. 49 (1897).
" (Eulecanium) berberidis Ckll. & Parr., The Industrialist, p. 237 (1899).
Habitat.—Australia; France.
On Vitis vinifera; barberry.

Eulecanium berberidis major (Mask.).

Lecanium berberidis var. major Mask., N. Z. Trans., xxx, p. 238 (1897).
Habitat.—Australia.

915. Eulecanium bituberculatum (Targ.).

Lecanium bituberculatum Targ., Catalogue, p. 38 (1869).
" " Sign., Ann. Soc. Ent. Fr., (5), iii, 414 (1873).
" " Dougl., Ent. Mon. Mag., xxv, p. 59 (1888).
" " Newst., " " " xxxii, p. 58 (1896).
" " Lampa, Entom. Tidskr., xvii, p. 170 (1896).
" (Eulecanium) bituberculatum Ckll. & Parr., The Industrialist, pp. 233, 237 (1899).
Habitat.—England; France: Sweden; Italy; Oregon.
On apple; Cratægus oxyacantha.

916. Eulecanium canadense (Ckll.).

Lecanium caryæ var. canadense Ckll., Can. Ent., xxvii, p. 253 (1895).
" " " " Harvey, Rep. Me. Exp. Sta., p. 107 (1894-95).
" canadense Ckll., Can. Ent., xxx, p. 294 (1898).
" " King, " " xxxi, p. 252 (1899).
" (Eulecanium) canadense Ckll. & Parr., The Industrialist, p. 232 (1899).
" canadense Hunter, Kan. Univ. Quar., viii, p. 68 (1899).
" " " " " " ix, p. 107 (1900).
" " King, Can. Ent., xxxiii, p. 195 (1901).
Eulecanium " " " " " p. 333 (1901).
Habitat.—Can.; Nova Scotia; Me.; Mass.; Kans.; Ohio.
On elm; maple; hickory; white oak; peach.

917. **Eulecanium capreæ** (Linn.).

—— —— Reaum., Mem. Ins., iv, p. 60, pl. 5, fig. 2 (1738).
Coccus capreæ Linn., Syst. Nat., Ed. xii, i, p. 741 (1766).
" " Fab., Gen. Ins., p. 304 (1776).
" rotundus salicis DeGeer, Mem. Ins., vi, p. 440, pl. 28 (1776).
" capreæ Mod., Act. Goth., i, p. 22 (1778).
" " Gmel., Syst. Nat., Ed. xiii, i, p. 2218 (1789).
Chermes salicis Oliv., Ency. Meth., vii, p. 439 (1792).
Coccus " Fab., Ent. Syst., iv, p. 226 (1794).
" " Turton, Syst. Nat., ii, pt. 1, p. 713 (1801).
" " Fab., Syst. Rhyng., p. 309 (1803).
" " Bechst., Forstins., i, p. 287 (1804).
" gibber Dalm., K. Vet. Akad. Handl., p. 366 (1825).
" cypræola Dalm., K. Vet. Akad. Handl., p. 367 (1825).
" capreæ Fonsc., Ann. Soc. Ent. Fr., iii, p. 213 (1834).
" gibba Westw., Mod. Class. Ins., ii, p. 445 (1840).
Lecanium salicis Bouché, Stett. Ent. Zeit., xii, p. 112 (1851).
Pulvinaria " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 44 (1873).
Lecanium capreæ " " " " " " " p. 415 (1873).
" gibber " " " " " " " p. 422 (1873).
Pulvinaria salicis Putn., Pr. Dav. Ac. Sci., p. 339 (1879).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 137 (1883).
Lecanium gibber Dougl., Ent. Mon. Mag., xxiv, p. 165 (1887).
" capreæ " " " " xxviii, p. 278 (1892).
" (Eulecanium) capreæ Ckll., Check List, p. 332 (1896).
Eulecanium capreæ King, Can. Ent., xxxiii, p. 314 (1901).

Habitat.—Europe: Nova Scotia.

On Salix: linden; poplar: Pyrus malus; P. communis; Prunus domestica, etc.

918. **Eulecanium caryæ** (Fitch).

Lecanium caryæ Fitch, 3rd Rep. Ins. N. Y., p. 443 (1856).
" " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 416 (1873).
" " Comst., Rep. U. S. Dep. Ag., 1880, p. 364 (1881).
" " Pack., Shade Trees, p. 75 (1881).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 133 (1883).
" " Pack., 5th Rep. U. S. Ent. Com., p. 298 (1890).
" " Coq., Ins. Life, iii, p. 383 (1891).
" (Eulecanium) caryæ Ckll., Check List, p. 332 (1896).
" caryæ King, Can. Ent., xxxi, p. 141 (1899).
" " " Ent. News, xii, p. 50 (1901).
Eulecanium " " Can. Ent., xxxiv, p. 160 (1902).

Habitat.—Canada; Nova Scotia; Maine; Mass.; Ohio.

On elm: hickory; wild red cherry.

919. Eulecanium caryarum (Ckll.).

Lecanium (Eulecanium) caryarum Ckll., Can. Ent., xxx, p. 293 (1898).
" " " " & Parr., The Industrialist, p. 233 (1899).
Eulecanium caryarum King, Can. Ent., xxxiv, p. 160 (1902).
Habitat.—Ontario, Canada.
On Carya alba.

920. Eulecanium cerasi (Goethe).

Lecanium cerasi Goethe, Jahrb. Nass. Ver. Nat., xxxvii, p. 125 (1884).
" " Dougl., Ent. Mon. Mag., xxiii, p. 28 (1886).
" (Eulecanium) cerasi Ckll., Check List, p. 332 (1896).
" cerasi Frank & Kruger, Schildlausbuch, p. 110 (1900).
Habitat —Germany; England.
On cherry; plum; laurel.

921. Eulecanium cerasifex (Fitch).

Lecanium cerasifex Fitch, 3rd Rep. Ins. N. Y., p. 368 (1856).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 612 (1876).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 133 (1883).
" " Saund., Ins. Inj. to Fruits, p. 203 (1883).
" " Ckll., Can. Ent., xxvii, p. 60 (1895).
" " Davis, Bull. 121, Mich. Exp. Sta., p. 416 (1895).
" (Eulecanium) cerasifex Ckll., Check List, p. 332 (1896).
" cerasifex Smith. Bull. 136. N. J. Exp. Sta., p. 583 (1897).
" " Lowe, 16th Rep. N. Y. Exp. Sta., p. 447 (1898).
" " Felt, Bull. 17, n. s., Dep. Ag., p. 22 (1898).
" " Barrows, Bull. 160, Mich. Exp. Sta., p. 416 (1898).
" " Felt, 14th Rep. Ins. N. Y., p. 240 (1898).
" " Lugger, 6th Rep. Minn. Exp. Sta., p. 217 (1900).
" " Fletcher, Trans. Roy. Soc. Can., p. 219 (1900).
Eulecanium " King, Can. Ent., xxxiv, p. 60 (1902).
Habitat.—Can.; N. E. States; N. Y.; N. J.; D. C.; Mich.; Minn.
On cherry; plum; peach; apple; pear; maple; oak; ash.

922. Eulecanium(?) cerasorum (Ckll.).

Lecanium cerasorum Ckll., Psyche, ix, p. 71 (1900).
Eulecanium(?) " " in litt. (1902).
Habitat.—Japan.
On cherry.

923. Eulecanium ciliatum (Dougl.).

Lecanium ciliatum Dougl., Ent. Mon. Mag., xxvii, p. 67 (1891).
" (Eulecanium) ciliatum Ckll., Check List, p. 332 (1896).
Habitat.—Europe.
On Quercus robur.

Eulecanium ciliatum var. a. Ckll.

Eulecanium ciliatum var. a. Ckll., Psyche, x, p. 20 (1903).
Habitat.—France.

924. **Eulecanium cockerelli** (Hunter).

Lecanium cockerelli Hunter, Kan. Univ. Quar., viii, p. 70 (1899).
" " King, Can. Ent., xxxi. p. 252 (1899).
Eulecanium " Ckll., in litt. (1902).
Habitat.—Kansas; Nebraska; Ohio; Massachusetts.
On elm; oak; walnut; plum; peach; pear; sweet-fern.

925. **Eulecanium corni** (Bouché).

Lecanium corni Bouché, Stett. Ent. Zeit., v, p. 298 (1844).
" " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 417 (1873).
" " Kalt., Die Pflanz., pp. 261, 296 (1874).
" " Henschel, Die Schädl. Forst. & Obst. Ins., p. 511 (1895).
" (Eulecanium) corni Ckll., Check List, p. 332 (1896).
Habitat.—Europe.
On Cornus sanguinea; Ribes rubrum; Corylus; Pyrus; Tilia.

926. **Eulecanium coryli** (Linn.).

Coccus coryli Linn., Syst. Nat., Ed. x, i, p. 456 (1758).
" " " Faun. Suec., ii, p. 265 (1761).
Chermes " hemisphæricus Geoff., Abr. Ins., p. 507 (1762).
Coccus " Linn., Syst. Nat., Ed. xii, i, p. 741 (1766).
" " Mueller, Faun. Frid., p. 31 (1767).
" " Fab., Syst. Ent., p. 743 (1775).
" " Mod., Act. Goth., i, p. 29 (1778).
" " Fab., Spec. Ins., ii, p. 394 (1781).
Chermes " Fourc., Ent. Paris., p. 229 (1785).
Coccus " Fab., Mant. Ins., ii, p. 319 (1787).
" " Gmel., Syst. Nat., Ed. xiii, p. 2217 (1789).
" " DeVillers, Syst. Nat., i, p. 560 (1789).
Chermes " Oliv., Ency. Meth., vii. p. 440 (1792).
Coccus " Fab., Ent. Syst., iv, p. 225 (1794).
" " Turton, Syst. Nat., p. 713 (1801).
" " Fab., Syst. Rhyng., p. 308 (1803).
" " Bechst., Forstins., i, p. 286 (1804).
" " " " iii, p. 891 (1805).
Lecanium " Blanch., Hist. Nat. Ins., iii, p. 214 (1840).
" " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 418 (1873).
Coccus " Kalt., Die Pflanz., p. 638 (1874).
Lecanium " Newst., Jn. Roy. Hor. Soc., xxiii, p. 23 (1900).
" " King & Reh, Jahrb. Hamb. Wiss. Anst., xviii, p. 4 (1900).
Eulecanium coryli Ckll., The Entom., xxxiv, p. 92 (1901).
Habitat.—Europe.
On Corylus avellana; currant; gooseberry; raspberry; Cotoneaster.

927. **Eulecanium corylifex** (Fitch).

Lecanium corylifex Fitch, 3rd Rep. Ins. N. Y., p. 473 (1856).
" " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 419 (1873).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 133 (1883).
" (Eulecanium) corylifex Ckll., Check List, p. 332 (1896).
Eulecanium corylifex King, Can. Ent., xxxiii, p. 314 (1901).
Habitat.—Can.: N. Y.: Mass.
On Corylus rostrata: C. americana: Viburnum pubescens.

928. **Eulecanium crawii** (Ehrh.).

Lecanium crawii Ehrh., Can. Ent., xxx, p. 245 (1898).
" (Eulecanium) crawii Ckll. & Parr., The Industrialist, p. 237 (1899).
Habitat.—California.
On Acer macrophyllum.

929. **Eulecanium cynosbati** (Fitch).

Lecanium cynosbati Fitch, 3rd Rep. Ins. N. Y., p. 436 (1856).
" " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 419 (1873).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 133 (1883).
" (Eulecanium) cynosbati Ckll. & Parr., The Industrialist, p. 233 (1899).
Lecanium cynosbati Ckll., Can. Ent., xxxi, p. 140 (1899).
Eulecanium " King, " " xxxiv, p. 159 (1902).
Habitat.—Can., Mass.: N. Y.
On gooseberry: Gleditschia triacanthos.

930. **Eulecanium distinguendum** (Dougl.).

Lecanium distinguendum Dougl., Ent. Mon. Mag., xxvii, p. 96 (1891).
" " " " " " xxviii, p. 106 (1892).
" " Luff, " " " xxix, p. 139 (1893).
" (Eulecanium) distinguendum Ckll., Check List, p. 332 (1896).
Habitat.—Great Britain.
On Vaccinium myrtillum: Sarothamnus.

931. **Eulecanium douglasi** (Sulc).

Lecanium douglasi Sulc, Ent. Mon. Mag., xxxi, p. 37 (1899).
" (Eulecanium) douglasi Ckll. & Parr., The Industrialist, p. 237 (1899).
Habitat.—Bohemia.
On Betula alba.

932. **Eulecanium eugeniæ** (Hemp.).

Lecanium eugeniæ Hemp., Rév. Mus. Paul., iv, p. 439 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 215 (1901).
Eulecanium " Ckll., " " " " ix, p. 453 (1902).
Habitat.—Brazil.
On Eugenia.

933. Eulecanium fasciatum (Costa).

Chermes ulmi rotundus Geoff., Abr. Ins., i, p. 507 (1762).
Coccus (ovatus ulmi) DeG., Mem. Ins., vi, p. 436, pl. 28, figs. 7-15 (1776).
|| " ulmi Mod., Act. Goth., i, p. 27 (1778).
||Chermes ulmi Fourc. (not Linn. 1758), Ent. Paris., p. 229 (1785).
Coccus " Gmel. (not Linn.), Syst. Nat., Ed. xiii, p. 2217 (1789).
Chermes " Oliv., Ency. Meth., vii, p. 439 (1792).
" " Latr., Mag. Ency., p. 11 (1796).
Coccus " Turton, Syst. Nat., p. 713 (1801).
Calypticus fasciatus Costa, Faun. Reg. Nap., Cocc., p. 14 (1835).
Lecanium fasciatum Walk., Cat. Br. Mus., Hom., p. 1078 (1852).
" " Targ., Catalogue, p. 37 (1869).
" ulmi Sign., Ann. Soc. Ent. Fr., (5), iii, p. 432 (1873).
" " Dougl., Ent. Mon. Mag., xxiii, p. 79 and note (1886).
" (Eulecanium) ulmi var. fasciatum Ckll., Check List, p. 332 (1896).
" ulmi Ckll., Pr. Ac. N. Sci. Ph., p. 271 (1899).
Habitat.—Europe.
On elm.

934. Eulecanium fitchii (Sign.).

Lecanium fitchii Sign., Ann. Soc. Ent. Fr., (5). iii, p. 404 (1873).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 133 (1883).
" " Ckll., Ins. Life, vii, p. 29 (1894).
" " " Can. Ent., xxvii, p. 255 (1895).
" (Eulecanium) fitchii Ckll. & Parr., The Industrialist, p. 236 (1899).
Eulecanium fitchii King, Can. Ent., xxxiii, p. 333 (1901).
Lecanium " Fletcher, Rep. Can. Exp. Farms, 1901, p. 241 (1902).
Habitat.—Canada; Northeastern States; Ohio.
On raspberry; blackberry.

935. Eulecanium fletcheri (Ckll.).

Lecanium fletcheri Ckll., Can. Ent., xxv, p. 221 (1893).
" " Fletcher, " " xxvii. p. 6 (1895).
" (Eulecanium) fletcheri Ckll., Check List, p. 332 (1896).
" fletcheri King, Can. Ent., xxxi, p. 141 (1899).
" " Harrington, Rep. Ent. Soc. Ont., p. 96 (1899).
" " King, Psyche, viii, p. 350 (1899).
" " " Can. Ent., xxxiii, p. 194 (1901).
Eulecanium " " " " xxxiv, p. 159 (1902).
Habitat.—Can.; Mass.; N. Y.; Ohio.
On Arbor-vitæ.

936. Eulecanium fraxini King.

Eulecaninm fraxini King, Can. Ent., xxxiv, p. 158 (1902).
Habitat.—Can.; Mass.
On Fraxinus americanus.

937. Eulecanium fuscum (Gmel.).

—— —— Reaum. (non Sign.), Mem. Ins., iv, p. 60, pl. 5, fig. 2 (1738).
?Chermes quercus rotundus fuscus Geoff., Abr. Ins., i, p. 507 (1762).
?Coccus quercus fuscus Mod., Act. Goth., p. 24 (1778).
?Chermes quercus Fourc. (non Linn.), Ent. Paris., i, p. 229 (1785).
Coccus fuscus Gmel., Syst. Nat., Ed. xiii, p. 2221 (1789).
Chermes rotundus quercus Oliv., Ency. Meth., vii, p. 440 (1792).
Coccus fuscus Turt., Syst. Nat., ii, p. 715 (1801).
" " Bechst., Forstins., i, p. 288 (1804).
" " " " iii, p. 891 (1805).
Lecanium fuscum Dougl., Ent. Mon. Mag., xxiv, p. 98 (1887).
" " " " " " xxvi, p. 318 (1890).
" " Ckll., Can. Ent., xxvii, p. 35 (1895).
Eulecanium " " The Entom., xxxiv, p. 91 (1901).
Habitat.—Europe.
On oak.

938. Eulecanium genevense (Targ.).

Lecanium genevense Targ., Catalogue, p. 38 (1869).
" " Sign., Ann. Soc. Ent. Fr., (5), iii, pp. 41, 421 (1873).
" " Dougl., Ent. Mon. Mag., xxii, p. 15 (1885).
" " " " " " xxiii, pp. 25, 28 (1886).
" " " " " " xxvii, p. 267 (1891).
" " Newst., " " " xxxi, p. 85 (1895).
" " Dougl., " " " xxxii, p. 182 (1896).
" (Eulecanium) genevense Ckll., Check List, p. 332 (1896).
" genevense Newst., Ind. Mus. Notes, iv, p. 82 (1897).
" " " Journ. Roy. Hor. Soc., xxiii, p. 23 (1900).
Habitat.—Europe.
On hawthorn.

Eulecanium genevense marchali Ckll.

Eulecanium genevense var. marchali Ckll., Psyche, x, p. 20 (1903).
Habitat.—France.

939. Eulecanium guignardi King.

Eulecanium guignardi King, Can. Ent., xxxiii, p. 334 (1901).
Habitat.—Ontario, Canada.
On plum.

940. Eulecanium juglandifex (Fitch).

(*Butternut scale.*)

Lecanium juglandifex Fitch, 3rd Rep. Ins. N. Y., p. 463 (1856).
" " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 406 (1873).
" " Pack., Shade Trees, p. 86 (1881).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 134 (1883).
" " Pack., 5th Rep. U. S. Ent. Com., p. 338 (1890).

Lecanium juglandifex Ckll., The Entom., xxvii, p. 332 (1894).
" " " Can. Ent., xxvii, p. 60 (1895).
" (Eulecanium) juglandifex Ckll., Check List, p. 332 (1896).
Habitat.—United States.
On butternut; plum?

Entomologists differ so much in regard to the identity of this species and numbers 941, 954 and 973 that they are here given as separate species.

941. Eulecanium juglandis (Bouché).

(*The N. Y. Plum scale.*)

Lecanium juglandis Bouché, Stett. Ent. Zeit., v, p. 299 (1844).
" " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 406 (1873).
" " Kalt., Die Pflanz., p. 98 (1874).
" " Goethe, Jahrb. Nass. Ver. Nat., pp. 122, 129 (1884).
" " Ckll., The Entom., xxvii, p. 332 (1894).
" " " Can. Ent., xxvii, p. 60 (1895).
" " Henschel, Die Schädl. Forst. & Obst. Ins., p. 511 (1895).
" " Lint., 10th Rep. N. Y. St. Mus., p. 273 (1895).
" " Lowe & Sirrine, 14th Rep. N. Y. Exp. Sta., 1895, p. 574 (1896).
" " Lint., 11th Rep. Ins. N. Y., 1895, p. 205 (1896).
" " Slingerland, Bull. 108, Corn. Univ. Exp. Sta., p. 82 (1896).
" (Eulecanium) juglandis Ckll., Check List, p. 332 (1896).
" juglandis Smith, Rep. N. J. St. Bd. Agr., p. 112 (1899).
" " Frank & Kruger, Schildlausbuch, p. 109 (1900).
" " King & Reh, Jahrb. Hamb. Wiss. Anst., xviii, p. 5 (1900).
Eulecanium " " Can. Ent., xxxiii, p. 333 (1901).
Habitat.—Canada; Nova Scotia; Middle States; Germany.
On Juglans regia; J. nigra; plum.

942. Eulecanium kansasense (Hunter).

Lecanium kansasense Hunter, Kan. Univ. Quar., viii, p. 69 (1899).
" " King, Can. Ent., xxxiii, p. 107 (1901).
Eulecanium " " " " xxxiv, p. 60 (1901).
Habitat.—Kansas; Mass.
On Cercis canadensis; shad-bush.

943. Eulecanium kingii (Ckll.).

Lecanium (Eulecanium) kingii Ckll., Ann. Mag. N. H., (7), ii, p. 322 (1898).
" " " " & Parr., The Industrialist, p. 235 (1899).
Habitat.—Mass.
On Vaccinium corymbosum.

944. Eulecanium lintneri (Ckll. & Benn.).

Lecanium lintneri Ckll. & Benn., Am. Nat., xxix, p. 381 (1895).
" " Berl., Riv. Pat. Veg., iv, p. 380 (1896).
" (Eulecanium) lintneri Ckll., Check List, p. 333 (1896).
Habitat.—New York.
On Sassafras.

945. **Eulecanium(?) liriodendri** (Gmel.).

?Coccus tulipiferæ Hill. Hamb. Mag., xii, pp. 1-24 (1753).
" liriodendri Gmel., Syst. Nat., Ed. xiii, p. 2220 (1789).
" " Turton, " " p. 715 (1801).
" " Sign.. Ann. Soc. Ent. Fr., (5), vi, p. 620 (1876).
Lecanium " Ckll., Pr. Ac. N. Sci. Ph., p. 271 (1899).
Eulecanium " " in litt. (1902).
Habitat.—Europe.
On Liriodendron tulipifera.

946. **Eulecanium lymani** King.

Eulecanium lymani King, Can. Ent., xxxiii. p. 335 (1901).
Habitat.—Quebec, Canada.
On oak.

947. **Eulecanium maclurarum** (Ckll.).

Lecanium (Eulecanium) maclurarum Ckll., Can. Ent., xxx, p. 294 (1898).
" " " " & Parr., The Industrialist,p. 236 (1899).
Eulecanium maclurarum King, Can. Ent., xxxiii, p. 335 (1901).
Habitat.—Ontario, Canada.
On osage orange.

948. **Eulecanium magnoliarum** (Ckll.).

Lecanium magnoliarum Ckll., Ent. News, ix, p. 145 (1898).
" (Eulecanium) magnoliarum Ckll. & Parr., The Industrialist, p. 236 (1899).
" magnoliarum Butz, Rep. Pa. St. Coll., 1900-01, p. 344 (1902).
" " Thro, Bull. 209, Corn. Univ. Exp. Sta., p. 217 (1903).
Habitat.—California: Ohio.
On Magnolia; Daphne; Virginia creeper.

Eulecanium magnoliarum hortensiæ Ckll.

Eulecanium magnoliarum var. hortensiæ Ckll., Psyche, x, p. 19 (1903).
Habitat.—France.
On "Hortensia" (Hydrangea).

949. **Eulecanium mori** (Sign.).

Lecanium mori Sign., Ann. Soc. Ent. Fr., (5), iii, p. 407 (1873).
" " Mask., N. Z. Trans., xvii, p. 29 (1884).
" " " Ins. Nox. Agr. N. Z., p. 82 (1887).
" " " N. Z. Trans., xxvi, p. 75 (1893).
" " " " " xxviii, p. 392 (1896).
" (Eulecanium) mori Ckll., Check List, p. 332 (1896).
Coccus mori Kirkaldy, Fauna Haw., iii, pt. 2, p. 106 (1902).
Habitat.—France; New Zealand; Hawaiian Islands.
On Morus (mulberry): Alsophila colensoi: Nephrolepis cordifolia; Asplenium flaccidum; Ulex europæus; Spartium.

950. Eulecanium nigrofasciatum (Perg.).

(*Terrapin Scale.*)

Lecanium nigrofasciatum Perg., Bull. 18, n. s., Dep. Ag., p. 26 (1898).
" " Chambliss, Bull. 4, Tenn. Exp. Sta., p. 149 (1898).
" " Johnson, Bull. 20, n. s., Dep. Ag., p. 66 (1899).
" " Marlatt, " " " " " p. 75 (1899).
" (Eulecanium) nigrofasciatum Ckll. & Parr., The Industrialist, p. 234 (1899).
" nigrofasciatum Johnson, Can. Ent., xxxi, p. 87 (1899).
" " King, " " " p. 141 (1899).
" " Lugger, 6th Rep. Minn. Exp. Sta., p. 218 (1900).
" " Quaint. & Scott, Cocc. Amer., Dec. iii-iv, No. 8 (1901).
" " Banks, Bull. 34, n. s., Dep. Ag., p. 11 (1902).
" " Pettit, " 200, Mich. Exp. Sta., p. 187 (1902).
Eulecanium " King, Can. Ent., xxxiv, p. 160 (1902).
Lecanium " Thro, Bull. 209, Corn. Univ. Exp. Sta., p. 211 (1903).

Habitat.—Can.; Mass.; N. Y.; N. J.; Pa.; Del.; Md.; D. C.; Fla.; Ohio; Tenn.; Ill.; Mo.; Minn.

On plum; peach; apple; olive; sycamore; maple; linden; birch; Vaccinium.

951. Eulecanium obtusum (Thro).

Lecanium obtusum Thro, Bull. 209, Corn. Univ. Exp. Sta., p. 212 (1903).
Eulecanium " Ckll., in litt. (1903).

Habitat.—New York.

On blackberry (Rubus villosus).

952. Eulecanium pallidior (Ckll. & King).

Lecanium pallidior Ckll. & King, Psyche, viii, p. 350 (1899).
Eulecanium " " in litt. (1902).

Habitat.—Mass.

On white cedar.

953. Eulecanium perornatum (Ckll. & Parr.).

Lecanium (Eulecanium) perornatum Ckll. & Parr., The Industrialist, p. 236 (1899).

Habitat.—Austria.

On Rosa canina.

954. Eulecanium persicæ (Fab.).

(*Peach scale.*)

—— —— Reaum., Mem. Ins., iv, p. i, pl. i, figs. 1, 2 (1838).
Chermes persicæ oblongus Geoff., Abr. Ins., i, p. 506 (1762).
Coccus " Fab., Gen. Ins., p. 304 (1776).
" persicorum Sulzer, Gesch. Ins., p. 112 (1776).
" costatus Schr., Enum. Ins. Austr., p. 589, pl. 10, fig. 11 (1781).
Chermes persicæ Fourc., Ent. Paris., p. 228 (1785).

Coccus persicorum Ramer, Gener., pl. 11, fig. 9 (1789).
Chermes persicæ Oliv., Ency. Meth., vii, p. 439 (1892).
Coccus " Fab., Ent. Syst., iv, p. 222 (1794).
" " " " " Suppl., p. 546 (1799).
" " Schr., Faun. Boica, ii, pt. 1, p. 144 (1801).
" " Fab., Syst. Rhyng., p. 307 (1803).
" " Latr., Gen. Crust. et Ins., p. 175 (1807).
" " Bouché, Schädl. Gart. Ins., p. 51 (1833).
" " Fonsc., Ann. Soc. Ent. Fr., iii, p. 207 (1834).
" " Burm., Handb. Ent., ii, p. 71 (1835).
" " Lam., Hist. Nat. Anim., iv, p. 115 (1835).
" " Blanch., Hist. Nat. Ins., iii, p. 214 (1840).
Lecanium " Bouché. Stett. Ent. Zeit., v, p. 296 (1844).
" rosarum Snell. v. Voll., Tijdschr. voor Entom., v, p. 94 (1862).
Coccus persicæ Targ., Studii sul. Cocc., pp. 47, 68 (1867).
Lecanium " " Catalogue, p. 37 (1869).
" cymbiformis Targ., " p. 37 (1869).
" persicochilense " " p. 38 (1869).
" persicæ Sign., Ann. Soc. Ent. Fr., (5), iii, p. 407 (1873).
" rosarum " " " " " " " p. 427 (1873).
Coccus persicæ Kalt., Die Pflanz., p. 534 (1874).
Lecanium " Lint., Coun. Gent., pp. 679, 711 (1879).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 134 (1883).
" " Saund., Ins. Inj. to Fruits, p. 195 (1883).
" " Goethe, Jahrb. Nass. Ver. Nat., p. 144 (1884).
" cymbiformis Targ., Annali di Agr., p. 56 (1884).
" persicæ Riley, Ins. Life, i, p. 144 (1888).
" rosarum Mask., N. Z. Trans., xxiv, p. 22 (1891).
" sarothamni Dougl., Ent. Mon. Mag., xxvii, p. 65 (1891).
" persicæ Riley & How., Ins. Life, iv, p. 410 (1892).
" " Howard, Yearbook U. S. Dep. Ag., p. 270 (1894).
" " Ckll., The Entom., xxvii, p. 334 (1894).
" " Hopkins, Rep. W. Va. Exp. Sta., p. 583 (1894).
" " Beckwith, 7th Rep. Del. Exp. Sta., p. 168 (1895).
" " Henschel, Die Schädl. Forst. & Obst. Ins., p. 511 (1895).
" " Gillette, Bull. 38, Col. Exp. Sta., p. 37 (1897).
" " Starnes, " 36, Ga. " " p. 28 (1897).
" " Laem., Die Obstbaumschadlinge, Dresden, p. 32 (1898).
" " Berl. e Leon., Cherm. Ital., Fasc. iii, No. 65 (1898).
" " Newst., Jn. Roy. Hor. Soc., xxiii, p. 21 (1900).
" " Bruner, Rep. Neb. St. Hor. Soc., p. 80 (1900).
" (Eulecanium) rosarum King & Reh, Jahrb. Hamb. Wiss. Anst., xviii, p. 6 (1900).
" persicæ Frank & Kruger, Schildlausbuch, p. 107 (1900).
Eulecanium " Ckll., The Entom., xxxiv, p. 92 (1901).
" " Hofer, Mitth. Schw. Ent. Ges., (10), x, p. 476 (1902).

Habitat.—Europe; Australia; United States; Nova Scotia.

On peach: Magnolia glauca; Ilex opaca; Vitis vinifera; Elæagnus angustifolia; Morus; nectarine; plum; Japanese quince; gooseberry; rose.

955. **Eulecanium pruinosum** (Coq.).

(*Frosted scale.*)

Lecanium pruinosum Coq., Ins. Life, iii, pp. 382, 383 (1891).
" " Craw, Rep. Cal. Bd. Hort., p. 13 (1891).
" " Coq., Bull. 26, Div. Ent. Dep. Ag., p. 33 (1892).
" " Craw, Rep. Cal. Bd. Hort., pp. 256, 267 (1894).
" " Ckll., Can. Ent., xxvii, p. 255, note (1895).
" (Eulecanium) pruinosum Ckll., Check List, p. 333 (1896).
Eulecanium pruinosum King, Can. Ent., xxxiv, p. 60 (1902).

Habitat.—Can.; Mass.; N. Y.; Ariz.; Cal.

On apricot; prune; peach; plum; cherry; pear; apple; English walnut; laurel; ash; birch; cork-elm; grape-vine; rose; orange.

956. **Eulecanium prunastri** (Fonsc.).

(*Plum Lecanium.*)

—— —— Reaum., Mem. Ins., iv, pl. 2, figs. 4, 5 (1738).
?Chermes persicæ rotundus Geoff., Abr. Ins., i, p. 506 (1762).
? " amygdali Fourc., Ent. Paris., p. 228 (1785).
?Coccus persicæ Gmel., Syst. Nat., Ed. xiii, p. 2220 (1789).
Chermes " rotundus Oliv., Ency. Meth., vii, p. 439 (1792).
Coccus " Turton, Syst. Nat., p. 715 (1801).
" prunastri Fonsc., Ann. Soc. Ent. Fr., iii, p. 211 (1834).
Lecanium blanchardii Targ., Catalogue, p. 38 (1869).
" prunastri Sign., Ann. Soc. Ent. Fr., (5), iii, p. 423 (1873).
" rotundum " " " " " " " p. 428 (1873).
" " Goethe, Jahrb. Nass. Ver. Nat., p. 124 (1884).
" prunastri Dougl., Ent. Mon. Mag., xxii, pp. 14, 158 (1885).
" " Howard, Yearbook U. S. Dep. Ag., p. 272 (1894).
" " Henschel, Schädl. Forst. & Obst. Ins., p. 511 (1895).
" rotundum Ckll., Can. Ent., xxvii, p. 60 (1895).
" (Eulecanium) rotundum Ckll., Check List, p. 332 (1896).
" prunastri Starnes, Bull. 36, Ga. Exp. Sta., p. 28 (1897).
" rotundum Frank & Kruger, Schildlausbuch, p. 108 (1900).
" prunastri Ckll., The Entom., xxxiv, p. 92 (1901).
" " Banks, Bull. 34, n. s., Dep. Ag., p. 12 (1902).

Habitat.—Europe; Japan?; New York; Ohio.

On plum; peach.

Eulecanium prunastri var. a. Ckll.

Eulecanium prunastri var. a. Ckll., Psyche, x, p. 21 (1903).

Habitat.—France.

On peach.

957. **Eulecanium pubescens** (Ehrh.).

Lecanium pubescens Ehrh., Can. Ent., xxx, p. 244 (1898).
" (Eulecanium) pubescens Ckll. & Parr., The Industrialist, p. 237 (1899).
Habitat.—California.
On oak.

958. **Eulecanium pyri** (Schr.).

Coccus pyri Schr., Enum. Ins. Austr., pp. 295, 587 (1781).
" " " Faun. Boica, ii, pt. i, p. 145 (1801).
Lecanium " Fitch, 1st Rep. Ins. N. Y., p. 809 (1854).
" " " 3rd " " " p. 352 (1856).
" " Uhler, Rep. U. S. Dep. Ag., p. 313 (1860).
" " Walsh & Riley, Am. Ent., i, p. 14 (1868).
Pulvinaria pyri Sign., Ann. Soc. Ent. Fr., (5), iii, p. 41 (1873).
Lecanium " " " " " " " " p. 424 (1873).
" " Putn., Pr. Dav. Ac. N. Sci., p. 339 (1879).
Pulvinaria " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 137 (1883).
" " Goethe, Jahrb. Nass. Ver. Nat., p. 123 (1884).
Lecanium " Editor, Amer. Garden, viii, p. 284 (1887).
" " Dougl., Ent. Mon. Mag., xxvii, p. 96 (1891).
" " Ckll., Can. Ent., xxvi, p. 35 (1894).
" " Henschel. Die Schädl. Forst. & Obst. Ins., p. 511 (1895).
" (Eulecanium) pyri Ckll., Check List, p. 332 (1896).
" pyri Frank & Kruger, Schildlausbuch, p. 109 (1900).
Eulecanium " King, Can. Ent., xxxiv, p. 60 (1902).
Habitat.—Europe; United States; Prince Edward's Island.
On pear; apple; hickory; white thorn.

959. **Eulecanium quercifex** (Fitch).

Lecanium quercifex Fitch, 5th Rep. Ins. N. Y., p. 805 (1858).
" " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 425 (1873).
" " Pack., Shade Trees, p. 38 (1881).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 135 (1883).
" " Pack., 5th Rep. U. S. Ent. Com., p. 98 (1890).
" " Ckll., Can. Ent., xxvii, p. 35 (1895).
" " King, " " xxxi, p. 140 (1899).
" (Eulecanium) quercifex Ckll. & Parr., The Industrialist, p. 235 (1899).
Eulecanium quercifex King, Can. Ent., xxxiii, p. 31 (1901).
Lecanium " Thro, Bull. 209, Corn. Univ. Exp. Sta., p. 213 (1903).
Habitat.—Can.; N. Y.; Mass.; Ohio.
On oak.

960. **Eulecanium quercitronis** (Fitch).

Lecanium quercitronis Fitch, 5th Rep. Ins. N. Y., p. 805 (1858).
" " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 426 (1873).
" " Pack., Shade Trees, p. 38 (1881).
" " Comst.. 2nd Rep. Dep. Ent. Corn. Univ.,p.135 (1883).
" " Pack.. 5th Rep. U. S. Ent. Com., p. 98 (1890).
" " Ckll., Can. Ent., xxvii, pp. 35, 255 (1895).
" (Eulecanium) quercitronis Ckll. & Parr., The Industrialist, p. 232 (1899).
" quercitronis Parr., Jn. N. Y. Ent. Soc., vii, p. 257 (1899).
Eulecanium " King, Can. Ent.. xxxiii, p. 315 (1901).

Habitat.—Can.; Mass.; N. Y.; Ill.; Ariz.; N. Mex.

On black oak; ironwood; Xanthoxylum americanum; Castanea pumila; elm.

Eulecanium quercitronis kermoides (Tyr.).

Lecanium quercitronis var. kermoides Tyr., Rep. Cal. Exp. Sta., 1894, pp. 256, 269 (1896).

Habitat.—California.

On oak; orange; locust.

961. **Eulecanium rehi** (King).

Lecanium rehi King. Jahrb. Hamb. Wiss. Anst., xviii, p. 5 (1900).
" " Hofer, Mitth. Schw. Ent. Ges., (10), x, p. 477 (1903).
Eulecanium " " " " " " " " p. 481 (1903).

Habitat.—Europe.

On Ribes nigrum; R. rubrum; R. aureum; gooseberry; Symphoricarpos racemosus.

962. **Eulecanium ribis** (Fitch).

(*Currant scale.*)

Lecanium ribis Fitch, 3rd Rep. Ins. N. Y., p. 427 (1856).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 624 (1876).
" " Dougl., Ent. Mon. Mag., xix, p. 88 (1882).
" " Comst.. 2nd Rep. Dep. Ent. Corn. Univ.. p. 135 (1883).
" " Dougl., Ent. Mon. Mag., xxiii, p. 29 (1886).
" " Fletcher, Rep. Can. Exp. Farms, p. 32 (1887).
" " Mask., N. Z. Trans., xxiii, p. 16 (1890).
" " " " " xxiv, p. 22 (1891).
" (Eulecanium) ribis Ckll. & Parr.. The Industrialist, p. 234 (1899).
" ribis Lugger, 6th Rep. Minn. Exp. Sta., p. 218 (1900).

Habitat.—Can.; N. Y.; Ohio; Minn.; England; Germany?; New Zealand; W. Australia?

On currant; gooseberry; mulberry; Carpinus; Ostrya.

963. Eulecanium robiniæ (Towns.).

Lecanium robiniæ Towns., Bull. 7, N. Mex. Exp. Sta., p. 11 (1892).
" " Riley & How., Ins. Life, v, p. 65 (1892).
" robiniarum Ckll. (non Dougl.), Can. Ent., xxvii, p. 257 (1895).
" " " Science Gossip, May, p. 367 (1900).
Eulecanium " " The Entom., xxxv, p. 178 (1902).
Habitat.—New Mexico: Arizona.
On Robinia pseudacacia: osage orange.

Eulecanium robiniæ subsimile Ckll.

Eulecanium robiniæ var. subsimile Ckll., The Entom., xxxv, p. 178 (1902).
Habitat.—Mexico.
On ash?; Rhus?

964. Eulecanium robiniarum (Dougl.).

Lecanium robiniarum Dougl., Ent. Mon. Mag., xxvi, p. 318 (1890).
" " " " " " xxix, p. 167 (1893).
" " Eckst., Forst. Zool., p. 557 (1897).
" " Henry, "Sur quelques Cochenilles forestiéres "(1898).
" " " Feuille Jeune Nat., (3), xxviii, p. 138 (1898).
" " Kiefer, Bull. Soc. Ent. Fr., lxviii, p. 158 (1899).
Eulecanium " Ckll., The Entom., xxxv, p. 178 (1902).
Habitat.—Europe; New Mexico.
On Robinia pseudacacia.

965. Eulecanium rosæ King.

Eulecanium rosæ King, Can. Ent., xxxiii, p. 336 (1901).
Habitat.—Quebec, Canada.
On rose.

966. Eulecanium rubi (Schr.).

Coccus rubi Schr., Faun. Boica, ii. pt. i, p. 144 (1801).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 624 (1876).
" " Licht., Bull. " " " (6), i, p. cxvi (1881).
" " " " " " " " ii, p. lxxv (1882).
" " " Wien. Ent. Zeit., i, p. 124 (1882).
Lecanium rubi Dougl., Ent. Mon. Mag., xxviii, p. 105 (1892).
Coccus " " " " " xxx, p. 17 (1894).
Lecanium " " " " " " p. 136 (1894).
" " Ckll., Ins. Life, vii, pp. 29, 30, 31 (1894).
" (Eulecanium) rubi Ckll., Check List, p. 332 (1896).
" rubi King & Reh, Jahrb. Hamb. Wiss. Anst., xviii, p. 6 (1900).
Habitat.—Europe.
On Rubus.

967. Eulecanium rugosum (Sign.).

Lecanium rugosum Sign., Ann. Soc. Ent. Fr., (5), iii, p. 429 (1873).
" " Slingerland, Bull. 83, Dep. Ent. Corn.Univ., p. 685 (1894).

Lecanium rugosum Ckll., Can. Ent., xxvii, p. 59 (1895).
" (Eulecanium) rugosum Ckll., Check List, p. 332 (1896).
" rugosum Frank & Kruger, Schildlausbuch, p. 108 (1900).
Habitat.—France; Germany; United States.
On peach; plum; quince; apple; pear; cherry; honey locust; elm; maple.
It is very doubtful whether all the above citations refer to the same species.

968. Eulecanium subaustrale (Ckll.).

Lecanium subaustrale Ckll., The Entom., xxxi, p. 131 (1898).
" (Eulecanium) subaustrale Ckll., Check List, Suppl., p. 394 (1899).
Habitat.—Mexico.
On Celtis occidentalis?

969. Eulecanium takachihoi (Kuwana).

Lecanium (Eulecanium) takachihoi Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 63 (1902).
Habitat.—Japan.
On chestnut.

970. Eulecanium tarsale (Sign.).

Lecanium tarsalis Sign., Ann. Soc. Ent. Fr., (5), iii, p. 430 (1873).
" (Eulecanium) tarsale Ckll. & Parr., The Industrialist, p. 234 (1899).
" tarsale King, Can. Ent., xxxi, p. 141 (1899).
Habitat.—N. Y.; Mass.
On Cornus sanguinea; C. alternifolia.

971. Eulecanium tiliæ (Linn.).

Coccus tiliæ Linn., Syst. Nat., Ed. x, i, p. 456 (1758).
" " " Faun. Suec., ii, p. 265 (1761).
Chermes " hemisphæricus Geoff., Abr. Ins., i, p. 507 (1762).
Coccus " Linn., Syst. Nat., Ed. xii, i, p. 741 (1766).
" " Fab., Syst. Ent., p. 743 (1775).
" " Mod., Act. Goth., p. 30 (1778).
" " Fab., Spec. Ins., ii, p. 394 (1781).
Chermes " Fourc., Ent. Paris., p. 229 (1785).
Coccus " Fab., Mant. Ins., ii, p. 319 (1787).
" " Gmel., Syst. Nat., Ed. xiii, p. 2217 (1789).
Chermes " Oliv., Ency. Meth., vii, p. 440 (1792).
Coccus " Fab., Ent. Syst., iv, p. 226 (1794).
" " Turton, Syst. Nat., p. 713 (1801).
" " Fab., Syst. Rhyng., p. 309 (1803).
" " Bechst., Forstins., i, p. 286 (1804).
Lecanium tiliæ Blanch., Hist. Nat. Ins., iii, p. 214 (1840).
" " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 431 (1873).
Coccus " Dougl., Ent. Mon. Mag., xxiii, p. 25 (1886).
Eulecanium tiliæ Ckll., The Entom., xxxiv, p. 92 (1901).
Habitat.—Europe.
On Citrus; poplar; elm; maple; plum; pear; cherry.

972. **Eulecanium tulipiferæ** (Cook).

||Lecanium tiliæ Fitch (non Linn.), 4th Rep. Regents Univ. N. Y.,p.69 (1851).
" tulipiferæ Cook, Can. Ent., x, p. 192 (1878).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 136 (1883).
" tiliæ Cook, Ent. Am., i, p. 211 (1885).
" tulipiferæ Riley & How., Ins. Life, iii, p. 28 (1890).
" tiliæ Sturgis, Rep. Conn. Exp. Sta., p. 193 (1895).
" " Smith, Rep. N. J. Exp. Sta., 1897, p. 403 (1898).
" " Johns., Rep. Md. Exp. Sta., p. 273 (1898).
" tulipiferæ Felt, 14th Rep. Ins. N. Y., p. 213 (1898).
Eulecanium " King, Can. Ent., xxxiv, p. 60 (1902).

Habitat.—Mass.; Conn.; N. Y.; N. J.; Tenn.; W. States.

On linden; tulip-tree; Magnolia Soulangiana; clover.

973. **Eulecanium variegatum** (Goethe).

Lecanium variegatum Goethe, Jahrb. Nass. Ver. Nat., p. 37 (1884).
" " Dougl., Ent. Mon. Mag., xxiii, p. 28 (1886).
" " " " " " xxvii, p. 96 (1891).
" " Ckll., The Entom., xxvii, p. 335 (1894).
" (Eulecanium) variegatum Ckll. & Parr., The Industrialist, p. 235 (1899).
Lecanium variegatum Frank & Kruger, Schildlausbuch, p. 110 (1900).

Habitat.—Europe.

On plum; apple.

974. **Eulecanium vini** (Bouché).

Lecanium vini Bouché, Stett. Ent. Zeit., xii, p. 112 (1851).
" (Eulecanium) vini King & Reh, Jahrb. Hamb. Wiss. Anst., xviii, p. 6 (1900).
Eulecanium vini Ckll., The Entom., xxxiv, p. 92 (1901).
" " Hofer, Mitth. Schw. Ent. Ges., (10), x, p. 476 (1902).

Habitat.—Europe.

On grape vine; Lonicera; Pyrus malus; P. communis; Spiræa; Prunus persica; P. armeniaca; Robinia pseudacacia.

975. **Eulecanium websteri** (King).

||Lecanium ribis Ckll. (non Fitch), Can. Ent., xxvii, p. 255 (1895).
" (Eulecanium) ribis Ckll. & Parr., The Industrialist, p. 234 (1899).
" websteri King, Can. Ent., xxxiii, p. 106 (1901).
Eulecanium " " " " xxxiv, p. 60 (1902).

Habitat.—Can.: Nova Scotia; Mass.; Ohio; Iowa; Kansas.

On currant; white birch; Spiræa; Vaccinium; mulberry; Ostrya; Carpinus; Celtis occidentalis.

Eulecanium websteri mirabile (King).

Lecanium websteri var. mirabilis King, Mitth. Schw. Ent. Ges., (10), x, p. 482 (1902).

Habitat.—Switzerland.

On Acer negundo.

Genus **PARALECANIUM** Ckll. Type, frenchii.

s. g. Paralecanium Ckll. & Parr., The Industrialist, p. 227 (1899): Ckll., Can. Ent., xxxiii, p. 57 (1901): g. Ann. Mag. N. H., (7), ix, p. 455 (1902).

976. **Paralecanium expansum** (Green).

Lecanium expansum Green, Ind. Mus. Notes, iv, p. 9 (1896).
" (Paralecanium) expansum Ckll. & Parr., The Industrialist, p. 227 (1899).
Habitat.—Ceylon.
On Litsea; Dalbergia.

977. **Paralecanium frenchii** (Mask.).

Lecanium frenchii Mask., N. Z. Trans., xxiii. p. 17 (1890).
" (Paralecanium) frenchii Ckll. & Parr., The Industrialist, p. 227 (1899).
Habitat.—Australia.
On Banksia australis.

Paralecanium frenchii macrozamiæ (Full.).

Lecanium frenchii var. macrozamiæ Full., Notes on Cocc. W. Austr., p. 6 (1897).
" (Paralecanium) frenchii var. macrozamiæ Ckll. & Parr., The Industrialist, p. 227 (1899).
" frenchii var. macrozamiæ Full., Tr. Ent. Soc. Lond., p. 459 (1899).
Habitat.—W. Australia.
On Macrozamia fraseri.

978. **Paralecanium geometricum** (Green).

Lecanium geometricum Green, Ind. Mus. Notes, iv, p. 9 (1896).
" (Paralecanium) geometricum Ckll. & Parr., The Industrialist, p. 227 (1899).
Habitat.—Ceylon; China.
On Laurus canariensis.

979. **Paralecanium marginatum** (Green).

Lecanium marginatum Green, Ind. Mus. Notes, iv, p. 9 (1896).
" (Paralecanium) marginatum Ckll. & Parr., The Industrialist, p. 227 (1899).
Habitat.—Ceylon.
On Psychotria Thwaitesii.

980. **Paralecanium marianum** Ckll.

Paralecanium marianum Ckll., Ann. Mag. N. H., (7), ix, p. 455 (1902).
Habitat.—Rio Janeiro.

981. **Paralecanium maritimum** (Green).

Lecanium planum var. maritimum Green, Ind. Mus. Notes, iv, p. 9 (1896).
" (Paralecanium) " Ckll. & Parr., The Industrialist, p. 228 (1899).
Habitat.—Ceylon.

982. Paralecanium planum (Green).

Lecanium planum Green, Ind. Mus. Notes, iv, p. 9 (1896).
" (Paralecanium) planum Ckll.& Parr.,The Industrialist,p.228(1899).
Habitat.—Ceylon.

Genus **SAISSETIA** Deplanches. Type, coffeæ=hemisphæricum.

Saissetia Deplanches, Fauvel. Bull. Soc. Linn. Norm., ix, p. 127 (1865): Ckll., Can. Ent., xxxiii, p. 58 (1901).
Bernardia Ashm., Tr. Am. Ent. Soc., xviii, p. 100 (1891).

983. Saissetia anthurii (Bdv.).

Chermes anthurii Bdv., Ent. Hort., p. 328 (1867).
Lecanium " Sign., Ann. Soc. Ent. Fr., (4), viii, p. 843 (1868).
" " " " " " " (5), iii, p. 435 (1873).
" " Mask., N. Z. Trans., xxv, p. 219 (1892).
" " Ckll. & Parr., The Industrialist, p. 164, note (1899).
" (Saissetia) anthurii King, Can. Ent., xxxi, p. 142 (1899).
Saissetia anthurii Ckll., in litt. (1902).
Habitat.—Europe; Australia; Mass. (in hothouses).
On Anthurium; Asparagus; orchids; grass.

984. Saissetia beaumontiæ (Dougl.).

Lecanium beaumontiæ Dougl., Ent. Mon. Mag., xxiv, p. 95 (1887).
" (Saissetia) beaumontiæ Ckll. & Parr., The Industrialist, p. 163 (1899).
Saissetia beaumontiæ Ckll., The Ent. Student, ii, p. 32 (1901).
Habitat.—Europe.
On Beaumontia grandiflora.

985. Saissetia begoniæ (Dougl.).

Lecanium begoniæ Dougl., Ent. Mon. Mag., xxviii, p. 209 (1892).
" " Mask., N. Z. Trans., xxvi, p. 73 (1893).
" " Ckll., Tr. Am. Ent. Soc., xx, p. 52 (1893).
" " Mask., The Entom., xxvii, p. 166 (1894).
" " Ckll., Bull. Bot. Dep. Jam., p. 70 (1894).
" " Green, Ent. Mon. Mag., xxxiii, p. 70 (1897).
" (Saissetia) nigrum var. begoniæ Ckll. & Parr., The Industrialist, p. 163 (1899).
Habitat.—Demerara; Antigua.
On Begonia; Terminalia Catappa.

986. Saissetia cassiniæ (Mask.).

Lecanium cassiniæ Mask., N. Z. Trans., xxiii, p. 15 (1890).
" (Saissetia) cassiniæ Ckll. & Parr., The Industrialist, p. 163 (1899).
Habitat.—New Zealand.
On Cassinia leptophylla.

987. **Saissetia depressa** (Targ.).

Lecanium depressum Targ., Studii sul. Cocc., p. 29 (1867).
" " " Catalogue, p. 37 (1869).
" " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 439 (1873).
" " Mark, Anat. Cocc., pp. 26, 47 (1876).
" " Mask., N. Z. Trans., xi, p. 206 (1878).
" " Dougl., Ent. Mon. Mag., xxiv, p. 27 (1887).
" " Mask., Ins. Nox. Ag. N. Z., p. 79 (1887).
" " " N. Z. Trans., xxv, p. 220 (1892).
" " " " " xxvi, p. 73 (1893).
" " Ckll., Tr. Am. Ent. Soc., xx, p. 55 (1893).
" " Mask., The Entom., xxvii, p. 166 (1894).
" " Ckll., Bull, Bot. Dep. Jam., p. 70 (1894).
" " Craw, 4th Bien. Rep. Cal. Bd. Hort., p. 92 (1894).
" " " Bull. 68, Cal. Bd. Hort., p. 14 (1894).
" " Green, Ent. Mon. Mag., xxxi, p. 232 (1895).
" nigrum ? var. depressum Ckll., Check List, p. 332 (1896).
" " " " " & Parr., The Industrialist, p. 163 (1899).
" " " " Hemp., Rev. Mus. Paul., iv, p. 425 (1900).
Saissetia depressa King, Psyche, ix, p. 296 (1902).

Habitat.—New Zealand; Australia; Hawaiian Islands; Brazil; West Indies: France and Italy, (in greenhouses).

On Ficus; Hibiscus; Hakea; Psidium; Bambusa; various hothouse plants.

Saissetia depressa simulans (Dougl.).

Lecanium depressum var. simulans Dougl., Ent. Mon. Mag., xxiv, p. 28 (1887).

Habitat.—Great Britain.

On Ficus elastica; Camellia.

988. **Saissetia discoides** (Hemp.).

Lecanium discoides Hemp., Rev. Mus. Paul., iv, p. 433 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 213 (1901).
Saissetia " Ckll., " " " " ix, p. 453 (1902).

Habitat.—Brazil.

On "Psidium and other Myrtaceous plants."

989. **Saissetia dura** (Hemp.).

Lecanium durum Hemp., Rev. Mus. Paul., iv, p. 427 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 210 (1901).
Saissetia dura Ckll., " " " " ix, p. 453 (1902).

Habitat.—Brazil.

On Baccharis dracunculifolia.

990. **Saissetia filicum** (Bdv.).

Chermes filicum Bdv., Ent. Hort., p. 335 (1867).

Lecanium filicum Pack., 17th Rep. Mass. Bd. Ag., p. 260 (1869-70).
" " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 436 (1873).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 133 (1883).
Chermes " Mask., N. Z. Trans., xvii, p. 29 (1884).
Lecanium " Dougl., Ent. Mon. Mag., xxiv, p. 28 (1887).
" " Mask., N. Z. Trans., xxv, p. 220 (1892).
" " Ckll., Tr. Am. Ent. Soc., xx, p. 55 (1893).
" " " Bull. Bot. Dep. Jam., p. 72 (1894).
" " Craw, 4th Bien. Rep. Cal. Bd. Hort., p. 147 (1894).
" hemisphæricum var. filicum Green, Ent. Mon. Mag., xxxiii, pp. 70, 77 (1897).
" " " " de Charm., Pr. Soc. Amic. Scien., p. 40 (1899).
Saissetia filicum King, Psyche, ix, p. 298 (1902).
Lecanium " Thro, Bull. 209, Corn. Univ. Exp. Sta., p. 215 (1903).

Habitat.—Europe; Australia; New Zealand; Mauritius; Jamaica; United States.

On ferns.

991. Saissetia formicarii (Green).

Lecanium formicarii Green, Ind. Mus. Notes, iv, p. 10 (1896).
" (Saissetia) formicarii Ckll. & Parr., The Industrialist, p. 164 (1899).
Saissetia formicarii Ckll., The Ent. Student, ii, p. 32 (1901).

Habitat.—Ceylon.

On tea-plant; in nests of Cremastogaster.

992. Saissetia glanulosa (Hemp.).

Lecanium glanulosum Hemp., Rev. Mus. Paul., iv, p. 428 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 210 (1901).
Saissetia glanulosa Ckll., " " " " ix, p. 453 (1902).

Habitat.—Brazil.

On Myrtaceæ.

993. Saissetia hemisphærica (Targ.).

(*Hemisphærical scale.*)

Lecanium hemisphæricum Targ., Studii sul. Cocc., pp. 26, 27, 30, 39, 63 (1867).
" " " Catalogue, p. 38 (1869).
" coffeæ Sign. (non Walk.), Ann. Soc. Ent. Fr., (5), iii, p. 435 (1873).
" hemisphæricum Sign., " " " " " " p. 436 (1873).
" " Comst., Rep. U. S. Dep. Ag., 1880. p. 334 (1881).
" " " 2nd Rep. Dep. Ent. Corn. Univ., p. 134 (1883).
" " Saund., Ins. Inj. to Fruits, p. 409 (1883).
" " Mask., N. Z. Trans., xvii, p. 29 (1884).
" " Dougl., Ent. Mon. Mag., xxiii, p. 78 (1886).
" " Mask., Ins. Nox. Agr. N. Z., p. 80 (1887).
" " Penzig, Annali di Agr., p. 529 (1887).

Lecanium hemisphæricum Comst., Intr. Ent., p. 141 (1888).
" " Riley, Ins. Life, i, p. 144 (1888).
" coffeæ Cotes, Ind. Mus. Notes, i, pp. 117, 122 (1889).
" hemisphæricum Coq., Bull. 26, Div. Ent. Dep. Ag., p. 27 (1892).
" " Ckll., Tr. Am. Ent. Soc., xx, p. 55 (1893).
" coffeæ Cotes, Ind. Mus. Notes, ii, p. 163 (1893).
" hemisphæricum Mask., N. Z. Trans., xxvii, p. 59 (1894).
" " Craw, Rep. Cal. Exp. Sta., pp. 256, 266 (1894).
" " Ckll., Bull. Bot. Dep. Jam., p. 70 (1894).
" coffeæ " " " " " p. 71 (1894).
" " Cotes, Ind. Mus. Notes, iii, No. 4, pp. 41, 42 (1894).
" hemisphæricum Comst., Man. Ins., p. 171 (1895).
" " Davis, Spec. Bull. 2, Mich. Exp. Sta., p. 32 (1896).
" " Harvey, Rep. Me. Exp. Sta., p. 118 (1896).
" coffeæ Green, Cocc. Ceylon, pt. i, p. 1 (1896).
" " Ckll., Rev. Mus. Paul., ii, p. 71 (1897).
" hemisphæricum Green, Ent. Mon. Mag., xxxiii, p. 70 (1897).
" " Berl. e Leon., Cherm. Ital., Fasc. ii, No. 48 (1897).
" " Starnes, Bull. 6, Ga. Exp. Sta., p. 29 (1897).
" " Osborn, Contr. Ia. Ag. Coll., No. 3, p. 3 (1898).
" " Rolfs & Quaint., Cocc. Amer., Dec. i-ii, No. 2 (1898).
" " Newell, Bull. 43, Ia. Exp. Sta., p. 169 (1899).
" " de Charm., Pr. Soc. Amic. Scien., p. 40 (1899).
" " Ckll., Biol. Centr. Amer., ii, pt. 2, p. 12 1899).
" (Saissetia) coffeæ Ckll. & Parr., The Industrialist, p. 164 (1899).
" coffeæ Ckll., Pr. Ac. N. Sci. Ph., p. 270 (1899).
" hemisphæricum Marlatt, Yearbook U. S. Dep. Ag., p. 276 (1900).
" " Gossard, Bull. 51, Fla. Exp. Sta., p. 116 (1900).
" " Lefroy, Scale Ins. Less. Antil., p. 43 (1901).
" " King, Ent. News, xii, p. 311 (1901).
Saissetia hemisphærica Ckll., The Ent. Student, ii, p. 32 (1901).
" " King, Psyche, ix, p. 297 (1902).
Lecanium (Saissetia) hemisphæricum Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 63 (1902).
Coccus coffeæ Kirkaldy, Fauna Haw., iii, pt. 2, p. 105 (1902).
Lecanium hemisphæricum Thro, Bull. 209, Corn. Univ. Exp. Sta., p. 215 (1903).

Habitat.—Europe; New Zealand; Australia; Mauritius; Hawaiian Islands; Galapagos Islands; Brazil; West Indies; United States; Mexico.

On Oleander; Camellia; Eranthemum; Areca Catechu; Ixora; Cocos; Chrysophyllum; Croton variegatum; coffee; ferns; peach; orange; sago-palm; orchids; etc.—Ins. Life, v, p. 161; Bull. Bot. Dep. Jam., p. 71 (1894).

Saissetia hemisphærica hibernaculorum (Bdv.).

Chermes hibernaculorum Bdv., Ent. Hort., p. 337 (1867).
Lecanium hybernaculorum Targ., Catalogue, p. 37 (1869).
" hibernaculorum Sign., Ann. Soc. Ent. Fr., (5), iii, p. 437 (1873).
Chermes " Mask., N. Z. Trans., xi, p. 207 (1878).

Lecanium hibernaculorum Dougl., Ent. Mon. Mag., xxiii, p. 78 (1886).
" " Mask., Ins. Nox. Agr. N. Z., p. 81 (1887).
" " Coq., Bull. 26, Div. Ent. Dep. Ag., p. 27 (1892).
" " Ckll., Gard. Chron., (3), xiii, p. 548 (1893).
" hemisphæricum var. hibernaculorum Ckll., Bull. Bot. Dep. Jam., p. 71 (1894).
" (Saissetia) coffeæ " " Ckll. & Parr., The Industrialist, p. 164 (1899).

Habitat.—Europe; New Zealand; Australia; Demerara; Jamaica; Cal.

On peach; orange; oleander; coffee; Zamia; Ardisia; Grevillea; Gardenia; Brexia; sago-palm; ferns; various green-house plants.

Saissetia hemisphærica clypeata (Dougl.).

Lecanium clypeatum Dougl., Ent. Mon. Mag., xxv, p. 58 (1888).
" (Saissetia) coffeæ var. clypeatum Ckll. & Parr., The Industrialist, p. 164 (1899).

Habitat.—England; Ireland.

On Adiantum capillus-veneris; Bryophyllum calycrinum; Asparagus plumosus.

994. **Saissetia** (?) **infrequens** (Hemp.).

Lecanium infrequens Hemp., Rev. Mus. Paul., iv, p. 431 (1900).
" " " Ann. Mag. N. H., (7), vii, p. 212 (1901).
Saissetia(?) " Ckll., in litt. (1902).

Habitat.—Brazil.

On bark of Xanthoxylum.

995. **Saissetia mirifica** (Mask.).

Lecanium mirificum Mask., N. Z. Trans., xxix, p. 312 (1897).
" (Saissetia) mirificum Ckll. & Parr., The Industrialist, p. 164 (1899).
Saissetia mirifica Ckll., The Ent. Student, ii, p. 32 (1901).

Habitat.—Australia.

On Acacia pendula.

996. **Saissetia nigra** (Nietn.).

Lecanium nigrum Nietn., "Enemies of Coffee-tree," p. 9 (1861).
" " Atk., Jn. Asiatic Soc., Bengal, lv, p. 284 (1886).
" " Green, Ind. Mus. Notes, i, p. 117 (1889).
" " Dougl., Ent. Mon. Mag., xxvii, p. 95 (1891).
" " Cotes, Ind. Mus. Notes, ii, p. 168 (1893).
" " Mask., N. Z. Trans., xxvi, p. 73 (1893).
" " " The Entom., xxvii, p. 166 (1894).
" " Ckll., Bull. Bot. Dep. Jam., p. 70 (1894).
" " " " " " " p. 256 (1896).
" " Green, Ind. Mus. Notes, iv, p. 9 (1896).
" " " Cocc. Ceylon, pt. i, p. 1 (1896).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 46 (1896).
" " Green, Ent. Mon. Mag., xxxiii, p. 71 (1897).

Lecanium (Saissetia) nigrum Ckll. & Parr., The Industrialist, p. 163 (1899).
" nigrum de Charm., Pr. Soc. Amic. Scien., p. 40 (1899).
" " Lefroy, Scale Ins. Less. Antil., p. 49 (1901).
Saissetia nigra King, Psyche, ix, p. 296 (1902).
Coccus nigrum Kirkaldy, Fauna Haw., iii, pt. 2, p. 106 (1902).

Habitat.—Ceylon; India; Demerara; Mauritius; Hawaiian Islands; Grenada; Br. Guiana; Barbados; Trinidad; Porto Rico; Australia; New Zealand.

On coffee-tree; teak-tree; Croton; Asparagus; Cobæa; Begonia; Terminalia Catappa; cotton; Psidium; Bambusa; Ceara rubber.

997. **Saissetia nigrella** King.

Saissetia nigrella King, Psyche, ix, p. 296 (1902).

Habitat.—Natal.

On Ficus.

998. **Saissetia oleæ** (Bern.).

(*The Black scale.*)

Chermes oleæ Bern., Mem. d'Hist. Nat. Acad., Marseille, p. 108 (1782).
Coccus olea Oliv., Ency. Meth., vi, p. 95 (1791).
" oleæ Latr., Hist. Nat. Crust. et Ins., ii, p. 384 (1804).
" " Giovene, Mem. Soc. Ital., xiv, p. 128 (1809).
" " Fonsc., Ann. Soc. Ent. Fr., iii, p. 206 (1834).
Lecanium oleæ Walk., Cat. Br. Mus., Hom., p. 1070 (1852).
Chermes " Bdv., Ent. Hort., p. 318 (1867).
Lecanium " Targ., Studii sul. Cocc., pp. 29, 38 (1867).
Chermes " Bdv., Insectologie Agricole, p. 61 (1868).
Lecanium " Targ., Catalogue, p. 39 (1869).
" " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 440 (1873).
" " Mark, Anat. Cocc., p. 47 (1876).
" " Comst., Rep. U. S. Dep. Ag., 1880, p. 336 (1881).
" " " 2nd Rep. Dep. Ent. Corn. Univ., p. 134 (1883).
" " Saund., Ins. Inj. to Fruits, p. 407 (1883).
" " Mask., N. Z. Trans., xvii, p. 28 (1884).
" " Hubbard, Ins. Aff. Orange, p. 53 (1885).
" " Mask., Ins. Nox. Agr. N. Z., p. 82 (1887).
" " Penzig, Studi Bot. sug. Agr., p. 529 (1887).
" " Comst., Intr. Ent., p. 143 (1888).
" " Coq., Ins. Life, ii, p. 73 (1889).
" " McIntire, Jn. Quekett Micr. Club, p. 24 (1889).
" " Riley & How., Ins. Life, ii, p. 379 (1890).
" " Pack., 5th Rep. U. S. Ent. Com., p. 98 (1890).
" " Koebele, Bull. 21, Div. Ent. Dep. Ag., p. 15 (1890).
" " Targ., Cocc. deg. Agr. Ital., p. 11 (1891).
" " Berl., Riv. Pat. Veg., i, p. 62 (1892).
" " Coq., Bull. 26, Div. Ent. Dep. Ag., p. 28 (1892).

Lecanium oleæ Craw, 4th Bien. Rep. Cal. Bd. Hort., p. 93 (1894).
" " " Bull. 68, Cal. Exp. Sta., p. 15 (1894).
" " Ckll., Bull. Bot. Dep. Jam., p. 72 (1894).
" " Berl., Riv. Pat. Veg., iii, p. 54 (1894).
" " Green. Ent. Mon. Mag., xxxi, p. 231 (1895).
" " Comst., Man. Ins., p. 170 (1895).
" " Ckll., Can. Ent., xxvii, p. 257 (1895).
" " Saccardo, Riv. Pat. Veg., iv, p. 48 (1895).
" " Marlatt, Yearbook U. S. Dep. Ag., p. 220 (1896).
" " Davis, Spec. Bull. Mich. Exp. Sta., p. 31 (1896).
" " Lounsb., Rep. Ent. Cape Good Hope, p. 87 (1896).
" " Green, Ent. Mon. Mag., xxxiii, p. 72 (1897).
" " Frog., Rep. Dep. Ag. N. S. W., No. 175, p. 5 (1897).
" " Berl. e Leon., Cherm. Ital., Fasc. iii, No. 67 (1898).
" " de Charm., Pr. Soc. Amic. Scien., p. 39 (1899).
" " Ckll., Biol. Centr. Amer., ii, pt. 2, p. 12 (1899).
" " Leon., Lab. di Ent. Agr., Portici, p. 3 (1899).
" " Marlatt, Yearbook U. S. Dep. Ag., p. 272 (1900).
" " Gossard, Bull. 51, Fla. Exp. Sta., p. 115 (1900).
" " Hemp., Rev. Mus. Paul., iv, p. 425 (1900).
" " Lounsb., Rep. Ent. Cape Good Hope, p. 5 (1900).
" " Lefroy, Scale Ins. Less. Antil., p. 50 (1901).
Saissetia " Ckll., The Ent. Student, ii, p. 31 (1901).
Lecanium (Saissetia) oleæ Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 64 (1902).
Coccus oleæ Kirkaldy, Fauna Haw., iii, pt. 2, p. 106 (1902).
Lecanium oleæ Thro, Bull. 209, Corn. Univ. Exp. Sta., p. 214 (1903).

Habitat.—Europe; New Zealand; Australia; China; Japan; Hawaiian Islands; Mauritius; S. Africa; Ceylon; Brazil; West Indies; Mexico; Mass.; S. Car.; Ohio; Cal.

On orange; apple; pear; plum; olive; apricot; pomgranate; Oregon ash; honey locust; Magnolia; Eucalyptus; oleander; coffee; rose; Vitis; Camellia; guava; Terminalia Catappa, etc.

Saissetia oleæ testudo (Curt.).

Coccus testudo Curt., Gard. Chron., p. 444 (1843).
Lecanium " Sign., Ann. Soc. Ent. Fr., (5), iii, p. 441 (1873).
" " Dougl., Ent. Mon. Mag., xxiv, p. 95 (1887).
" " Green, " " " xxxi, p. 232 (1895).
" oleæ var. testudo Ckll., Check List, p. 331 (1896).
" testudo Green, Ent. Mon. Mag., xxxiii, p. 72 (1897).

Habitat.—England (in greenhouses.)

On Brexia spinosa; B. madagascariensis; Cratæva gynandra.

Saissetia oleæ miranda (Ckll. & Parr.).

Lecanium oleæ var. mirandum Ckll. & Parr., Biol. Centr. Amer., ii, pt. 2, p. 12 (1899).

Habitat.—Mexico.

On Abutilon.

999. Saissetia palmæ (Haw.).

Coccus palmæ Haw., Tr. Ent. Soc. Lond., p. 307 (1812).
Chermes cycadis Bdv., Ent. Hort., p. 323 (1867).
Lecanium " Dougl., Ent, Mon. Mag., xxiv, p. 96 (1887).
" palmæ " " " " " p. 97 (1887).
" cycadis Green, " " " xxxi, p. 232 (1895).
" (Saissetia) palmæ Ckll. & Parr., The Industrialist, p. 164 (1899).
Habitat.—England and France (in greenhouses).
On Cycas and other palms.

1000. Saissetia reticulata (Ckll.).

Lecanium reticulatum Ckll., Am. Nat., xxix, p. 174 (1895).
" " " Rev. Mus. Paul., ii, p. 408 (1897).
" " Hemp., " " " iv, p. 426 (1900).
Saissetia reticulata Ckll., The Ent. Student, ii, p. 32 (1901).
Habitat.—Brazil.
On Myrtaceæ.

1001. Saissetia tolucana (Parr. & Ckll.).

Lecanium tolucanum Parr. & Ckll., The Industrialist, p. 164 (1899).
Saissetia tolucana Ckll., The Ent. Student, ii, p. 32 (1901).
Habitat.—Mexico.
On potato.

1002. Saissetia xanthoxylum (Hemp.).

Lecanium xanthoxylum Hemp., Rev. Mus. Paul., iv, p. 430 (1900).
Saissetia " Ckll., Ann. Mag. N. H., (7). ix, p. 453 (1902).
Habitat.—Brazil.
On Xanthoxylum.

Genus **MEGASAISSETIA** Ckll. Type, inflata.

s. g. Megasaissetia Ckll., The Ent. Student, ii, p. 32 (1901); g. in litt. (1902).

1003. Megasaissetia inflata (Ckll. & Parr.).

Lecanium (Saissetia) inflatum Ckll. & Parr., Biol. Centr. Amer., ii, pt. 2, p. 13 (1899).
Saissetia inflata Ckll., The Ent. Student, ii, p. 32 (1901).
Megasaissetia inflata Ckll., in litt. (1902).
Habitat.—Mexico.
On "Laurel-tree."

Genus **PLATYSAISSETIA** Ckll. Type, castilloæ.

s. g. Platysaissetia Ckll., The Ent. Student, ii, p. 32 (1901); g. in litt. (1902).

1004. Platysaissetia castilloæ (Ckll.).

Lecanium (Saissetia) castilloæ Ckll., Ann. Mag. N. H., (7), i, p. 436 (1898).
" castilloæ Ckll., Pr. Ac. N. Sci. Ph., p. 271 (1899).
Saissetia " " The Ent. Student, ii. p. 32 (1901).
Platysaissetia " " in litt. (1902).
Habitat.—Mexico.
On Castilloa elastica.

Genus **MYXOLECANIUM** Beccari. Type, kibaræ.

Myxolecanium Beccari, Bull. Soc. Ent. Ital., ix, p. 317 (1877): Ckll., Can. Ent., xxxiii, p.58 (1901).

1005. Myxolecanium kibaræ Beccari.

Myxolecanium kibaræ Beccari, Bull. Soc. Ent. Ital., ix, p. 317 (1877).
Habitat.—New Guinea.
On Kibara.

Genus **PHYSOKERMES** Targ. Type, abietis=piceæ.

Physokermes Targ., Catalogue, p. 41 (1869): Sign., Ann. Soc. Ent. Fr., (5), iv, p. 87 (1874): Ckll., Can. Ent., xxxiii, p. 58 (1901).

1006. Physokermes coloradensis Ckll.

Physokermes coloradensis Ckll., The Entom., xxviii, p. 101 (1895).
" " Gillette & Baker, Bull. 31, Col. Exp. Sta., p. 126 (1895).
Habitat.—Colorado.
On spruce; Pinus edulis.

1007. Physokermes insignicola (Craw).

Lecanium insignicola Craw, Bull. 68, Cal. Exp. Sta., p. 14 (1894).
" " " 4th Bien. Rep. Cal. Bd. Hort., p. 92 (1894).
" " " Ann. Rep. Cal. Bd. Hort., pp. 256, 269 (1894).
Physokermes " Ckll., Can. Ent., xxvii, p. 258 (1895).
" " Am. Nat., xxxi, p. 591 (1897).
Habitat.—California.
On Pinus insignis.

1008. Physokermes piceæ (Schr.).

Chermes abietis rotundus Geoff., Hist. Abr. Ins., i, p. 507 (1762).
||Coccus abietis Mod. (non Schr.), Act. Goth., ii, p. 20 (1778).
Chermes " Fourc., Ent. Paris., i, p. 229 (1785).
Coccus " Gmel., Syst. Nat., Ed. xiii, p. 2221 (1789).
Chermes " Oliv., Ency. Meth., vii, p. 440 (1792).
Coccus piceæ Schr., Faun. Boica, ii, pt. i, p. 146 (1801).
" abietis Turton, Syst. Nat.. p. 715 (1801).
" " Bechst., Forstins., i, p. 286 (1804).
" hemicryphus Dalm., K. Vet. Akad. Handl., xlvi, p. 368 (1825).

Coccus racemosus Ratz., Stett. Ent. Zeit., iv, p. 204 (1843).
" " " Forstins., iii, p. 191, pl. xi, fig. 8 (1844).
Chermes piceæ Bdv., Ent. Hort., p. 320 (1867).
Lecanium racemosus Gour., Ins. nuis. aux Forêts, pp. 159, 161 (1867).
Physokermes " Targ., Catalogue, p. 41 (1869).
" abietis Sign., Ann. Soc. Ent. Fr., (5), iii, p. 443 (1873).
" racemosus " " " " " " " p. 445 (1873).
Coccus hemicryphus " " " " " " " pp. 443, 446 (1873).
Physokermes " " " " " " " iv, p. 88 (1874).
Lecanium racemosum Altum, Forstzoologie, iii, pt. 2, p. 368 (1881).
Physokermes abietis Newst., Ent. Mon. Mag., xxix, p. 207 (1893).
Lecanium racemosum Henschel, Die Schädl. Forst. & Obst. Ins., p. 511 (1895).
" hemicryphus Eckst., Forst. Zool., p. 558 (1897).

Habitat.—Europe.

On Abies excelsa; Pinus.

Genus **CRYPTES** Crawf. Type, baccatus.

Cryptes "Crawf.," Mask., N. Z. Trans., xxiv, p. 21 (1891): Ckll. & Parr., The Industrialist, p. 162 (1899): Ckll., Can. Ent., xxxiii, p. 58 (1901).

1009. Cryptes baccatus (Mask.).

Lecanium baccatum Mask., N. Z. Trans., xxiv, p. 20 (1891).
" " " " " xxv, p. 217 (1892).
" " " " " xxix, p. 311 (1897).
" " Full., Tr. Ent. Soc. Lond., p. 458 (1899).
Cryptes baccatus Ckll. & Parr., The Industrialist, p. 161 (1899).
Lecanium baccatum Frog., Agr. Gaz. N. S. W., July, p. 19 (1902).

Habitat.—Australia.

On Acacia armata; A. calamifolia: A. linearis: A. longifolia; A. melanoxylon.

Cryptes baccatus marmoreus (Full.).

Lecanium baccatum var. marmoreum Full., Notes on Cocc. W. Austr., p. 6 (1897).
" " " " " Tr. Ent. Soc. Lond., p. 458 (1899).

Habitat.—W. Australia.

On Acacia.

Genus **LECANOPSIS** Targ. Type, rhizophila.

Rhizobium Targ., Studii sul. Cocc., p. 23 (1867). No type specified.
Lecanopsis Targ., Catalogue, p. 36 (1869): Sign., Ann. Soc. Ent. Fr., (5), iv, p. 93 (1874): Newst., Ent. Mon. Mag., xxix, p. 205 (1893): Ckll., Can. Ent., xxxiii, p. 58 (1901).

1010. Lecanopsis brevicornis Newst.

Lecanopsis brevicornis Newst., Ent. Mon. Mag., xxxii, p. 59 (1896).

Habitat.—England.

On roots of grass.

1011. Lecanopsis formicarum Newst.

Lecanopsis formicarum Newst., Ent. Mon. Mag., xxix, pp. 138, 206 (1893).
" " " " " " xxx, p. 206 (1894).

Habitat.—England.

In nests of Formica nigra.

1012. Lecanopsis lineolatæ King & Ckll.

Lecanopsis lineolatæ King & Ckll., Can. Ent., xxix, p. 90 (1897).

Habitat.—Mass.

In nests of Cremastogaster lineolata Say.

1013. Lecanopsis rhizophila Targ.

Lecanopsis rhyzophila Targ., Catalogue, p. 36 (1869).
" rhizophila Sign., Ann. Soc. Ent. Fr., (5), iv, p. 93 (1874).
" rhyzophila " Bull. " " " " " p. vii (1874).
" rhizophila Newst., Ent. Mon. Mag., xxix, p. 205 (1893).

Habitat.—Europe.

On roots of Asperula.

Genus **ACLERDA** Sign. Type, subterranea.

Aclerda Sign., Ann. Soc. Ent. Fr., (5), iv, p. 96 (1874): Buffa, Riv. Pat. Veg., vi, p. 138 (1897): Ckll., Can. Ent., xxxiii, p. 58 (1901); Ent. News, xiii, p. 182 (1902).

Pseudolecanium Ckll., Pr. Ac. N. Sci. Ph., p. 262 (1899).

1014. Aclerda berlesii Buffa.

Aclerda berlesii Buffa, Riv. Pat. Veg., vi, pp. 135-139 (1897).
" " Berl. e Leon., Cherm. Ital., Fasc. iii, p. 63 (1898).

Habitat.—Italy.

On Arundo donax.

1015. Aclerda californica (Ehrh.).

Nidularia(?) californica Ehrh., Can. Ent., xxxi, p. 103 (1899).

Pseudolecanium californicum Parr., Bull. 98, Kan. Exp. Sta., p. 145 (1900).

Habitat.—Cal.; Kan.; New Mexico.

On Andropogon furcatus.

1016. Aclerda digitata (Ckll.).

Pseudolecanium digitatum Ckll., Ann. Mag. N. H., (7), ix, p. 24 (1902).

Habitat.—Natal.

On grass.

1017. Aclerda japonica Newst.

Aclerda japonica Newst., Ent. Mon. Mag., xxxvii, p. 84 (1901).

Habitat.—England (in hothouses).

On Arundinaria japonica.

1018. Aclerda obscura (Parr.).

Pseudolecanium obscurum Parr., Bull. 98, Kan. Exp. Sta., p. 144 (1900).
Habitat.—Kansas.
On Andropogon scoparius; Spo obolus longifolius.

1019. Acle a subterranea Sign.

Aclerda subterranea Sign., An Soc. Ent. Fr., (5), iv, p. 97 (1874).
Habitat.—France.
On Agropyrum; Milium.

1020. Aclerda tokionis (Ckll.).

Sphærococcus (Pseudolecanium) tokionis Ckll., Psyche, vii, Suppl., i, p. 19 (1896).
" " " " Bull. 4, T. s., Dep. Ag., p. 49 (1896).
Pseudolecanium tokionis Ckll., Pr. Ac. N. Sci. Ph., p. 263 (1899).
" " Kuw., Pr. Cal. Ac. Sci., (3), ii, p. 403 (1901).
" " " " " " " " iii, p. 57 (1902).
Habitat.—California; Japan.
On bamboo.

Genus **ALECANOPSIS** Ckll. Type, filicum.

Alecanopsis Ckll., Can. Ent., xxxiii, p. 58 (1901).

1021. Alecanopsis filicum (Mask.).

Lecanopsis filicum Mask., Pr. Linn. Soc. N. S. W., (2), viii, p. 225 (1893).
Alecanopsis " Ckll., Can. Ent., xxxiii, p. 58 (1901).
Habitat.—N. S. Wales.
On Doodia aspera.

The following species heretofore catalogued under Lecanium are allowed to retain that name until the insects can be studied and their proper location determined.

1022. Lecanium casuarinæ Mask.

Lecanium casuarinæ Mask., N. Z. Trans., xxx, p. 240 (1898).
" " Ckll. & Parr., The Industrialist, p. 164 (1899).
Habitat.—Australia.

1023. Lecanium emerici Planch.

Lecanium emerici Planch., Le Kermes du Chêne, p. 17 (1864).
" " Sign., Ann. Soc. Ent. Fr., (4), viii, p. 525 (1868).
" " " " " " " (5), iii, pp. 420, 444 (1873).
" " Dougl., Ent. Mon. Mag., xxiv, p. 99 (1887).
Habitat.—Europe.
On Quercus ilex; Q. coccifera.

1024. Lecanium globulosum Mask.

Lecanium globulosum Mask., Ent. Mon. Mag., xxxiii, p. 243 (1897).
" " " N. Z. Trans., xxx, p. 238 (1898).
Habitat.—Hong Kong. China.
On Stillingia sebifera.

1025. Lecanium guerinii Sign.

Lecanium guerinii Sign., Ann. Soc. Ent. Fr., (4), ix, p. 96 (1869).
Habitat.—Mauritius.
On sugar-cane.

1026. Lecanium imbricans Green.

Lecanium imbricans Green, Ind. Mus. Notes, v, p. 94 (1903).
Habitat.—India.
On Ficus mysorensis.

1027. Lecanium krugeri Zehnt.

Lecanium krugeri Zehnt., Mede. Proef. Suik., Java, No. 40 (1897).
" " " Zool. Centralb., p. 804 (1898).
Habitat.—Java.

1028. Lecanium lidgetti Ckll. in litt., new name.

Lecanium australis Lidg., Victorian Naturalist, xviii, p. 59 (1901).
Habitat.—Australia.

1029. Lecanium padi (Schr.).

Coccus padi Schr., Faun. Boica, ii, pt. i, p. 145 (1801).
Lecanium padi Sign., Ann. Soc. Ent. Fr., (4), x, p. 109 (1870).
Habitat.—Europe.
On Prunus Padus.

1030. Lecanium patersoniæ Mask.

Lecanium patersoniæ Mask., N. Z. Trans., xxvii, p. 57 (1894).
" " Ckll. & Parr., The Industrialist, p. 164 (1899).
Habitat.—Australia.
On Patersonia glabrata.

1031. Lecanium wistariæ Sign.

Lecanium wistariæ Sign., Ann. Soc. Ent. Fr., (5), iii, p. 433 (1873).
Habitat.—France.
On "Glycine."

Subfamily DIASPINÆ.

Genus **PROTODIASPIS** Ckll. Type, parvula.

Protodiaspis Ckll., Ann. Mag. N. H., (7), i, p. 428 (1898).

1032. Protodiaspis parvula Ckll.

Protodiaspis parvula Ckll., Ann. Mag. N. H., (7), i, p. 428 (1898).
Habitat.—Mexico.
On oak.

Genus **XANTHOPHTHALMA** Ckll. & Parr. Type, concinnum.

Xanthophthalma Ckll. & Parr., Biol. Centr. Amer., ii, pt. 2, p. 33 (1899).

1033. Xanthophthalma concinnum Ckll. & Parr.

Xanthophthalma concinnum Ckll. & Parr., Biol. Centr. Amer., ii, pt. 2, p. 33 (1899).
Habitat.—Mexico.
On "Laurel-tree."

Genus **CHIONASPIS** Sign. Type, salicis.

Chionaspis Sign., Ann. Soc. Ent. Fr., (4), ix, p. 442 (1869): Comst., Rep. U. S. Dep. Ag., 1880. p. 313 (1881); 2nd Rep. Dep. Ent. Corn. Univ., p. 97 (1883): Mask., Ins.Nox.Agr. N. Z., p. 54 (1887): Green, Coccidæ Ceylon, pt. ii, p. 105 (1899): Cooley, Spec. Bull. Mass. Exp. Sta., p. 8 (1899): Newst., Mon. Brit. Coccidæ, i, p. 179 (1901).

1034. Chionaspis acuminata Green.

Chionaspis acuminata Green, Ind. Mus. Notes, iv, p. 3 (1896).
" " " Cocc. Ceylon, pt. ii, p. 136 (1899).
Habitat.—Ceylon.
On Ardisia.

1035. Chionaspis agonis Full.

Chionaspis agonis Full., Notes on Cocc. W. Austr., p. 5 (1897).
" " " Tr. Ent. Soc. Lond., p. 471 (1899).
Habitat.—W. Australia.
On Agonis flexuosa.

1036. Chionaspis americana Johnson.

(*Elm-tree white scale.*)

Chionaspis americana Johns., Ent. News, vii, p. 150 (1896).
" " " Bull. Ill. St. Lab. N. H., iv, p. 390 (1896).
" " Cooley, Spec. Bull. Mass. Exp. Sta., p. 41 (1899).
" " Newell, Bull. 43, Ia. Exp. Sta., p. 152 (1899).

Chionaspis americana Hunter, Kan. Univ. Quar., ix, p. 102 (1900).
" " Lugger, 6th Rep. Minn. Exp. Sta., p. 238 (1900).
" " Quaint.& Scott. Cocc. Amer., Dec. iii-iv, No.16 (1901).
" " King. Can. Ent., xxxiv, p. 62 (1902).
Habitat.—Mass.: Conn.: N. Y.: Ohio: Ill.: Mo.: Kan.: Tex.: Minn.: Okla.
On Ulmus americanus: " Camperdown elm."

1037. **Chionaspis arundinariæ** Green.

Chionaspis arundinariæ Green, Cocc. Ceylon, pt. ii, p. 127 (1899).
Habitat.—Ceylon.
On Arundinaria.

1038. **Chionaspis assimilis** Mask.

Chionaspis assimilis Mask., Tr. Roy. Soc. S. Austr., p. 102 (1888).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 35 (1896).
Habitat.—S. Australia; California (at quarantine from Australia).
On Eucalyptus.

1039. **Chionaspis bambusæ** Ckll.

Chionaspis bambusæ Ckll., Psyche, vii, Suppl., i, p. 21 (1896).
" " " Bull. 4, T. s., Dep. Ag., p. 54 (1896).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 76 (1902).
Habitat.—Japan.
On bamboo.

1040. **Chionaspis berlesii** Leon.

Chionaspis berlesii Leon., Riv. Pat. Veg., vi, p. 275 (1898).
" " Berl. e Leon., Cherm. Ital., Fasc. iii, No. 54 (1898).
Habitat.—Italy.
On Asparagus acutifolius.

1041. **Chionaspis bilobis** Newst.

Chionaspis bilobis Newst., Ent. Mon. Mag., xxxi, p. 233 (1895).
Habitat.—Algeria.
On Deverra scoparia.

1042. **Chionaspis caryæ** Cooley.

Chionaspis caryæ Cooley, Can. Ent., xxx, p. 86 (1898).
" " Berl., Riv. Pat. Veg., vi, p. 379 (1898).
" " Cooley, Spec. Bull. Mass. Exp. Sta., p. 40 (1899).
Habitat.—Washington, D. C.
On hickory.

1043. **Chionaspis citri** Comst.

(*Orange Chionaspis.*)

Chionaspis euonymi Comst., Rep. U. S. Dep. Ag., 1880, p. 313 (1881) in part.
" citri Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 100 (1883).
" " Mask., N. Z. Trans., xvii, p. 23 (1884).
" " " Ins. Nox. Agr. N. Z., p. 54 (1887).

Chionaspis citri Ckll., Bull. Bot. Dep. Jam., No. 36, p. 8 (1892).
" " Morg., Ent. Mon. Mag., xxviii, p. 14 (1892).
" " Mask., N. Z. Trans., xxv, p. 211 (1892).
" " Riley & How., Ins. Life, v, p. 203 (1893).
" " Morg., Spec. Bull. La. Exp. Sta., p. 63 (1893).
" " Craw, Bull. 68, Cal. Bd. Hort., p. 16 (1894).
" " " 4th Bien. Rep. Cal. Bd. Hort., p. 94 (1894).
" " Ckll., Jn. Trin. Nat. Club, p. 312 (1894).
" " " Bull. N. Mex. Exp. Sta., p. 5 (1895).
" " " Ann. Mag. N. H., (6), xvi, p. 62 (1895).
" " " Bull. Bot. Dep. Jam., iii, p. 256 (1896).
" " Towns., Bull. 4, T. s., Dep. Ag., p. 11 (1896).
" euonymi Davis, Spec. Bull. 2, Mich. Exp. Sta., p. 38 (1896).
" citri Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 38 (1896).
Howardia " Berl. e Leon., Annali di Agr., p. 125 (1898).
Chionaspis " Marlatt, Yearbook U. S. Dep. Ag., p. 270 (1900).
" " Lefroy, Scale Ins. Less. Antil., p. 58 (1901).

Habitat.—S. States; West Indies: Mexico; Bermuda; Australia; Japan; Samoa: New Zealand.

On orange: Euonymus latifolius: palms; Osmanthus, etc.

1044. Chionaspis colemani Kuwana.

Chionaspis colemani Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 77 (1902).

Habitat.—Japan.

On bamboo.

1045. Chionaspis corni Cooley.

Chionaspis corni Cooley, Spec. Bull. Mass. Exp. Sta., p. 15 (1899).
" " King, Can. Ent., xxxiv, p. 61 (1902).

Habitat.—Mass.: Ohio.

On Cornus paniculata; C. alternifolia.

1046. Chionaspis depressa Zehnt.

Chionaspis depressa Zehnt., Mede. Proef. Suik., Java, n. s., No. 36, p. 21 (1897).

Habitat.—E. Java.

On Saccharum ciliare.

1047. Chionaspis difficilis Ckll.

Chionaspis difficilis Ckll., Psyche, vii, Suppl., i, p. 21 (1896).
" " " Bull. 4, T. s., Dep. Ag., p. 42 (1896).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 38 (1896).

Habitat,—Japan; California (at quarantine from Japan).

On Elæagnus.

1048. Chionaspis dysoxyli Mask.

Chionaspis dysoxyli Mask., N. Z. Trans., xvii, p. 22 (1884).
" " " Ins. Nox. Agr. N. Z., p. 55 (1887).

Chionaspis dysoxyli Mask., N. Z. Trans., xxii, p. 135 (1889).
" " " " " xxiii, p. 8 (1890).
" " " " " xxvii, p. 50 (1894).
" " Cooley, Spec. Bull. Mass. Exp. Sta., p. 37 (1899).
Habitat.—New Zealand.
On Dysoxylon spectabile; Hoheria angustifolia; Melicytus ramiflorus.

1049. **Chionaspis elæagni** Green.

Chionaspis elæagni Green, Ind. Mus. Notes, iv, p. 3 (1896).
" " " Cocc. Ceylon. pt. ii, p. 138 (1899).
Habitat.—Ceylon.
On Elæagnus latifolia.

1050. **Chionaspis elongata** (Green).

Mytilaspis elongata Green, Ind. Mus. Notes, iv, p. 4 (1896).
Chionaspis " " Cocc. Ceylon, pt. ii, p. 125 (1896).
Habitat.—Ceylon.
On Arundinaria.

1051. **Chionaspis ethelæ** Full.

Chionaspis ethelæ Full., Notes on Cocc. W. Austr., p. 5 (1897).
" " " Tr. Ent. Soc. Lond., p. 471 (1899).
Habitat.—W. Australia.
On Eucalyptus.

1052. **Chionaspis euonymi** Comst.

Chionaspis euonymi Comst., Rep. U. S. Dep. Ag., 1880,p. 313 (1881) in part.
" " " 2nd Rep. Dep. Ent. Corn. Univ., p. 101 (1883).
" " Targ., Annali di Agr., p. 396 (1884).
" " Dougl., Ent. Mon. Mag., xxii, p. 249 (1886).
" " Comst., Intr. Ent., p. 151 (1888).
" " Morg., Ent. Mon. Mag., xxviii, p. 16 (1892).
" evonymi Saccardo, Riv. Pat. Veg., iv, p. 53 (1895).
" " Berl. e Leon., Cherm. Ital., Fasc. i, No. 17 (1895).
" euonymi Quaint. & Scott, Cocc. Amer., Dec. iii-iv, No. 17 (1901).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 75 (1902).
Habitat.—N. Y.; Va.; Ga.; Ohio; England; France.
On Euonymus latifolius; E. japonicus; orange.

1053. **Chionaspis exalbida** Ckll.

Chionaspis exalbida Ckll., The Entom., xxxv, p. 112 (1902).
Habitat.—Natal.
On leaves of aloe.

1054. **Chionaspis fodiens** Green.

Chionaspis fodiens Green, Coccidæ Ceylon, pt. ii, p. 155 (1898).
Habitat.—Ceylon.
On Loranthus.

1055. Chionaspis furfura (Fitch).

(*The Scurfy scale.*)

—— —— Harr., Rep. Ins. Mass. Inj. to Veg., p. 202 (1841).
Aspidiotus furfurus Fitch, 3rd Rep. Ins. N. Y., p. 352 (1856).
" cerasi " " " " " p. 368 (1856).
—— —— Harr., Treat. Ins. Inj. to Veg., Ed. 3, p. 255 (1862).
?Coccus harrisii Walsh, Pract. Ent., ii, p. 31 (1866).
Aspidiotus " " " " " p. 119 (1867).
" " " 1st Rep. Ins. Ill., pp. 36, 53 (1868).
" " Riley, 1st Rep. Ins. Mo., p. 7 (1869).
" " " Am. Ent., ii, pp. 110, 181 (1870).
" " " 2nd Rep. Ins. Mo., p. 9 (1870).
" " Beth., Rep. Ent. Soc. Ont., i, p. 303 (1870).
" cerasi Sign., Ann. Soc. Ent. Fr., (4), x, p. 107 (1870).
" harrisii Glover, Rep. U. S. Dep. Ag., 1870, p. 88 (1871).
" " Pack., Guide to Study of Ins., p. 530 (1872).
" " Bessey, Rep. Ia. St. Ag. Soc., p. 232 (1875).
Diaspis " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 604 (1876).
Aspidiotus " Thom., 7th Rep. Ins. Ill., p. 108 (1878).
Diaspis " Riley, Am. Nat., xv, p. 487 (1881).
Chionaspis furfurus Lint., 1st Rep. Ins. N. Y., p. 331 (1882).
" " Osborn, Tr. Ia. Hor. Soc., xvii, p. 211 (1883).
" " Saund., Ins. Inj. to Fruits, p. 44 (1883).
Aspidiotus cerasi " " " " " p. 204 (1883).
" " Osborn, Bull. 2, Ia. Ag. Exp. Sta. (1884).
" " Comst., Intr. Ent., p. 151 (1888).
" " Lint., 4th Rep. Ins. N. Y., p. 208 (1888).
" " Tryon, Rep. Ins. & Fungous Pests, No. 1, p. 89 (1889).
" " Riley, Ins. Life, i, p. 324 (1889).
Chionaspis furfurus Lint., 5th Rep. Ins. N. Y., p. 300 (1889).
" " Weed, Bull. 4, Ohio Exp. Sta., p. 128 (1890).
" " Pack., 5th Rep. U. S. Ent. Com., p. 537 (1890).
Aspidiotus cerasi " " " " " " p. 538 (1890).
" furfurus Morg., Ent. Mon. Mag., xxvi, p. 43 (1890).
A species of Coccus Downing, Fruits and Trees of America, p. 66 (1890).
Chionaspis furfurus Weed, Insects & Insecticides, p. 66 (1891).
" " Gillette, Ins. Life, iii, p. 259 (1891).
" " Towns., Bull. 3, N. Mex. Exp. Sta., p. 12 (1891).
" " Weed, Rep. Columbian Hor. Soc., p. 16 (1891).
" " Troop, Tr. Ind. Hor. Soc., p. 75 (1891-1892).
" " Webster, Bull. 45, Ohio Exp. Sta., p. 208 (1892).
" " Lint., 8th Rep. Ins. N. Y., 1891, pp. 293, 299 (1893).
" " " 9th " " " 1892, p. 440 (1893).
" " Osborn, Rep. Ia. St. Hor. Soc., xxviii, p. 122 (1893).
" " Howard, Can. Ent., xxvi, p. 354 (1894).
Aspidiotus " " Ins. Life, vii, p. 5 (1894).

Chionaspis furfurus Smith, Rep. N. J. Exp. Sta., p. 496 (1894).
" " Bruner, Rep. Neb. St. Hor. Soc., p. 175 (1894).
" " Marlatt, Ins. Life, vii, p. 120 (1894).
" " Howard, Yearbook U. S. Dep. Ag., 1894, p. 259 (1895).
" " Comst., Man. Ins., p. 174 (1895).
" " Lint., 10th Rep. Ins. N. Y., p. 518 (1895).
" " " Bull. N. Y. St. Mus., p. 270 (1895).
" " Fletcher, Rep. Can. Exp. Farms, p. 148 (1895-1896).
" " Howard, Tr. Mass. Hor. Soc., p. 89 (1896).
" " Lint., 11th Rep. Ins. N. Y., p. 202 (1896).
" " Garman, Rep. Ky. Exp. Sta., p. xxxvii (1896).
" " Smith, Econ. Ent., p. 119 (1896).
" " Coons, Rep. Conn. Bd. Agr., p. 16 (1896).
" " Starnes, Bull. 36, Ga. Exp. Sta., p. 27 (1896).
" " Lowe, Bull. 136, N. Y. Exp. Sta., p. 582 (1897).
" " Lint., 12th Rep. Ins. N. Y., p. 348 (1897).
" " Webster, Bull. 81, Ohio Exp. Sta., p. 210 (1897).
" " Osborn, Pr. Ia. Ac. Sci., v, p. 224 (1898).
" " Gillette, Bull. 47, Col. Exp. Sta., p. 12 (1898).
" " Chambliss, Bull. 4, Tenn. Exp. Sta., p. 147 (1898).
" " Kirkland, Mass. Crop Rep., June, p. 28 (1898).
" " Pettit, Bull. 160, Mich. Exp. Sta., p. 415 (1898).
" " Osborn, Contr. Ia. Ag. Coll., No. 3, pp. 4, 5 (1898).
" furfura Cooley, Spec. Bull. Mass. Exp. Sta., p. 23 (1899).
" furfurus King, Can. Ent., xxxi, p. 251 (1899).
" " Forbes, 20th Rep. Ins. Ill., p. 16 (1899).
" " Garman, Bull. 80, Ky. Exp. Sta., p. 220 (1899).
" " Newell, Bull. 43, Ia. Exp. Sta., p. 150 (1899).
" " Smith, Bull. 140, N. J. Exp. Sta., p. 7 (1899).
" " Bruner, Rep. Neb. St. Hor. Soc., p. 147 (1899).
" furfura Cooley, 6th Rep. Mont. Exp. Sta., p. 88 (1899).
" furfurus Lockhead, Rep. Ent. Soc. Ont., p. 68 (1899).
" " " Dep. Agr. Ont., p. 42 (1900).
" " Howard, Bull. 22, n. s., Dep. Ag., pp. 80, 81, 82 (1900).
" " Lugger, 6th Rep. Minn. Exp. Sta., p. 236 (1900).
" " Beach, Lowe, Stewart, 18th Rep. N. Y. Exp. Sta., p. 416 (1900).
" " Bruner, Rep. Neb. St. Hor. Soc., p. 84 (1900).
" " Frank & Kruger, Schildlausbuch, p. 100 (1900).
" " Ckll., Science, n. s., xi, p. 671 (1900).
" furfura Fernald H. T., Mass. Crop Rep., May, p. 33 (1901).
" " Felt, Bull. 46, Rep. Ins. N. Y., p. 300 (1901).
" " Forbes, Circ. 36, Ill. Exp. Sta., p. 22 (1901).
" furfurus Quaint. & Scott, Cocc. Amer., Dec. iii-iv, No. 18 (1901).
" " Newst., Mon. Brit. Cocc., i, p. 186 (1901).
" " Banks, Bull. 34, n. s., Dep. Ag., p. 14 (1902).

Chionaspis furfura Forbes, 22nd Rep. Ins. Ill., p. 118 (1903).
Habitat.—Canada; Nova Scotia; Prince Edward's Island; United States; England (introduced from America).
On apple; pear; cherry; quince; crab-apple; peach; choke-cherry; black walnut; mountain ash; elm; Pyrus japonica; currant; hawthorn.

Chionaspis furfura fulva King.

Chionaspis furfurus var. fulvus King, Psyche, viii, p. 334 (1899).
Habitat.—Mass.
On Rhamnus cathartica.

Chionaspis furfura ulmi Ckll.

Chionaspis furfurus var. ulmi Ckll., Pr. U. S. Nat. Mus., xix, p. 766 (1897).
Habitat.—Texas.
On elm.

1056. **Chionaspis galliformens** Green.

Chionaspis galliformens Green, Cocc. Ceylon, pt. ii, p. 158 (1899).
Habitat.—Ceylon.
On Hedyotis lasertiana.

1057. **Chionaspis graminis** Green.

Chionaspis graminis Green, Ind. Mus. Notes, iv, p. 3 (1896).
" " " Cocc. Ceylon, pt. ii, p. 123 (1899).
Habitat.—Ceylon; Japan.
On bamboo; Andropogon (lemon-grass).

1058. **Chionaspis hedyotidis** Green.

Chionaspis hedyotidis Green, Cocc. Ceylon, pt. ii, p. 142 (1899).
Habitat.—Ceylon.
On Hedyotis auricularia; H. Lawsoniæ.

1059. **Chionaspis herbæ** Green.

Chionaspis herbæ Green, Cocc. Ceylon, pt. ii, p. 132 (1899).
" " Cooley, Spec. Bull. Mass. Exp. Sta., p. 37 (1899).
Habitat.—Ceylon.
On grasses.

1060. **Chionaspis(?) hikosani** Kuwana.

Chionaspis(?) hikosani Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 76 (1902).
Habitat.—Japan.
On Phyllostachys bambusoides.

1061. **Chionaspis howardi** Cooley.

Chionaspis howardi Cooley, Can. Ent., xxx, p. 88 (1898).
Habitat—District of Columbia.
On East Indian bamboo.

1062. Chionaspis lintneri Comst.

Chionaspis lintneri Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 103 (1883).
" " " Can. Ent., xxvii, p. 33 (1895).
" " Cooley, " " xxx, p. 89 (1898).
" " King, " " xxxi, p. 252 (1899).
" " Cooley, Spec. Bull. Mass. Exp. Sta., p. 22 (1899).
Habitat.—Can.; Mass.; N. Y.; Prince Edward's Island.
On alder; willow; Viburnum lantanoides; Cornus stolonifera; Benzoin odoriferum; Amelanchier canadensis; Betula papyrifera; Dirca palustris, etc.

Chionaspis lintneri betulæ Cooley.

Chionaspis lintneri betulæ Cooley, Can. Ent., xxx, p. 85 (1898).
Habitat.—Prince Edward's Island.
On Betula papyrifera.

1063. Chionaspis longiloba Cooley.

Chionaspis longiloba Cooley, Spec. Bull. Mass. Exp. Sta., p. 16 (1899).
Habitat.—Texas.
On cottonwood.

1064. Chionaspis madiunensis Zehnt.

Chionaspis madiunensis Zehnt., Mede. Proef. Suik., Java,(3),No.6,p.1 (1898).
Habitat.—Java.
On sugar-cane.

1065. Chionaspis major Ckll.

Chionaspis major Ckll., Ent. News, v, p. 43 (1894).
" " " Can. Ent., xxvii, p. 127 (1894).
" " " Bull. Bot. Dep. Jam., p. 257 (1896).
Habitat.—Antigua.
On Heliotrope.

1066. Chionaspis minuta Green.

Chionaspis minuta Green, Ind. Mus. Notes, iv, p. 3 (1896).
" " " Cocc. Ceylon, pt. ii, p. 128 (1899).
Habitat.—Ceylon.
On Tetranthera.

1067. Chionaspis(?) **myrthi** (Bouché).

Aspidiotus myrthi Bouché, Stett. Ent. Zeit., xii, p. 112 (1851).
Chionaspis " Sign., Ann. Soc. Ent. Fr., (4), ix, p. 445 (1869).
Habitat.—France.
On Myrtus communis.

1068. Chionaspis natalensis Mask.

Chionaspis spartinæ var. natalensis Mask., N. Z. Trans., xxviii, p. 390 (1896).
" natalensis Ckll., in litt. (1902).
Habitat.—Natal.
On grass.

1069. **Chionaspis nerii** Newst.

Chionaspis nerii Newst., Ent. Mon. Mag., xxxi, p. 234 (1895).
" " " Tr. Ent. Soc. Lond., p. 96 (1897).
Habitat.—Algeria.
On Nerium oleander; Olea europæa.

1070. **Chionaspis nitida** Mask.

Chionaspis nitida Mask., N. Z. Trans., xxiv, p. 15 (1891).
Habitat.—Australia.
On Daviesia corymbosa.

1071. **Chionaspis ortholobis** Comst.

(*Cottonwood scale.*)

Chionaspis ortholobis Comst., Rep. U. S. Dep. Ag., 1880. p. 317 (1881).
" " " 2nd Rep. Dep. Ent. Corn. Univ., p. 105 (1883).
" " Pack., 5th Rep. U. S. Ent. Com., p. 594 (1890).
" " Ckll., Can. Ent., xxvi, p. 189 (1894).
" " Gillette & Baker, Bull. 31, Col. Exp. Sta., p. 129 (1895).
" " Ckll., Bull. 24, N. Mex. Exp. Sta., p. 38 (1897).
" " Osborn. Contr. Ia. Ag. Coll., No. 3, p. 5 (1898).
" " Waldron, Bull. 34, N. Dak. Exp. Sta., p. 302 (1898).
" " Cooley, Spec. Bull. Mass. Exp. Sta., p. 17 (1899).
" " Newell. Bull. 43, Ia. Exp. Sta., p. 154 (1899).
" " Hunter, Kan. Univ. Quar., ix, p. 101 (1900).
" " King, Can. Ent., xxxiv, p. 62 (1902).
Habitat.—Mass.; Ohio; Mo.; Kan.; Neb.; S. Cal.; New Mexico.
On willow; cottonwood; poplar; butternut; honey-locust.

1072. **Chionaspis permutans** Green.

Chionaspis permutans Green, Cocc. Ceylon, pt. ii, p. 130 (1899).
Habitat.—Ceylon.
On Antidesma Bunius.

Chionaspis permutans verecunda Green.

Chionaspis permutans var. verecunda Green, Cocc. Ceylon, pt. ii, p. 131 (1899).
Habitat.—Ceylon.
On Antidesma.

1073. **Chionaspis pinifoliæ** (Fitch).

(*The Pine-leaf scale.*)

Aspidiotus pinifoliæ Fitch, 2nd Rep. Ins. N. Y., p. 488 (1855).
" " " 4th " " " p. 741 (1857).
" " Walsh, Pract. Ent., i, p. 90 (1866).
" (Mytilaspis) pinifoliæ Riley. 3rd Rep. Ins. Mo., p. 92 (1871).
Mytilaspis pinifoliæ LeBaron, 1st Rep. Ins. Ill., p. 83 (1871).
" pinifolii " 2nd " " " p. 161 (1872).

Mytilaspis pinifoliæ Bessey, Rep. Ia. Ag. Soc., p. 161 (1872).
" " " " " " " p. 232 (1874-1875).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 604 (1876).
Aspidiotus " Glover, Rep. U. S. Dep. Ag., p. 43 (1876).
Chionaspis " Comst., " " " " 1880, p. 318 (1881).
Mytilaspis " Pack., Bull. 7, U. S. Ent. Com., p. 218 (1881).
Chionaspis pinifolii Riley, Am. Nat., xvi, p. 514 (1882).
" pinifoliæ Saund., Rep. Ent. Soc. Ont., p. 53 (1884).
" " Lint., 2nd Rep. Ins. N. Y., p. 184 (1885).
" pinifolii " 5th " " " p. 266 (1889).
Mytilaspis pinifoliæ Pack., 5th Rep. U. S. Ent. Com., p. 805 (1890).
Chionaspis " Morg., Ent. Mon. Mag., xxviii, p. 14 (1892).
" " Lint., 9th Rep. Ins. N. Y., p. 376 (1893).
" " Howard, Bull. 1, T. s., Dep. Ag., pp. 13, 22 (1895).
" " Comst., Man. Ins., p. 174 (1895).
" pinifolii Gillette & Baker, Bull. 31, Col. Exp. Sta., p. 129 (1895).
" " Lint., 11th Rep. Ins. N. Y., p. 203 (1896).
" " Ckll., Bull. 24, N. Mex. Exp. Sta., p. 38 (1896).
" pinifoliæ Osborn, Pr. Ia. Ac. Sci., v, p. 224 (1898).
" " Gillette, Bull. 47, Col. Exp. Sta., p. 36 (1898).
" pinifolii Pettit, Bull. 160, Mich. Exp. Sta., p. 415 (1898).
" pinifoliæ Newell, Bull. 43, Ia. Exp. Sta., p. 157 (1899).
" " Marlatt, Bull. 20, n. s., Dep. Ag., p. 75 (1899).
" " Cooley, Spec. Bull. Mass. Exp. Sta., p. 30 (1899).
" " Lugger, 6th Rep. Ent. Minn. Exp. Sta., p. 239 (1900).

Habitat.—Canada; United States.

On pine; spruce; other coniferous trees.

Chionaspis pinifoliæ semiaurea Ckll.

Chionaspis pinifoliæ var. semiaurea Ckll., Am. Nat., xxix, p. 731 (1895).

Habitat.—United States.

Chionaspis pinifoliæ heterophyllæ Cooley.

Chionaspis pinifoliæ heterophyllæ Cooley, Can. Ent., xxix, p. 281 (1897).
" " " " Spec. Bull. Mass. Exp. Sta., p. 34 (1899).

Habitat.—Rhode Island; Florida.

On Pinus heterophylla; P. sylvestris; P. mitis.

1074. Chionaspis planchonii Sign.

Chionaspis planchonii Sign., Ann. Soc. Ent. Fr., (4), ix, p. 446 (1869).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 109 (1883).

Habitat.—Southern Europe.

On Quercus ilex.

1075. Chionaspis platani Cooley.

Chionaspis platani Cooley, Spec. Bull. Mass. Exp. Sta., p. 36 (1899).
" " Hunter, Kan. Univ. Quar., ix, p. 103 (1900).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 77 (1902).
Habitat.—Kansas; Japan.
On sycamore; Rhus.

1076. Chionaspis polygoni Green.

Chionaspis polygoni Green, Cocc. Ceylon, pt. ii, p. 134 (1899).
Habitat.—Ceylon.
On Polygonum chinense.

1077. Chionaspis quercus Comst.

Chionaspis quercus Comst., Rep. U. S. Dep. Ag., 1880, p. 319 (1881).
" " " 2nd Rep. Dep. Ent. Corn. Univ., p. 105 (1883).
" " Pack., 5th Rep. U. S. Ent. Com., p. 103 (1890).
" " Newst., Ent. Mon. Mag., xxxi, p. 234 (1895).
" " de Charm., Pr. Soc. Amic. Scien., p. 30 (1899).
Habitat.—California; New Mexico; Mauritius.
On oak.

1078. Chionaspis retigera Ckll.

Chionaspis retigera Ckll., The Entom., xxxiv, p. 249 (1901).
Habitat.—Natal.
"On a native shrub."

1079. Chionaspis rosæ Goethe.

Chionaspis rosæ Goethe, Jahrb. Nass. Ver. Nat., No. 37, p. 117 (1884).
" " Karsch, Ent. Nach., xi, p. 380 (1885).
Habitat.—Germany.

1080. Chionaspis sacchari-folii Zehnt.

Chionaspis sacchari-folii Zehnt., Mede. Proef. Suik., Java, n. s., No. 36, p. 1 (1897).
Habitat.—Java.
On sugar-cane.

1081. Chionaspis salicis (Linn.).

(*Willow scale.*)

Coccus salicis Linn., Syst. Nat., Ed. x, i, p. 456 (1758).
" " " Faun. Suec., Ed. ii, p. 265 (1761).
" " " Syst. Nat., Ed. xii, i, p. 741 (1766).
" " Mueller, Faun. Frid., p. 31 (1767).
" " Mod., Act. Goth., i, p. 21 (1778).
" " Gmel., Syst. Nat., Ed. xiii, p. 2218 (1789).
" " De Villers, Syst. Nat., Ed. x, p. 560 (1789).
" " Oliv., Ency. Meth., vi, p. 96 (1791).
" " Schr., Faun. Boica, ii, pt. i, p. 143 (1801).

Coccus cryptogamus Dalm., K. Vet. Akad. Handl., p. 357 (1825).
" " " " " " Extr., x, p. 1, pl. 3, figs. 1-17 (1826).
" " Harr., N. E. Farm., p. 289 (1829).
" (Aspidiotus) salicis Ratz., Forstins., iii, p. 195 (1844).
Aspidiotus salicis Bouché, Stett. Ent. Zeit., v, p. 294 (1844).
Coccus " Macq., Ann. Soc. Ent. Fr., (2), v, p. 47 (1847).
Aspidiotus salicifex Amyot, Monom., p. 480 (1847).
" populi Baer., D'Alton, Zeit. für Zool., p. 167 (1849).
" minimus " " " " " p. 168 (1849).
Coccus salicis Macq., Bull. Soc. Ent. Fr., (2), ix, p. lxxv (1849).
Aspidiotus vaccinii Bouché, Stett. Ent. Zeit., xii, p. 111 (1851).
" populi " " " " " p. 111 (1851).
" saliceti " " " " " p. 111 (1851).
Coccus cryptogamus Harr., Am. Farm. Ency., p. 139 (1858).
Mytilaspis maquarti Targ., Catalogue, p. 44 (1869).
" saliceti " " p. 44 (1869).
Chionaspis aceris Sign., Ann. Soc. Ent. Fr., (4), ix, p. 442 (1869).
" alni " " " " " " " p. 443 (1869).
" fraxini " " " " " " " p. 445 (1869).
" populi " " " " " " " p. 446 (1869).
" salicis " " " " " " " p. 447 (1869).
" vaccinii " " " " " " " p. 448 (1869).
Aspidiotus saliceti " " " " " " x, p. 110 (1870).
Lecanium vaccinii Kalt., Die Pflanz., p. 420 (1874).
" myrtilli " " " p. 420 (1874).
Aspidiotus populi " " " p. 561 (1874).
" saliceti " " " p. 587 (1874).
Coccus myrtilli Sign., Ann. Soc. Ent. Fr., (5), vi, p. 620 (1876).
" cryptogamus Vick, Mon. Mag., iv, p. 17 (1881).
Chionaspis fraxini Ormerod, Man. Inj. Ins., Ed. i, p. 176 (1881).
" salicis Loew, Wien. Ent. Zeit., ii, p. 6 (1883).
" aceris Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 107 (1883).
" alni " " " " " " " p. 108 (1883).
" populi " " " " " " " p. 109 (1883).
" salicis Targ., Annali di Agr., p. 384 (1884).
" vaccinii Goethe, Jahrb. Nass. Ver. Nat., p. 116 (1884).
" populi Dougl., Ent. Mon. Mag., xxii, p. 247 (1886).
" salicis " " " " " p. 249 (1886).
" populi Mosley, Naturalist's Guide, vi, p. 31 (1890).
" fraxini " " " " p. 31 (1890).
Coccus cryptogamus Morg., Ent. Mon. Mag., xxvi, p. 43 (1890).
Lecanium vaccinii Dougl., " " " xxvii, p. 97 (1891).
Chionaspis salicis Morg., " " " xxviii, p. 16 (1892).
" furfurus " " " " " p. 16 (1892).
" fraxini " " " " " p. 16 (1892).
" " Curt., Manifestation of Disease, Forest Trees, p. 33 (1892).

Chionaspis sorbi Dougl., Ent. Mon. Mag., xxix, p. 130 (1893).
" salicis Lint., 9th Rep. Ins. N. Y., p. 411 (1893).
" fraxini Sign., British Naturalist, p. 23 (1894).
" alni Ckll., Can. Ent., xxvii, p. 33 (1895).
Aspidiotus fraxini Henschel, Die Schädl. Forst. & Obst. Ins., p. 514 (1895).
" salicis " " " " " " p. 514 (1895).
Chionaspis " Reuter, Meddel. Soc. Faun. Flo. Fenn., xxii, p. 21 (1896).
" " Dougl., Notes on Brit. Coccidæ, No. 2, p. 249 (1896).
" vaccinii Ckll., Bull. 4, T. s., Dep. Ag., p. 54 (1896).
Aspidiotus salicis Eckst., Forstliche Zoologie, p. 558 (1897).
Chionaspis " Berl. e Leon., Cherm. Ital., Fasc. iii, Nos. 55, 56,57 (1898).
" " Newell, Contr. Ia. Ag. Coll., No. 3, p. 4 (1898).
" " Cooley, Spec. Bull. Mass. Exp. Sta., p. 11 (1899).
" " Lugger, 6th Rep. Ent. Minn. Exp. Sta., p. 237 (1900).
" " Newst., Jn. Roy. Hor. Soc., xxiii, p. 16 (1900).
" " " Mon. Brit. Cocc., i, p. 180 (1901).

Habitat.—Europe.

On Salix hermaphrodita; S. alba; S. viminalis; S. holoserica; Populus pyramidoides; P. nigra; P. tremuloides; Alnus communis; A. vulgare; A. glutinosa; Cornus sanguinea; Acer pseudoplatanus; Vaccinium myrtillus; V. vitis-idæa; V. uliginosum; Tilia parvifolia; Sorbus aucuparia; Fraxinus excelsior; Sarcothamnus scoparius; S. vulgaris.

1082. Chionaspis salicis-nigræ (Walsh).

Aspidiotus salicis-nigræ Walsh, 1st Rep. Ins. Ill., p. 40 (1868).
Mytilaspis salicis LeBaron (non Linn.), Tr. Ill. Hor. Soc., App., p.140 (1871).
" " " 2nd Rep. Ins. Ill., p. 140 (1872).
?Diaspis salicicorticis Bessey, Ia. Ag. Rep., p. 244 (1874).
Chionaspis salicis Comst., Rep. U. S. Dep. Ag., 1880, p. 320 (1881).
" " Osborn, Tr. Ia. Hor. Soc., xvii, p. 214 (1882).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 106 (1883).
" " " Intr. Ent., p. 151 (1888).
" " Pack., 5th Rep. U. S. Ent. Com., p. 593 (1890).
Mytilaspis " Forbes, 17th Rep. Ins. Ill., App., p. 23 (1891).
Chionaspis " Lugger, Bull. 43, Minn. Exp. Sta., p. 224 (1895).
" " " 1st Ann. Rep. Minn. Exp. Sta., p. 128 (1895).
" " Osborn, Pr. Ia. Ac. Sci., v, p. 224 (1898).
" " " Contr. Ia. Ag. Coll., No. 3, p. 4 (1898).
" salicis-nigræ Cooley, Spec. Bull. Mass. Exp. Sta., p. 19 (1899).
" " " Hunter, Kan. Univ. Quar., ix, p. 101 (1900).
" " " Quaint. & Scott, Cocc. Amer., Dec. iii-iv, No. 20 (1901).

Habitat.—Can.; Me.; Mass.; N. Y.; Ohio; Ind.; Ill.; Minn.; Ia.; Mo.; Neb.; Kan.; Col.; N. Mex.; Ariz.; Wash.; Cal.

On willow; poplar; tulip-tree; Cornus stolonifera; Amelanchier canadensis; Ceanothus. List in Spec. Bull. Mass. Exp. Sta., p. 21 (1899).

1083. Chionaspis simplex Green.

Chionaspis simplex Green, Coccidæ Ceylon, pt. ii, p. 160 (1899).
Habitat.—Ceylon.
On bamboo.

1084. Chionaspis spartinæ Comst.

Chionaspis spartinæ Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 106 (1883).
" " Mask., N. Z. Trans., xxvii, p. 51 (1894).
" " King, Can. Ent., xxxi, p. 251 (1899).
Habitat.—Mass.: California.
On Spartina stricta.

1085. Chionaspis stanotophri Cooley.

Chionaspis stanotophri Cooley, Spec. Bull. Mass. Exp. Sta., p. 35 (1899).
Habitat.—Cape Town, S. Africa.
On Stanotophrum glabrum.

1086. Chionaspis striata Newst.

Chionaspis striata Newst., Tr. Ent. Soc. Lond., p. 96 (1897).
Habitat.—Algeria.
On Cypress.

1087. Chionaspis tegalensis Zehnt.

Chionaspis tegalensis Zehnt., Mede. Proef. Suik., Java, (3), No. 6, p. 7 (1898).
" " de Charm., Pr. Soc. Amic. Scien., p. 31 (1899).
Habitat.—Java; Mauritius.

1088. Chionaspis vitis Green.

Chionaspis vitis Green, Ind. Mus. Notes, iv, p. 3 (1896).
" " " Cocc. Ceylon, pt. ii, p. 140 (1899).
Habitat.—Ceylon: Japan.
On Vitis lanceolaria; Elæagnus latifolia; Loranthus.

1089. Chionaspis wistariæ Cooley.

Chionaspis wistariæ Cooley, Can. Ent., xxix, p. 280 (1897).
" " " Spec. Bull. Mass. Exp. Sta., p. 39 (1899).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 77 (1902).
Habitat.—California: Japan.
On Wistaria from Japan: Alnus japonica: Salix babylonica.

1090. Chionaspis xanthorrhϾ Full.

Chionaspis xanthorrhϾ Full., Notes on Cocc. W. Austr., p. 12 (1897).
" " " Tr. Ent. Soc. Lond., p. 472 (1899).
Habitat.—W. Australia.
On Xanthorrhœa.

Genus **HOWARDIA** Berl. e Leon. Type, biclavis.

Howardia Berl. e Leon., Riv. Pat. Veg., iv, p. 347 (1896).

1091. **Howardia biclavis** (Comst.).

(*The Mining scale.*)

Chionaspis(?) biclavis Comst., 2nd Rep. Dep. Ent. Corn. Univ.. p. 98 (1883).
" " " Intr. Ent.. p. 153 (1888).
Aspidiotus theæ Green (non Mask.), Ins. Pests, p. 13 (1890) female.
Chionaspis biclavis Craw, Rep. Cal. Bd. Hort.. p. 14 (1891).
" " Morg.. Ent. Mon. Mag.. xxviii, p. 15 (1892).
" " Riley & How., Ins. Life, iv, p. 400 (1892).
Howardia " Berl. e Leon.. Riv. Pat. Veg., iv, p. 348 (1896).
Chionaspis " Green, Ind. Mus. Notes, iv, p. 2 (1896).
Howardia " Ckll., Bull. Bot. Dep. Jam., p. 256 (1896).
" " Berl. e Leon., Annali di Agr., p. 127 (1898).
" " Ckll., Jn. N. Y. Ent. Soc., vii, p. 258 (1899).
Chionaspis " de Charm., Pr. Soc. Amic. Scien., p. 30 (1899).
" " Green, Cocc. Ceylon, pt. ii, p. 152 (1899).
" " Newst., Mon. Brit. Cocc., i, p. 190 (1901).

Habitat.—Washington, D. C.; Ohio; Cal.; Mex.; West Indies; Tahiti; Ceylon; Japan; Hawaiian Islands; Mauritius; England; Ireland (in conservatories).

On orange; lime; coffee; tea; tamarind; Flacourtia; Cinchona; Ochrea sapoti; Bixa orellana; Ficus laurifolia; Anona muricata; Hibiscus aculeatus; Microglossa zeylanica.

Howardia biclavis detecta (Mask.).

Chionaspis biclavis var. detecta Mask., N. Z. Trans., xxvii, p. 49 (1894).

Habitat.—Hawaiian Islands.

Genus **DIASPIS** Costa. Type. calyptroides=echinocacti.

Diaspis Costa, Prospetto nuova Div. Met. Coccus, p. 7 (1828) described but no type named; Faun. del Reg. Nap., Cocciniglie, p. 19 (1835); Sign., Ann. Soc. Ent. Fr., (4), ix, p. 431 (1869); Comst., Rep. U. S. Dep. Ag., 1880, p. 310 (1881); 2nd Rep. Dep. Ent. Corn. Univ., p. 85 (1883); Mask., Ins. Nox. Agr. N. Z., p. 45 (1887); Green, Coccidæ Ceylon, pt. i, p. 86 (1896); Newst., Mon. Brit. Cocc., i, p. 151 (1901).

1092. **Diaspis arizonica** Ckll.

Diaspis arizonicus Ckll., Can. Ent., xxxii, p. 131 (1900).

Habitat.—Arizona.

On Prosopis velutina.

1093. **Diaspis australis** Hemp.

Diaspis australis Hemp., Rev. Mus. Paul., iv, p. 521 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 109 (1901).

Habitat.—Brazil.

On Myrtaceæ.

1094. Diaspis baccharidis Towns. & Ckll.

Diaspis baccharidis Towns. & Ckll., Jn. N. Y. Ent. Soc., vi, p. 179 (1898).
Habitat.—Mexico.
On Baccharis glutinosa.

1095. Diaspis blankenhorni Targ.

Diaspis blankenhorni Targ., Bull. Soc. Ent. Ital., p. 17 (1879).
" " " " " " " p. 109 (1885).
Habitat.—Italy.

1096. Diaspis boisduvalii Sign.

Diaspis boisduvalii Sign., Ann. Soc. Ent. Fr., (4), ix, p. 432 (1869).
" " Mask., N. Z. Trans., xi, p. 200 (1878).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 86 (1883).
" " Mask., N. Z. Trans., xvii, p. 23 (1884).
" " " Ins. Nox. Agr. N. Z., p. 46 (1887).
" " Morg., Ent. Mon. Mag., xxvi, p. 44 (1890).
Aulacaspis " Ckll., Gard. Chron., (3), xiii, p. 548 (1893).
Diaspis " Mask., N. Z. Trans., xxvii, p. 44 (1894).
Aulacaspis " Ckll., Bull. Bot. Dep. Jam., p. 107 (1897).
" " Hemp., Rev. Mus. Paul., iv, p. 518 (1900).
Diaspis " Newst., Jn. Roy. Hor. Soc., xxiii, p. 8 (1900).
" " " Mon. Brit. Cocc., i, p. 153 (1901).

Habitat.—Europe (in hot houses); New Zealand; Australia; Hawaiian Islands; Brazil; West Indies; Mexico. In greenhouses, Canada; Mass.; New York; Washington, D. C.; Ohio.

On palms; Acacia; Cattleya; wattle; various hothouse plants.

Diaspis boisduvalii coccois Licht.

Diaspis coccois Licht., Bull. Soc. Ent. Fr., (6), ii, p. xxxvi (1882).
Aulacaspis " Ckll., Pr. Ac. N. Sci. Ph., p. 273 (1899).
Diaspis tentaculatus Morg., Ent. Mon. Mag., xxix, p. 41 (1893).
Habitat.—France; Jamaica.
On cocoanut-palm.

Diaspis boisduvalii maculata (Ckll.).

Aulacaspis boisduvalii var. maculata Ckll., Rev. Mus. Paul., iii, p. 502 (1898).
" " " " Hemp., " " " iv, p. 518 (1900).
Diaspis " " " Ckll., The Entom., xxxv, p. 59 (1902).
Habitat.—Brazil; Antigua.
On pineapple.

1097. Diaspis bromeliæ (Kern.).

Coccus bromeliæ Kern., Naturg. Coccus bromeliæ, pp. 20, 52 (1778).
" " Koll., Inj. Ins., p. 178 (1840).
Chermes " Bdv., Ent. Hort., p. 334 (1867).
Diaspis " Sign., Ann. Soc. Ent. Fr., (4), ix, p. 434 (1869).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 89 (1883).

Aulacaspis bromeliæ Ckll., Can. Ent., xxvi, p. 33 (1894).
" " " " " xxxi, p. 227 (1899).
Diaspis " Newst., Jn. Roy. Hor. Soc., xxiii, p. 8 (1900).
" " " Mon. Brit. Cocc., i, p. 156 (1901).

Habitat.—Europe (in hot houses); Mass.; Washington, D. C.; Ohio and Cal. (in greenhouses); Mexico.

On Bromelia pinguin; pineapple; Hibiscus; Canna; ivy; Billbergia zebrina; Olea fragrans.

1098. **Diaspis carueli** Targ.

(*Juniper scale.*)

Diaspis carueli Targ., Catalogue, p. 43 (1869).
" " Sign., Ann. Soc. Ent. Fr., (4), ix, p. 436 (1869).
" " Comst., Rep. U. S. Dep. Ag., 1880, p. 310 (1881).
" " Pack., 5th Rep. U. S. Ent. Com., p. 915 (1890).
" " Howard, Ins. Life, vii, p. 360 (1895).
" " Berl. e Leon., Cherm. Ital., Fasc. i, No. 15 (1895).
" " Newst., Jn. Roy. Hor. Soc., xxiii, p. 10 (1900).
" " " Mon. Brit. Cocc., i, p. 162 (1901).

Habitat.—Italy; England; Mass.; New York; Washington, D. C.

On Juniper; arbor-vitæ.

1099. **Diaspis cattleyæ** (Ckll.).

Aulacaspis cymbidii McIntire, Jn. Quekett Micr. Club, pl. xxvi (1888) no desc.
" cattleyæ Ckll., Biol. Centr. Amer., ii, pt. 2, p. 30 (1899).
Diaspis " " The Entom., xxxv, p. 59 (1902).

Habitat.—Mexico; California.

On Cattleya.

1100. **Diaspis celtidis** Ckll.

Diaspis celtidis Ckll., Can. Ent., xxxi, p. 106 (1899).

Habitat.—Texas.

On Celtis.

1101. **Diaspis chilensis** Ckll.

Diaspis chilensis Ckll., Actes Soc. Sci. Chili, (5), i, p. 6 (1895).

Habitat.—Chili.

1102. **Diaspis colvei** Penzig.

Diaspis colvei Penzig, Studi Bot. sug. Agr., p. 497 (1887).

Habitat.—Italy.

1103. **Diaspis echinocacti** (Bouché).

Aspidiotus echinocacti Bouché, Schädl. Gart. Ins., p. 53 (1833).
" " " Naturg. Ins., p. 15 (1834).
" " Burm., Handb. Ent., ii, p. 68 (1835).
Diaspis calyptroides Costa, Faun. Reg. Nap., Cocc., p. 20 (1835).

Aspidiotus echinocacti Koll., Inj. Ins., p. 180 (1840).
" " Först., "Ueber Schildlause," p. 562 (1851).
Diaspis calyptroides Targ., Studii sul. Cocc., pp. 13, 14, 21, 27, 45 (1867).
" " Sign.. Ann. Soc. Ent. Fr., (4), ix, pp. 99, 434 (1869).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ.,pp.93,95(1883).
" " Mask., N. Z. Trans., xxix, p. 298 (1897).
" " Newst., Ent. Mon. Mag., xxxiii, p. 75 (1897).
" " " Tr. Ent. Soc. Lond., p. 94 (1897).
" " " Mon. Brit. Cocc.. i, p. 159 (1901).

Habitat.—Europe; India; Algeria; Porto Rico; Mexico; New Mexico: New York.

On Opuntia ficus-indica; Echinocactus ottonis; E. tenuispinus, etc.

Diaspis echinocacti cacti Comst.

Diaspis cacti Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 91 (1883).
" " Ckll., Can. Ent., xxv, p. 127 (1894).
" " Lugger, Bull. 43, Minn. Exp. Sta., p. 225 (1895).
" " " Rep. Minn. Exp. Sta., p. 129 (1895).
" " Davis, Spec. Bull. 2, Mich. Exp. Sta., p. 37 (1896).
" " Ckll., Bull. Bot. Dep. Jam., p. 258 (1896).
" calyptroides var. cacti Mask., N. Z. Trans., xxix, p. 299 (1897).
" " Osborn, Contr. Ia. Ag. Coll., p. 5 (1898).
" " " " Rolfs & Quaint., Cocc. Amer., Dec. i-ii, No. 14 (1898).
" " " " Barlow, Ind. Mus. Notes. iv, p. 211 (1899).
" " cacti de Charm., Pr. Soc. Amic. Scien., p. 29 (1899).
" cacti Lugger, 6th Rep. Minn. Exp. Sta., p. 235 (1900).
" " Hemp., Rev. Mus. Paul., iv, p. 520 (1900).

Habitat.—Mass. and N. Y. (in greenhouses); Ia.; Ariz.; New Mexico; Brazil; India; Mauritius.

On Cactus; Cereus giganteus; C. macrogonus; Echinocactus.

Diaspis echinocacti opuntiæ Ckll.

Diaspis calyptroides var. opuntiæ Ckll., Jn. Inst. Jam., i, p. 256 (1893).
" opuntiæ Newst., Ent. Mon. Mag., xxix. p. 188 (1893).
" opunticola " " " " " p. 281 (1893).
" calyptroides var. opuntiæ Mask., N. Z. Trans., xxix, p. 299 (1897).
" " " " Ckll.& Parr.,The Industrialist,p.277(1899).

Habitat.—Demerara; Texas; Mexico; Jamaica.

On Opuntia arborescens; O. elongata.

1104. **Diaspis euphoriæ** de Charm.

Diaspis euphoriæ de Charm., Pr. Soc. Amic. Scien., p. 28 (1899).

Habitat.—Mauritius.

On Nephelium longana.

1105. Diaspis gennadii Leon.

Diaspis gennadii Leon., Riv. Pat. Veg., vi, p. 273 (1898).
Habitat.—Greece.
On Pistacia terebinthus.

1106. Diaspis juniperi (Bouché).

Aspidiotus juniperi Bouché, Stett. Ent. Zeit., xii, p. 112 (1851).
" " Targ., Catalogue, p. 43 (1869).
Diaspis " Sign., Ann. Soc. Ent. Fr., (4), ix, p. 437 (1869).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 96 (1883).
Habitat.—Europe.
On Juniperus communis.

1107. Diaspis leperii Sign.

Diaspis leperii Sign., Ann. Soc. Ent. Fr., (4), ix, p. 437 (1869).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 96 (1883).
" " Goethe, Jahrb. Nass. Ver. Nat., p. 115 (1884).
Habitat.—Europe.
On peach.

1108. Diaspis minima Targ.

Diaspis minima Targ., Catalogue, p. 43 (1869).
" " Sign., Ann. Soc. Ent. Fr., (4), ix, p. 438 (1869).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 96 (1883).
" " King, Can. Ent., xxxiv, p. 61 (1902).
Habitat.—Europe: Mass. (Harvard Bot. Gardens).
On arbor-vitæ.

1109. Diaspis miranda (Ckll.).

Aulacaspis miranda Ckll., Ann. Mag. N. H., (7), i, p. 437 (1898).
Diaspis " " The Entom., xxxv, p. 59 (1902).
Habitat.—Mexico.
On "Cherimoya:" "Zapote."

1110. Diaspis(?) **monserrati** Colvée.

Diaspis monserrati Colvée, Estud. sob. alg. Ins., Cocc., p. 21 (1881).
" " Targ., Annali di Agr., p. 391 (1884).
Habitat.—Spain.
On Corynocarpus?
"This species may belong to Parlatoria."

1111. Diaspis montana (Ckll.).

Aulacaspis montana Ckll., Can. Ent., xxviii, p. 226 (1896).
Diaspis " " in litt. (1902).
Habitat.—New Mexico.
On Quercus wrightii.

1112. Diaspis oleæ Colvée.

Diaspis oleæ Colvée, "Gac.Agr.del Minist.de Fomento," xiv,No.2,p.39(1880).
" " " Estud. sob. alg. Ins., Cocc., p. 13, fig. 1 (1881).
" " Targ., Annali di Agr., p. 390 (1884).
Habitat.—Spain.
On olive.

1113. Diaspis phoradendri Ckll.

Diaspis phoradendri Ckll., Ann. Mag. N. H., (7), i, p. 437 (1898).
Habitat.—Mexico.
On mistletoe.

1114. Diaspis pyri Colvée.

Diaspis pyri Colvée, Estud. sob. alg. Ins., Cocc., p. 33 (1881).
" " " Bull. Soc. Ent. Fr., (6), i, p. li (1881).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 4, note (1897).
Habitat.—Spain.
On pear; apple.

1115. Diaspis santali Mask.

Diaspis santali Mask., N. Z. Trans., xvi, p. 122 (1883).
" " " " " xvii, p. 23 (1884).
" " " Ins. Nox. Agr. N. Z., p. 47 (1887).
" " " N. Z. Trans., xxii, p. 135 (1892).
Habitat.—New Zealand.
On Santalum cunninghamii; pear; plum and other fruit trees.

1116. Diaspis texensis (Ckll.).

Aulacaspis texensis Ckll., Can. Ent., xxviii, p. 83 (1896).
Diaspis texensis Ckll., in litt. (1902).
Habitat.—Texas.
On Sophora secundiflora (both sides of leaves).

1117. Diaspis toumeyi Ckll.

Diaspis toumeyi Ckll., Psyche, vii, Suppl., i, p. 4 (1895).
Habitat.—Arizona.
On Holacantha Emoryi.

1118. Diaspis townsendi Ckll.

Diaspis townsendi Ckll., Biol. Centr. Amer., ii, pt. 2, p. 28 (1899).
Habitat.—Mexico.
On Prosopis.

1119. Diaspis trinacis Colvée.

Diaspis trinacis Colvée, Estud. sob. alg. Ins., Cocc., p. 19 (1881).
Habitat.—Spain.
On Trinax; Strelitzia Reginæ.

1120. **Diaspis visci** (Schr.).

Coccus visci Schr., Enum. Ins. Austr., pp. 296. 588 (1781).
Aspidiotus visci Loew, Verh. z. b. Ges., Wien, xii, p. 110 (1862).
Diaspis " " " " " " xxii, p. 273 (1872).
Aspidiotus " Kalt., Die Pflanz., pp. 293, 785 (1874).
Diaspis " " " " p. 785 (1874).
Aspidiotus " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 603 (1876).
Diaspis " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 96 (1883).
Habitat.—Europe.
On mistletoe (Viscum album).

1121. **Diaspis zamiæ** Morg.

Diaspis zamiæ Morg., Ent. Mon. Mag., xxvi, p. 44 (1890).
Howardia elegans Berl. e Leon., Cherm. Ital., Fasc. i, No. 18 (1895).
" " " " Riv. Pat. Veg., iv, p. 348 (1896).
Aulacaspis " King, Psyche. viii, p. 350 (1899).
" " " Can. Ent., xxxi, p. 228 (1899).
Diaspis zamiæ Newst., Mon. Brit. Cocc., i, p. 165 (1901).
" " Ckll., The Entom., xxxv, p. 59 (1902).
Habitat.—England; Portugal; Italy; Bermuda?; New York; Mass. (in greenhouses).
On Zamia villosa; Z. integrifolia; Cycas revoluta.

Genus **AULACASPIS** Ckll. Type, rosæ.

Aulacaspis Ckll., Journ. Inst. Jam., i, p. 180 (1893): Newst., Mon. Brit. Coccidæ, i, p. 167 (1901): Ckll., The Entom., xxxv, p. 58 (1902).

1122. **Aulacaspis crawii** (Ckll.).

Diaspis crawii Ckll., Psyche, viii, p. 190 (1898).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 73 (1902).
Aulacaspis crawii Ckll., The Entom., xxxv, p. 59 (1902).
Habitat.—California from China; Japan.
On Elæagnus umbellata.

Aulacaspis crawii fulleri (Ckll.).

Diaspis crawii var. fulleri Ckll., The Entom., xxxiv, p. 225 (1901).
Habitat.—Natal.
On Melia Azedarach.

1123. **Aulacaspis fagrææ** (Green).

Diaspis fagrææ Green, Cocc. Ceylon, pt. i, p. 91 (1896).
Aulacaspis " Ckll., The Entom., xxxv, p. 59 (1902).
Habitat.—Ceylon.
On Fagræa zeylanica.

1124. **Aulacaspis loranthi** (Green).

Diaspis loranthi Green. Jn. Bomb. N. H. Soc., xiii, p. 225 (1900).
Aulacaspis " Ckll., The Entom., xxxv, p. 59 (1902).
Habitat.—Ceylon.
On Loranthus tomentosus.

1125. **Aulacaspis pentagona** (Targ.).

(*West Indian Peach scale.*)

Diaspis pentagona Targ., Revista di Bacchicoltura, No. 11 (1885).
" " " Bull. Soc. Ent. Ital., xix, p. 184 (1887).
" amygdali Tryon, Rep. on Fungous Pests, p. 89 (1889).
" pentagona Targ., Bull. Soc. Ent. Ital., xxi, p. 57 (1890).
" " Riley & How., Ins. Life, iii, p. 196 (1891).
" " Franc., Boll. di Notiz. Agr., xiii (1891-92).
" lanatus Morg. & Ckll., Journ. Inst. Jam., i, p. 137 (1892).
" " Towns., " " " " pp. 283, 378 (1893).
" pentagona Franc., La gen. autun. del Dias. pentagona (1893).
" " " Atti del Istituto Ven. Sci., (7), iv, p. 1011 (1893.)
" lanatus Ckll., Ins. Life, v, p. 247 (1893).
" " Howard, Can. Ent., xxvi, p. 355 (1894).
" " Riley & How., Ins. Life, vi, p. 287 (1894).
" " Mask., N. Z. Trans., xxvii, p. 45 (1894).
" " Ckll., Jn. Trin. Nat. Club, i, p. 307 (1894).
?Chionaspis prunicola Mask., N. Z. Trans., xxvii, p. 49 (1894).
Diaspis patelliformis Sasaki, Bull. Agr. Coll., Tokio, p. 107 (1894).
" amygdali Riley & How., Ins. Life, vi, p. 290 (1894).
" " Mask., N. Z. Trans., xxvii, pp. 5, 44 (1894).
" " Ckll., Can. Ent., xxvii, p. 260 (1895).
" " " Rep. N. Mex. Exp. Sta., p. 3 (1895).
" " " Ent. News, vi, p. 123 (1895).
" pentagona Berl. e Leon., Cherm. Ital., Fasc. i, No. 16 (1895).
" lanatus Ckll., Ent. News, vi, p. 123 (1895).
" " Lounsb., Rep. Ent. Cape Good Hope, 1895, p. 48 (1896).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 39 (1896).
" lanata Green, Ind. Mus. Notes, iv, p. 4 (1896).
" pentagona Berl., Riv. Pat. Veg., iv, p. 382 (1896).
" amygdali Ckll., Bull. Bot. Dep. Jam., p. 257 (1896).
" " " Bull. 4, T. s., Dep. Ag., p. 40 (1896).
" " Lounsb., Rep. Ent. Cape Good Hope, p. 76 (1896).
" " Green, Cocc. Ceylon, pt. i, p. 87 (1896).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 38 (1896).
" patelliformis Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 39 (1896).
" " Green, Cocc. Ceylon, pt. i, p. 87 (1896).
" amygdali Mask., Ent. Mon. Mag., xxxiii, p. 241 (1897).
" lanatus Starnes, Bull. 36, Ga. Exp. Sta., p. 25 (1897).

Diaspis amygdali Berl. e Leon., Ann. di Agr., p. 121 (1898).
" " Webst. & Mally, Bull. 96, Ohio Exp. Sta., p. 22 (1898).
" " Webster, Can. Ent., xxx, pp. 78, 169 (1898).
" " Cooley, " " " p. 232 (1898).
?Chionaspis prunicola Berl. e Leon., Annali di Agr., p. 123 (1898).
Diaspis pentagona Ckll., Pr. Ac. N. Sci. Ph., p. 275 (1899).
" amygdali Webster, Can. Ent., xxxi, p. 130 (1899).
" " de Charm., Pr. Soc. Amic. Scien., p. 29 (1899).
" " Scott, Bull. 1, Ga. St. Bd. Ent., p. 16 (1899).
" " " " 20, n. s., Dep. Ag., p. 84 (1899).
" " Newst., Jn. Roy. Hor. Soc., xxiii, p. 12 (1900).
" pentagona Hemp., Rev. Mus. Paul., iv, p. 519 (1900).
" " Quaint. & Scott, Cocc. Amer., Dec. iii-iv, No. 14 (1901).
" " Newst., Mon. Brit. Cocc., i, p. 173 (1901).
" amygdali Lefroy, Scale Ins. Less. Antil., p. 57 (1901).
" " Zimm., Bull. Inst. Bot. Buitenzorg, No. 10, p. 12 (1901).
" " Full., 1st Rep. Ent. Natal, p. 102 (1901).
" pentagona Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 72 (1902).
" " Banks, Bull. 34, n. s., Dep. Ag., p. 21 (1902).
?Howardia prunicola Kirkaldy, Fauna Haw., iii, pt. 2, p. 112 (1902).

Habitat.—England; Switzerland; Italy; New Zealand; Ceylon; Australia; Hawaiian Islands; Japan; China; South Africa; Mauritius; Brazil; West Indies; Panama; Mass.; Washington, D. C.; Ohio; Ga.; Fla.; Cal.

On peach; plum; prune; cherry; apricot; walnut; grape; persimmon; geranium; Hibiscus; etc. Full list of food plants in Can. Ent., xxx, p. 79; Bull. Bot. Dep. Jam., p. 257 (1896).

Aulacaspis pentagona auranticolor (Ckll.).

Diaspis auranticolor Ckll., Can. Ent., xxxi, p. 106 (1899).
Aulacaspis pentagona auranticolor Ckll., in litt. (1902).

Habitat.—California.

On Osmanthus illicifolia from Japan.

Aulacaspis pentagona rubra (Mask.).

Diaspis amygdali var. rubra Mask., N. Z. Trans., xxx, p. 228 (1898).

Habitat.—Japan; Ceylon.

On Orixa japonica; Loranthus.

Aulacaspis pentagona theæ (Mask.).

?Chionaspis prunicola var. theæ Mask., N. Z. Trans., xxviii, p. 389 (1896).
" " " " Green, Ind. Mus. Notes, v, p. 12 (1900).

Habitat.—Northern India.

On tea.

1126. Aulacaspis persimilis (Ckll.).

Diaspis persimilis Ckll., Can. Ent., xxix, p. 267 (1897).
Aulacaspis " " The Entom., xxxv, p. 59 (1902).

Habitat.—Mexico.

On " Chico Sapote."

1127. Aulacaspis rosæ (Bouché).

(*The Rose scale.*)

Aspidiotus rosæ Bouché, Naturg. Ins., p. 14 (1834).
" " Burm., Handb. Ent., ii, p. 68 (1835).
" " Blanch., Hist. Nat. Ins., iii, p. 214 (1840).
Diaspis " Sign., Ann. Soc. Ent. Fr., (4), ix, p. 441 (1869).
Aspidiotus " Kalt., Die Pflanz., p. 224 (1874).
Diaspis " Mask., N. Z. Trans., xi, p. 201 (1878).
Aspidiotus " Vick., Mon. Mag., ii, p. 146 (1879).
Diaspis " Comst., Rep. U. S. Dep. Ag., 1880, p. 312 (1881).
" " Goethe, Jahrb. Nass. Ver. Nat., p. 116 (1884).
" " Mask., Ins. Nox. Agr. N. Z., p. 47 (1887).
" " Dougl., Ent. Mon. Mag., xxiv, p. 23 (1887).
" " Comst., Intr. Ent., p. 151 (1888).
" " Morg., Ent. Mon. Mag., xxvi, p. 44 (1890).
" " Riley & How., Ins. Life, iv, p. 213 (1891).
" " Webster, Bull. 45, Ohio Exp. Sta., p. 208 (1893).
" " Morg., Bull. 28, La. Exp. Sta., p. 994 (1893).
" " Riley & How., Ins. Life, v, p. 207 (1893).
" " Howard, Ins. Life, vi, p. 233 (1894).
" " Hopkins, Rep. W. Va. Exp. Sta., p. 533 (1894).
" " Smith, Rep. N. J. Exp. Sta., 1894, p. 499 (1895).
" " Green, Ent. Mon. Mag., xxxi, p. 229 (1895).
" " Berl. e Leon., Cherm. Ital., Fasc. i, No. 7 (1895).
" " Davis, Spec. Bull. 2, Mich. Exp. Sta., p. 36 (1896).
Aulacaspis " Ckll., Bull. Bot. Dep. Jam., p. 259 (1896).
Diaspis " Chambliss, Bull. 4, Tenn. Exp. Sta., p. 147 (1896).
Aulacaspis " Frog., Rep. Dep. Ag. N. S. W., No. 175, p. 7 (1897).
" " Johns., Bull. 22, Md. Exp. Sta., p. 273 (1898).
" " Osborn, Contr. Ia. Ag. Coll., p. 5 (1898).
Diaspis " Lucet, Ins. Nuis. Ross., France, p. 312 (1898).
Aulacaspis " Newell, Bull. 43, Ia. Exp. Sta., p. 158 (1899).
Diaspis " Lugger, 6th Rep. Minn. Exp. Sta., p. 235 (1900).
" (Aulacaspis) rosæ Newst., Jn. Roy. Hor. Soc., xxiii, p. 10 (1900).
Aulacaspis (Diaspis) " " Mon. Brit. Cocc., i, p. 168 (1901).
" rosæ Forbes, Circ. 36, Ill. Exp. Sta., p. 24 (1901).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 73 (1902).
" " Banks, Bull. 34, n. s., Dep. Ag., p. 23 (1902).
Diaspis " Smith, " 159, N. J. Exp. Sta. (1902).
" " Forbes, 22nd Rep. Ins. Ill., p. 120 (1903).

Habitat.—Europe; Japan; Australia; New Zealand; Hawaiian Islands; Demerara; China; Fiji; Chili; West Indies; Mexico; Can.; N. Y.; Fla.; Ohio; Cal.

On rose; raspberry; strawberry; blackberry; myrtle; pear; Ailanthus; Cycas; mango, etc.

Aulacaspis rosæ spinosa Mask.

Aulacaspis rosæ var. spinosa Mask., Ent. Mon. Mag., xxxiii, p. 241 (1897).
Diaspis " " " " N. Z. Trans., xxx, p. 228 (1898).
Habitat.—Japan.
On Smilax.

Genus **PHENACASPIS** Cooley & Ckll. Type, nyssæ.

Phenacaspis Cooley & Ckll., Check List Coccidæ, Suppl., p. 398, note (1899): Cooley, Can. Ent., xxxv, p. 48 (1903).

1128. Phenacaspis aucubæ (Cooley).

Chionaspis aucubæ Cooley, Can. Ent., xxix, p. 279 (1897).
Phenacaspis " " in litt. (1902).
Habitat.—California (at quarantine from Japan).
On Aucuba.

1129. Phenacaspis chinensis (Ckll.).

Chionaspis chinensis Ckll., 5th Bien. Rep. Cal. Bd. Hort., p. 37 (1896).
" " Mask., N. Z. Trans., xxx, p. 231 (1898).
Phenacaspis " Ckll., Check List, Suppl., p. 398, note (1899).
" " Cooley, Can. Ent., xxxv, p. 48 (1903).
Habitat.—California (at quarantine from China); Japan.
On Quercus.

1130. Phenacaspis cockerelli (Cooley).

Chionaspis cockerelli Cooley, Can. Ent., xxix, p. 278 (1897).
Phenacaspis " " in litt. (1902).
Habitat.—California (at quarantine from China).
On palm.

1131. Phenacaspis dilatata (Green).

Chionaspis dilatata Green, Cocc. Ceylon, pt. ii, p. 148 (1899).
" " Zimm., Bull. Inst. Bot. Buitenzorg, No. 10, pp. 19, 22 (1901).
Phenacaspis " Cooley, in litt. (1902).
Habitat.—Ceylon.
On Eurycles; Myristica moschata; M. laurifolia; mango.

1132. Phenacaspis dubia (Mask.).

Chionaspis dubia Mask., N. Z. Trans., xiv, p. 216 (1881).
" " " Ins. Nox. Ag. N. Z., p. 54 (1887).
" " " N. Z. Trans., xxiii, p. 8 (1890).
Phenacaspis " Cooley, in litt. (1902).
Habitat.—New Zealand.
On Coprosma; Pellæa; Rubus; Asplenium.

1133. Phenacaspis eugeniæ (Mask.).

Chionaspis eugeniæ Mask., N. Z. Trans., xxiv, p. 14 (1891).
" " " " " xxv, p. 211 (1892).
" " " " " xxix, p. 306 (1897).
Phenacaspis " Ckll., Check List, Suppl., p. 398 (1899).
Chionaspis " Full., Tr. Ent. Soc. Lond., p. 472 (1899).
Howardia " Kirkaldy, Fauna Haw., iii, pt. 2, p. 112 (1902).
Phenacaspis " Cooley, Can. Ent., xxxv, p. 48 (1903).

Habitat.—Australia; China; Japan; Ceylon; Hawaiian Islands.

On Eugenia elliptica; Ricinus communis; Eucalyptus; Viburnum; Leptospermum lævigatum; Melaleuca ericifolia; palms.

1134. Phenacaspis flava (Green).

Chionaspis flava Green, Cocc. Ceylon, pt. ii, p. 150 (1899).
Phenacaspis " Cooley, in litt. (1902).

Habitat.—Ceylon.

On Antidesma Bunius.

1135. Phenacaspis latissima (Ckll.).

Chionaspis latissima Ckll., "California Fruit Grower," p. 45 (1897).
" " Cooley; Can. Ent., xxix, p. 282 (1897).
Phenacaspis " " in litt. (1902).

Habitat.—California; Japan.

On Distylium racemosum from Japan.

1136. Phenacaspis litzeæ (Green).

Chionaspis eugeniæ var. litzeæ Green, Ind. Mus. Notes, iv, p. 3 (1896).
" litzeæ Green, Cocc. Ceylon, pt. ii, p. 144 (1899).
Phenacaspis " Cooley, in litt. (1902).

Habitat.—Ceylon.

On Litzea zeylanica.

1137. Phenacaspis lounsburyi (Cooley).

Chionaspis lounsburyi Cooley, Can. Ent., xxx, p. 87 (1898).
Phenacaspis " " in litt. (1902).

Habitat.—Cape Colony, S. Africa.

1138. Phenacaspis megaloba (Green).

Chionaspis megaloba Green, Cocc. Ceylon, pt. ii, p. 149 (1899).
Phenacaspis " Cooley, in litt. (1902).

Habitat.—Ceylon.

On Psidium; Actinodaphne molochina.

1139. Phenacaspis natalensis Ckll.

Phenacaspis natalensis Ckll., Ann. Mag. N. H., (7), ix, p. 25 (1902).

Habitat.—Natal.

On mango.

1140. Phenacaspis nyssæ (Comst.).

(*Sour-gum scale.*)

Chionaspis nyssæ Comst., Rep. U. S. Dep. Ag., 1880, p. 316 (1881).
" " Pack., 5th Rep. U. S. Ent. Com., p. 659 (1890).
Phenacaspis " Ckll., Check List, Suppl., p. 398 (1899).
Chionaspis " Quaint. & Scott, Cocc. Amer., Dec. iii-iv, No. 19 (1901).
Phenacaspis " Cooley, Can. Ent., xxxv, p. 48 (1903).
Habitat.—North Carolina; Georgia.
On "Sour-gum."

1141. Phenacaspis varicosa (Green).

Chionaspis eugeniæ var. varicosa Green, Ind. Mus. Notes, iv, p. 2 (1896).
" varicosa Green, Cocc. Ceylon, pt. ii, p. 146 (1899).
Phenacaspis " Cooley, in litt. (1902).
Habitat.—Ceylon.
On Gelonium lanceolatum.

1142. Phenacaspis xerotidis (Mask.).

Chionaspis xerotidis Mask., N. Z Trans., xxvii, p. 50 (1894).
Phenacaspis " Cooley, in litt. (1902).
Habitat.—Australia.
On Xerotes longifolia.

Genus **HEMICHIONASPIS** Ckll. Type, aspidistræ.

s. g. Hemichionaspis Ckll., Am. Nat., xxxi, p. 592 (1897): g. Cooley, Spec. Bull. Mass. Exp. Sta., p. 44 (1899): Ckll., Check List, Suppl., p. 397 (1899); Bull. Soc. Ent. Fr., lxxi, p. 81 (1902).

1143. Hemichionaspis aspidistræ (Sign.).

Chionaspis aspidistræ Sign., Ann. Soc. Ent. Fr., (4), ix, p. 443 (1869).
" brasiliensis " " " " " " " p. 444 (1869).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 109 (1883).
" aspidistræ Mask., N. Z. Trans., xxiv, p. 15 (1891).
" " Cotes, Ind. Mus. Notes, ii, No. 1, p. 17 (1891).
" braziliensis Mask., N. Z. Trans., xxv, p. 210 (1892).
" " " " " xxvi, p. 68 (1893).
" " Ckll., Jn. Trin. Nat. Club, i, p. 306 (1894).
" " Cotes, Ind. Mus. Notes, iii, No. 5, p. 52 (1894).
" aspidistræ Ckll., Pr. U. S. Nat. Mus., xvii, p. 620 (1895).
" " Newst., Ent. Mon. Mag., xxxii, p. 60 (1896).
" " Mask., " " " " p. 223 (1896).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 35 (1896).
" braziliensis Ckll., Bull. Bot. Dep. Jam., p. 257 (1896).
" " Green, Ind. Mus. Notes, iv, p. 2 (1896).
" " Newst., Ent. Mon. Mag., xxxii, p. 60 (1896).
" " Mask., " " " " p. 223 (1896).

Chionaspis latus Ckll., Psyche, vii, Suppl., i, p. 21 (1896).
" " " Bull. 4, T. s., Dep. Ag., p. 53 (1896).
" aspidistræ Mask., N. Z. Trans., xxix, p. 305 (1897).
" " Green, Ent. Mon. Mag., xxxiii, p. 70 (1897).
" braziliensis Mask., " " " " p. 242 (1897).
" " Ckll., Am. Nat., xxxi, p. 592 (1897).
" latus Berl. e Leon., Annali di Agr., p. 124 (1898).
" aspidistræ Green, Cocc. Ceylon, pt. ii, p. 110 (1899).
Hemichionaspis " Cooley, Spec. Bull. Mass. Exp. Sta., p. 45 (1899).
" " Hemp., Rev. Mus. Paul., iv, p. 516 (1900).
" " var. braziliensis Hemp., Rev. Mus. Paul., iv, p. 516 (1900).
Chionaspis " Newst., Jn. Roy. Hor. Soc., xxiii, p. 17 (1900).
" " " Mon. Brit. Cocc., i, p. 187 (1901).
Hemichionaspis " King, Can. Ent., xxxiv, p. 62 (1902).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 75 (1902).

Habitat.—France; England; India; Formosa; Japan; Ceylon; Australia; Brazil; Trinidad; Canada (in greenhouses); Mass. (Harvard Bot. Gardens); Washington, D. C.; Cal.

On Aspidistra lurida; orchids; ferns; orange; mango; fig; pepper-tree; tea; Acacia melanoxylon; Davallia moorei; Cocos plumosa; Cyanotus; Areca catechu, etc.

1144. **Hemichionaspis cyanogena** Ckll.

Hemichionaspis cyanogena Ckll., The Entom., xxxiv, p. 226 (1901).

Habitat.—Natal.

1145. **Hemichionaspis dracænæ** Cooley.

Hemichionaspis dracænæ Cooley, Spec. Bull. Mass. Exp. Sta., p. 57 (1899).

Habitat.—Socotra Island.

On Dracæna cinnabari.

1146. **Hemichionaspis marchali** Ckll.

Hemichionaspis marchali Ckll., Bull. Soc. Ent. Fr., lxxi, p. 82 (1902).

Habitat.—French Guinea, Africa.

On fruit of oil-palm (Eleis).

1147. **Hemichionaspis minor** (Mask.).

Chionaspis minor Mask., N. Z. Trans., xvii, p. 33 (1884).
" " " Ins. Nox. Agr. N. Z., p. 56 (1887).
" timidus Riley & How., Ins. Life, vi, p. 50 (1893) no desc.
" angustior " " " " " p. 50 (1893) no desc.
" minor Ckll., Ann. Mag. N. H., (6), xvi, p. 62 (1895).
" " " Bull. Bot. Dep. Jam., p. 257 (1896).
" " Cooley, Can. Ent., xxx, p. 89 (1898).
" " Rolfs & Quaint., Cocc. Amer., Dec. i-ii, No. 13 (1898).
Hemichionaspis minor Cooley, Spec. Bull. Mass. Exp. Sta., p. 52 (1899).
Chionaspis albizziæ Green, Cocc. Ceylon, pt. ii, p. 115 (1899).

Hemichionaspis minor Hemp., Rev. Mus. Paul., iv, p. 517 (1900).
Chionaspis " Lefroy, Scale Ins. Less. Antil., p. 59 (1901).
Hemichionaspis " Kuw., Pr. Cal. Ac. Sci., (3), iii, p.75 (1902).

Habitat.—New Zealand; Japan; Ceylon; Brazil; Grenada; Antigua; Jamaica; Panama; Florida.

On Parsonia; Rhipogonum scandens; Hibiscus; Capsicum; Melia Azedarach; Cycas revoluta; cocoa-palm; cotton; pepper; Pelargonium; oleander; orange; Albizzia stipulata; Agave; fig, etc.

Hemichionaspis minor strachani Cooley.

Hemichionaspis minor var. strachani Cooley, Spec. Bull. Mass. Exp. Sta., p. 54 (1899).
" " " " Kuw., Pr. Cal. Ac. Sci.,(3),iii,p.75(1902).

Habitat.—West Africa.

1148. Hemichionaspis mussændæ (Green).

Chionaspis aspidistræ var. mussændæ Green, Ind. Mus. Notes, iv,p.2 (1896).
" " " " Mask.,Ent.Mon.Mag.,xxxii,p.224(1896).
" " " " " N. Z. Trans., xxix, p.306 (1897).
" mussændæ Green, Cocc. Ceylon, pt. ii, p. 117 (1899).
Hemichionaspis " Cooley, Spec. Bull. Mass. Exp. Sta., p. 49 (1899).

Habitat.—Ceylon.

On Mussænda frondosa; Loranthus; Debregeasia.

1149. Hemichionaspis rhododendri (Green).

Chionaspis rhododendri Green, Cocc. Ceylon, pt. ii, p. 119 (1899).
Hemichionaspis " Cooley, Spec. Bull. Mass. Exp. Sta., p. 56 (1899).

Habitat.—Ceylon.

On Rhododendron arboreum.

1150. Hemichionaspis scrobicularum (Green).

Chionaspis scrobicularum Green, Cocc. Ceylon, pt. ii, p. 121 (1899).
Hemichionaspis " Cooley, Spec. Bull. Mass. Exp. Sta., p. 55 (1899).

Habitat.—Ceylon.

On Elæocarpus amœnus.

1151. Hemichionaspis separata (Green).

Chionaspis separata Green, Ind. Mus. Notes, v, No. 1, p. 5 (1900).
Hemichionaspis " Ckll., in litt. (1902).

Habitat.—Darjeeling.

On tea leaves.

1152. Hemichionaspis theæ (Mask.).

Chionaspis theæ Mask., Ind. Mus. Notes, ii. No. 1, p. 60 (1891).
" " " N. Z. Trans., xxiv. p.14 (1891).
Aspidiotus " " " " xxv, p. 207 (1892).

Chionaspis theæ Cotes, Ind. Mus. Notes, ii, No. 6, p. 168 (1893).
" " " " " " iii, No. 1, p. 25 (1893).
" " " " " " " No. 4, p. 39 (1894).
" " Ckll., Pr. U. S. Nat. Mus., xvii, p. 620 (1895).
" exercitata Green, Ind. Mus. Notes, iv, p. 3 (1896).
" aspidistræ var. theæ Mask., N. Z. Trans., xxix, p. 305 (1897).
" theæ Green, Cocc. Ceylon, pt. ii, p. 113 (1899).
Hemichionaspis theæ Cooley, Spec. Bull. Mass. Exp. Sta., p. 51 (1899).
Habitat.—India; Ceylon.
On Thea; Psychotria.

Genus **PINNASPIS** Ckll. Type, pandani=buxi.

Pinnaspis Ckll., Journ. Inst. Jam., i, p. 136 (1892).

1153. Pinnaspis bambusæ Ckll.

Pinnaspis bambusæ Ckll., Ent. Mon. Mag., xxix, p. 157 (1893).
" " " Bull. Bot. Dep. Jam., p. 149 (1897).
Habitat.—Jamaica.
On bamboo.

1154. Pinnaspis buxi (Bouché).

Aspidiotus buxi Bouché, Stett. Ent. Zeit., xii, p. 111 (1851).
Mytilaspis " Sign., Ann. Soc. Ent. Fr., (4), x, p. 93 (1870).
Aspidiotus " Kalt., Die Pflanz., p. 526 (1874).
Mytilaspis pandani Comst., Rep. U. S. Dep. Ag., 1880, p. 324 (1881).
" buxi " 2nd Rep. Dep. Ent. Corn. Univ., p. 121 (1883).
" " Morg., Ent. Mon. Mag., xxvi, p. 229 (1890).
" " Ckll., " " " xxix, p. 38 (1893).
Pinnaspis pandani " " " " " p. 157 (1893).
" " " Jn. Trin. Nat. Club, i, p. 307 (1894).
" " " Bull. Bot. Dep. Jam., p. 149 (1897).
" " Berl. e Leon., Cherm. Ital., Fasc. iii, No. 58 (1898).
" " King, Can. Ent., xxxi, p. 229 (1899).
" buxi Newst., Mon. Brit. Cocc., i, p. 207 (1901).
Habitat.—Mass.; N. Y.; Jamaica; Trinidad; Panama; Grenada; Europe.
On Buxus sempervirens; Dictyosperma album; Areca lutescens; cocoa-palm; Pandanus conoideus; Anthurium cristallinum; Thrinax excelsa; Dracæna.

Pinnaspis buxi alba Ckll.

Pinnaspis pandani var. alba Ckll., Jn. Trin. Nat. Club, i, p. 307 (1894).
Habitat.—Trinidad.
On palm.

Genus **POLIASPIS** Mask. Type, media.

Poliaspis Mask., N. Z. Trans., xii, p. 293 (1879): Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 126 (1883): Mask., Ins. Nox. Agr. N. Z., p. 56 (1887): Full., Tr. Ent. Soc. Lond., p. 470 (1899): Newst., Mon. Brit. Cocc., i, p. 176 (1901).

1155. **Poliaspis carissæ** Ckll.

Poliaspis carissæ Ckll., The Entom., xxxv, p. 112 (1902).
Habitat.—Natal.
On Carissa.

1156. **Poliaspis casuarinæ** Lidg.

Poliaspis casuarinæ Lidg., The Wombat, iv, p. 14 (1898).
Habitat.—Victoria, Australia.
On Casuarina suberosa.

1157. **Poliaspis cycadis** Comst.

Poliaspis cycadis Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 126 (1883).
" " Dougl., Ent. Mon. Mag., xxiv. p. 22 (1887).
" " Newst., Mon. Brit. Cocc., i, p. 177 (1901).
Habitat.—Washington, D. C.; Great Britain.
On Cycas revoluta; Dion edule; palms.

1158. **Poliaspis exocarpi** Mask.

Poliaspis exocarpi Mask., N. Z. Trans., xxiv. p. 17 (1891).
" " " " " xxvi, p. 72 (1893).
" " " " " xxvii, p. 52 (1894).
" " " " " xxviii, p. 391 (1896).
" " " " " xxix, p. 306 (1897).
Habitat.—Australia.
On Exocarpus cupressiformis; Santalum; Leptospermum; Oxylobium trilobatum; Dillwynia ericifolia.

1159. **Poliaspis intermedia** Full.

Poliaspis intermedia Full., Notes on Cocc. W. Austr., p. 5 (1897).
" " " Tr. Ent. Soc. Lond., p. 470 (1899).
Habitat.—W. Australia.
On "a leguminous plant."

1160. **Poliaspis media** Mask.

Poliaspis media Mask., N. Z. Trans., xii, p. 293 (1879).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 128 (1883).
" " Mask., Ins. Nox. Agr. N. Z., p. 57 (1887).
Habitat.—New Zealand.
On Veronica; Leucopogon Fraseri; Cyathodes acerosa; ferns.

1161. **Poliaspis nitens** Full.

Poliaspis nitens Full., Notes on Cocc. W. Austr., p. 5 (1897).
" " " Tr. Ent. Soc. Lond., p. 470 (1899).
Habitat.—W. Australia.
On Daviesia.

1162. **Poliaspis pini** Mask.

Poliaspis pini Mask., Ent. Mon. Mag., xxxiii, p. 242 (1897).
" " " N. Z. Trans., xxx, p. 231 (1898).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 82 (1902).
Habitat.—Japan.
On Pinus densiflora; P. austriaca; P. thunbergii; Abies firma; A. bicolor; Torreya nucifera; Podocarpus chinensis.

Genus **LEUCASPIS** Targ. Type, candida=pini.

Leucaspis Targ., Catalogue, p. 41 (1869): Sign., Ann. Soc. Ent. Fr., (4), x, p. 100 (1870): Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 129 (1883): Mask., N. Z. Trans., xxv, p. 209 (1892).

1163. **Leucaspis bambusæ** Kuwana.

Leucaspis bambusæ Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 74 (1902).
Habitat.—Japan.
On bamboo.

1164. **Leucaspis cordylinidis** Mask.

Leucaspis cordylinidis Mask., N. Z. Trans., xxv, p. 209 (1892).
Habitat.—Australia.
On Cordyline.

1165. **Leucaspis epidaurica** Genn.

Leucaspis epidaurica Genn., Ann. Soc. Ent. Fr., (6), iii, p. 31 (1883).
Habitat.—Greece.
On olive.

1166. **Leucaspis japonica** Ckll.

Leucaspis japonicus Ckll., Psyche, viii, p. 53 (1897).
" " Craw, Rep. Cal. Bd. Hort., p. 111 (1897-98).
Habitat.—California; Japan.
On broom (from Japan); apple; maple; Magnolia; Pæonia.

1167. **Leucaspis loewi** Colvée.

Leucaspis loewi Colvée, Nuevos Estud. sob. alg. Cocc., p. 10 (1882).
" " Loew., Wien. Ent. Zeit., ii, p. 43 (1883).
Habitat.—Valencia.
On pine.

1168. Leucaspis pini (Hartig).

Coccus pini Hartig, Jahresb. u. d. Forstwiss., p. 642 (1839).
Aspidiotus flavus " " " " p. 642 (1839) female.
" pini Bouché, Stett. Ent. Zeit., xii, p. 111 (1851).
Leucaspis candida Targ., Catalogue, p. 41 (1869).
" pini Sign., Ann. Soc. Ent. Fr., (4), x, p. 102 (1870).
Aspidiotus flavus " " " " " " " p. 108 (1870).
Coccus pini Riley, 5th Rep. Ins. Mo., p. 98 (1873).
Leucaspis pini Sign., Bull. Soc. Ent. Fr., (6), ii, p. clxxxiv (1882).
Aspidiotus flavus " " " " " " " p. clxxxiv (1882).
Leuçaspis pini Loew, Wien. Ent. Zeit., i, p. 273 (1882).
" " " " " " ii, p. 5 (1883).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 129 (1883).
" " Witlaczil, Zur Morph. Anat. Cocc., p. 158 (1885).
" " " Zeit. f. Wiss. Zool., xliii, p. 149 (1886).
Aspidiotus " Eckst., Die Kiefer, i, p. 32 (1893).
Leucaspis " Newst., Ent. Mon. Mag., xxx, p. 181 (1894).
" " Saccardo, Riv. Pat. Veg., iv, p. 52 (1895).
" " Berl. e Leon., Cherm. Ital., Fasc. i, No. 19 (1895).
Aspidiotus " Eckst., Forst. Zool., p. 558 (1897).
Habitat.—Europe.
On pine.

1169. Leucaspis pusilla Loew.

Leucaspis pusilla Loew, Wien. Ent. Zeit., ii, p. 3 (1883).
Habitat.—Austria.
On Pinus sylvestris.

1170. Leucaspis signoreti Targ.

Leucaspis signoreti Targ., Catalogue, p. 42 (1869).
" " Sign., Ann. Soc. Ent. Fr., (4), x, p. 100 (1870).
" " " Bull. " " " (6), ii, p. clxxxv (1882).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 129 (1883).
Habitat.—Europe.
On pine.

Genus **SYNGENASPIS** Sulc. Type, parlatoriæ.

Syngenaspis Sulc, Sitzb. K. Bohm. Ges. Wiss., No. xlix, pp. 2, 15 (1895).

1171. Syngenaspis parlatoriæ Sulc.

Syngenaspis parlatoriæ Sulc, Sitzb. K. Bohm. Ges. Wiss., No. xlix, pp. 3, 15 (1895).
Habitat.—Europe.

Genus **FIORINIA** Targ. Type pellucida=fioriniæ.

Fiorinia Targ., Catalogue, p. 42 (1869): Sign., Ann. Soc. Ent. Fr., (4), ix, p. 449 (1869): Comst., Rep. U. S. Dep. Ag., 1880, p. 328 (1881): Mask., Ins. Nox. Agr. N. Z., p. 57 (1887): Green, Coccidæ Ceylon, pt. i, p. 93 (1896): Newst., Mon. Brit. Cocc., i, p. 133 (1901).
Uhleria Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 110 (1883).

1172. Fiorinia acaciæ Mask.

Fiorinia acaciæ Mask., N. Z. Trans., xxiv, p. 16 (1891).
" " Frog., Ag. Gaz. N. S. W., July, p. 19 (1902).
Habitat.—New Zealand; Australia.
On Acacia pycnantha.

Fiorinia acaciæ bilobis Full.

Fiorinia acaciæ var. bilobis Full., Notes on Cocc. W. Austr., p. 5 (1897).
" " " " " Tr. Ent. Soc. Lond., p. 472 (1899).
Habitat.—W. Australia.
On Acacia pulchella.

1173. Fiorinia alæodendri de Charm.

Fiorinia alæodendri de Charm., Pr. Soc. Amic. Scien., p. 36 (1899).
Habitat.—Mauritius.

1174. Fiorinia bambusæ Mask.

Fiorinia bambusæ Mask., Ent. Mon. Mag., xxxiii, p. 242 (1897).
" " " N. Z. Trans., xxx, p. 233 (1898).
Habitat.—China.
On Bambusa fortunei.

1175. Fiorinia casuarinæ Mask.

Fiorinia casuarinæ Mask., N. Z. Trans., xxix, p. 307 (1897).
Habitat.—Australia.
On Casuarina.

1176. Fiorinia cockerelli de Charm.

Fiorinia cockerelli de Charm., Pr. Soc. Amic. Scien., p. 33 (1899).
Habitat.—Mauritius.

1177. Fiorinia expansa Mask.

Fiorinia expansa Mask., N. Z. Trans., xxvii, p. 51 (1894).
" " " " " xxviii, p. 391 (1896).
Habitat.—Australia.
On Melaleuca linariifolia.

1178. Fiorinia fioriniæ (Targ.).

Diaspis fioriniæ Targ., Studii sul. Cocc., p. 14 (1867).
Chermes arecæ Bdv., Insectologie Agricole, p. 262 (1868).

Fiorinia pellucida Targ., Catalogue, p. 42 (1869).
" " Sign., Ann. Soc. Ent. Fr., (4), ix, p. 449 (1869).
" camelliæ Comst., Rep. U. S. Dep. Ag., 1880, p. 329 (1881).
Uhleria fioriniæ " 2nd Rep. Dep. Ent. Corn. Univ., p. 111 (1883).
" camelliæ " " " " " " " p. 111 (1883).
Fiorinia pellucida Morg., Ent. Mon. Mag., xxv, p. 46 (1888).
Uhleria camelliæ " " " " " p. 46 (1888).
Fiorinia " Riley, Ins. Life, i, p. 377 (1889).
" pellucida " " " " p. 355 (1889).
" camelliæ Mask., N. Z. Trans., xxiv, p. 16 (1891).
" " " " " xxv. p. 211 (1892).
Uhleria fioriniæ Morg., Ent. Mon. Mag., xxviii, p. 12 (1892).
Fiorinia " Ckll., " " " xxix, p. 39 (1893).
" camelliæ Morg., Bull. 28, La. Exp. Sta., p. 995 (1893).
" fioriniæ Ckll., Can Ent., xxvi, p. 33 (1894).
" camelliæ Berl. e Leon., Cherm. Ital., Fasc. i, No. 25 (1895).
" fioriniæ var. camelliæ Ckll., Check List, p. 337 (1896).
Uhleria camelliæ Davis. Spec. Bull. 2, Mich. Exp. Sta., p. 38 (1896).
Fiorinia fioriniæ Green, Cocc. Ceylon, pt. i, p. 94 (1896).
" palmæ " Ind. Mus. Notes, iv, p. 5 (1896).
" fioriniæ Ckll., Bull. Bot. Dep. Jam., p. 149 (1897).
" pinicola Mask., Ent. Mon. Mag., xxxiii, p. 242 (1897).
" fioriniæ var. camelliæ Rolfs & Quaint., Cocc., Amer., Dec. i-ii, No. 6 (1898).
" " de Charm., Pr. Soc. Amic. Scien., p. 37 (1899).
" " Green. Jn. Bomb. N. H. Soc., xiii, p. 256 (1900).
" " Hemp., Rev. Mus. Paul., iv, p. 509 (1900).
" " Newst., Jn. Roy. Hor. Soc., xxiii, p. 17 (1900).
" " " Mon. Brit. Cocc., i, p. 134 (1901).
" pellucida Kirkaldy, Faun. Haw., iii, pt. 2, p. 112 (1902).

Habitat.—Europe; Australia; Ceylon; Hawaiian Islands; Mauritius; China; Brazil; Jamaica; Barbados; Mexico; Mass.; Md.; Washington, D. C. (in greenhouses); La.; Col.; Cal.

On cocoanut-palm; Camellia; Areca aurea; Cycas revoluta; Anthurium acaule; Phytelephas macrocarpa; Kentia Balmoreana; Hedera helix; Leptospermum; Ficus; Livistona; Podocarpus; Cupressus; tea; ferns, etc.

Fiorinia fioriniæ japonica Kuw.

Fiorinia fioriniæ var. japonica Kuw., Pr. Cal. Ac. Sci., (3), III, p. 79 (1902).

Habitat.—Japan.

On Podocarpus chinensis; Pinus.

Fiorinia fioriniæ minor Mask.

Fiorinia camelliæ var. minor Mask., N. Z. Trans., xxix, p. 307 (1897).
" " " " " Ent. Mon. Mag., xxxiii, p. 242 (1897).

Habitat.—Amoy; Formosa; Australia.

On Camellia; Ficus; palms.

1179. Fiorinia gigas (Mask.).

Diaspis gigas Mask., N. Z. Trans., xi, p. 201 (1878).
" " " " " xiv, p. 217 (1881).
Uhleria " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 111 (1883).
Diaspis " Mask., N. Z. Trans., xvii, p. 24 (1884).
Fiorinia asteliæ " Ins. Nox. Ag. N. Z., p. 58 (1887).
" gigas " N. Z. Trans., xxii, p. 137 (1889).
Habitat.—New Zealand.
On Atherosperma Novæ Zælandiæ; Astelia cunninghamii; Coprosma; Pittosporum eugenioides.

1180. Fiorinia grossulariæ Mask.

Fiorinia grossulariæ Mask., N. Z. Trans., xvi, p. 123 (1883).
" " " Ins. Nox. Agr. N. Z., p. 59 (1887).
Habitat.—New Zealand.
On gooseberry.

1181. Fiorinia kewensis Newst.

Fiorinia kewensis Newst., Ent. Mon. Mag., xxxvii, p. 82 (1901).
" " " Mon. Brit. Cocc., i, p. 137 (1901).
Habitat.—Royal Gardens, Kew, England.
On Howea forsteriana.

1182. Fiorinia lidgetti Green.

Fiorinia lidgetti Green, Victorian Naturalist, xv, p. 10 (1900).
Habitat.—Australia.

1183. Fiorinia minima Mask.

Fiorinia minima Mask., N. Z. Trans., xvi, p. 122 (1883).
" " " Ins. Nox. Agr. N. Z., p. 59 (1887).
Habitat.—New Zealand.
On Brachyglottis repanda; Panax arboreum.

1184. Fiorinia nephelii Mask.

Fiorinia nephelii Mask., Ent. Mon. Mag., xxxiii, p. 242 (1897).
" " " N. Z. Trans., xxx, p. 234 (1898).
Habitat.—China; Formosa; Queensland.
On Nephelium longana.

1185. Fiorinia proboscidaria Green.

Fiorinia proboscidaria Green, Jn. Bomb. N. H. Soc., xiii, p. 256 (1900).
Habitat.—Ceylon.
On Gelonium lanceolatum.

1186. Fiorinia rubra Mask.

Fiorinia rubra Mask., N. Z. Trans., xxvi, p. 71 (1893).
Habitat.—Australia.
On Acacia.

Fiorinia rubra propinqua Mask.

Fiorinia rubra var. propinqua Mask., N. Z. Trans., xxix, p. 307 (1897).
Habitat.—Australia.
On Acacia.

1187. **Fiorinia saprosmæ** Green.

Fiorinia saprosmæ Green, Ind. Mus. Notes, iv, p. 5 (1896).
" " " Cocc. Ceylon, pt. i, p. 96 (1896).
" " " Jn. Bomb. N. H. Soc., xiii, p. 256 (1900).
Habitat.—Ceylon.
On Saprosma.

Fiorinia saprosmæ gelonii Green.

Fiorinia saprosmæ var. gelonii Green, Jn. Bomb. N.H.Soc.,xiii,p. 256 (1900).
Habitat.—Ceylon.
On Gelonium lanceolatum.

1188. **Fiorinia scrobicularum** Green.

Fiorinia scrobicularum Green, Ind. Mus. Notes, iv, p. 5 (1896).
" " " Cocc. Ceylon, pt. i, p. 100 (1896).
Habitat.—Ceylon.
On Gærtnera kœnigii.

1189. **Fiorinia secreta** Green.

Fiorinia secreta Green, Ind. Mus. Notes, iv, p. 5 (1896).
" " " Cocc. Ceylon, pt. i, p. 102 (1896).
Habitat.—Ceylon.
On Grewia orientalis.

1190. **Fiorinia signata** Mask.

Fiorinia signata Mask., Ent. Mon. Mag., xxxiii, p. 242 (1897).
" " " N. Z. Trans., xxx, p. 231 (1898).
Habitat.—Japan.
On Bambusa tessellata.

1191. **Fiorinia similis** Green.

Fiorinia similis Green, Cocc. Ceylon, pt. i, p. 98 (1896).
Habitat.—Ceylon.

1192. **Fiorinia stricta** Mask.

Fiorinia stricta Mask., N. Z. Trans., xvi, p. 124 (1883).
" " " " " xvii, p. 24 (1884).
" " " Ins. Nox. Agr. N. Z., p. 60 (1887).
" " Ckll., Gard. Chron., (3), xiii, p. 548 (1893).
Habitat.—New Zealand.
On Dendrobium; Hedycarpus; Phormium tenax; Cordyline australis; Astelia cunninghamii; Hoheria angustifolia.

1193. Fiorinia(?) sulcii Newst.

||Leucaspis pini Morg. (non Hart.), Ent. Mon. Mag., xxviii, p. 13 (1892).
" " Newst., " " " " " xxx, p. 181 (1894).
Fiorinia sulcii " Ent. Mon. Mag., xxx, p. 232 (1894).
Habitat.—Europe.
On pine.

1194. Fiorinia syncarpiæ Mask.

Fiorinia syncarpiæ Mask., N. Z. Trans., xxv, p. 212 (1892).
Habitat.—Australia.
On Syncarpia laurifolia.

1195. Fiorinia tenuis Mask.

Fiorinia tenuis Mask., Ent. Mon. Mag., xxxiii, p. 242 (1897).
" " " N. Z. Trans., xxx, p. 232 (1898).
Habitat.—Japan.
On Bambusa.

1196. Fiorinia theæ Green.

Fiorinia theæ Green, Ind. Mus. Notes, v, p. 3 (1900).
Habitat.—India.
On tea-plant.

Genus **EPIDIASPIS** Ckll. Type, piricola.

Epidiaspis Ckll., Check List, Coccidæ, Suppl., p. 398 (1899); The Entom., xxxv, p. 59 (1902).

1197. Epidiaspis piricola (Del Guer.).

||Diaspis ostreæformis Sign. (non Curt.), Ann. Soc. Ent.Fr.,(4),ix,p.439(1869).
" " " " " " " " " (5),vi,p.603(1876).
" " Licht., Bull. Soc. Ent. Fr., (6), i, p. li (1881).
" " Sign., " " " " " " p. lii (1881).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p.94 (1883).
" " Goethe, Jahrb. Nass. Ver. Nat., pp. 114, 128 (1884).
" " Morg., Ent. Mon. Mag., xxv, p. 119 (1888).
" " " " " " xxvi, p. 42 (1890).
Aspidiotus piricola Del Guer., Il Naturalista Siciliano, p. 142 (1894).
" pyricola Berl., Riv. Pat. Veg., iv, p. 185 (1895).
Diaspis ostreæformis Berl. e Leon., Cherm. Ital., Fasc. i, No. 10 (1895).
Aspidiotus piricola Ckll., Can. Ent., xxvii, p. 260 (1895).
" " Smith J. B., Rep. N. J. Exp. Sta., p. 499 (1896).
Diaspis " Ckll., Bull. 6, T. s., Dep. Ag., p. 4 (1897).
" fallax Horvath, Rev. Ent. France, xvi, p. 95 (1897).
? " snowii Hunter, Kan. Univ. Quar., viii, p. 14 (1899).
" piricola Marlatt, Ent. News, xi, p. 590 (1900).
" ostreæformis Felt, Bull. 46, N. Y. St. Mus., p. 359 (1901).
" fallax Frank & Kruger, Schildlausbuch, pp. 39, 85 (1901).
" piricola Ckll., The Entom., xxxv, p. 59 (1902).

Habitat.—Italy; France; Portugal; Germany; England; New York; California.

On plum; apple; pear; peach; currant.

Genus **ASPIDIOTUS** Bouché. Type, nerii=hederæ.

Aspidiotus Bouché, Naturg. Schädl. Gart. Ins., p. 52 (1833): Naturg. Ins., p. 9 (1834): Burm., Handb. Ent., ii, p. 66 (1835): Curt., Gard. Chron., iii, p. 804 (1843): Targ., Mem. Soc. Ital. Sci. Nat., No. 3 (1867): Catalogue, p. 43 (1869): Comst., Rep. U. S. Dep. Ag., 1880, p. 292 (1881); 2nd Rep. Dep. Ent. Corn. Univ., p. 55 (1883): Targ., Coccin. deg. Agr. Ital., p. 20 (1891): Green, Coccidæ Ceylon, pt. i, p. 39 (1896): Newst., Mon. Brit. Cocc., i, p. 80 (1901).

Phaulaspis Leon., Riv. Pat. Veg., v, p. 284 (1897). Type, hakeæ.
Chentraspis " " " " vi, p. 111 (1897). " unilobis.
s. g. Hemiberlesia Leon., Riv. Pat. Veg., vi, p. 117 (1897). Type rapax.
s. g. Diaspidiotus " " " " " p. 215 (1898). " ancylus.
s. g. Aspidiella " " " " " p. 220 (1898). " sacchari.
s. g. Evaspidiotus " " " " " p. 232 (1898). " hederæ.
s. g. Cryptoaonidia " " " " viii, p. 323 (1900). " hakeæ.

1198. **Aspidiotus abietis** (Schr.).

Coccus abietis Schr. (non Mod.), Beitr. z. Naturg., p. 48 (1776).
" pineti Schr., Faun. Boica, ii, pt. i, p. 146 (1801).
" flavus Hartig, Jahresb. u. d. Forstwiss., i, p. 642 (1839) male.
Aspidiotus " Sign., Ann. Soc. Ent. Fr., (4), x, p. 108 (1870).
" pini Comst., Rep. U. S. Dep. Ag., 1880, p. 306 (1881).
Coccus abietis Sign., Bull. Soc. Ent. Fr., (6), ii, p. clxxxiv (1882).
" " Loew, Wien. Ent. Zeit., i, p. 270 (1882).
Aspidiotus abietis Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 57 (1883).
" pini Targ., Annali di Agr. (1884).
" " Pack., 5th Rep. U. S. Ent. Com., p. 807 (1890).
" abietis " " " " " " p. 878 (1890).
" " Ckll., Can. Ent., xxvi, p. 190 (1894).
" pini " " " " p. 190 (1894).
" abietis Newst., Ent. Mon. Mag., xxx, p. 179 (1894).
" " Ckll., Bull. 6, T. s., Dep. Ag., pp. 10, 18 (1897).
" " Leon., Riv. Pat. Veg., vii, p. 67 (1898).
" " Smith, Rep. N. J. St. Bd. Ag., p. 12 (1899).
" " Leon., Gen. e Spec. Diaspiti, Asp., p. 94 (1900).
" " King, Can. Ent., xxiv, p. 61 (1902).

Habitat.—Europe; Maine; Mass.; New York; New Jersey; Georgia.

On hemlock; pine; maple; fir.

1199. **Aspidiotus æsculi** Johnson.

Aspidiotus æsculi Johns., Bull. Ill. St. Lab. N. H., iv, p. 386 (1896).
" " " Ent. News, vii, p. 152 (1896).

A. (Diaspidiotus) æsculi Ckll., Bull. 6, T. s., Dep. Ag., p. 20 (1897).
Aspidiotus æsculi Newell, Contr. Ia. Ag. Coll., No. 3, p. 13 (1899).
Chrysomphalus æsculi Leon., Gen. e Spec. Diaspiti, Asp., p. 225 (1900).
Habitat.—California.
On Æsculus californica.

Aspidiotus æsculi solus Hunter.

Aspidiotus æsculi subsp. solus Hunter, Kan. Univ. Quar., viii, p. 12 (1899).
" " " " Newell, Contr. Ia. Ag. Coll., No.3.p.13 (1899).
Habitat.—Kansas.
On Juglans nigra.

1200. Aspidiotus ancylus (Putn.).

?Aspidiotus circularis Fitch, 3rd Rep. Ins. N. Y., p. 426 (1856).
? " " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 601 (1876).
Diaspis ancylus Putn., Tr. Ia. Hor. Soc., xii, p. 321 (1877).
Aspidiotus " " Pr. Dav. Ac. N. Sci., ii, p. 346 (1879).
" " Comst., Rep. U. S. Dep. Agr., 1880, p. 292 (1881).
" " " 2nd Rep. Dep. Ent. Corn. Univ., p. 58 (1883).
" " Pack., 5th Rep. U. S. Ent. Com., p. 553 (1890).
" " Ckll., Can. Ent., xxvi, p. 19 (1894).
" " " " " xxvii, p. 261 (1895).
" " Lugger, Bull. 43, Minn. Exp. Sta., p. 225 (1895).
" " " Rep. Minn. Exp. Sta., p. 129 (1895).
" " Ckll., Bull. 19, N. Mex. Exp. Sta., p. 106 (1896).
" " Lint., 11th Rep. Ins. N. Y., p. 275 (1896).
" " Fletcher, 28th Rep. Ent. Soc. Ont., p. 87 (1897).
" circularis Ckll., Bull. 6, T. s., Dep. Ag., p. 4, note (1897).
" (Diaspidiotus) ancylus Ckll., Bull. 6, T. s., Dep.Ag.,pp.8,20(1897).
" ancylus Gillette, Bull. 38, Col. Exp. Sta., p. 36 (1897).
" " " " 47, " " " p. 15 (1898).
" " Lowe, Rep. N. Y. Exp. Sta., 1897, p. 458 (1898).
" " Johns., Can. Ent., xxx, p. 82 (1898).
" " Aldr., Bull. 15, Idaho Exp. Sta., p. 175 (1898).
" " Osborn, Contr. Ia. Ag. Coll., p. 6 (1898).
" (Diaspidiotus) ancylus Leon., Riv. Pat. Veg., vi, p. 216 (1898).
" ancylus Berl. e Leon., Annali di Agr., p. 108 (1898).
" " Pettit, Bull. 160, Mich. Exp. Sta., p. 414 (1898).
" " Forbes, 20th Rep. Ins. Ill., p. 16 (1898).
" " Reh, Jahrb. Hamb. Wiss. Anst., xvi, pp. 8, 10 (1898).
" " Fletcher, 30th Rep. Ent. Soc. Ont., p. 109 (1899).
" " Newell, Contr. Ia. Ag. Coll., No. 3, pp. 1, 7 (1899).
" " " Bull. 43, Ia. Ag. Coll., p. 160 (1899).
" " Hunter, Kan. Univ. Quar., viii, p. 4 (1899).
" " Lugger, 6th Rep. Minn. Exp. Sta., p. 224 (1900).
" circularis Marlatt, Ent. News, xi, p. 590 (1900).

Aspidiotus ancylus Quaint. & Scott, Cocc. Amer., Dec. iii-iv, No. 9 (1901).
" " Frank & Kruger, Schildlausbuch, p. 72 (1901).
" " Felt, Bull. 46, N. Y. St. Mus., pp. 326, 351 (1901).
" " Banks, Bull. 34, n. s., Dep. Ag., p. 19 (1902).

Habitat.—Can.; Mass.; N. Y.; N. J.; Del.; Md.; D. C.; Va.; Ga.; Ohio; Ill.; Ia.; Minn.; Kan.; Col.; N. Mex.; Wash.; Germany.

On ash; beech; maple; oak; linden; peach; cherry; apple; pear; quince; osage orange; hackberry; currant; bladder-nut, etc.

Aspidiotus ancylus serratus Newell & Ckll.

Aspidiotus ancylus var. serratus Newell & Ckll., Ia. Ac. Sci., v. p. 229 (1898).
" " " " " Contr. Ia. Ag. Coll., No. 3, p. 8 (1899).

Habitat.—Iowa.

On willow.

Aspidiotus ancylus latilobis Newell.

Aspidiotus ancylus var. latilobis Newell, Contr. Ia. Ag. Coll., No. 3, p. 9 (1899).

Habitat.—Iowa.

On mountain-ash.

1201. Aspidiotus atherospermæ Mask.

Aspidiotus atherospermæ Mask., N. Z. Trans., xi, p. 198 (1878).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 72 (1883).
" " Mask., Ins. Nox. Agr. N. Z., p. 40 (1887).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 25 (1897).

Habitat.—New Zealand.

On Atherosperma Novæ Zælandiæ.

1202. Aspidiotus bilobis Mask.

Aspidiotus bilobis Mask., N. Z. Trans., xxx, p. 225 (1898).
Hemiberlesia " Leon., Gen. e Spec. Diaspiti, Asp., p. 221 (1900).

Habitat.—China.

On grass.

1203. Aspidiotus bossieæ Mask.

Aspidiotus bossieæ Mask., N. Z. Trans., xxiv, p. 10 (1891).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 26 (1897).
Hemiberlesia " Leon., Riv. Pat. Veg., vi, p. 122 (1897).
" " " Gen. e Spec. Diaspiti, Asp., p. 21 (1900).

Habitat.—Australia.

On Bossiæa procumbens.

1204. Aspidiotus britannicus Newst.

Aspidiotus hederæ Newst. (non Vall.), Ent. Mon. Mag., xxxii, p. 279 (1896).
" britannicus Newst., " " " xxxiv, p. 93 (1898).
" " Leon., Gen. e Spec. Diaspiti, Asp., p. 223 (1900).
" " Newst., Journ. Roy. Hor. Soc., xxiii, p. 6 (1900).
" " " Mon. Brit. Cocc., i, p. 117 (1901).
" " King, Can. Ent., xxxiv, p. 61 (1902).

Habitat.—England; Mass.; Oregon.

On holly; Ruscus hypoglossum.

1205. **Aspidiotus caldesii** Targ.

Aspidiotus caldesii Targ., Catalogue, p. 43 (1869).
" " Sign., Ann. Soc. Ent. Fr., (4), ix, p. 116 (1869).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 73 (1883).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 18 (1897).
Habitat.—Italy: W. Australia.
On Daphne collina: Acacia.

1206. **Aspidiotus candidulus** Ckll.

Aspidiotus (Hemiberlesia) candidulus Ckll., Can. Ent., xxxii, p. 130 (1900).
Habitat.—Arizona.
On Prosopis velutina.

1207. **Aspidiotus ceratus** Mask.

Aspidiotus ceratus Mask., N. Z. Trans., xxvii, p. 39 (1894).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 26 (1897).
Aonidiella cerata Leon., Riv. Pat. Veg., vii. p. 191 (1899).
" " " Gen. e Spec. Diaspiti, Asp., p. 146 (1900).
Habitat.—Australia.
On Acacia stenophylla; Templetonia.

1208. **Aspidiotus chamæropsis** Sign.

Aspidiotus chamæropsis Sign., Ann. Soc. Ent. Fr., (4), ix, p. 118 (1869).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 74 (1883).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 29 (1897).
Habitat.—France?
On Chamærops australis.

1209. **Aspidiotus coloratus** Ckll.

Aspidiotus uvæ var. coloratus Ckll., Psyche, vi, p. 571 (1893).
" coloratus Ckll., The Entom., xxx, p. 14 (1897).
A. (Diaspidiotus) coloratus Ckll., Bull. 6, T. s., Dep. Ag., p. 20 (1897).
A. (Evaspidiotus) " Leon., Riv. Pat. Veg., vii, p. 65 (1898).
Aspidiotus coloratus Newell, Contr. Ia. Ag. Coll., No. 3, p. 11 (1899).
" (Evaspidiotus) coloratus Leon., Gen. e Spec. Diaspiti, Asp., p. 92 (1900).
Habitat.—New Mexico.
On Chilopsis.

1210. **Aspidiotus comstocki** Johnson.

Aspidiotus comstocki Johns., Ent. News, vii, p. 151 (1896).
" " " Bull. Ill. St. Lab. N. H., iv, p. 383 (1896).
A. (Diaspidiotus) comstocki Ckll., Bull. 6, T. s., Dep. Ag., p. 20 (1897).
Aspidiotus comstocki Newell, Contr. Ia. Ag. Coll., No. 3. p. 22 (1899).
" (Aspidiella) comstocki Leon., Gen. e Spec. Diaspiti, Asp., p. 222 (1900).
Habitat.—New York; Ohio; Illinois; Iowa.
On maple.

1211. Aspidiotus coniferarum Ckll.

Aspidiotus (Diaspidiotus) coniferarum Ckll., Psyche, viii, p. 201 (1898).
" coniferarum Newell, Contr. Ia. Ag. Coll., p. 21 (1899).
Hemiberlesia " Leon., Gen. e Spec. Diaspiti, Asp., p. 221 (1900).
Habitat.—New Mexico.
On Pinus ponderosa.

1212. Aspidiotus corokiæ Mask.

Aspidiotus corokiæ Mask., N. Z. Trans., xxiii, p. 2 (1890).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 25 (1897).
" (Selenaspis) corokiæ Leon., Riv. Pat. Veg., vi, p. 213 (1898).
" " " " Gen. e Spec. Diaspiti, Asp., p. 39 (1900).
Habitat.—New Zealand.
On Corokia Cotoneaster.

1213. Aspidiotus cryptomeriæ Kuwana.

Aspidiotus cryptomeriæ Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 69 (1902).
Habitat.—Japan.
On Cryptomeria japonica.

1214. Aspidiotus cryptoxanthus Ckll.

Aspidiotus (Diaspidiotus) cryptoxanthus Ckll., Psyche, ix, p. 71 (1900).
Habitat.—Japan.
On Quercus glandulifera.

1215. Aspidiotus cupressi Ckll.

Aspidiotus cupressi Ckll., Ann. Mag. N. H., (7), iii, p. 168 (1899).
" " Newell, Contr. Ia. Ag. Coll., No. 3, p. 30 (1899).
Hemiberlesia " Leon., Gen. e Spec. Diaspiti, Asp., p. 221 (1900).
Habitat.—Mexico.
On Cupressus.

1216. Aspidiotus cyanophylli Sign.

Aspidiotus cyanophylli Sign., Ann. Soc. Ent. Fr., (4), ix, p. 119 (1869).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 59 (1883).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 29 (1897).
" " " Ent. Mon. Mag., xxxiv, p. 184 (1898).
" " de Charm., Pr. Soc. Amic. Scien., p. 24 (1899).
" (Evaspidiotus) cyanophylli Leon., Riv. Pat. Veg., vii, p. 53 (1899).
" " " " Gen. e. Spec. Diaspiti, Asp., p. 80 (1900).
" cyanophylli Hemp., Rev. Mus. Paul., iv. p. 498 (1900).
" " Newst., Mon. Brit. Cocc., i, p. 124 (1901).
Habitat.—Ceylon; Mauritius; Brazil; Mexico; England; France. In greenhouses, Mass.; Washington, D. C.; Ohio.
On Cyanophyllum from Venezuela; Ficus; Laurus; palms; orchids; Cycas revoluta; Ipomœa; Pritchardia filifera; tea; Cinchona.

1217. Aspidiotus cydoniæ Comst.

Aspidiotus cydoniæ Comst., Rep. U. S. Dep. Ag., 1880, p. 295 (1881).
" " Mask., N. Z. Trans., xxiv, p. 13 (1891).
" diffinis var. lateralis Ckll., Can. Ent., xxvi, p. 130 (1894).
" cydoniæ Green, Cocc. Ceylon, pt. i, p. 62 (1896).
A. (Hemiberlesia) cydoniæ Ckll., Bull. 6, T. s., Dep. Ag., pp. 5, 21 (1897).
A. (Diaspidiotus) greenii " " " " " " pp. 12, 27 (1897).
Aspidiotus diffinis var. lateralis " " " " " " p. 23 (1897).
" cydoniæ Newst., Ent. Mon. Mag., xxxiii, p. 74 (1897).
" " Ckll., " " " xxxiv, p. 185 (1898).
" " Leon., Riv. Pat. Veg., vii, p. 44 (1898).
" greenii Ckll., Ent. Mon. Mag., xxxiv, p. 184 (1898).
" " Hunter, Kan. Univ. Quar., viii, p. 11 (1899).
" cydoniæ Newell, Contr. Ia. Ag. Coll., No. 3, p. 31 (1899).
" " Marlatt, Can. Ent., xxxi, p. 211 (1899).
" diffinis var.lateralis Newell.Contr.Ia.Ag.Coll.,No.3,pp.5,24 (1899).
" (Evaspidiotus)cydoniæ Leon.,Gen. e Spec.Diasp.,Asp.,p.71(1900).
" cydoniæ Quaint. & Scott, Cocc. Amer., Dec. iii-iv, No. 10 (1901).
" " Ckll., Ann. Mag. N. H., (7), x, p. 471 (1902).

Habitat.—Ga.; Fla.; Tex.; Kan.; New Mexico; Mexico; West Indies; Ceylon; Samoa.

On quince; fig; palms; orange; tea-plant; cactus; Jasminum; Lantana.

Aspidiotus cydoniæ tectus Mask.

Aspidiotus cydoniæ var. tectus Mask., Ent. Mon. Mag., xxxiii, p. 240 (1897).
" " " " " N. Z. Trans., xxx, p. 224 (1898).
" (Evaspidiotus) cydoniæ var. tectus Leon., Gen. e Spec. Diaspiti, Asp., p. 223 (1900).

Habitat.—Hawaiian Islands.

On "Ohia."

Aspidiotus cydoniæ punicæ Ckll.

Aspidiotus punicæ Ckll., Journ. Inst. Jam., i, p. 225 (1893).
" " " Ent. Mon. Mag., xxix, p. 157 (1893).
" " " Can. Ent., xxvi, p. 129 (1894).
A. (Diaspidiotus) punicæ Ckll., Bull. 6, T. s., Dep. Ag., p. 24 (1897).
A. (Evaspidiotus) " Leon., Riv. Pat. Veg., vi, p. 235 (1898).
Aspidiotus " Newell, Contr. Ia. Ag. Coll., No. 3, pp. 2,24 (1899).
A. (Evaspidiotus) " Leon., Gen. e. Spec. Diaspiti, Asp., p. 63 (1900).

Habitat.—Jamaica; Dominica; New York; Iowa.

On cocoanut; pomegranate.

Aspidiotus cydoniæ crawii Ckll.

A. (Hemiberlesia) crawii Ckll., Bull. 6, T. s., Dep. Ag., pp. 5, 23 (1897).
Aspidiotus " Newell, Contr. Ia. Ag. Coll., No. 3, p. 27 (1899).
" " King, Can. Ent., xxxi, p. 227 (1899).

Habitat.—Mexico; Mass. (in greenhouse).

On grape-vine; ivy.

1218. Aspidiotus degeneratus (Leon.).

Chrysomphalus degeneratus Leon., Riv. Pat. Veg., iv, p. 345 (1896).
A. (Chrysomphalus) " Ckll., Bull. 6, T. s., Dep. Ag., p. 29 (1897).
Chrysomphalus " Leon., Riv. Pat. Veg., vii, p. 216 (1899).
" " " Gen. e Spec. Diaspiti, Asp., p. 171 (1900).

Habitat.—Italy.
On Camellia japonica.

1219. Aspidiotus destructor Sign.

Aspidiotus destructor Sign., Ann. Soc. Ent. Fr., (4), ix, p. 120 (1869).
" " Licht., Bull. " " " (6), ii, p. xxxvii (1882).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 75 (1883).
" transparens Green, Ins. Pests of Tea Plant, p. 20 (1890).
" destructor Mask., N. Z. Trans., xxiv, p. 12 (1891).
" " Cotes, Ind. Mus. Notes, ii, No. 6, p. 168 (1893).
" " " " " " iii, No. 1, p. 66 (1893).
" fallax Ckll., Journ. Inst. Jam., i, p. 225 (1893).
" cocotis Newst., Ent. Mon. Mag., xxix, p. 186 (1893).
" " Ckll., " " " xxx, p. 57 (1894).
" fallax " " " " " p. 57 (1894).
" destructor var. fallax Ckll., Ent. News, v, p. 79 (1894).
" " Ckll., Can. Ent., xxvii, p. 261 (1895).
" " Mask., N. Z. Trans., xxix, p. 297 (1897).
" " Ckll., Bull. 6, T. s., Dep. Ag., pp. 10, 29 (1897).
" (Evaspidiotus) destructor Leon., Riv. Pat. Veg., vii, p. 62 (1899).
" " " " Gen. e Spec. Diaspiti, Asp., p. 89 (1900).
" destructor Lefroy, Scale Ins. Less. Antil., p. 54 (1901).

Habitat.—China; Formosa; India; Laccadive Islands; Bourbon Island; Mauritius; Demerara; West Indies; Mexico.
On palms; mango; banana; nutmeg; Celtis occidentalis; Terminalia Catappa, etc.

1220. Aspidiotus diffinis Newst.

||Aspidiotus affinis Newst., Ent. Mon. Mag., xxix, p. 186 (1893).
" diffinis " " " " " p. 281 (1893).
Aspidiotus (Diaspidiotus) diffinis Ckll., Bull. 6, T. s., Dep. Ag., pp. 11, 23 (1897).
Hemiberlesia diffinis Leon., Riv. Pat. Veg., vi, p. 132 (1897).
Aspidiotus jatrophæ Towns. & Ckll., Jn. N. Y. Ent. Soc., vi, p. 178 (1898).
" " Newell, Contr. Ia. Ag. Coll., No. 3, p. 23 (1899).
" diffinis Marlatt, Ent. News, xi, p. 425 (1900).
Hemiberlesia " Leon., Gen. e Spec. Diaspiti, Asp., p. 31 (1900).
Aspidiotus jatrophæ Marlatt, Ent. News, xi, p. 426 (1900).

Habitat.—Demerara; Mexico; Washington, D. C.; Canada.
On basswood; lilac.

Aspidiotus diffinis parrotti Newell.

Aspidiotus jatrophæ var. parrotti Newell, Contr. Ia. Ag. Coll., No. 3, p. 23 (1899).
Habitat.—Mexico.
On "Barenjeno Chiquito."

1221. Aspidiotus dryandræ Full.

Aspidiotus dryandræ Full., Notes on Cocc. W. Austr., p. 3 (1897).
" " " Tr. Ent. Soc. Lond., p. 465 (1899).
Habitat.—West Australia.
On Dryandra floribunda.

1222. Aspidiotus dysoxyli Mask.

Aspidiotus dysoxyli Mask., N. Z. Trans., xi, p. 198 (1878).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 76 (1883).
" " Mask., Ins. Nox. Agr. N. Z., p. 43 (1887).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 25 (1897).
Habitat.—New Zealand.
On Dysoxylum spectabile.

1223. Aspidiotus euonymi Targ.

Aspidiotus euonymi Targ., Bull. Soc. Tosc. di Orticultura, p. 12 (1888).
" " Saccardo, Riv. Pat. Veg., iv, p. 51 (1895).
" " Ckll., Pr. Ac. N. Sci. Ph., p. 274 (1899).
Habitat.—Italy.
On Euonymus japonica.

1224. Aspidiotus excisus Green.

Aspidiotus excisus Green, Cocc. Ceylon, pt. i, p. 53 (1896).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 27 (1897).
" (Evaspidiotus) excisus Leon., Riv. Pat. Veg., vii, p. 46 (1899).
" " " " Gen. e Spec. Diaspiti, Asp., p. 73 (1900).
Habitat.—Ceylon.
On Cyanotis pilosa.

1225. Aspidiotus extensus Mask.

Aspidiotus extensus Mask., N. Z. Trans., xxvii, p. 41 (1894).
A. (Chentraspis) " Ckll., Bull. 6, T. s., Dep. Ag., p. 26 (1897).
Chentraspis " Leon., Riv. Pat. Veg., vi, p. 113 (1898).
" " " Gen. e Spec. Diaspiti, Asp., p. 12 (1900).
Habitat.—Australia.
On Eucalyptus capitellata.

1226. Aspidiotus fernaldi Ckll.

Aspidiotus fernaldi Ckll., Ann. Mag. N. H., (7), ii. p. 323 (1898).
" " Newell, Contr. Ia. Ag. Coll., No. 3, p. 18 (1899).
" " King, Can. Ent., xxxi, p. 226 (1899).
Habitat.—Massachusetts.
On Gleditschia triacanthos.

Aspidiotus fernaldi albiventer Hunter.

Aspidiotus fernaldi subsp. albiventer Hunter, Kan. Univ. Quar., viii, p. 6 (1899).
" " " cockerelli Parr., Can. Ent., xxxi, p. 10 (1899).
" " " albiventer Newell, Contr. Ia. Ag. Coll., No. 3, p. 19 (1899).

Habitat.—Kansas.
On maple; Juneberry.

Aspidiotus fernaldi hesperius Ckll.

Aspidiotus (Diaspidiotus) Fernaldi hesperius Ckll., Ann. Mag. N. H., (7), ix, p. 450 (1902).

Habitat.—Arizona.

1227. Aspidiotus fimbriatus (Mask.).

Diaspis(?) fimbriata Mask., N. Z. Trans., xxv, p. 208 (1892).
Aspidiotus fimbriatus Ckll., Can. Ent., xxvi, p. 128 (1894).
" " " Bull. 6, T. s., Dep. Ag., p. 26 (1897).
" (Evaspidiotus) fimbriatus Leon., Riv. Pat. Veg., vii, p. 58 (1899).
" " " " Gen. e Spec. Diaspiti, Asp., p. 85 (1900).

Habitat.—Australia.
On Eugenia Smithii.

1228. Aspidiotus fodiens Mask.

Aspidiotus fodiens Mask., N. Z. Trans., xxiv, p. 10 (1891).
A. (Chrysomphalus) fodiens Ckll., Bull. 6, T. s., Dep. Ag., p. 26 (1897).
Chrysomphalus fodiens Leon., Riv. Pat. Veg., vii, p. 198 (1899).
" " " Gen. e Spec. Diaspiti, Asp., p. 153 (1900)

Habitat.—Australia.
On Acacia.

1229. Aspidiotus forbesi Johnson.

(*Cherry scale.*)

Aspidiotus forbesi Johns., Ent. News, vii, p. 151 (1896).
" " " Bull. Ill. St. Lab. N. H., iv, p. 380 (1896).
A. (Diaspidiotus) forbesi Ckll., Bull. 6, T. s., Dep. Ag., pp. 5, 21 (1897).
Aspidiotus " Forbes, 20th Rep. Ins. Ill., p. 16 (1898).
" " Johns., Can. Ent., xxx, p. 82 (1898).
" " Leon., Riv. Pat. Veg., vi, p. 223 (1898).
" " Hunter, Kan. Univ. Quar., viii, p. 3 (1899).
" " Newell, Contr. Ia. Ag. Coll., No. 3. p. 14 (1899).
" " Ckll., Jn. N. Y. Ent. Soc., vii, p. 258 (1899).
" " Newell, Bull. 43, Ia. Exp. Sta., p. 162 (1899).
" " Fletcher, Rep. Ont. Dep. Agr., p. 35 (1900).
" " " " Ent. Soc. Ont., p. 109 (1900).
" (Aspidiella) forbesi Leon., Gen. e Spec. Diaspiti, Asp., p. 49 (1900).
" forbesi Frank & Kruger, Schildlausbuch, p. 74 (1900).

Aspidiotus forbesi Quaint. & Scott, Cocc. Amer., Dec. iii-iv, No. 12 (1901).
" " Felt, Bull. 46, N. Y. St. Mus., pp. 330, 347 (1901).
" " Forbes, Circ. 36, Ill. Exp. Sta., p. 19 (1901).
" " Banks, Bull. 34, n. s., Dep. Ag., p. 19 (1902).

Habitat.—Can.; Nova Scotia; Mass.; N. Y.; N. J.; Md.; W. Va.; Ga.; Fla.; Ala.; Ohio; Ill.; Kan.; New Mexico; Mexico; Porto Rico; Germany.

On plum; peach; pear; apple; quince; cherry; currant; gooseberry; apricot; beech; hawthorn; Jasmine; honey-locust; Acer pseudoplatanus; walnut.

1230. Aspidiotus glanduliferus Ckll.

Aspidiotus (Diaspidiotus) glanduliferus Ckll., Ohio Nat., ii, p. 287 (1902).

Habitat.—Ohio.

On Pinus sylvestris.

1231. Aspidiotus hakeæ Mask.

Aspidiotus hakeæ Mask., N. Z. Trans., xxviii, p. 383 (1896).
A. (Phaulaspis) hakeæ Ckll., Bull. 6, T. s., Dep. Ag., p. 27 (1897).
Aonidia (Cryptoaonidia) hackeæ Leon., Gen. e Spec. Diaspiti, Asp., p. 206 (1900).

Habitat.—Australia.

On Hakea.

1232. Aspidiotus hartii Ckll.

Aspidiotus hartii Ckll., Psyche, vii, Suppl., i, p. 7 (1895).
" " " Bull. 6, T. s., Dep. Ag., pp. 10, 24 (1897).
" " " " Bot. Dep. Jam., p. 151 (1897).
" (Aspidiella) hartii Leon., Riv. Pat. Veg., vi, p. 227 (1898).
" " " " Gen. e Spec. Diaspiti, Asp., p. 53 (1900).

Habitat.—West Indies.

On tubers of yam.

Aspidiotus hartii luntii Ckll.

Aspidiotus hartii var. luntii Ckll., Scale Ins. Trinidad, p. vii (1895).
" " " " " Bull. 6, T. s., Dep. Ag., p. 24 (1897).

Habitat.—Trinidad.

On tubers of yam.

1233. Aspidiotus hederæ (Vall.).

(*Oleander scale.*)

Chermes hederæ Vall., Mem. Acad. Dijon, p. 30 (1829).
? " capparis " " " " p. 30 (1829).
Aspidiotus nerii Bouché, Schädl. Gart. Ins., p. 52 (1833).
" " " Naturg. Ins., p. 12 (1834).
" palmarum Bouché Naturg. Ins., p. 17 (1834).
Diaspis obliquus Costa, Faun. Reg. Nap., Cocc., p. 21 (1835).
Aspidiotus nerii Burm., Handb. Ent., ii, p. 67 (1835).
" palmarum Burm., Handb. Ent., ii, p. 69 (1835).

Aspidiotus palmarum Blanch., Hist. Nat. Ins., iii, p. 215 (1840).
" nerii " " " " iii, p. 215 (1840).
" " Koll., Inj. Ins., p. 179 (1840).
" genistæ Westw., Synop. Gen. Br. Ins., p. 118 (1840).
" epidendri Bouché, Stett. Ent. Zeit., v, p. 293 (1844).
" palmarum Först., Verh. d. Nat. Ver., viii, p. 562 (1851).
" nerii Curt., Gard. Chron., p. 588 (1863).
" " Targ., Studii sul. Cocc., pp. 8. 13, 27, 58 (1867).
Chermes ericæ Bdv., Ent. Hort., p. 330 (1867).
" aloes " " " p. 327 (1867).
" epidendri Bdv., Ent. Hort., p. 339 (1867).
" nerii " " " p. 340 (1867).
" cycadicola " " " p. 345 (1867).
Aspidiotus bouchéi Targ., Studii sul. Cocc., p. 1 (1867).
" affinis " Catalogue, p. 43 (1869).
" " Sign., Ann. Soc. Ent. Fr., (4), ix, p. 114 (1869).
" aloes " " " " " " " p. 114 (1869).
" budleiæ " " " " " " " p. 115 (1869).
" ceratoniæ " " " " " " " p. 118 (1869).
" cycadicola " " " " " " " p. 119 (1869).
" denticulatus " " " " " " p. 120 (1869).
" " Targ., Catalogue, p. 43 (1869).
" epidendri Sign., Ann. Soc. Ent. Fr., (4), ix, p. 121 (1869).
" ericæ " " " " " " " p. 121 (1869).
" hederæ " " " " " " " p. 122 (1869).
" genistæ " " " " " " " p. 122 (1869).
" gnidii " " " " " " " p. 122 (1869).
" ilicis " " " " " " " p. 123 (1869).
" myricinæ " " " " " " " p. 125 (1869).
" limonii " " " " " " " p. 125 (1869).
" nerii " " " " " " " p. 126 (1869).
" palmarum " " " " " " " p. 131 (1869).
" ulicis " " " " " " " p. 132 (1869).
" villosus " " " " " " " p. 133 (1869).
" " Targ., Catalogue, p. 43 (1869).
" bouchéi " " p. 43 (1869).
" vriesciæ Sign., Ann. Soc. Ent. Fr., (4), ix, p. 134 (1869).
" lentisci " " " " " (5), vi, p. 601 (1876).
" capparis " " " " " " " p. 639 (1876).
" myrsinæ " " " " " " " p. 670 (1876).
" ulicis " " " " " " " p. 675 (1876).
" epidendri Mask., N. Z. Trans., xi, p. 197 (1878).
" budleiæ " " " " p. 198 (1878).
" oleæ Colvée, Gac. Agr. del Minist. de Fomento, p. 14 (1880).
" nerii Comst., Rep. U. S. Dep. Ag., 1880, p. 301 (1881).
" ceratoniæ Colvée, Estud. sob. alg. Ins., Cocc., p. 16 (1881).
? " corynocarpi " " " " " " p. 39 (1881).

Aspidiotus nerii Mask., N. Z. Trans., xiv, p. 217 (1881).
" bouchei " " " " p. 217 (1881).
" oleastri Colvée, Nuev. Estud. Cocc., p. 12 (1882).
" nerii Osborn, Tr. Ia. Hor. Soc., xvii, p. 213 (1882).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ.,p. 63 (1883).
" affinis " " " " " " " p. 72 (1883).
" aloes " " " " " " " p. 72 (1883).
" budleiæ " " " " " " " p. 73 (1883).
" ceratoniæ " " " " " " " p. 74 (1883).
" denticulatus" " " " " " " p. 75 (1883).
" ericæ " " " " " " " p. 76 (1883).
" hederæ " " " " " " " p. 77 (1883).
" genistæ " " " " " " " p. 77 (1883).
" gnidii " " " " " " " p. 77 (1883).
" ilicis " " " " " " " p. 78 (1883).
" lentisci " " " " " " " p. 79 (1883).
" limonii " " " " " " " p. 79 (1883).
" myrsinæ " " " " " " " p. 79 (1883).
" palmarum " " " " " " " p. 81 (1883).
" villosus " " " " " " " p. 83 (1883).
" vriesciæ " " " " " " " p. 84 (1883).
" nerii Saund., Ins. Inj. to Fruits, p. 398 (1883).
" " Targ., Annali di Agr., p. 389 (1884).
" ceratoniæ " " " " p. 390 (1884).
? " corynocarpi " " " " p. 390 (1884).
" carpodeti Mask., N. Z. Trans., xvii, p. 17 (1884).
" nerii Sign., Bull. Soc. Ent. Fr., (6), iv, p. cli (1884).
" " Hubbard, Ins. Aff. Orange, p. 35 (1885).
" " Witlaczil, Zur Morph. Anat. Cocc., p. 158 (1885).
" " Schmidt, Metamorph. Anat. A. nerii (1885).
" " Karsch, Ent. Nach., xii, p. 110 (1886).
" epidendri Mask., Ins. Nox. Agr. N. Z., p. 44 (1887).
" budlæiæ " " " " " p. 40 (1887).
" carpodeti " " " " " p. 41 (1887).
" nerii " " " " " p. 44 (1887).
" " Penzig, Annali di Agr., p. 485 (1887).
" " Targ., " " " (1888).
" " Comst., Intr. Ent., p. 151 (1888).
" " Lint., 5th Rep. Ins. N. Y., pp. 278, 317 (1889).
" " Coq., Bull. 26, Div. Ent. Dep. Ag., p. 20 (1892).
" limonii Berl., Riv. Pat. Veg., i, pp. 64, 66 (1892).
" epidendri Ckll., Gard. Chron., (3), xiii, p. 548 (1893).
" nerii French, Handb. Destr. Ins. Vict., p. 47 (1893).
" " Morg., Bull. 28, La. Exp. Sta., p. 996 (1893).
" hederæ Ckll., Ent. News, v, p. 211 (1894).
" nerii " " " v, p. 79 (1894).
" " " " Mon. Mag., xxx, p. 57 (1894).

Aspidiotus nerii Riley & How., Ins. Life, vi, p. 327 (1894).
" " Ckll., Jn. Trin. Nat. Club, ii, p. 307 (1895).
" " Lint., Bull. N. Y. St. Mus., p. 271 (1895).
" " Saccardo, Riv. Pat. Veg., iv, p. 49 (1895).
" hederæ " " " " " p. 50 (1895).
" limonii " " " " " p. 50 (1895).
" cycadicola " " " " " p. 50 (1895).
" limonii Berl., " " " " p. 82 (1895).
" nerii Lint., 11th Rep. Ins. N. Y., p. 203 (1896).
" " Lounsb., Rep. Ent. Cape Good Hope, p. 58 (1896).
" hederæ Newst., Ent. Mon. Mag., xxxii, p. 279 (1896).
" nerii Davis, Spec. Bull. 2, Mich. Exp. Sta., p. 34 (1896).
" " Berl. e Leon., Cherm. Ital., Fasc. ii, No. 26 (1897).
" " Frog., Rep. Dep. Ag. N. S. W., No. 175, p. 1 (1897).
" " Newst., Tr. Ent. Soc. Lond., p. 93 (1897).
" hederæ Ckll., Bull. 6, T. s., Dep. Ag., pp. 12, 18 (1897).
" " Berl. e Leon., Cherm. Ital., Fasc. ii, No. 40 (1897).
" ceratoniæ " " " " " " No. 41 (1897).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 18 (1897).
" affinis " " " " " " p. 18 (1897).
" ericæ " " " " " " p. 18 (1897).
" denticulatus " " " " " " p. 18 (1897).
" genistæ " " " " " " p. 18 (1897).
" gnidii " " " " " " p. 18 (1897).
" lentisci " " " " " " p. 18 (1897).
" (Diaspidiotus) ilicis Ckll., Bull. 6, T. s., Dep. Ag., p. 18 (1897).
" " villosus " " " " " " p. 19 (1897).
" oleæ " " " " " " p. 19 (1897).
" oleastri " " " " " " p. 19 (1897).
" villosus Berl. e Leon., Cherm. Ital., Fasc. ii, No. 42 (1897).
" carpodeti Ckll., Bull. 6, T. s., Dep. Ag., p. 21 (1897).
" aloes " " " " " " p. 29 (1897).
" buddleiæ " " " " " " p. 29 (1897).
" cycadicola " " " " " " p. 29 (1897).
" epidendri " " " " " " p. 29 (1897).
" vriesciæ " " " " " " p. 30 (1897).
" myrsinæ " " " " " " p. 30 (1897).
" palmarum " " " " " " p. 30 (1897).
" nerii " " " " " " pp. 10, 30 (1897).
" " var. limonii Ckll., Bull. 6, T. s., Dep. Ag., p. 30 (1897).
" aloes Green, Ent. Mon. Mag., xxxiii, p. 69 (1897).
" " Newst., " " " " p. 77 (1897).
" hederæ Targ., Annali di Agr., p. 97 (1898).
" nerii Osborn, Contr. Ia. Ag. Coll., p. 7 (1898).
" " Rolfs & Quaint., Cocc. Amer., Dec. i-ii, No. 20 (1898).
" " Newell, Bull. 43, Ia. Exp. Sta., p. 168 (1899).

Aspidiotus hederæ var. nerii Hunter, Kan. Univ. Quar., viii, p. 11 (1899).
" " King, Can. Ent., xxxi, p. 225 (1899).
" " Leon., Lab. di Ent. Agr., Portici, p. 3 (1899).
" " var. carpodeti Ckll. & Parr., The Industrialist. p. 276 (1899).
" " Ckll., Check List, Suppl., p. 395 (1899).
" " Berl. e Leon., Riv. Pat. Veg., vii, p. 71 (1899).
" (Evaspidiotus) hederæ Berl. e Leon., Riv. Pat. Veg., pp. 262, 268 (1899).
" " " Leon., Gen. e Spec. Diaspiti, Asp., p. 98 (1900).
" hederæ Newst., Journ. Roy. Hor. Soc., xxiii, p. 7 (1900).
" " Marl., Yearbook U. S. Dep. Ag., p. 269 (1900).
" affinis " Ent. News, xi, p. 426 (1900).
" hederæ Newst., Mon. Brit. Cocc., 1, p. 120 (1901).
" nerii Full., 1st Rep. Ent. Natal, p. 101 (1901).
" hederæ Lidg., Ent. News, xiii, p. 43 (1902).
" carpodeti " " " " p. 44 (1902).

Habitat.—Europe; S. Africa; New Zealand; Australia; Algeria; Madagascar; Hawaiian Islands; Bermuda; Chili; West Indies; Mexico; Georgia; Florida; California; Ohio; Canada.

On ivy; holly; box; orange; Asparagus plumosus; Melia; Ruscus aculeatus; Ceratonia; Cerceris; Erica; Rubia peregrina; Genista; Daphne gnidium; Quercus ilex; olive; Aloe umbellata; Agave palmeri; Acacia; Cycas revoluta; Myrsine retusa; Vriescia splendens; palms; orchids; Carpodetus serratus; Vitex littoralis; oleander; arbutus; Magnolia; cherry; plum; currant; lemon; Camellia; maple; Yucca; grass; clover, etc.—Tr. Ent. Soc. Lond., p. 93 (1897).

Aspidiotus hederæ simplex de Charm.

Aspidiotus aloes simplex de Charm., Pr. Soc. Amic. Scien., p. 20 (1899).
Habitat.—Mauritius.

1234. Aspidiotus howardi Ckll.

(*Howard's scale.*)

Aspidiotus howardi Ckll., Can. Ent., xxvii, p. 16 (1895).
" " " Bull. 19, N. Mex. Exp. Sta., p. 106 (1896).
" (Diaspidiotus) howardi Ckll., Bull. 6, T. s., Dep. Ag., p. 21 (1897).
" howardi Gillette, Bull. 38, Col. Exp. Sta., p. 37 (1897).
" (Aspidiella) howardi Leon., Riv. Pat. Veg., vi, p. 229 (1898).
" howardi Berl. e Leon., Annali di Agr., p. 107 (1898).
" " Forbes, 20th Rep. Ins. Ill., p. 16 (1898).
" " Newell, Contr. Ia. Ag. Coll., No. 3, p. 10 (1899).
" (Aspidiella) howardi Leon., Gen. e Spec. Diaspiti, Asp., p. 55 (1900).

Habitat.—Colorado; New Mexico.
On plum.

1235. Aspidiotus hunteri Newell.

Aspidiotus hunteri Newell, Contr. Ia. Ag. Coll., No. 3. pp. 2, 10, 31 (1899).
" (Diaspidiotus) hunteri Leon., Gen. e Spec. Diaspiti, Asp., p. 223 (1900).

Habitat.—Iowa; Texas.

On currant.

1236. Aspidiotus implicatus Mask.

Aspidiotus implicatus Mask., Ent. Mon. Mag., xxxiii, p. 241 (1897) no desc.
" " " N. Z. Trans., xxx, p. 226 (1898).
" " Leon., Gen. e Spec. Diaspiti, Asp., p. 224 (1900).

Habitat.—Formosa; China.

On Campanula.

1237. Aspidiotus jordani Kuwana.

Aspidiotus jordani Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 69 (1902).

Habitat.—Japan.

On oak.

1238. Aspidiotus juglandis Colvée.

Aspidiotus juglandis Colvée, Bull. Soc. Ent. Fr., (6), i, p. clxv (1881).

Habitat.—Spain.

On walnut.

1239. Aspidiotus juglans-regiæ Comst.

(*English walnut scale.*)

Aspidiotus juglans-regiæ Comst., Rep. U. S. Dep. Ag., 1880, p. 300 (1881).
" " Pack., 5th Rep. U. S. Ent. Com., p. 335 (1890).
" " Morg., Bull. 28, La. Exp. Sta., p. 993 (1893).
" " Howard, Yearbook U. S. Dep. Ag., p. 264 (1894).
" " Ckll., The Entom., xxvii, p. 334 (1894).
" " " Can. Ent., xxvi, pp. 131, 354 (1894).
" " Hillman, Bull. 36, Nev. Exp. Sta., p. 33 (1897).
" " Starnes, Bull. 36, Ga. Exp. Sta., p. 23 (1897).
A. (Diaspidiotus) " Ckll., Bull. 6, T. s., Dep. Ag., pp. 8,16, 17, 21 (1897).
'Aspidiotus " Osborn, Contr. Ia. Ag. Coll., p. 7 (1898).
" " Leon., Riv. Pat. Veg., vii, p. 40 (1898).
" " Rolfs & Quaint., Cocc. Amer., Dec.i-ii, No.19 (1898).
" " Hunter, Kan. Univ. Quar., viii, p. 8 (1899).
" " Newell, Contr. Ia. Ag. Coll., No. 3, p. 19 (1899).
" " Fletcher, Rep. Ont. Dep. Ag., p. 38 (1900).
" (Evaspidiotus) juglans-regiæ Leon., Gen. e Spec. Diaspiti, Asp., p. 67 (1900).
" juglans-regiæ Banks, Bull. 34, n. s., Dep. Ag., p. 19 (1902).
" " Pettit, Bull. 200, Mich. Exp. Sta., p. 191 (1902).

Habitat.—Can.: Mass.; N. Y.: D. C.: Miss.; La.: Tex.: N. Mex.: Cal.: Ohio; Switzerland.

On walnut: apricot: apple; pear: peach: cherry; Japan plum: locust: maple, etc.

Aspidiotus juglans-regiæ pruni Ckll.

Aspidiotus juglans-regiæ var. pruni Ckll., Can. Ent., xxvi, p. 132 (1894).
" " " " " Bull. 6, T. s., Dep. Ag., p. 21 (1897).
" " " " Leon., Riv. Pat. Veg., vii, p. 42 (1898).
" " " " Newell, Contr. Ia. Ag. Coll., No. 3, p. 21 (1899).
" " " " Leon., Gen. e Spec. Diaspiti, Asp., p. 69 (1900).

Habitat.—New Mexico.
On plum; bark of Liquidambar.

Aspidiotus juglans-regiæ albus Ckll.

Aspidiotus juglans-regiæ var. albus Ckll., Can. Ent., xxvi, p. 132 (1894).
" " " " Howard, Ins. Life, vii, p. 211 (1894).
" " " " Ckll., Bull. 6, T. s., Dep. Ag., p. 21 (1897).
" " " " Leon., Riv. Pat. Veg., vii, p. 43 (1898).
" " " " Gen. e Spec. Diaspiti, Asp., p. 70 (1900).

Habitat.—New Mexico.
On pear; plum; apple; apricot; ash.

Aspidiotus juglans-regiæ kafkæ Ckll.

Aspidiotus juglans-regiæ var. kafkæ Ckll., The Entom., xxxi, p. 65 (1898).
" " " " Leon., Gen. e Spec. Diaspiti, Asp., p. 224 (1900).

Habitat.—Austria.
On bark of Fraxinus excelsior.

1240. Aspidiotus kennedyæ (Bdv.).

Chermes kennedyæ Bdv., Ent. Hort., p. 326 (1867).
Aspidiotus " Sign., Ann. Soc. Ent. Fr., (4), ix, p. 124 (1869).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 78 (1883).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 29 (1897).

Habitat.—Australia.
On Kennedya.

1241. Aspidiotus lataniæ Sign.

Aspidiotus lataniæ Sign., Ann. Soc. Ent. Fr., (4), ix, p. 124 (1869).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 78 (1883).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 29 (1897).
" " Green, Ent. Mon. Mag., xxxv, p. 181 (1899).
" " Newell, Contr. Ia. Ag. Coll., No. 3, p. 31 (1899).
" " de Charm., Pr. Soc. Amic. Scien., p. 25 (1899).
" " Ckll., Psyche, ix, p. 72 (1900).
" (Hemiberlesia) lataniæ Hemp., Rev. Mus. Paul., iv, p. 502 (1900).
" (Evaspidiotus) " Leon., Gen. e Spec. Diaspiti, Asp., p. 96 (1900).
" (Hemiberlesia) " Kuw., Jn. N. Y. Ent. Soc., x, p. 31 (1902).

Habitat.—Europe (in hot houses); Mauritius; Galapagos Islands; Brazil.
On Latania; Areca lutescens; cocoanut-palm; Scalesia.
The synonomy of lataniæ, cydoniæ, greenii and punicæ is uncertain and it is very doubtful whether that given in this work is correct.

1242. Aspidiotus latastei Ckll.

Aspidiotus latastei Ckll., Actes Soc. Sci. Chili, p. 35 (1894).
" " " Bull. 6, T. s., Dep. Ag., pp. 15, 24 (1897).
" " Leon., Riv. Pat. Veg., vii, p. 55 (1898).
" (Evaspidiotus) latastei Leon., Gen. e Spec. Diaspiti, Asp., p. 82 (1900).
Habitat.—Chili.

1243. Aspidiotus lucumæ Ckll.

Aspidiotus lucumæ Ckll., Biol. Centr. Amer., ii, pt. 2, p. 22 (1899).
" " Marlatt, Can. Ent., xxxi, p. 211 (1899).
Habitat.—Mexico.
On bark of "Mammea sapota."

1244. Aspidiotus maculatus Newst.

Aspidiotus maculatus Newst., Ent. Mon. Mag., xxxii, p. 133 (1896).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 28 (1897).
Hemiberlesia maculata Leon., Riv. Pat. Veg., vi, p. 123 (1897).
" " " Gen. e Spec. Diaspiti, Asp., p. 22 (1900).
Habitat.—Africa.

1245. Aspidiotus minimus (Leon.).

||Aspidites minimus Leon., Riv. Pat. Veg., iv, p. 350 (1896).
" " Berl. e Leon., Cherm. Ital., Fasc. ii, No. 45 (1897).
Aspidiotus " Ckll., Bull. 6, T. s., Dep. Ag., pp. 12, 18 (1897).
Hemiberlesia minima Leon., Riv. Pat. Veg., vi, p. 126 (1898).
" " " Gen. e Spec. Diaspiti, Asp., p. 25 (1900).
Habitat.—Italy.
On Quercus ilex.

1246. Aspidiotus myoporii Lidg.

Aspidiotus myoporii Lidg., The Wombat, iv, p. 14 (1898).
Chrysomphalus Yoporii [typ. err.] Leon., Gen. e Spec. Diaspiti, Asp., p. 226 (1900).
Habitat.—Australia.
On Myoporum deserti.

1247. Aspidiotus nigropunctatus Ckll.

Aspidiotus nigropunctatus Ckll., Psyche, vii, Suppl., i, p. 20 (1896).
" " " Bull. 4, T. s., Dep. Ag., p. 31 (1896).
A. (Melanaspis) " " " 6, " " " pp. 13, 24 (1897).
Chrysomphalus " Leon., Riv. Pat. Veg., vii, p. 207 (1899).
" " " Gen. e Spec. Diaspiti, Asp., p. 162 (1900).
Habitat.—Mexico.
On "Trueno."

1248. Aspidiotus niveus Full.

Aspidiotus niveus Full., Notes on Cocc. W. Austr., p. 11 (1897).
" " " Tr. Ent. Soc. Lond., p. 465 (1899).
Habitat.—W. Australia.
On Acacia pulchella.

1249. Aspidiotus orientalis Newst.

Aspidiotus orientalis Newst., Ind. Mus. Notes, iii, No. 5, p. 26 (1894).
" osbeckiæ Green, " " " iv, p. 4 (1896).
" " " Cocc. Ceylon, pt. i, p. 47 (1896).
" orientalis Ckll., Bull. 6, T. s., Dep. Ag., p. 28 (1897).
A. (Diaspidiotus) osbeckiæ Ckll., Bull. 6, T. s., Dep. Ag., p. 28 (1897).
Aspidiotus (Evaspidiotus) osbeckiæ Leon., Riv. Pat. Veg., vii, p. 77 (1898).
" " orientalis " " " " " p. 79 (1898).
" " " " Gen. e Spec. Diaspiti, Asp., p.106 (1900).
" " osbeckiæ Leon.,Gen. e Spec. Diaspiti. Asp.,p.104 (1900).
Habitat.—India; Ceylon.
On Osbeckia.

1250. Aspidiotus osborni Newell & Ckll.

Aspidiotus osborni Newell & Ckll., Rep. Ia. Ac. Sci., v, p. 229 (1898).
" " Osborn, Contr. Ia. Ag. Coll., p. 6 (1898).
" " Newell, " " " " No. 3, pp. 2, 5 (1899).
" " Hunter, Kan. Univ. Quar., viii, p. 5 (1899).
" " Newell, Bull. 43, Ia. Exp. Sta., p. 165 (1899).
A. (Diaspidiotus) osborni Leon., Gen. e Spec. Diaspiti, Asp., p. 223 (1900).
Habitat.—Kansas; Iowa; Georgia.
On Quercus alba; Ostrya virginica.

1251. Aspidiotus osmanthi Vall.

Chermes osmanthi Vall., Mem. Acad. Dijon, p. 32 (1829).
Aspidiotus " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 621 (1876).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 30 (1897).
Habitat.—France.
On Olea fragrans.

1252. Aspidiotus ostreæformis Curt.

(*Pear-tree oyster scale.*)

Aspidiotus ostreæformis Curt. (Ruricola), Gard. Chron., iii, p. 805 (1843).
" betulæ Baer., D'Alton, Zeit. für Zool., p. 165 (1849).
" tiliæ Bouché, Stett. Ent. Zeit., xii, p. 111 (1851).
" betulæ Targ., Catalogue, p. 43 (1869).
" " Sign., Ann. Soc. Ent. Fr., (4), ix, p. 115 (1869).

Aspidiotus hippocastani Sign., Ann. Soc. Ent. Fr., (4), ix, p. 136 (1869).
? " oxyacanthæ " " " " " " " p. 137 (1869).
" tiliæ " " " " " " " p. 137 (1869).
" spurcatus " " " " " " " p. 138 (1869).
" betulæ Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 73 (1883).
" hippocastani " " " " " " " p. 77 (1883).
" oxyacanthæ " " " " " " " p. 80 (1883).
" spurcatus " " " " " " " p. 82 (1883).
" tiliæ " " " " " " " p. 83 (1883).
" spurcatus Witlaczil, Zur Morph. Anat. Cocc., p. 158 (1885).
" ostreæformis Dougl., Ent. Mon. Mag., xxiii, p. 239 (1887).
" " Morg., " " " xxv, pp. 45, 350 (1888).
" (Diaspidiotus) spurcatus Berl. e Leon., Cherm. Ital., Fasc. i, No. 3 (1895).
" " ostreæformis Ckll., Bull. 6, T. s., Dep. Ag., pp. 5, 8, 15, 19 (1897).
" " betulæ " " " " " " pp. 15, 18 (1897).
" " hippocastani " " " " " " p. 18 (1897).
" " oxyacanthæ " " " " " " p. 19 (1897).
" " spurcatus " " " " " " p. 19 (1897).
" " tiliæ " " " " " " p. 19 (1897).
" ostreæformis Goethe, Ber. Kgl. Lehr. Obst.—Wien. & Gartenbau, p. 23 (1898).
" " " Zeitschr., Pflanzenkrankh., viii, p. 80 (1898).
" " Laem., Die Obstbaumschadlinge, Dresden, p. 36 (1898).
" " Berl. e Leon., Annali di Agr., p. 96 (1898).
" " Marlatt, Science, n. s., x, p. 18 (1899).
" " Newell, Contr. Ia. Ag. Coll., No. 3, pp. 17, 31 (1899).
" " Lockhead, Rep. Ent. Soc. Ont., p. 67 (1899).
" " Fletcher, " " " " p. 109 (1899).
" (Evaspidiotus) betulæ Leon., Riv. Pat. Veg., vii, p. 38 (1899).
" betulæ Leon., Gen. e Spec. Diaspiti, Asp., p. 65 (1900).
" oxyacanthæ " " " " " p. 65 (1900).
" spurcatus " " " " " p. 65 (1900).
" ostreæformis, Marlatt, Ent. News, xi, p. 590 (1900).
" " Pettit, Bull. 180, Mich. Exp. Sta., p. 120 (1900).
" " Newst., Jn. Roy. Hor. Soc., xxiii, p. 5 (1900).
" " Frank & Kruger, Schildlausbuch, pp. 41, 51 (1900).
" " Pettit, 37th Rep. Mich. Bd. Ag., p. 248 (1900).
" " Reh, Zool. Anzeiger, xxiii, p. 497 (1900).
" " Felt, Bull. 46, N. Y. St. Mus., pp. 323, 352 (1901).
" " Newst., Mon. Brit. Cocc., i, p. 99 (1901).
" " Quaint. & Scott, Cocc. Amer., Dec. iii-iv, No. 13 (1901).
" " Banks, Bull. 34, n. s., Dep. Ag., p. 18 (1902).

Habitat.—Europe; Br. Col.; Prince Edward's Island; Ontario; New York; New Jersey; Mich.; Ohio; Iowa; Idaho; California.

On apple; pear; plum; peach; cherry; birch; poplar; horse-chestnut; linden; alder; Cratægus; maple; aspen; oak; date-palm; Calluna vulgaris.

Aspidiotus ostreæformis oblongus Goethe.

Aspidiotus ostreæformis var. oblongus Goethe, Ber. Kgl. Lehr. Obst.—Wien. & Gartenbau, p. 16 (1899).

Habitat.—Germany.

On apple; pear.

Aspidiotus ostreæformis magnus Goethe.

Aspidiotus ostreæformis var. magnus Goethe, Ber. Kgl. Lehr. Obst.—Wien. & Gartenbau, p. 16 (1899).

Habitat.—Germany.

On plum.

1253. Aspidiotus palmæ Morg. & Ckll.

Aspidiotus palmæ Ckll., Ent. Mon. Mag., xxix, pp. 39, 40 (1893) no desc.
" " Morg., " " " " p. 40 (1893).
" " Ckll., Ins. Life, v, p. 245 (1893).
" (Hemiberlesia) palmæ Ckll., Bull 6, T. s., Dep. Ag., p. 24 (1897).
" palmæ Ckll., Bull. Bot. Dep. Jam., p. 151 (1897).
" (Evaspidiotus) palmæ Leon., Riv. Pat. Veg., vii, p. 51 (1898).
" palmæ Newell, Contr. Ia. Ag. Coll., No. 3, p. 28 (1899).
" (Evaspidiotus) palmæ Leon., Gen. e Spec. Diaspiti, Asp., p. 78 (1900).

Habitat.—West Indies.

On banana; cocoanut-palm.

1254. Aspidiotus pandani (Bdv.).

Coccus pandani Bdv., Insectologie Agricole, ii, p. 301 (1868).
Aspidiotus " Sign., Ann. Soc. Ent. Fr., (4), ix, p. 131 (1869).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 80 (1883).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 30 (1897).

Habitat.—India.

On Pandanus utilis.

1255. Aspidiotus patavinus Berl.

Aspidiotus (Diaspidiotus) patavinus Berl., Riv. Pat. Veg., iv, p. 350 (1896).
" " " Ckll., Bull. 6, T. s., Dep. Ag., p. 19 (1897).
" (Evaspidiotus) " Leon., Riv. Pat. Veg., vii, p. 48 (1898).
" " " Gen. e Spec. Diaspiti, Asp., p. 75 (1900).

Habitat.—Italy.

On cherry.

1256. Aspidiotus perniciosus Comst.

(*San Jose scale.*)

Aspidiotus perniciosus Comst., Rep. U. S. Dep. Ag., 1880, p. 304 (1881).
" " Cooke, Treatise on Ins., p. 33 (1881).
" " Osborn, Tr. Ia. Hor. Soc., p. 519 (1883).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p.65 (1883).
" " Chapin, Rep. Cal. Bd. Hort., p. 91 (1883).
" " Klee, " " " " 1885-6, p. 373 (1887).
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" " " Treatise on Ins. Cal., p. 10 (1888).
" " Lelong, Rep. Cal. Bd. Hort., p. 170 (1889).
" " " Bull. 53, Cal. Bd. Hort., p. 3 (1889).
" " Riley & How.. Ins. Life, iii, p. 68 (1890).
" " Lelong, Rep. Cal. Bd. Hort., pp. 196, 198 (1891).
" " Coq.. Bull. 26, Div. Ent. Dep. Ag., p. 21 (1892).
" " Towns., Bull. 7, N. Mex. Exp. Sta., pp. 6, 7 (1892).
" " Olliff, Ag. Gaz. N. S. W., iii, pt. 9, pp. 698.699 (1892).
" " Riley & How., Ins. Life, v, p. 53 (1892).
" " Ckll., Bull. 10, N. Mex. Exp. Sta., pp. 14, 16 (1893).
" " Koebele, Spec. Bull. U. S. Dep. Ag., p. 39 (1893).
" " Howard, Circ. No. 3, Ser. 2, Div.Ent.Dep.Ag. (1894).
" " " Pr. Ent. Soc. Wash., iii, p. 220 (1894).
" " Schwarz, Ins. Life, vi, p. 247 (1894).
" " Coq., " " " pp. 253, 324 (1894).
" " Rolfs, Pr. Fla. St. Hor. Soc., pp. 94, 99 (1894).
" " Riley, Rep. Va. St. Bd. Agr., p. 172 (1894).
" " Smith, Ent. News, v, pp. 182, 312 (1894).
" " " Garden & Forest, vii, p. 344 (1894).
" " Riley & How., Ins. Life, vi, p. 360 (1894).
" " " Proc. Am. Assoc. Adv. Sci., xliii, p. 229 (1894).
" " Howard, Yearbook U. S. Dep. Ag., p. 267 (1894).
" " " Ins. Life, vii, p. 153 (1894).
" " Smith, " " " p. 163 (1894).
" " Sirrine, Garden & Forest, vii, p. 449 (1894).
" " Weed C. M., Bull. 23, N. H. Exp. Sta., p. 14 (1894).
" " Smith, Bull. 106, N. J. Exp. Sta., p. 24 (1894).
" " Howard, Can. Ent., xxvi, p. 353 (1894).
" " Lint., Rural New Yorker, liii, p. 791 (1894).
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" " Fletcher, Evidence Com. Agr. Ont., p. 312 (1894).
" " " Rep. Ent. Can. Exp. Farms, p. 206 (1894).
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" " Webster, Pr. Columbus Hor. Soc., p. 168 (1894).
?Aonidia fusca Mask., N. Z. Trans., xxvii, p. 43 (1894).
Aspidiotus perniciosus Smith, Rep. N. J. Exp. Sta., 1894, pp. 478, 494 (1895).
" " Slingerland, Rural New Yorker, liv, pp. 5, 167 (1895).

Aspidotus perniciosus Fox, Circ. Penn. St. Bd. Agr., Jan. 23 (1895).
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" " Riley, Bull. 32, Md. Exp. Sta., April (1895).
" " Taft & Davis, Bull. 121, Mich. Exp. Sta., p.36 (1895).
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" " Beckwith, Bull. 25, Del. Exp. Sta. (1895).
" " Toumey, Bull. 14, Ariz. Exp. Sta., p. 32 (1895).
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" " Mask., N. Z. Trans., xxviii, p. 386 (1896).
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" " Green, Ent Mon. Mag., xxxii, p. 84 (1896).
" " Lowe & Sirrine, Rep. N.Y.Exp.Sta., 1895, p.605 (1896).
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?Aonidia fusca Mask., Can. Ent., xxviii, p. 14 (1896).
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Aspidiotus perniciosus Forbes, Bull. 48, Ill. Exp. Sta., p. 413 (1897).
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A. (Diaspidiotus) " Ckll., Bull. 6, T. s., Dep. Ag., p. 30 (1897).

Aspidiotus perniciosus Fletcher, Rep. Ent. Soc. Ont., p. 78 (1897).
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Aonidiella perniciosa Berl. e Leon., Cherm. Ital., Fasc. iii, No. 53 (1898).
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? " fusca " " Annali di Agr., p. 118 (1898).
Aspidiotus perniciosus Forbes, 20th Rep. Ins. Ill., p. 1 (1898).
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?Aonidiella fusca Leon., Riv. Pat. Veg., vii, p. 187 (1899).
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" " " Gen. e Spec. Diaspiti, Asp., p. 129 (1900).
Aspidiotus perniciosus Marlatt, Circ. 42, (2), Div. Ent. Dep. Ag. (1900).
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" " Fernald H. T., Reprint Bull. 43, Pa. Dep. Ag., p. 5 (1900).
" " Lockhead, 31st Rep. Ent. Soc. Ont., p. 8 (1900).
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" " Hall, Lowe, Parr., Reprint Bulls. 193 and 194, N. Y. Exp. Sta. (1900).
" " Reh, Zool. Anzeiger, xxiii, p. 502 (1900).
" " Sjostedt, Entom. Tidskr., xxi, p. 121 (1900).
" " Frank & Kruger, Schildlausbuch, pp. 58, 63 (1900).
" " Johnson, 7th Rep. Mass. Fruit Growers' Assoc., p. 12 (1901).
" " Frog., Ag. Gaz. N. S. W., July, p. 11 (1901).
" " Fernald H. T., Mass. Crop. Rep., May, p. 34 (1901).
" " Alwood, 3rd Rep. Inspector San Jose scale, Va. (1901).
" " Britton, Bull. 135, Conn. Exp. Sta. (1901).
" " Felt, Bull. 46, N. Y. St. Mus., pp. 304, 349 (1901).
" " Forbes, Circ. 36, Ill. Exp. Sta., p. 18 (1901).
" " Kuw., San Jose Scale in Japan (1901).
" " Benson, Queensland Agr. Journ., p. 451 (1901).
" " Kellogg, Science, n. s., xiii, p. 383 (1901).
" " Britton, 1st Rep. St. Ent. Conn., p. 231 (1901).
" " Stewart, Bull. 78, W. Va. Exp. Sta. (1902).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 67 (1902).
" " Lowe & Parr., Bull. 228, N. Y. Exp. Sta. (1902).
" " Smith, Bull. 162, N. J. Exp. Sta. (1902).
" " Banks, Bull. 34, n. s., Dep. Ag., p. 15 (1902).
" " Smith J. B., Bull. 90, Pa. Dep. Ag. (1902).
" " Fisher, Rep. Ent. Soc. Ont., p. 3 (1902).
" " Fernald H. T., Bull. 86, Mass. Exp. Sta. (1903).
" " Sanders., Bull. 58, Del. Exp. Sta. (1903).

Habitat.—Canada; United States; Chili; Germany; Australia; Japan; China; Hawaiian Islands.

On apple; crab-apple; pear; peach; quince; Japanese quince; apricot; plum; Japan plum; Satsuma plum; Prunus maritima; P. pissardi; P. domestica; P. avium; almond; Cratægus; persimmon; English walnut; black walnut; Japan walnut; Lombardy poplar; Carolina poplar; golden-leaved poplar; chestnut; sumac; Catalpa speciosa; English willow; golden willow; weeping willow; laurel-leaved willow; osage-orange; American linden; European linden; ash; dogwood; elm; orange; lemon; lime; June-berry; Acacia; Euonymus; alder; Eucalyptus corynocalyx; laurel; hawthorn; snow-ball; Ptelea trifoliata; silver-maple; Spiræa; rose; strawberry; raspberry; gooseberry; currant; huckleberry; cotoneaster; pecan; Actinidia; Lonicera xylosteum; Symphoricarpus racemosus; cut-leaved birch; milkweed; spruce; cedar, etc. For a late list see Rep. Conn. Exp. Sta., 1902, p. 132 (1903).

Aspidiotus perniciosus albopunctatus Ckll.

Aspidiotus albopunctatus Ckll., Psyche, vii, Suppl., 1, p. 20 (1896).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 33 (1896).
" " Ckll., Bull. 4, T. s., Dep. Ag., p. 43 (1896).

A. (Diaspidiotus) perniciosus var. albopunctatus Ckll., Bull. 6, T. s., Dep. Ag., p. 20 (1897).
Habitat.—Japan; California.
On orange and plum from Japan.

Aspidiotus perniciosus andromelas Ckll.

A. (Diaspidiotus) andromelas Ckll., Bull. 6, T. s., Dep. Ag., pp. 14, 20 (1897).
Aonidiella " Leon., Gen. e Spec. Diaspiti, Asp., p. 224 (1900).
Habitat.—Japan.
On "Phœtenia glauca."

1257. Aspidiotus persearum Ckll.

Aspidistus [typ. err.] persearum Ckll., The Entom., xxxi, p. 240 (1898).
Aspidiotus " Craw, Rep. Cal. Bd. Hort., 1897-98, p. 108 (1898).
" (Evaspidiotus) " Leon., Gen. e Spec. Diaspiti, Asp., p. 224 (1900).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 65 (1902).
Habitat.—Hawaiian Islands; Japan.
On Persea gratissima; Trachycarpus excelsus; Magnolia.

1258. Aspidiotus phormii "Brême," Sign.

Aspidiotus phormii "Brême," Sign., Ann. Soc. Ent. Fr., (4), ix, p. 130 (1869).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 80 (1883).
" " Ckll., Psyche, vii, Suppl., i, p. 8 (1895).
" " " Bull. 6, T. s., Dep. Ag., p. 30 (1897).
Habitat.—France; Switzerland.
On Phormium tenax.

1259. Aspidiotus putearius Green.

Aspidiotus putearius Green, Cocc. Ceylon, pt. i, p. 54 (1896).
" " Ckll., Bull. 6, T. s., Dep. Ag., pp. 10, 28 (1897).
Hemiberlesia " Leon., Riv. Pat. Veg., vi, p. 131 (1897).
" " " Gen. e Spec. Diaspiti, Asp., p. 30 (1900).
Habitat.—Ceylon.
On Strobilanthes viscosus.

1260. Aspidiotus pyri Licht.

Aspidiotus pyri Licht., Bull. Soc. Ent. Fr., (9), i, p. lii (1881).
" " Reh, Zool. Anzeiger, xxiii, p. 497 (1900).
Habitat.—France; Switzerland.
On pear; apple.

1261. Aspidiotus rapax Comst.

(*The Greedy scale.*)

||Aspidiotus camelliæ Sign. (non Bdv.), Ann. Soc. Ent. Fr., (4), ix, p. 117 (1869).
? " acuminatus Targ., Relaz. del. Staz. Ent. Agrar., Firenze, pp. 78, 153 (1877-78).
" camelliæ Mask., N. Z. Trans., xi, p. 200 (1878).

Aspidiotus convexus Comst., Rep. U. S. Dep. Ag., 1880, p. 285 (1881) in part.
“ rapax “ “ “ “ “ “ p. 307 (1881).
“ “ Saund., Ins. Inj. to Fruits, p. 423 (1883).
“ camelliæ Mask., N. Z. Trans., xvii, p. 21 (1884).
? “ acuminatus Targ., Annali di Agr., pp. 38, 41 (1884).
“ camelliæ Morg., Ent. Mon. Mag., xxiv, pp. 68, 79 (1887).
“ rapax “ “ “ “ “ pp. 68, 79 (1887).
“ camelliæ Mask., Ins. Nox. Agr. N. Z., p. 41 (1887).
“ rapax Morg., Ent. Mon. Mag., xxv, p. 119 (1888).
“ camelliæ “ “ “ “ “ p. 351 (1888).
“ flavescens Green, Ceylon Independent (1889).
“ “ Riley & How., Ins. Life, ii, p. 193 (1889).
“ rapax Pack., 5th Rep. U. S. Ent. Com., p. 371 (1890).
“ convexus “ “ “ “ “ “ p. 595 (1890).
“ camelliæ Mask., N. Z. Trans., xxiii, p. 3 (1890).
“ “ “ Ent. Mon. Mag., xxviii, p. 70 (1892).
“ rapax Towns., Bull. 7, N. Mex. Exp. Sta., p. 9 (1892).
“ convexus “ “ “ “ “ “ p. 10 (1892).
“ “ Coq., Bull. 26, Div. Ent. Dep. Ag., p. 20 (1892).
“ rapax “ “ “ “ “ “ “ p. 25 (1892).
“ flavescens Green, Ind. Mus. Notes, ii, No. 6, p. 168 (1893).
“ “ “ “ “ “ iii, No. 4, p. 41 (1894).
“ rapax Morg., Bull. 28, La. Exp. Sta., p. 996 (1894).
“ convexus Ckll., Can. Ent., xxvi, p. 287 (1894) in part.
“ camelliæ “ “ “ “ p. 354 (1894).
“ “ Mask., N. Z. Trans., xxvii, p. 39 (1894).
“ “ Howard, Yearbook U. S. Dep. Ag., p. 261 (1894).
“ “ Berl. e Leon., Cherm. Ital., Fasc. i, No. 6 (1895).
Hemiberlesia “ Saccardo, Riv. Pat. Veg., iv, p. 50 (1895).
Aspidiotus “ Lounsb., Rep. Ent. Cape Good Hope, p. 63 (1896).
“ “ Green, Cocc. Ceylon, pt. i, p. 60 (1896).
Diaspis circulata “ Ind. Mus. Notes, iv, p. 4 (1896).
“ “ Ckll., Check List, p. 339 (1896).
Aspidiotus camelliæ Berl. e Leon., Cherm. Ital., Fasc. ii, No. 44 (1897).
“ “ Starnes, Bull. 36, Ga. Exp. Sta., p. 24 (1897).
Hemiberlesia “ Leon., Riv. Pat. Veg., vi, p. 124 (1897).
Aspidiotus rapax Full., Notes on Cocc. W. Austr., p. 4 (1897).
A. (Hemiberlesia) rapax Ckll., Bull. 6, T. s., Dep. Ag., p. 30 (1897).
“ “ convexus “ “ “ “ “ “ p. 20 (1897).
Hemiberlesia camelliæ Berl. e Leon., Cherm. Ital., Fasc. iii, No. 61 (1897).
Aspidiotus rapax Osborn, Contr. Ia. Ag. Coll., p. 7 (1898).
“ convexus Newell, “ “ “ “ No. 3, p. 25 (1899).
“ rapax “ “ “ “ “ “ “ p. 29 (1899).
“ “ “ Bull. 43, Ia. Exp. Sta., p. 169 (1899).
“ “ Marlatt, Can. Ent., xxxi, pp. 209, 211 (1899).
“ camelliæ “ “ “ “ pp. 209, 211 (1899).
“ convexus “ “ “ “ pp. 208, 211 (1899).

Aspidiotus (Evaspidiotus) convexus Leon., Riv. Pat. Veg., vii, p.50 (1899) in part.
" acuminatus Ckll., Pr. Ac. N. Sci. Ph., p. 274 (1899).
" rapax Frank & Kruger, Schildlausbuch, p. 75 (1900).
" (Hemiberlesia) camelliæ Hemp., Rev. Mus. Paul.,iv,p.501 (1900).
Hemiberlesia camelliæ Leon., Gen. e Spec. Diaspiti, Asp., p. 23 (1900).
Aspidiotus " Newst., Journ. Roy. Hor. Soc., xxiii, p. 4 (1900).
" " " Mon. Brit. Cocc., i, p. 91 (1901).
" " Full., 1st Rep. Ent. Natal, p. 101 (1901).
" " Frog., Ag. Gaz. N. S. W., p. 18 (1902).
" rapax Banks, Bull. 34, n. s., Dep. Ag., p. 20 (1902).

Habitat.—United States (in greenhouses in the north); Mexico ?; West Indies; Brazil; Europe; Hawaiian Islands; New Zealand; Australia; Natal; S. Africa.

On Camellia; cottonwood; walnut; willow; maple; birch; holly; laurel; Acacia; olive; fig; almond; orange; lemon; apple; pear; quince; silver-tree; tea; Fuchsia; Eucalyptus; Myoporum; Rhamnus crocea; Cercis; Coprosma, etc.

1262. Aspidiotus sacchari Ckll.

Aspidiotus sacchari Ckll., Journ. Inst. Jam., i, p. 255 (1893).
" " " Ins. Life, vi, p. 103 (1893).
" " " Bull. 6, T. s., Dep. Ag., p. 25 (1897).
" " " " Bot. Dep. Jam., p. 150 (1897).
" (Aspidiella) sacchari Leon., Riv. Pat. Veg., vi, p. 232 (1898).
" " " " Gen. e Spec.Diaspiti,Asp.,p.58 (1900).
" sacchari Ckll., Ent. News, xiii, p. 24 (1902).

Habitat.—Jamaica; Barbados; Antigua; Java.

On sugar-cane.

1263. Aspidiotus simillimus Ckll.

Aspidiotus transparens subsp. simillimus Ckll., Ann. Mag. N. H., (7), ii, p. 27 (1898).
" simillimus Ckll., in litt. (1902).

Habitat.—Australia.

On palm.

Aspidiotus simillimus translucens Ckll. in litt., new name.

Aspidiotus lataniæ Green, Cocc. Ceylon, pt. i, p. 49 (1896) in part.
" transparens Ckll., Bull. 6, T. s., Dep. Ag., p. 28 (1897).
" " Green, Jn. Bomb. N. H. Soc., xiii, p. 69 (1899).
" (Evaspidiotus) transparens Ckll., The Entom., xxxii, p. 93 (1899).
" " " Leon., Gen. e Spec. Diaspiti, Asp., p. 96 (1900).

Habitat.—Hawaiian Islands; Ceylon.

On tea; Loranthus; Dalbergia championii.

1264. Aspidiotus sophoræ Mask.

Aspidiotus sophoræ Mask., N. Z. Trans., xvi, p. 121 (1883).
" " " Ins. Nox. Agr. N. Z., p. 45 (1887).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 25 (1897).
Habitat.—New Zealand.
On Sophora tetraptera.

1265. Aspidiotus spinosus Comst.

Aspidiotus spinosus Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 70 (1883).
" " Ckll., Can. Ent., xxvii, p. 17 (1895).
" " " Bull. 6, T. s., Dep. Ag., p. 30 (1897).
" cydoniæ Newst. (non. Comst.), Ent. Mon. Mag., xxxiii, p. 74 (1897).
" (Evaspidiotus) spinosus Leon., Riv. Pat. Veg., vii, p. 56 (1898).
" " " " Gen. e Spec. Diaspiti, Asp., p. 83 (1900).
" spinosus Newst., Mon. Brit. Cocc., i, p. 114 (1901).
Habitat.—Washington, D. C. (in greenhouses); England.
On Camellia; Arenga saccharifera, from Malay Archipelago.

1266. Aspidiotus subrubescens Mask.

Aspidiotus subrubescens Mask., N. Z. Trans., xxiv, p. 9 (1891).
" " " " " xxv, p. 207 (1892).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 27 (1897).
" (Evaspidiotus) subrubescens Leon., Riv. Pat. Veg., vii, p. 84 (1898).
" " " " Gen. e Spec. Diaspiti, Asp., p. 111 (1900).
Habitat.—Australia.
On Banksia; Eucalyptus; Pittosporum.

1267. Aspidiotus subsimilis Ckll.

Aspidiotus subsimilis Ckll., Ann. Mag. N. H., (7), iii, p. 168 (1899).
" " Newell, Contr. Ia. Ag. Coll., No. 3, p. 14 (1899).
Aonidiella " Leon., Gen. e Spec. Diaspiti, Asp., p. 225 (1900).
Habitat.—Mexico.
On Cæsalpina palmeri?

1268. Aspidiotus townsendi Ckll.

Aspidiotus townsendi Ckll., Psyche, vii, Suppl., i, p. 20 (1896).
" " " Bull. 4, T. s., Dep. Ag., p. 32 (1896).
" (Diaspidiotus) townsendi Ckll., Bull. 6, T. s., Dep. Ag., p. 22 (1897).
" (Aspidiella) " Leon., Riv. Pat. Veg., vi, p. 230 (1898).
" " " " Gen. e Spec. Diaspiti, Asp., p. 56 (1900).
Habitat.—Mexico; Arizona.
On ash.

1269. Aspidiotus tricolor Ckll.

Aspidiotus (Hemiberlesia) tricolor Ckll., Can. Ent., xxix, p. 266 (1897).
" " " " Bull. 6, T. s., Dep. Ag., p. 25 (1897).
" tricolor Newell, Contr. Ia. Ag. Coll., No. 3, p. 30 (1899).
Habitat.—Mexico.

1270. Aspidiotus ulmi Johnson.

Aspidiotus ulmi Johns., Bull. Ill. St. Lab. N. H., iv, p. 388 (1896).
" (Hemiberlesia) ulmi Ckll., Bull. 6, T. s., Dep. Ag., p. 22 (1897).
" ulmi Hunter, Kan. Univ. Quar., viii, p. 6 (1899).
" " Newell, Contr. Ia. Ag. Coll., No. 3, p. 28 (1899).
Aonidiella " Leon., Gen. e Spec. Diaspiti, Asp., p. 225 (1900).
Habitat.—Ill.; Kan.; N. Y.; Japan.
On elm; Catalpa; Cycas revoluta.

1271. Aspidiotus unilobis Mask.

Aspidiotus unilobis Mask., N. Z. Trans., xxvii, p. 40 (1894).
" " Newst., Ent. Mon. Mag., xxxi, p. 234 (1895).
" (Chentraspis) unilobis Ckll., Bull. 6, T. s., Dep. Ag., p. 27 (1897).
Chentraspis unilobis Leon., Riv. Pat. Veg., vi, p. 111 (1897).
" " " Gen. e Spec. Diaspiti, Asp., p. 10 (1900).
Habitat.—Australia.
On Acacia.

1272. Aspidiotus uvæ Comst.

(*The Grape scale.*)

Aspidiotus uvæ Comst., Rep. U. S. Dep. Ag., 1880, p. 309 (1881).
" " Targ., Annali di Agr., p. 389 (1884).
" " How., Ins. Life, vii, p. 53 (1894).
" (Diaspidiotus) uvæ Ckll., Bull. 6, T. s., Dep. Ag., p. 22 (1897).
" " " Leon., Riv. Pat. Veg., vi, p. 218 (1898).
" uvæ Chambliss, Bull. 4, Tenn. Exp. Sta., p. 149 (1898).
" " Newell, Contr. Ia. Ag. Coll., No. 3, p. 12 (1899).
" (Diaspidiotus) uvæ Leon., Gen. e Spec. Diaspiti, Asp., p. 44 (1900).
" uvæ Forbes, Circ. 36, Ill. Exp. Sta., p. 26 (1901).
" " Banks, Bull. 34, n. s., Dep. Ag., p. 20 (1902).
" " Forbes, 22nd Rep. Ins. Ill., p. 120 (1903).
Habitat.—Ohio; Ill.; Ind.; Tenn.; Kan.; Fla.; Jamaica; Europe.
On grape-vine; hickory.

1273. Aspidiotus vagabundus Ckll.

Aspidiotus vagabundus Ckll., Biol. Centr. Amer., ii, pt. 2, p. 20 (1899).
Habitat.—Mexico.
On bark of ash.

1274. Aspidiotus virescens Mask.

Aspidiotus virescens Mask., N. Z. Trans., xxviii, p. 384 (1896).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 27 (1897).

Aspidiotus (Evaspidiotus) virescens Leon., Riv. Pat. Veg., vii, p. 64 (1898).
" " " " Gen. e Spec. Diaspiti, Asp., p. 91 (1900).

Habitat.—Australia.
On Eugenia Smithii.

1275. Aspidiotus vitiensis Mask.

Aspidiotus vitiensis Mask., N. Z. Trans., xxvii, p. 40 (1894).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 25 (1897).

Habitat.—Fiji.
On "various forest trees."

1276. Aspidiotus zonatus Frauenf.

Aspidiotus zonatus Frauenf., Verh. z. b. Ges. Wien, p. 888 (1868).
" quercus Sign., Ann. Soc. Ent. Fr., (4), ix, p. 132 (1869).
" zonatus " " " " " " " p. 135 (1869).
" " " Bull. " " " (5), vi, p. lxxvi (1876).
" quercus Colvée, Nuev. Estud. Cocc., p. 14 (1882).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 81 (1883).
" zonatus " " " " " " " p. 85 (1883).
" " Witlaczil, Zur Morph. Anat. Cocc., p. 158 (1885).
" " Dougl., Ent. Mon. Mag., xxiii, p. 150 (1886).
" " Morg., " " " xxiv, p. 205 (1888).
" " Newst., " " " xxix, p. 279 (1893).
" " Green, " " " xxxi, p. 230 (1895).
" (Diaspidiotus) zonatus Ckll., Bull. 6, T. s., Dep. Ag., p. 19 (1897).
" (Aspidiella) " Leon., Riv. Pat. Veg., vi, p. 224 (1898).
" " " " Gen. e Spec. Diaspiti, Asp., p. 50 (1900).
" zonatus Newst., Mon. Brit. Cocc., i, p. 94 (1901).

Habitat.—Europe.
On oak.

Genus **CRYPTOPHYLLASPIS** Ckll. Type, occultus.

s. g. Cryptophyllaspis Ckll., Bull. 6, T. s., Dep. Ag., p. 14 (1897); g. Check List, Suppl., p. 396 (1899).

1277. Cryptophyllaspis liquidambaris Kotinsky.

Cryptophyllaspis liquidambaris Kotins., Pr. Ent. Soc. Wash., v, p. 149 (1903).

Habitat.—Washington, D. C.; Atlanta, Ga.
On Liquidambar styraciflua.

1278. Cryptophyllaspis occultus (Green).

Aspidiotus occultus Green, Ind. Mus. Notes, iv, p. 4 (1896).
" " " Cocc. Ceylon, pt. 1, p. 56 (1896).
" " " Ckll., Bull. 6, T. s., Dep. Ag., p. 14 (1897).
Hemiberlesia " Leon., Riv. Pat. Veg., vi, p. 129 (1898).

Cryptophyllaspis occultus Ckll., Check List, Suppl., p. 396 (1899).
Habitat.—Ceylon.
On Grewia orientalis.

1279. Cryptophyllaspis rubsaameni Ckll.

Cryptophyllaspis rübsaameni Ckll., Ann. Mag. N. H., (7), ix, p. 26 (1902).
" " " Can. Ent., xxxiv, p. 75 (1902).
Habitat.—Bismarck Archipelago.
On Codiæum.

Genus **MASKELLIA** Full. Type, globosa.

Maskellia Full., Ag. Gaz. N. S. W., viii, p. 579 (1897).

1280. Maskellia globosa Full.

Maskellia globosa Full., Notes on Cocc. W. Austr., p. 5 (1897).
" " " Ag. Gaz. N. S. W., viii, p. 579 (1897).
Habitat.—W. Australia.
On Eucalyptus gomphocephala.

Genus **MORGANELLA** Ckll. Type, maskelli.

s. g. Morganella Ckll., Bull. 6, T. s., Dep. Ag., p. 22 (1897); g. in litt. (1902).

1281. Morganella longispina (Morg.).

Aspidiotus longispina Morg., Ent. Mon. Mag., xxv, p. 352 (1889).
A. (Morganella) longispinus Ckll., Bull. 6, T. s., Dep. Ag., p. 24 (1897).
Hemiberlesia " Leon., Riv. Pat. Veg., vi, p. 120 (1897).
" " Berl. e Leon., Annali di Agr., p. 111 (1898).
" " Leon., Gen. e Spec. Diaspiti, Asp., p. 19 (1900).
Habitat.—Demerara.
On Cupania sapida.

1282. Morganella maskelli (Ckll.).

Aspidiotus longispina Mask. (non Morg.), N. Z. Trans., xxvii, p. 38 (1894).
A. (Morganella) maskelli Ckll., Bull. 6, T. s., Dep. Ag., p. 22 (1897).
Aspidiotus maskelli var. ornatus Mask., N. Z. Trans., xxx, p. 225 (1898).
" " de Charm., Pr. Soc. Amic. Scien., p. 24 (1899).
" (Morganella) maskelli Hemp., Rev. Mus. Paul., iv, p. 498 (1900).
" maskelli Kirkaldy, Fauna Haw., iii, pt. 2, p. 107 (1902).
Habitat.—Hawaiian Islands; Mauritius; Brazil.
On Michelia flava; Camellia.

Genus **COMSTOCKIELLA** Ckll. Type, sabalis.

Comstockiella Ckll., Check List, Coccidæ, p. 320 (1896).

1283. Comstockiella sabalis (Comst.).

(*Palmetto scale.*)

Aspidiotus sabalis Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 67 (1883).

Comstockiella sabalis Ckll., Check List, p. 335 (1896).
" " var. Ckll., Jn. N. Y. Ent. Soc., vii, p. 257 (1899).
Habitat.—Florida; Guadaloupe Island.
On palmetto; Erythea edulis.

Comstockiella sabalis mexicana Ckll.

Comstockiella sabalis var. mexicana Ckll., Can. Ent., xxix, p. 267 (1899).
Habitat.—Mexico.
On palms.

Genus **PSEUDAONIDIA** Ckll. Type, duplex.

s. g. Pseudaonidia Ckll., Bull. 6, T. s., Dep. Ag., p. 14 (1897); g. The Entom., xxxiv, p. 226 (1901).

1284. **Pseudaonidia clavigera** Ckll.

Pseudaonidia clavigera Ckll., The Entom., xxxiv, p. 226 (1901).
Habitat.—Natal.
On Camellia.

1285. **Pseudaonidia duplex** (Ckll.).

Aspidiotus duplex Ckll., Psyche, vii, Suppl., i, p. 20 (1896).
" " " Bull. 4, T. s., Dep. Ag., p. 52 (1896).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 33 (1896).
" (Pseudaonidia) duplex Ckll., Bull. 6, T. s., Dep. Ag., pp. 14, 20 (1897).
" (Evaspidiotus) " Leon., Riv. Pat. Veg., vii, p. 173 (1899).
" " " Gen. e Spec. Diaspiti, Asp., p. 113 (1900).
" duplex Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 66 (1902).
Habitat.—Japan; Hawaiian Islands; Washington, D. C.; California (in Japanese nursery).
On Camellia; orange; camphor-tree; tea; Olea fragrans; Rhus succedanea; Azalea; Rhododendron; Myrica rubra; Eurya ochnacea.

1286. **Pseudaonidia pæoniæ** (Ckll.).

Aspidiotus duplex var. pæoniæ Ckll., Can. Ent., xxxi, p. 105 (1899).
" " " " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 66 (1902).
Pseudaonidia pæoniæ Ckll., in litt. (1902).
Habitat.—California; Japan.
On peony from Japan; Camellia japonica; Rhododendron; Ilex latifolia; Thea japonica.

1287. **Pseudaonidia rhododendri** (Green).

Aspidiotus theæ var. rhododendri Green, Jn. Bomb. N. H. Soc., xiii, p. 67 (1900).
Habitat.—India.
On Rhododendron.

Pseudaonidia rhododendri thearum Ckll. in litt., new name.

Aspidiotus theæ Mask. (non Green), Ind. Mus. Notes, ii, p. 59 (1891).
" " " N. Z. Trans., xxiv, p. 11 (1891).
" " " " " xxv, p. 207 (1892).

Aspidiotus (Pseudaonidia) theæ Ckll., Bull. 6, T. s., Dep. Ag., p. 28 (1897).
" (Evaspidiotus) " Leon., Riv. Pat. Veg., vii, p. 80 (1898).
" " " " Gen.e Spec. Diaspiti,Asp.,p.107(1900).
Pseudaonidia rhododendri thearum Ckll., in litt. (1902).
Habitat.—India.
On tea.

1288. Pseudaonidia tesserata (de Charm.).

Aspidiotus(Diaspidiotus)tesseratus de Charm.,Pr.Soc.Amic.Scien.,p.23(1899).
" tesseratus Ckll., Biol. Centr. Amer., ii, pt. 2, p. 24 (1899).
Pseudaonidia " " Am. Nat., xxxiii, p. 900 (1899).
Aspidiotus (Pseudaonidia) tesseratus Lefroy, West Indian Bulletin, iii, No. 3, p. 247 (1902).
Habitat.—Mauritius; Mexico; Antigua.
On Malvaviscus; grape-vine.

1289. Pseudaonidia trilobitiformis (Green).

Aspidiotus trilobitiformis Green, Ind. Mus. Notes, iv, p. 4 (1896).
" " " Cocc. Ceylon, pt. 1, p. 41 (1896).
" (Pseudaonidia) trilobitiformis Ckll.,Bull. 6, T. s., Dep. Ag., p. 28 (1897).
" (Evaspidiotus) " Leon., Riv. Pat. Veg., vii,p.82 (1898).
" trilobitiformis Ckll., Psyche, viii, p. 312 (1899).
" " de Charm., Pr. Soc. Amic. Scien., p. 26 (1899).
" (Pseudaonidia) trilobitiformis Hemp., Rev. Mus. Paul., iv, p. 499 (1900).
" (Evaspidiotus) " Leon., Gen. e Spec. Diaspiti,Asp., p. 109 (1900).
Pseudaonidia trilobitiformis Ckll., Ann. Mag. N. H., (7), ix, p. 456 (1902).
Habitat.—East Indies; Ceylon; Mauritius; Japan; Brazil.
On Dalbergia championii; Myrtaceæ; Ficus scandens.

Pseudaonidia trilobitiformis darutyi (de Charm.).

Aspidiotus darutyi de Charm., Bull. Soc. Ent. Fr., lxvii, p. 278 (1898).
" " " Revue Agricole, July 30, p. 2 (1898).
Habitat.—Mauritius; Seychelles; Liberia.
On Mangifera indica; Murraya exotica; Euphoria longana.

Genus **SELENASPIDUS** Ckll. Type, articulatus.

s. g. Selenaspidus Ckll., Bull. 6, T. s., Div. Ent. Dep. Ag., p. 14 (1897); g. in litt. (1902).
s. g. Selenaspis Leon., Riv. Pat. Veg., vi, p. 211 (1898).

1290. Selenaspidus articulatus (Morg.).

(*Rufous scale.*)

Aspidiotus articulatus Morg., Ent. Mon. Mag., xxv, p. 352 (1889).
" " Ckll., Journ. Inst. Jam., i, p. 54 (1892).

Aspidiotus articulatus Ckll., Jn. Trin. Nat. Club, p. 307 (1894).
" " " Scale Ins. Trinidad, p. 5 (1895).
" " Green, Ent. Mon. Mag., xxxii, p. 200 (1896).
" (Selenaspidus) articulatus Ckll., Bull. 6, T. s., Dep. Ag., pp. 14, 23 (1897).
" (Selenaspis) " Leon., Riv. Pat. Veg., vi,p.211 (1898).
" " " " Gen. e Spec. Diaspiti,Asp., p. 37 (1900).
" (Selenaspidus) articulatus Hemp., Rev. Mus.Paul.,iv,p.499(1900).
" articulatus Ckll., Ent. Mon. Mag., xxxvii, p. 171 (1901).
" " Lefroy, Scale Ins. Less. Antil., p. 51 (1901).
" " Newst., Mon. Brit. Cocc., i, p. 128 (1901).

Habitat.—England (in greenhouses); W. Africa; Demerara; Brazil; W. Indies; Costa Rica; Panama; Mexico.

On Pandanus; Dictyosperma album; Cordyline terminalis; orange; lime; coffee; Gardenia; Ficus, etc.

Selenaspidus articulatus celastri (Mask.).

Aspidiotus articulatus var. celastri Mask., N. Z. Trans., xxix, p. 297 (1897).

Habitat.—Cape of Good Hope.

On Celastrus laurinus.

Selenaspidus articulatus simplex (de Charm.).

Aspidiotus articulatus var.simplex de Charm.,Pr.Soc.Amic.Scien.,p.20(1899).

Habitat.—Mauritius.

Genus **CHRYSOMPHALUS** Ashm. Type, ficus.

Chrysomphalus Ashm., Am. Ent., iii, p. 268 (1880); Orange Ins., p. 21 (1880); Leon., Riv. Pat. Veg., vii, p. 198 (1899).
Aonidiella Berl. e Leon., Riv. Pat. Veg., iv, p. 77 (1895) and vii, p.174 (1899). Type, aurantii.
s. g. Melanaspis Ckll., Bull. 6, T. s., Dep. Ag., p. 9 (1897). Type, obscurus.
s. g. Mycetaspis " " " " " " p. 9 (1897). Type,personatus.
Insaspidiotus Barreda, Boll. Com. Parasit. Agr., i, p. 229 (1901).

1291. Chrysomphalus agavis (Towns. & Ckll.).

Aspidiotus agavis Towns. & Ckll., Jn. N. Y. Ent. Soc., vi, p. 178 (1898).
Chrysomphalus agavis Ckll., Check List, Suppl., p. 396 (1899).
Insaspidiotus " Barreda, Boll. Com. Parasit. Agr., i, p. 229 (1901).
Chrysomphalus " Ckll., Ent. News, xiii, p. 15 (1902).

Habitat.—Mexico.

On Agave.

1292. Chrysomphalus albopictus (Ckll.).

Aspidiotus (Chrysomphalus) albopictus Ckll., Ann. Mag. N. H., (7), i, p. 433 (1898).

Habitat.—Mexico.

On leaves of orange.

Chrysomphalus albopictus leonis (Towns. & Ckll.).

Aspidiotus albopictus var. leonis Towns. & Ckll., Jn. N. Y. Ent. Soc., vi, p. 179 (1898).

Chrysomphalus " " " " " " " " " vi, p. 179 (1898).

Habitat.—Mexico.

On orange.

1293. **Chrysomphalus alienus** (Newst.).

Aspidiotus alienus Newst., Ent. Mon. Mag., xxxvii, p. 81 (1901).

" " " Mon. Brit. Cocc., i, p. 110 (1901).

Chrysomphalus alienus Ckll., in litt. (1902).

Habitat.—London (in greenhouses).

On Cattleya Skinneri.

1294. **Chrysomphalus aonidum** (Linn.).

Coccus aonidum Linn., Syst. Nat., Ed. x, i, p. 455 (1758).

" " " " " " xii, i, p. 739 (1766).

" " Fab., Gen. Ins., p. 304 (1776).

" " Mod., Act. Goth., p. 30 (1778).

" " Fab., Spec. Ins., ii, p. 393 (1781).

" " " Mant. Ins., ii, p. 318 (1787).

" " Gmel., Syst. Nat., Ed. xiii, p. 2215 (1789).

" " Oliv., Ency. Meth., vi, p. 94 (1791).

" " Fab., Ent. Syst., iv, p. 224 (1794).

" " Turton, Syst. Nat., p. 712 (1801).

" " Fab., Syst. Rhyng., p. 307 (1803).

" " Sign., Ann. Soc. Ent. Fr., (4), x, p. 104 (1870).

Chrysomphalus ficus Ashm., Am. Ent., iii, p. 267 (1880).

Aspidiotus " Comst., Rep. U. S. Dep. Ag., 1880, p. 296 (1881).

" " " Can. Ent., xiii, p. 9 (1881).

" " Saund., Ins. Inj. to Fruits, p. 396 (1883).

" " Targ., Annali di Agr., p. 398 (1884).

" " Hubbard, Ins. Aff. Orange, p. 28 (1885).

" " Comst., Intr. Ent., p. 146 (1888).

" " Craw, Rep. Cal. Bd. Hort., p. 10 (1891).

" " Ckll., Ins. Life, vi, p. 101 (1893).

" " Morg., Bull. 28, La. Exp. Sta., p. 992 (1893).

" " " Spec. Bull. La. Exp. Sta., p. 60 (1893).

" " Howard, Can. Ent., xxvi, p. 355 (1894).

" " Mask., N. Z. Trans., xxvii, p. 39 (1894).

Chrysomphalus " Berl. e Leon., Cherm. Ital., Fasc. i, No. 4 (1895).

Aspidiotus (Chrysomphalus) ficus Berl., Riv. Pat. Veg., iv, pp. 83, 112, 232 (1895-1896).

" ficus Davis, Spec. Bull. 2, Mich. Exp. Sta., p. 35 (1896).

" " Barlow, Ind. Mus. Notes, iv, pp. 69, 78 (1897).

" " Starnes, Bull. 36, Ga. Exp. Sta., p. 22 (1897).

Aspidiotus (Chrysomphalus) ficus Ckll., Bull. 6, T. s., Dep. Ag., p. 23 (1897).
" ficus Osborn, Contr. Ia. Ag. Coll., No. 3, p. 7 (1898).
" " Berl. e Leon., Annali di Agr., p. 113 (1899).
" " de Charm., Pr. Soc. Amic. Scien., p. 25 (1899).
Chrysomphalus ficus Leon., Riv. Pat. Veg., vii, p. 211 (1899).
" " Pettit, Bull. 43, Ia. Exp. Sta., p. 166 (1899).
" aonidum Ckll., Biol. Centr. Amer., ii, pt. 2, p. 25 (1899).
Aspidiotus (Chrysomphalus) aonidum Hemp., Rev.Mus.Paul.,iv,p.502 (1900).
" ficus Lugger, 6th Rep. Minn. Exp. Sta., p. 225 (1900).
" " Marlatt, Yearbook U. S. Dep. Ag., p. 269 (1900).
" " Quaint. & Scott. Cocc. Amer., Dec. iii-iv, No. 11 (1901).
" " Lefroy, Scale Ins. Less. Antil., p. 53 (1901).
" " Full., 1st Rep. Ent. Natal, p. 100 (1901).
" " Zimm., Bull. Inst. Bot. Buitenzorg, No. 10, p. 19 (1901).
" " Newst., Mon. Brit. Cocc., i, p. 104 (1901).
" (Chrysomphalus) ficus Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 71 (1902).

Habitat.—Europe; Egypt; Ceylon; India; Mauritius; Natal; Australia; Japan; Brazil; Jamaica; Barbados; New York; Washington, D. C.; Ga.; Fla.; La.; Texas; Ohio; Col.; N. Mex.; Cal.; Mexico.

On orange; lemon; cocoanut; banana; camphor-tree; palms; rose; Ilex latifolia; I. lurida; Camellia; Dictyosperma album; Rhododendron arboreum; guava; grape-fruit; Ficus nitida; oleander; Begonia magnifica, etc.

1295. Chrysomphalus aurantii (Mask.).

(*Red scale of California.*)

Aspidiotus aurantii Mask., N. Z. Trans., xi, p. 199 (1878).
" " Comst., Rep. U. S. Dep. Ag., 1880, p. 293 (1881).
" citri " Can. Ent., xiii, p. 8 (1881).
" coccineus Genn., Ann. Soc. Ent. Fr., (6), i, p. 189 (1881).
Aonidia gennadii Targ., Annali di Agr., p. 151 (1881).
Aspidiotus aurantii Mask., N. Z. Trans., xvi, p. 120 (1883).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 59 (1883).
" " Saund., Ins. Inj. to Fruits, p. 395 (1883).
Aonidia " Targ., Annali di Agr., pp. 383, 386 (1884).
Aspidiotus aurantiæ Hubbard, Ins. Aff. Orange, p. 32 (1885).
" aurantii Mask., Ins. Nox. Ag. N. Z., p. 42 (1887).
" coccineus " " " " " p. 42 (1887).
" gennadii Penzig, Studi bot. sug. Agr., p. 497 (1887).
" aurantii Coq., Bull. 22, Div. Ent. Dep. Ag., p. 10 (1890).
" " Mask., N. Z. Trans., xxiv, p. 12 (1891).
Aonidia " Craw, Rep. Cal. Bd. Hort., p. 12 (1891).
Aspidiotus " Coq., Bull. 26, Div. Ent. Dep. Ag., p. 14 (1892).
" " Mask., N. Z. Trans., xxv, p. 206 (1892).
" " Morg., Spec. Bull. La. Exp. Sta., p. 74 (1893).
" coccineus French, Handb. Destr. Ins. Victoria, p. 53 (1893).

Aspidiotus aurantii Mask., N. Z. Trans., xxvii, p. 40 (1894).
" " Lounsb., Rep. Ent. Cape Good Hope, p. 41 (1895).
Aonidia " Saccardo, Riv. Pat. Veg., iv, p. 51 (1895).
Aonidiella " Berl., " " " " p. 83 (1895).
" " Berl. e Leon., Cherm. Ital., Fasc. i, No. 23 (1895).
Aspidiotus " Green, Cocc. Ceylon, pt. i, p. 58 (1896).
" coccineus Risso, Hist. Nat. Oranges, p. 81 (1896).
" aurantii Frog., Dep. Ag. N. S. W., No. 175, p. 2 (1897).
Aonidia " Starnes, Bull. 36, Ga. Exp. Sta., p. 23 (1897).
A. (Aonidiella) " Ckll., Bull. 6, T. s., Dep. Ag., pp. 13, 29 (1897).
" " " Allen, Ag. Gaz. N. S. W., ix, p. 618 (1898).
Chrysomphalus " Ckll., Check List, Suppl., p. 396 (1899).
Aspidiotus " de Charm., Pr. Soc. Amic. Scien., p. 22 (1899).
" " Lounsb., Rep. Ent. Cape Good Hope, p. 23 (1900).
Chrysomphalus " Marlatt, Yearbook U. S. Dep. Ag., p. 268 (1900).
Aonidiella " Leon., Gen. e Spec. Diaspiti, Asp., p. 124 (1900).
Aspidiotus " Newst., Mon. Brit. Cocc., i, p. 88 (1901).
" " Full., 1st Rep. Ent. Natal, p. 99 (1901).
" (Chrysomphalus) aurantii Kuw., Pr.Cal.Ac.Sci.,(3),iii,p. 70 (1902).

Habitat.—S. Europe; Syria; Natal; Cape Colony; Mauritius; Ceylon; China; Japan; Australia; New Zealand; New Caledonia; Samoa; Fiji; Hawaiian Islands; West Indies; New York; Florida; Ohio; California.

On orange; lemon; cocoa-nut; fig; olive; agave; plum; lignum-vitæ; Buxus; Euonymus japonicus; Pistacia; rose; pear; quince; apple; willow; oak; grape, etc.

Chrysomphalus aurantii citrinus (Coq.).

Aspidiotus citrinus Coq., Bull. 23, Div. Ent. Dep. Ag., p. 29 (1891).
" " Craw, Rep. Cal. Bd. Hort., p. 10 (1891).
" " Riley & How., Ins. Life, v, p. 281 (1893).
" " Morg., Spec. Bull. La. Exp. Sta., p. 75 (1893).
" " Craw, 4th Bien. Rep. Cal. Bd. Hort., p. 97 (1894).
" aurantii var. citrinus Howard, Ins. Life, vi, p. 228 (1894).
A. (Aonidiella) aurantii var. citrinus Ckll., Bull. 6, T. s., Dep. Ag.,p.29(1897).
Aonidiella " " " Leon., Riv. Pat. Veg., vii, p. 187 (1899).
Aspidiotus citrinus Lounsb., Rep. Ent. Cape Good Hope, p. 25 (1900).
" " Marlatt, Yearbook U. S. Dep. Ag., p. 269 (1900).

Habitat.—California; Japan.

On orange; Euonymus; Aucuba.

1296. Chrysomphalus biformis (Ckll.).

Aspidiotus biformis Ckll., Gard. Chron., (3), xiii, p. 548 (1893).
" " " Can. Ent., xxvi, p. 131 (1894).
" " " Bull. Bot. Dep. Jam., p. 151 (1897).
" (Chrysomphalus) biformis Ckll., Bull. 6, T. s., Dep. Ag., pp. 13, 23 (1897).
" (Evaspidiotus) " Leon., Riv. Pat. Veg., vii, p.60(1898).

Chrysomphalus biformis Ckll., Biol. Centr. Amer., ii, pt. 2, p. 26 (1899).
Aspidiotus (Evaspidiotus) biformis Ckll., Gen. e Spec. Diaspiti, Asp., p. 87 (1900).

Habitat.—Central America; Jamaica; Trinidad; Grenada; Antigua.
On orchids.

Chrysomphalus biformis cattleyæ (Ckll.).

Aspidiotus biformis var. cattleyæ Ckll., Gard. Chron., (3), xiii, p. 548 (1893).
A. (Chrysomphalus) biformis var. cattleyæ Ckll., Bull. 6, T. s., Dep. Ag., p. 23 (1897).

Habitat.—Jamaica.
On Cattleya Bowringiana.

1297. Chrysomphalus bromeliæ ("Newst.," Leon.).

Aonidiella bromiliæ Leon., Riv. Pat. Veg., vii, p. 177 (1899).
" " " Gen. e Spec. Diaspiti, Asp., p. 115 (1900).
Aspidiotus " Newst., Mon. Brit. Cocc., i, p. 86 (1901).
Chrysomphalus bromeliæ Ckll., in litt. (1901-1902).

Habitat.—England.
On pine-apple (from Canary Islands?).

1298. Chrysomphalus calurus (Ckll.).

Aspidiotus (Chrysomphalus) calurus Ckll., Ann. Mag. N. H., (7), i, p. 440 (1898).
Chrysomphalus calurus Ckll., Biol. Centr. Amer., ii, pt. 2, p. 27 (1899).

Habitat.—Mexico.
On Cratægus.

1299. Chrysomphalus cladii (Mask.).

Aspidiotus cladii Mask., N. Z. Trans., xxiii, p. 3 (1890).
" " " " " xxv, p. 205 (1892).
" " " " " xxvi, p. 67 (1893).
" " " " " xxviii, p. 385 (1896).
A. (Chrysomphalus) cladii Ckll., Bull. 6, T. s., Dep. Ag., pp. 13, 26 (1897).
Aspidiotus " de Charm., Pr. Soc. Amic. Scien., p. 22 (1899).
Aonidiella " Leon., Riv. Pat. Veg., vii, p. 195 (1899).
" " " Gen. e Spec. Diaspiti, Asp., p. 150 (1900).

Habitat.—Australia; Natal; Mauritius.
On Cladium; Lepidosperma; Xerotes; sedges; aloe.

1300. Chrysomphalus dictyospermi (Morg.).

Aspidiotus dictyospermi Morg., Ent. Mon. Mag., xxv, p. 352 (1889).
" " Newst., " " " xxix, p. 185 (1893).
" " Ckll., Can. Ent., xxvi, p. 128 (1894).
" " Mask., N. Z. Trans., xxvii, p. 44 (1894).
A. (Chrysomphalus) dictyospermi Ckll., Bull. 6, T. s., Dep. Ag., p. 23 (1897).
Aspidiotus " Barlow, Ind. Mus. Notes, iv, p. 119 (1899).

Chrysomphalus dictyospermi Leon., Riv. Pat. Veg., vii, p. 218 (1899).
" " " Gen. e Spec. Diaspiti, Asp., p. 173 (1900).
" " Ckll., Ent. Mon. Mag., xxxvi, p. 157 (1900).
Aspidiotus (Chrysomphalus) dictyospermi Hemp., Rev. Mus. Paul., iv, p. 505 (1900).
" dictyospermi Lefroy, Scale Ins. Less. Antil., p. 56 (1901).

Habitat.—China; Demerara; Brazil; West Indies; Mexico; United States (in greenhouses).

On Dictyospermum album; Erythrina indica; Cycas; Latania; palms; rose; mango, etc.

Chrysomphalus dictyospermi pinnulifera (Mask.).

Diaspis pinnulifera Mask., N. Z. Trans., xxiii, p. 4 (1890) female.
" " " " " xxv, p. 208 (1892).
" " " " " xxvii, p. 44 (1894).
" " Ckll., Can. Ent., xxvi, p. 129 (1894).
Aspidiotus dictyospermi var. jamaicensis Ckll., Can. Ent., xxvi, p. 129 (1894).
Chrysomphalus minor Berl. e Leon., Riv. Pat. Veg., iv, p. 346 (1896).
A. (Chrysomphalus) " Ckll., Bull. 6, T. s., Dep. Ag., p. 30 (1897).
A. " dictyospermi var. jamaicensis Ckll., Bull. 6, T. s., Dep. Ag., p. 23 (1897).
Chrysomphalus minor Leon., Riv. Pat. Veg., vii, p. 214 (1899).
" " " Gen. e Spec. Diaspiti, Asp., p. 169 (1900).
Diaspis pinnulifera Green, Ind. Mus. Notes, v, p. 2 (1900).
" " Ckll., Ent. Mon. Mag., xxxvi, p. 157 (1900).

Habitat.—Demerara; Fiji; Italy; Jamaica.

On Croton: Cycas; rose; mango; Pandanus graminifolius.

Chrysomphalus dictyospermi arecæ (Newst.).

Aspidiotus dictyospermi var. arecæ Newst., Ent. Mon. Mag., xxix, p. 185 (1893).
" " " " Barlow, Ind. Mus. Notes, iv, p. 119 (1899).
Chrysomphalus " " " Leon., Riv. Pat. Veg., vii, p. 218 (1899).
Aspidiotus " " " Newst., Mon. Brit. Cocc., i, p. 107 (1901).

Habitat.—India; Demerara; Brazil; England; West Indies.

On Areca triandra; Cypripedium; Dendrobium; Anthurium; Aloe zeyheri; tea.

Chrysomphalus dictyospermi mangiferæ (Ckll.).

Aspidiotus mangiferæ Ckll., Journ. Inst. Jam., i, p. 255 (1893).
" " " Can. Ent., xxvi, p. 129 (1894).
" " " Rev. Mus. Paul., ii, p. 68 (1897).
A. (Chrysomphalus) mangiferæ Ckll., Bull. 6, T. s., Dep. Ag., p. 24 (1897).
Chrysomphalus " Leon., Riv. Pat. Veg., vii, p. 215 (1899).
" dictyospermi var. mangiferæ Ckll., Check List, Suppl., p. 396 (1899).

Habitat.—Jamaica.

On Mango.

1301. Chrysomphalus kelloggi (Kuwana).

Aspidiotus (Chrysomphalus) kelloggi Kuw., Pr. Cal. Ac.Sci.,(3),iii,p.71(1902).
Habitat.—Japan.

1302. Chrysomphalus koebelei (Towns. & Ckll.).

Aspidiotus koebelei Towns. & Ckll., Jn. N. Y. Ent. Soc., vi, p. 179 (1898).
Chrysomphalus " Ckll., Check List, Suppl., p. 396 (1899).
Habitat.—Mexico.
On orange.

1303. Chrysomphalus lilacinus (Ckll.).

Aspidiotus lilacinus Ckll., Ann. Mag. N. H., (7), ii, p. 26 (1898).
Chrysomphalus " " Biol. Centr. Amer., ii, pt. 2, p. 27 (1899).
Habitat.—Mexico.
On various species of oak.

1304. Chrysomphalus mimosæ (Comst.).

(*Mimosa scale.*)

Aspidiotus mimosæ Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 62 (1883).
A. (Chrysomphalus) mimosæ Ckll., Bull. 6, T. s., Dep. Ag., p. 24 (1897).
Aonidiella " Leon., Riv. Pat. Veg., vii, p. 181 (1899).
Chrysomphalus " Ckll., Biol. Centr. Amer., ii, pt. 2, p. 26 (1899).
Aonidiella " Leon., Gen. e Spec. Diaspiti, Asp., p.121(1900).
Habitat.—Mexico.
On Mimosa.

1305. Chrysomphalus obscurus (Comst.).

Aspidiotus obscurus Comst., Rep. U. S. Dep. Ag., 1880, p. 303 (1881).
" " Pack., 5th Rep. U. S. Ent. Com., p. 101 (1890).
A. (Melanaspis)" Ckll., Bull. 6, T. s., Dep. Ag., pp. 13, 21 (1897).
Aspidiotus " Rolfs & Quaint., Cocc. Amer., Dec. i-ii, No. 16 (1898).
Chrysomphalus " Leon., Riv. Pat. Veg., vii, p. 205 (1899).
Aspidiotus " Hunter, Kan. Univ. Quar., viii, p. 7 (1899).
" " " " " " ix, p. 107 (1900).
Chrysomphalus " Leon., Gen. e Spec. Diaspiti, Asp., p. 160 (1900).
Habitat.—Washington, D. C.; Florida; Ohio; Illinois; Kansas.
On oak; hickory; grape-vine.

1306. Chrysomphalus odontoglossi (Ckll.).

Aspidiotus biformis var. odontoglossi Ckll., Gard. Chron., (3),xiii,p.548(1893).
" " " " " Bull. 6, T.s.,Dep.Ag.,p.23(1897).
" odontoglossi Leon., Gen. e Spec. Diaspiti, Asp., p. 89 (1900).
Habitat.—Jamaica.
On Odontoglossum grande.

1307. Chrysomphalus paulistus (Hemp.).

Aspidiotus (Chrysomphalus) paulistus Hemp., Rev.Mus.Paul.,iv,p.504(1900).
Chrysomphalus " Ckll., Ann. Mag. N. H., (7), viii, p. 107 (1901).

Habitat.—Brazil.
On Laurus.

1308. Chrysomphalus perseæ (Comst.).

Aspidiotus perseæ Comst., Rep. U. S. Dep. Ag., 1880, p. 305 (1881).
" " Ckll., Bull. 4, T. s., Dep. Ag., p. 33 (1896).
A. (Chrysomphalus) perseæ Ckll., Bull. 6, T. s., Dep. Ag., p. 22 (1897).
Aspidiotus " " Psyche, viii, p. 90 (1897).
" " Rolfs & Quaint., Cocc. Amer., Dec. i-ii, No. 17 (1898).
Chrysomphalus " Leon., Riv. Pat. Veg., vii, p. 223 (1899).
" " Ckll., Biol. Centr. Amer., ii, pt. 2, p. 25 (1899).
" " Leon., Gen. e Spec. Diaspiti, Asp., p.178 (1900).
Aspidiotus " Newst., Mon. Brit. Cocc., i, p. 112 (1901).

Habitat.—Florida; Mexico; Kew Gardens, England.
On Persea carolinensis; Magnolia glauca; M. grandiflora; Anthurium Harrisii; Ilex; cocoanut-palm.

1309. Chrysomphalus personatus (Comst.).

(*The Masked scale.*)

Aspidiotus personatus Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 66 (1883).
" " McIntire, Journ. Quekett Micr.Club,(2),iv,p.23 (1889).
A. (Mycetaspis)" Ckll., Bull. 6, T. s., Dep. Ag., pp. 13, 24 (1897).
Aonidiella personata Leon., Riv. Pat. Veg., vii, p. 193 (1899).
Chrysomphalus personatus Ckll., Check List, Suppl., p. 396 (1899).
Aspidistus " " Journ. N. Y. Ent. Soc., vii, p. 258 (1899).
Aonidiella " Leon., Gen. e Spec. Diaspiti, Asp., p. 148 (1900).
Aspidiotus " Lefroy, Scale Ins. Less. Antil., p. 55 (1901).
" " Newst., Mon. Brit. Cocc., i, p. 83 (1901).

Habitat.—West Indies; Mexico; British Guiana; England (in greenhouses).
On orange; Areca rubra; Sabal; Jasminum; plantain; banana; mango: fig; Tillandsia corallina; T. confertiflora; T. saundersii; Anacardium occidentale, etc. Lists in Ins. Life, v, pp. 159, 160, 245, 246 and vi,pp.50,100,103.

1310. Chrysomphalus phenax Ckll.

Chrysomphalus phenax Ckll., The Entom., xxxiv, p. 225 (1901).
Habitat.—Natal.
On Mimosa.

1311. Chrysomphalus reniformis (Ckll.).

Aspidiotus reniformis Ckll., Can. Ent., xxix, p. 265 (1897).
Chrysomphalus " " Check List, Suppl., p. 396 (1899).
" " " Biol. Centr. Amer., ii, pt. 2, p. 25 (1899).
" " Leon., Gen. e Spec. Diaspiti, Asp., p. 226 (1900).
Habitat.—Mexico.

1312. Chrysomphalus rhizophoræ Ckll.

Chrysomphalus rhizophoræ Ckll., Ann. Mag. N. H., (7), iii, p. 169 (1899).
" " " Biol. Centr. Amer., ii, pt. 2, p. 25(1899).
" " Leon., Gen. e Spec. Diaspiti, Asp., p. 226 (1900).
Habitat.—Mexico.
On mangrove.

1313. Chrysomphalus rossi (Mask.).

Aspidiotus rossi Mask., N. Z. Trans., xxiii, p. 3 (1890).
" " " " " xxiv, p. 11 (1891).
" " " " " xxv, p. 207 (1892).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 34 (1896).
" " Green, Cocc. Ceylon, pt. 1, p. 45 (1896).
A. (Chrysomphalus) rossi Ckll., Bull. 6, T. s., Dep. Ag., p. 27 (1897).
Aspidiotus " Mask., N. Z. Trans., xxix, p. 296 (1897).
" " " " " xxx, p. 224 (1898).
Chrysomphalus " Leon., Riv. Pat. Veg., vii, p. 202 (1899).
" " Ckll., Pr. Ac. N. Sci. Ph., p. 274 (1899).
" " Leon., Gen. e Spec. Diaspiti, Asp., p. 157 (1900).
Habitat.—Australia; New Zealand; Philippine Islands; Japan; China; Ceylon; S. Africa.
On Xanthorrhœa; Eucalyptus; Nerium oleander; Capparis moonii; Rhinocarpus; Acacia; Araucaria bidwillii; palms; olive; Abutilon; Artemisia, etc.

Chrysomphalus rossi victoriæ Ckll.

Chrysomphalus rossi victoriæ Ckll., Victorian Naturalist, xvi, p. 8 (1899).
Habitat.—Victoria.

1314. Chrysomphalus scutiformis (Ckll.).

Aspidiotus scutiformis Ckll., Ann. Mag. N. H., (6), xii, p. 48 (1893).
A. (Chrysomphalus) scutiformis Ckll., Bull. 6, T. s., Dep. Ag., p. 25 (1897).
Chrysomphalus " " Biol. Centr. Amer., ii, pt.2,p.26 (1899).
Aspidiotus (Chrysomphalus) " Leon.,Gen.e Spec.Diaspiti,Asp.,p.177(1900).
" " " Hemp., Rev. Mus. Paul., iv, p. 503 (1900).
Habitat.—Mexico; Central America.
On Citrus; Avocado pear; Laurus.

1315. Chrysomphalus setiger (Mask.).

Aspidiotus setiger Mask., N. Z. Trans., xxix, p. 298 (1897).
Chrysomphalus " Ckll., Check List, Suppl., p. 396 (1899).
" " Leon., Gen. e Spec. Diaspiti, Asp., p. 165 (1900).
Habitat.—Japan.
On Quercus.

1316. Chrysomphalus smilacis (Comst.).

Aspidiotus smilacis Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 69 (1883).
A. (Chrysomphalus) smilacis Ckll., Bull. 6, T. s., Dep. Ag., pp. 12,22 (1897).
Aonidiella " Leon., Riv. Pat. Veg., vii, p. 182 (1899).
" " " Gen. e Spec. Diaspiti, Asp., p. 122 (1900).
Chrysomphalus " Kuw., Jn. N. Y. Ent. Soc., x, p. 32 (1902).
Habitat.—Mass.; Galapagos Islands.
On Smilax; Croton?

1317. Chrysomphalus sphærioides (Ckll.).

Aspidiotus sphærioides Ckll., Psyche, vii, Suppl., i, p. 7 (1895).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 35 (1896).
A. (Chrysomphalus) sphærioides Ckll., Bull. 6, T. s., Dep. Ag., p. 30 (1897).
Chrysomphalus " Leon., Riv. Pat. Veg., vii, p. 203 (1899).
" " " Gen. e Spec. Diaspiti, Asp., p. 158 (1900).
Habitat.—Louisiana.
On New Zealand flax (Phormium).

1318. Chrysomphalus tenebricosus (Comst.).

Aspidiotus tenebricosus Comst., Rep. U. S. Dep. Ag., 1880, p. 308 (1881).
" " Pack., 5th Rep. U. S. Ent. Com., p. 417 (1890).
" " Craw, Rep. Cal. Bd. Hort., p. 11 (1891).
" " Lint., 11th Rep. Ins. N. Y., p. 221 (1896).
A. (Chrysomphalus) " Ckll., Bull. 6, T. s., Dep. Ag., p. 22 (1897).
Aspidiotus " Rolfs & Quaint., Cocc. Amer., Dec. i-ii, No. 18 (1898).
Aonidiella tenebricosa Leon., Riv. Pat. Veg., vii, p. 178 (1899).
" " " Gen. e Spec. Diaspiti, Asp., p. 119 (1900).
Habitat.—Washington, D. C.; Georgia; California.
On maple; apple.

1319. Chrysomphalus tonilensis Ckll.

Chrysomphalus (Melanaspis) tonilensis Ckll., Ann. Mag. N. H., (7), x, p. 470 (1902).
Habitat.—Mexico.
"On a low bush of the sage family."

Genus **PSEUDISCHNASPIS** Hemp. Type, linearis.

Pseudischnaspis Hemp., Rev. Mus. Paul., iv, p. 506 (1900).

1320. Pseudischnaspis bowreyi (Ckll.).

Aspidiotus bowreyi Ckll., Journ. Inst. Jam., i, p. 383 (1893).
" " " Ent. News, v, p. 59 (1894).
A. (Chrysomphalus) bowreyi Ckll., Bull. 6, T. s., Dep. Ag., p. 23 (1897).
Chrysomphalus " Leon., Riv. Pat. Veg., vii, p. 220 (1899).
Pseudischnaspis " Ckll., Am. Nat., xxxv, p. 64 (1901).
Habitat.—Jamaica; Mexico.
On Agave rigida.

1321. Pseudischnaspis linearis Hemp.

Pseudischnaspis linearis Hemp., Rev. Mus. Paul., iv, p. 506 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 108 (1901).
Habitat.—Brazil.
On Myrcia.

1322. Pseudischnaspis longissima (Ckll.).

Aspidiotus (Chrysomphalus) longissimus Ckll., Ann. Mag. N. H., (7), i, p. 439 (1898).
Pseudischnaspis longissima Ckll., Am. Nat., xxxv, p. 64 (1901).
Habitat.—Mexico.
On Mango.

Genus **PSEUDODIASPIS** Ckll. Type, larreæ.

s. g. Pseudodiaspis Ckll., Bull. 6, T. s., Div. Ent. Dep. Ag., p. 21 (1897); g. Check List, Suppl., p. 398 (1899).

1323. Pseudodiaspis dentilobis (Ckll.).

Aspidiotus (Pseudodiaspis) dentilobis Ckll., Ann. Mag.N.H.,(7),i,p.438(1898).
Habitat.—Mexico.
On Mimosa; Acacia?

1324. Pseudodiaspis larreæ (Ckll.).

A. (Pseudodiaspis) larreæ Ckll., Bull. 6, T. s., Dep. Ag., p. 21 (1897).
Habitat.—Arizona.
On Larrea tridentata.

Genus **TARGIONIA** Sign. Type, nigra.

Targionia Sign., Ann. Soc. Ent. Fr., (4), x, p. 105 (1870): Leon., Riv. Pat. Veg., viii, p. 298 (1900); Gen. e Spec. Diaspiti, Asp., p. 181 (1900).

1325. Targionia acaciæ (Morg.).

Aspidiotus acaciæ Morg., Ent. Mon. Mag., xxv, p. 353 (1889).
" " Mask., N. Z. Trans., xxv, p. 205 (1892).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 26 (1897).
Targionia " Leon., Gen. e Spec. Diaspiti, Asp., p. 191 (1900).
Habitat.—New South Wales; Tasmania.
On Eucalyptus; Acacia pycnantha.

Targionia acaciæ propinqua (Mask.).

Aspidiotus acaciæ var. propinqua Mask., N. Z. Trans., xxv, p. 205 (1892).
" " " " Ckll., Bull. 6, T. s., Dep. Ag., p. 26 (1897).
Targionia " " " Leon., Gen. e Spec. Diaspiti, Asp., p. 191 (1900).
Habitat.—New South Wales.
On Acacia; Hakea saligna.

1326. Targionia artocarpi (Green).

Aspidiotus artocarpi Green, Ent. Mon. Mag., xxxii, p. 200 (1896).
A. (Mycetaspis) " Ckll., Bull. 6, T. s., Dep. Ag., pp. 13, 27 (1897).
Targionia " Leon., Gen. e Spec. Diaspiti, Asp., p. 198 (1900).
Habitat.—India.
On Artocarpus integrifolia.

1327. Targionia bigeloviæ (Ckll.).

A. (Hemiberlesia?) bigeloviæ Ckll., Bull. 6, T. s., Dep. Ag., p. 20 (1897).
Aspidiotus bigeloviæ Newell, Contr. Ia. Ag. Coll., No. 3, p. 25 (1899).
" " Ckll. & Parr., The Industrialist, pp. 278, 292 (1899).
Targionia " Leon., Gen. e Spec. Diaspiti, Asp., p. 226 (1900).
Habitat.—California.
On Bigelovia brachylepis.

1328. Targionia casuarinæ (Mask.).

Aspidiotus casuarinæ Mask., N. Z. Trans., xxvi, p. 66 (1893).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 26 (1897).
Targionia " Leon., Riv. Pat. Veg., viii, p. 314 (1900).
" " " Gen. e Spec. Diaspiti, Asp., p. 197 (1900).
Habitat.—Australia.
On Casuarina equisetifolia.

1329. Targionia cueroensis (Ckll.).

Aspidiotus cueroensis Ckll., Can. Ent., xxxi, p. 105 (1899).
" " Newell, Contr. Ia. Ag. Coll., No. 3, p. 21 (1899).
Targionia " Ckll. & Parr., The Industrialist, p. 278 (1899).
" " Leon., Gen. e Spec. Diaspiti, Asp., p. 226 (1900).
Habitat.—Texas.
On Celtis.

1330. Targionia dearnessi (Ckll.).

Aspidiotus dearnessi Ckll., Can. Ent., xxx, p. 226 (1898).
" " " & Parr., The Industrialist, p. 279 (1899).
Targionia " Leon., Gen. e Spec. Diaspiti, Asp., p. 266 (1900).
Habitat.—Bruce Peninsula, shores of Lake Huron; Canada.
On Arctostaphylos uva-ursi.

1331. Targionia eucalypti (Mask.).

Aspidiotus eucalypti Mask., Tr. Roy. Soc. S. Austr., p. 102 (1887-88).
" " " N. Z. Trans., xxiv, p. 11 (1891).
" " " " " xxv, p. 206 (1892).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 26 (1897).
Targionia " Leon., Gen. e Spec. Diaspiti. Asp., p. 193 (1900).
Habitat.—New South Wales.
On Eucalyptus; Casuarina.

Targionia eucalypti comata (Mask.).

Aspidiotus eucalypti var. comatus Mask., N. Z. Trans., xxviii, p. 385 (1896).
" " " " Ckll., Bull. 6, T. s., Dep. Ag., p. 26 (1897).
Targionia " " " Leon., Gen. e Spec. Diaspiti, Asp., p. 194 (1900).
Habitat.—Australia.
On Eucalyptus viminalis.

1332. Targionia graminella (Ckll.).

Aspidiotus graminellus Ckll., Ann. Mag. N. H., (7), vii, p. 333 (1901).
Targionia graminella " in litt. (1902).
Habitat.—New Mexico.
On grass.

1333. Targionia glomerata (Green).

Aspidiotus (Targionia) glomeratus Green, Ind. Mus. Notes, v, p. 93 (1903).
Habitat.—India.
On Saccharum officinale, associated with Aclerda japonica.

1334. Targionia gutierreziæ (Ckll. & Parr.).

Aspidiotus (Targionia) gutierreziæ Ckll. & Parr., The Industrialist, pp. 277, 282 (1899).
Targionia gutierreziæ Leon., Gen. e Spec. Diaspiti, Asp., p. 226 (1900).
Habitat.—New Mexico.
On Gutierrezia lucida.

1335. Targionia helianthi (Parr.).

Aspidiotus (Targionia) helianthi Parr., Can. Ent., xxxi, p. 176 (1899).
Habitat.—Kansas.
On roots of sunflower (Helianthus).

1336. Targionia marlatti (Parr.).

Aspidiotus (Targionia) marlatti Parr., Can. Ent., xxxi, p. 282 (1899).
" " " " Bull. 98, Kan. Exp. Sta., p. 143 (1900).
Habitat.—Kansas.
On Andropogon furcatus: A. scoparius: Panicum virgatum; Chrysopogon.

1337. Targionia moorei (Green).

Aspidiotus moorei Green, Ent. Mon. Mag., xxxii, p. 199 (1896).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 28 (1897).
Targionia " Leon., Gen. e Spec. Diaspiti, Asp., p. 195 (1900).
Habitat.—India.
On Grislea tomentosa.

1338. Targionia nigra Sign.

Targionia nigra Sign., Ann. Soc. Ent. Fr., (4), x, p. 106 (1870).
Aspidiotus signoreti Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 82 (1883).
A. (Targionia) " Ckll., Bull. 6, T. s., Dep. Ag., pp. 14, 19 (1897).
Targionia distincta Leon., Gen. e Spec. Diaspiti, Asp., p. 188 (1900).
Habitat.—France.
On Cineraria maritima.

1339. Targionia parkinsoniæ (Ckll.).

(*The Palo Verde scale.*)

Xerophilaspis parkinsoniæ Ckll., Bull. 32, Ariz. Exp. Sta., p. 282 (1899).
" " " Can. Ent., xxxii, p. 131 (1900).
Targionia " " in litt. (1902).
Habitat.—Arizona.
On Parkinsonia Torreyana.

1340. Targionia vitis (Sign.).

Aspidiotus vitis Sign., Bull. Soc. Ent. Fr., (5),vi,p.lii and Ann. p. 601 (1876).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 84 (1883).
" " Goethe, Jahrb. Nass. Ver. Nat., p. 113 (1884).
" " Leon., Riv. Pat. Veg., iv, p. 51 (1895).
A. (Diaspidiotus) vitis Ckll., Bull. 6, T. s., Dep. Ag., p. 19 (1897).
Aspidiotus " Berl. e Leon., Cherm. Ital., Fasc. ii, No. 43 (1897).
Targionia " Leon., Gen. e Spec. Diaspiti, Asp., p. 187 (1900).
Habitat.—France; Algiers.
On grapes.

1341. Targionia yuccæ (Ckll.).

Aspidiotus yuccæ Ckll., Psyche, vii, Suppl., i, p. 20 (1896).
" " " Bull. 4, T. s., Dep. Ag., p. 32 (1896).
A. (Chrysomphalus) yuccæ Ckll., Bull. 6, T. s., Dep. Ag., p. 25 (1897).
Hemiberlesia " Leon., Riv. Pat. Veg., vi, p. 127 (1897).
Aspidiotus " Ckll. & Parr., The Industrialist, p. 279 (1899).
Hemiberlesia " Leon., Gen. e Spec. Diaspiti, Asp., p. 26 (1900).
Habitat.—Mexico.
On Yucca.

Targionia yuccæ neomexicana (Ckll.).

Aspidiotus yuccæ var. neomexicanus Ckll., Ann. Mag.N.H.,(7),ii,p.25 (1898).
" " " " " & Parr., The Industrialist, p. 278 (1899).
Habitat.—New Mexico.
On Yucca elata.

1342. Targionia yuccarum (Ckll.).

Aspidiotus yuccarum Ckll., Ann. Mag. N. H., (7), ii, p. 25 (1898).
Targionia " " & Parr., The Industrialist, p. 279 (1899).
Hemiberlesia " Leon., Gen. e Spec. Diaspiti, Asp., p. 222 (1900).
Habitat.—New Mexico.
On Yucca elata; at base of stems of Bigelowia wrightii.

Genus **XEROPHILASPIS** Ckll. Type, prosopidis.

s. g. Xerophilaspis Ckll., Bull. 6, T. s., Dep. Ag., p. 14 (1897); g. Check List, Suppl., p. 396 (1899).

1343. Xerophilaspis prosopidis (Ckll.).

Aspidiotus prosopidis Ckll., Psyche, vii, Suppl., i, p. 15 (1895).
A. (Xerophilaspis) " " Bull. 6, T. s., Dep. Ag., pp. 14, 22 (1897).
Xerophilaspis " " Check List, Suppl., p. 396 (1899).
Targionia " Leon., Gen. e Spec. Diaspiti, Asp., p. 190 (1900).
Habitat.—Arizona; Mexico.
On Mesquite.

Genus **ODONASPIS** Leon. Type, secreta.

Odonaspis Leon., Riv. Pat. Veg., v, p. 284 (1897): Ckll., Bull. 6, T. s., Dep. Ag., p. 14 (1897).
Spatheaspis Leon., Riv. Pat. Veg., vi, p. 115 (1897); Gen. e Spec. Diaspiti, Asp., p. 14 (1900).
s. g. Froggattiella Leon., Riv. Pat. Veg., viii, p. 300 (1900): Ckll., Psyche, ix, p. 72 (1902). Type, inusitata.
Anoplaspis Leon., Riv. Pat. Veg., viii, p. 344 (1900); Gen. e Spec. Diaspiti, Asp., p. 227 (1900). Type, bambusarum.

1344. Odonaspis bambusarum (Ckll.).

Aspidiotus (Odonaspis) bambusarum Ckll., Psyche, viii, p. 191 (1898).
Anoplaspis bambusarum Leon., Gen. e Spec. Diaspiti, Asp., p. 228 (1900).
Habitat.—California (from Japan).
On bamboo.

1345. Odonaspis canaliculata Green.

Odonaspis canaliculata Green, Jn. Bomb. N. H. Soc., xiii, p. 72 (1900).
Habitat.—India.

1346. Odonaspis inusitata (Green).

Aspidiotus inusitatus Green, Cocc. Ceylon, pt. i, p. 66 (1896).
" " Ckll., Bull. 6, T. s., Dep. Ag., p. 27 (1897).
Targionia (Froggattiella) inusitata Leon., Gen. e Spec. Diaspiti, Asp., p. 183 (1900).
Habitat.—Ceylon.
On bamboo.

1347. Odonaspis janeirensis (Hemp.).

Aspidiotus (Odonaspis) janeirensis Hemp., Rev. Mus. Paul., iv, p.500 (1900).
" " " " Ann. Mag. N. H., (7), viii, p. 106 (1901).
Odonaspis janeirensis Ckll., Rev. Chil. Hist. Nat., vi, p. 256 (1902).
Habitat.—Brazil.
On grass.

1348. Odonaspis secreta (Ckll.).

Aspidiotus secretus Ckll., Psyche, vii, Suppl., i, p. 20 (1896).
" " " Bull. 4, T. s., Dep. Ag., p. 51 (1896).
" (Odonaspis) secretus Ckll., Bull. 6, T. s., Dep. Ag., pp. 14. 20. 31 (1897).
Spatheaspis secretus Leon., Riv. Pat. Veg., vi, p. 115 (1897).
Aspidiotus " var. lobulatus Mask., Ent.Mon.Mag., xxxiii, p.241 (1897).
" " " " " N. Z. Trans., xxx, p. 224 (1898).
Spatheaspis " " " Leon., Gen. e Spec. Diaspiti, Asp., p. 221 (1900).
" " Ckll., Psyche, ix, p. 72 (1900).
Habitat.—Japan; Honolulu.
On bamboo.

Odonaspis secreta saccharicaulis (Zehnt.).

Aspidiotus saccharicaulis Zehnt., Mede. Proef. Suik., Java, n. s., No. 39, p. 1 (1897).
" secretus var. saccharicaulis Ckll., Pr. Ac. N. Sci.Ph., p.274 (1899).
Habitat.—Java.
On bamboo.

Odonaspis secreta greenii (Ckll.).

?Aspidiotus secretus Green, Cocc. Ceylon, pt. i, p. 64 (1896).
Odonaspis secreta var. Greenii Ckll., Ann. Mag. N. H., (7), ix, p. 25 (1902).
Habitat.—Ceylon.
On Arundinaria.

Genus **PSEUDOPARLATORIA** Ckll. Type, ostreata.

Pseudoparlatoria Ckll., Journ. Inst. Jam., i, p. 136 (1892): Bull. Bot. Dep. Jam., n. s., iv, p. 108 (1897).

1349. Pseudoparlatoria noacki Ckll.

Pseudoparlatoria noacki Ckll., Psyche, viii, p. 201 (1898).
" " " Rev. Mus. Paul., iii, p. 42 (1898).
" " Hemp., " " " iv, p. 511 (1900).
Habitat.—Brazil.
On Nectandra.

1350. Pseudoparlatoria ostreata Ckll.

Pseudoparlatoria ostreata Ckll., Journ. Inst. Jam., i, p. 136 (1892).
" " " Bull. Bot. Dep. Jam., n. s., iv, p. 108 (1897).
Habitat.—Jamaica.
On Acalypha.

1351. Pseudoparlatoria parlatorioides (Comst.).

Aspidiotus (?) parlatorioides Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 64 (1883).
Pseudoparlatoria " Ckll., Rev. Mus. Paul., iii, p. 503 (1898).
" " Rolfs & Quaint., Cocc. Amer., Dec. i-ii, No. 9 (1898).
" " Ckll., Jn. N. Y. Ent. Soc., vii, p. 258 (1899).
" " Hemp., Rev. Mus. Paul., iv, p. 511 (1900).
Habitat.—Florida; Brazil; Mexico.
On Persea carolinensis; Drimys; Psidium; peach; Oncidium varicosum; Magnolia grandiflora, etc.

1352. Pseudoparlatoria serrulata Towns. & Ckll.

Pseudoparlatoria serrulata Towns. & Ckll., Jn. N.Y.Ent.Soc.,vi,p. 180 (1898).
Habitat.—Mexico.
On Myrtus tweedii.

Genus **DIASPIDISTIS** Hemp. Type, multilobis.

Diaspidistis Hemp., Rev. Mus. Paul., iv, p. 522 (1900); Ann. Mag. N. H., (7), viii, p. 110 (1901).

1353. Diaspidistis multilobis Hemp.

Diaspidistis multilobis Hemp., Rev. Mus. Paul., iv, p. 522 (1900).
" " " Ann. Mag. N. H., (7), viii, p. 110 (1901).
Habitat.—Brazil.
On Myrtaceæ.

Genus **AONIDIA** Targ. Type, purpurea=lauri.

Aonidia Targ., Catalogue, p. 42 (1869); Sign., Ann. Soc. Ent. Fr., (4), x, p. 102 (1870); Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 128 (1883); Targ., Coccin. deg. Agrumi Ital., p. 14 (1891); Green, Coccidæ Ceylon, pt. i, p. 68 (1896).

1354. Aonidia(?) allaudi (de Charm.).

Fiorinia allaudi de Charm., Pr. Soc. Amic. Scien., p. 35 (1899).
Aonidia(?) " Ckll., Am. Nat., xxxiii, p. 900 (1899).
Habitat.—Mauritius.

Aonidia allaudi galliformens (de Charm.).

Fiorinia allaudi var. galliformens de Charm., Pr. Soc.Amic.Scien.,p.36(1899).
Aonidia " " " Ckll., Am. Nat., xxxiii, p. 900 (1899).
Habitat.—Mauritius.

1355. Aonidia banksiæ Full.

Aonidia banksiæ Full., Notes on Cocc. W. Austr., p. 11 (1897).
" " " Tr. Ent. Soc. Lond., p. 473 (1899).
Habitat.—W. Australia.
On Banksia attenuata: B. menziesii: B. prionotes: B. ilicifolia.

1356. Aonidia crenulata Green.

Aonidia crenulata Green, Jn. Bomb. N. H. Soc., xiii. p. 74 (1900).
Habitat.—India.

1357. Aonidia distinctissima (Newst.).

Parlatoria distinctissima Newst., Ent. Mon. Mag., xxxii. p. 133 (1896).
Aonidia " Ckll., Check List. p. 338 (1896).
Habitat.—Baluchistan.
On Nerium oleander.

1358. Aonidia ebeni "Green." Leon.

Aonidia ebeni "Green." Leon., Riv. Pat. Veg., viii. p. 329 (1900).
" " " " Gen. e Spec. Diaspiti. Asp., p. 212 (1900).
Habitat.—Ceylon.
On Diospyros.

1359. Aonidia elæagna Mask.

Aonidia elæagnus Mask., Ent. Mon. Mag., xxxiii. p. 241 (1897).
" " " N. Z. Trans., xxx. p. 227 (1898).
" " Leon., Gen. e Spec. Diaspiti. Asp., p. 210 (1900).
Habitat.—Japan.
On Elæagnus macrophylla.

1360. Aonidia lauri (Bouché).

Aspidiotus lauri Bouché. Schädl. Gart. Ins., p. 52 (1833).
" " " Naturg. Ins., p. 16 (1834).
" " Burm., Handb. Ent., ii, p. 68 (1835).
" " Blanch., Hist. Nat. Ins., iii, p. 214 (1840).
" " Koll., Inj. Ins., p. 180 (1840).
Aonidia purpurea Targ., Catalogue, p. 42 (1869).
" lauri Sign., Ann. Soc. Ent. Fr., (4), x. p. 103 (1870).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 129 (1883).
" " Saccardo, Riv. Pat. Veg., iv. p. 52 (1895).
" " Berl. e Leon., Cherm. Ital., Fasc. i. No. 24 (1895).
" " Leon., Riv. Pat. Veg., viii, p. 327 (1900).
" " " Gen. e Spec. Diaspiti. Asp., p. 210 (1900).
Habitat.—Europe.
On Laurel.

1361. Aonidia loranthi Green.

Aonidia loranthi Green, Cocc. Ceylon, pt. i. p. 74 (1896).
" " Leon., Gen. e Spec. Diaspiti. Asp., p. 218 (1900).
Habitat.—Ceylon.
On Loranthus.

1362. Aonidia messuæ "Green." Leon.

Aonidia messuæ "Green." Leon., Gen. e Spec. Diaspiti. Asp., p. 214 (1900).
Habitat.—Ceylon.
On Mesua ferrea.

1363. Aonidia obscura Green.

Aonidia obscura Green, Cocc. Ceylon, pt. i, p. 76 (1896).
" " Leon., Gen. e Spec. Diaspiti. Asp., p. 214 (1900).
Habitat.—Ceylon.
On Loranthus.

1364. Aonidia planchonioides Green.

Aonidia planchonioides Green, Jn. Bomb. N. H. Soc., xiii, p. 252 (1900).
" " Leon., Gen. e Spec. Diaspiti. Asp., p. 216 (1900).
Habitat.—Ceylon (Botanic Gardens).
On Ficus.

1365. Aonidia spatulata Green.

Aonidia spatulata Green, Jn. Bomb. N. H. Soc., xiii, p. 73 (1900).
Habitat.—India.

Genus **GYMNASPIS** Newst. Type, æchmeæ.

Gymnaspis Newst., Ent. Mon. Mag., xxxiv, p. 92 (1898): Mon. Brit. Cocc., i, p. 130 (1901).

1366. Gymnaspis æchmeæ Newst.

Gymnaspis æchmeæ Newst., Ent. Mon. Mag., xxxiv, p. 92 (1898).
" " Hemp., Rev. Mus. Paul., iv, p. 508 (1900).
" " Newst., Mon. Brit. Cocc., i, p. 131 (1901).
Habitat.—England (Roy. Bot. Gardens, Kew): Brazil.
On Æchmea aquilega.

1367. Gymnaspis bullata (Green).

Aonidia bullata Green, Cocc. Ceylon, pt. i, p. 72 (1896).
Gymnaspis " Ckll., Check List, Suppl., p. 396 (1899).
Habitat.—Ceylon.

1368. Gymnaspis perpusilla (Mask.).

Parlatoria perpusilla Mask., N. Z. Trans., xxix, p. 299 (1897).
" " Full., Tr. Ent. Soc. Lond., p. 468 (1899).
Gymnaspis " Ckll. & Parr., The Industrialist, p. 278 (1899).
Habitat.—W. Australia.
On Hakea.

Genus **GREENIELLA** Ckll. Type, cornigera.

Greeniella Ckll., Am. Nat., xxxi, p. 703 (1897): Leon., Gen. e Spec. Diaspiti, Asp., p. 200 (1900).

1369. Greeniella cornigera (Green).

Aonidia corniger Green, Ind. Mus. Notes, iv, p. 5 (1896).
" " " Cocc. Ceylon, pt. i, p. 69 (1896).
Greeniella cornigera Ckll., Check List, Suppl., p. 396 (1899).
" " Leon., Gen. e Spec. Diaspiti, Asp., p. 200 (1900).
Habitat.—Ceylon.
On Psychotria thwaitesii; Litsia Zeylanica.

Genus **LEPIDOSAPHES** Shimer. Type, conchiformis=ulmi.

Lepidosaphes Shimer, Tr. Am. Ent. Soc., i, p. 373, Jan. (1868): Sign., Ann. Soc. Ent. Fr., (4), x, p. 91 (1870): Loew, Verh. k. k. zool. bot. Ges. Wien, p. 522 (1882): Dougl., Ent. Mon. Mag., xxiii, p. 242 (1887).
Mytilaspis Sign., Ann. Soc. Ent. Fr., (4), viii, p. 841 (1868) no desc.: Targ., Catalogue, p. 44 (1869): Sign., Ann. Soc. Ent. Fr., (4), x, p. 91 (1870): Comst., Rep. U. S. Dep. Ag., 1880, p. 320 (1881); 2nd Rep. Dep. Ent. Corn. Univ., p. 116 (1883): Mask., Ins. Nox. Agr. N. Z., p. 48 (1887): Dougl., Ent. Mon. Mag., xxiii, p. 242 (1887): Targ., Coccin. deg. Agrumi in Ital., p. 22 (1891): Berl., Riv. Pat. Veg., iv, p. 80 (1895): Green, Cocc. Ceylon, pt. i, p. 77 (1896): Newst., Mon. Brit. Cocc., i, p. 194 (1901).
Phaulomytilus Leon., Riv. Pat. Veg., vi, pp. 205, 206 (1897). Type, striatus.
Coccomytilus " " " " " pp. 205, 206 (1897). " convexus.
Trichomytilus " " " " " pp. 205, 206 (1897). " formosus.
s. g. Allantomytilus Leon., Riv. Pat. Veg., vi, pp. 205, 206 (1897). Type, maideni.

1370. Lepidosaphes abietis (Sign.).

Mytilaspis abietis Sign. (non. Schir.), Ann. Soc. Ent. Fr., (4), x, p. 92 (1870).
" " " Bull. Soc. Ent. Fr., (6), ii, p. clxxxiv (1882).
" confusus Horvath, Rev. Ent. Fr., p. 95 (1897).
" abietis Ckll., Pr. Ac. N. Sci. Ph., p. 274 (1899).
Habitat.—Europe.
On Abies.

1371. Lepidosaphes acaciæ (Mask.).

Mytilaspis acaciæ Mask., N. Z. Trans., xxviii, p. 387 (1896).
Habitat.—Australia.
On Acacia linifolia.

Lepidosaphes acaciæ albida (Mask.).

Mytilaspis acaciæ var. albida Mask., N. Z. Trans., xxix, p. 304 (1897).
Habitat.—W. Australia.
On Acacia.

1372. Lepidosaphes alba (Ckll.).

Mytilaspis albus Ckll., Ent. Mon. Mag., xxix, p. 156 (1893).
" " " Science, xxii, p. 151 (1893).
" " " Bull. Bot. Dep. Jam., p. 109 (1897).
" " Rolfs & Quaint., Cocc. Amer., Dec. i-ii, No. 12 (1898).

Habitat.—Jamaica; Mexico; Florida, from Bahama Islands; New Mexico.
On Solanum and two unknown plants.

1373. Lepidosaphes ampelodesmæ (Newst.).

Mytilaspis ampelodesmæ Newst., Tr. Ent. Soc. Lond., p. 95 (1897).
Habitat.—Algeria.
On Ampelodesma tenax.

1374. Lepidosaphes argentata (Ckll.).

Mytilaspis argentatus Ckll., Rev. Mus. Paul., iii, p. 43 (1898).
" " Hemp., " " " iv, p. 514 (1900).
Habitat.—Brazil; Mexico.

1375. Lepidosaphes bambusicola (Ckll.).

Mytilaspis bambusicola Ckll., Can. Ent., xxxi, p. 44 (1899).
" " Hemp., Rev. Mus. Paul., iv, p. 515 (1900).
Habitat.—Brazil.
On bamboo.

1376. Lepidosaphes banksiæ (Mask.).

Mytilaspis banksiæ Mask., N. Z. Trans., xxviii, p. 388 (1896).
Habitat.—Australia.
On Banksia integrifolia.

1377. Lepidosaphes beckii (Newm.).

(*Purple scale.*)

Coccus beckii Newm., The Entom., iv, p. 217, Feb. (1869).
Aspidiotus citricola Pack., Guide to Study of Insects, p. 527, Aug. (1869).
Coccus anguinus Bdv., Insectologie Agricole, iv (1870).
Mytilaspis fulva Targ., Bull. Soc. Ent. Ital., p. 131 (1872).
" flavescens Targ., Annali R. Minist. Agr., p. 84 (1876).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 604 (1876).
Aspidiotus citricola Glover, Rep. U. S. Dep. Ag., 1876, p. 43 (1877).
Mytilaspis " Comst., " " " " 1880, p. 321 (1881).
" flavescens Targ., Annali di Agr., p. 159 (1881).
" citricola Osborn, Tr. Ia. Hor. Soc., p. 214 (1882).
" " Saund., Ins. Inj. to Fruits, p. 390 (1883).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 117 (1883).
" flavescens " " " " " " " p. 123 (1883).
" " Targ., Annali di Agr., p. 392 (1884).
" citricola Voyle, Bull. 4, Div. Ent. Dep. Ag., p. 71 (1884).
" " Hubbard, Ins. Aff. Orange, p. 26 (1885).
" flavescens Dougl., Ent. Mon. Mag., xxii, p. 249 (1886).
" citricola Mask., N. Z. Trans., xxii, p. 135 (1889).
" " Craw, Rep. Cal. Bd. Hort., p. 8 (1891).
" fulva Targ., Cocc. deg. Agr. Ital., p. 23 (1891).
" " Berl., Riv. Pat. Veg., i, pp. 64, 67 (1892).
" " " " " " ii, p. 38 (1893).

Mytilaspis
~~Aspidiotus~~ citricola Ckll., Ent. Mon. Mag., xxix, p. 155 (1893).
" " Morg., Bull. 28, La. Exp. Sta., p. 992 (1893).
" " French, Handb. Destr. Ins. Victoria, p. 85 (1893).
" " Mask., N. Z. Trans., xxvii, p. 48 (1894).
" " Craw, Bull. 68, Cal. Bd. Hort., p. 17 (1894).
" " " 4th Bien. Rep. Cal. Bd. Hort., p. 95 (1894).
" fulva Saccardo, Riv. Pat. Veg., iv, p. 54 (1895).
" " Berl., " " " " pp. 84, 152 (1895).
" " Berl. e Leon., Cherm. Ital., Fasc. i, No. 20 (1895).
" " " Riv. Pat. Veg., iv, pp. 196, 201, 258 (1896).
" citricola Lounsb., Rep. Ent. Cape Good Hope, p. 67 (1896).
" " Davis, Spec. Bull. Mich. Exp. Sta., p. 38 (1896).
" " Green, Cocc. Ceylon, pt. i, p. 78 (1896).
" " Ckll., Bull. Bot. Dep. Jam., p. 108 (1897).
" " Starnes, Bull. 36, Ga. Exp. Sta., p. 27 (1897).
" " var. tasmaniæ Mask., N. Z. Trans., xxix, p. 303 (1897).
" " Rolfs & Quaint., Cocc. Amer., Dec. i-ii, No. 10 (1898).
" " de Charm., Pr. Soc. Amic. Scien., p. 34 (1899).
" beckii Ckll., Pr. Ac. N. Sci. Ph., p. 275 (1899).
" tasmaniæ Ckll., Victorian Naturalist, xvi, p. 14 (1899).
" citricola Frank & Kruger, Schildlausbuch, p. 99 (1900).
" " Gossard, Bull. 51, Fla. Exp. Sta., p. 108 (1900).
" " Marlatt, Yearbook U. S. Dep. Ag., 1900, p. 266 (1901).
" " Lefroy, Scale Ins. Less. Antil., p. 60 (1901).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 81 (1902).
" beckii Ckll., Ent. News, xiii, p. 17 (1902).

Habitat.—Europe; Madeira; W. Africa; S. Africa; Mauritius; Ceylon; Japan; Australia; Tasmania; New Zealand; Fiji; Hawaiian Islands; Bermuda; West Indies; Florida; Louisiana; Colorado; California.

On orange; lemon; citron; fig; Croton; grape-fruit; oak; Elæagnus; Banksia integrifolia; Taxus cuspidata; Cercidiphyllum japonicum; Pomaderris apetala.

1378. **Lepidosaphes carinata** (Ckll.).

Mytilaspis carinatus Ckll., Psyche, vii, Suppl., i, p. 21 (1896).
" " " Bull. 4, T. s., Dep. Ag., p. 45 (1896).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 40 (1896).

Habitat.—Central America; Mexico.

1379. **Lepidosaphes casuarinæ** (Mask.).

Mytilaspis casuarinæ Mask., N. Z. Trans., xxv, p. 209 (1892).
" " " " " xxvii, p. 45 (1894).

Habitat.—Australia.

On Casuarina.

1380. Lepidosaphes ceratoniæ (Genn.).

Mytilaspis ceratoniæ Genn., Bull. Soc. Ent. Fr., (7), v, p. cclxxvii (1895).
Habitat.—Isle of Cyprus.
On Ceratonia siliqua.

1381. Lepidosaphes cocculi (Green).

Mytilaspis cocculi Green. Coccidæ Ceylon, pt. i, p. 81 (1896).
Habitat.—Ceylon.
On Cocculus macrocarpus.

1382. Lepidosaphes concolor (Ckll.).

Mytilaspis albus var. concolor Ckll., Psyche, vi, p. 572 (1893).
" " " " " Can. Ent., xxvi, p. 190 (1894).
" " " " " Bull. Bot. Dep. Jam., p.109 (1897).
Habitat.—New Mexico; Colorado.
On Chenopodium; Atriplex canescens.

Lepidosaphes concolor viridissima (Ckll. & Parr.).

Mytilaspis concolor var. viridissima Ckll. & Parr., The Industrialist. p. 276 (1899).
Habitat.—New Mexico.
On Atriplex canescens.

1383. Lepidosaphes convexa (Mask.).

Mytilaspis convexa Mask., N. Z. Trans., xxvi, p. 70 (1893).
Habitat.—Australia.
On Acacia.

1384. Lepidosaphes cordylinidis (Mask.).

Mytilaspis cordylinidis Mask., N. Z. Trans., xi, p. 195 (1878).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p.122(1883).
" " Mask., Ins. Nox. Agr. N. Z., p. 48 (1887).
Habitat.—New Zealand.
On Cordyline australis; C. indivisa; Phormium; Gahnia; Astelia; Eucalyptus; ferns.

1385. Lepidosaphes crawii (Ckll.).

Mytilaspis crawii Ckll., Psyche, vii, Suppl., i, p. 21 (1896).
" " " Bull. 4, T. s., Dep. Ag., p. 44 (1896).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 41 (1896).
" " Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 82 (1902).
Habitat.—Japan; California.
On Elæagnus; Quercus.

Lepidosaphes crawii canaliculata (Mask.).

Mytilaspis crawii var. canaliculata Mask., N. Z. Trans., xxix, p. 304 (1897).
" " " " " Ent. Mon. Mag., xxxiii, p. 241 (1897).
Habitat.—Japan.
On Quercus cuspidata.

1386. Lepidosaphes crotonis (Ckll.).

Mytilaspis crotonis Ckll., Ent. Mon. Mag., xxix, p. 156 (1893).
" " " Bull. Bot. Dep. Jam., p. 109 (1897).
Habitat.—Jamaica.
On Croton.

1387. Lepidosaphes defecta (Mask.).

Mytilaspis defecta Mask., N. Z. Trans., xxix, p. 304 (1897).
Habitat.—W. Australia.

Lepidosaphes defecta tincta (Mask.).

Mytilaspis defecta var. tincta Mask., N. Z. Trans., xxix, p. 304 (1897).
Habitat.—W. Australia.
On Hakea.

1388. Lepidosaphes drimydis (Mask.).

Mytilaspis drimydis Mask., N. Z. Trans., xi, p. 196 (1878).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 123 (1883).
" " Mask., Ins. Nox. Agr. N. Z., p. 49 (1887).
Habitat.—New Zealand.
On Drimys colorata.

1389. Lepidosaphes epiphytidis (Mask.).

Mytilaspis epiphytidis Mask., N. Z. Trans., xvii, p. 21 (1884).
" " " Ins. Nox. Ag. N. Z., p. 49 (1887).
Habitat.—New Zealand.
On Astelia cunninghamii.

1390. Lepidosaphes euryæ (Kuwana).

Mytilaspis euryæ Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 80 (1902).
Habitat.—Japan.
On Eurya ochnacea.

1391. Lepidosaphes ficus (Sign.).

Mytilaspis ficus Sign., Ann. Soc. Ent. Fr., (4), x, p. 94 (1870).
" " Colvée, Estud. sob. alg. Ins., Cocc., p. 30 (1881).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 123 (1883).
" " Morg., Ent. Mon. Mag., xxvi, p. 230 (1890).
" " Berl. e Leon., Cherm. Ital., Fasc. i, No. 22 (1895).
" " Newst., Mon. Brit. Cocc., i, p. 202 (1901).
Habitat.—Europe.
On fig.

1392. Lepidosaphes flava (Targ.).

Mytilaspis flava Targ., Catalogue, p. 44 (1869).
" " Sign., Ann. Soc. Ent. Fr., (4), x, p. 96 (1870).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 123 (1883).
Lepidosaphes " Kirkaldy, Fauna Haw., iii, pt. 2, p. 111 (1902).
Habitat.—Europe; Australia; New Zealand; N. America.
On olive.

Lepidosaphes flava hawaiiensis (Mask.).

Mytilaspis flava var. hawaiiensis Mask., N. Z. Trans., xxvii, p. 47 (1894).
“ “ “ “ “ “ “ xxx, p. 230 (1898).

Habitat.—Hawaiian Islands; China.

On Pyrus sinensis.

Kirkaldy thinks that flava and var. hawaiiensis are the same and probably a variety of L. ulmi.

1393. Lepidosaphes formosa (Mask.).

Mytilaspis formosa Mask., N. Z. Trans., xxvi, p. 68 (1893).

Habitat.—Australia.

On Eucalyptus corynocalyx; E. orbifolia.

1394. Lepidosaphes fulleri (Ckll.) new name.

||Mytilaspis elongata Full., Tr. Ent. Soc. Lond., p. 469 (1899).
“ fulleri Ckll., in litt. (1902).

Habitat.—W. Australia.

On Banksia ilicifolia.

1395. Lepidosaphes gloverii (Pack.).

(*Glover's scale.*)

Coccus gloverii Pack., Guide to Study of Ins., Ed. i, p. 527 (1869).
Aspidiotus “ “ 7th Rep. Mass. Bd. Agr., 1869, p. 259 (1870).
“ “ “ Guide to Study of Ins., Ed. ii, p. 527 (1872).
“ (Coccus) gloverii Glover, Rep. U. S. Dep. Ag., 1876, p. 41 (1877).
Mytilaspis gloverii Comst., “ “ “ “ 1880, p. 323 (1881).
“ “ “ 2nd Rep. Dep. Ent. Corn. Univ., p. 117 (1883).
“ gloveri Saund., Ins. Inj. to Fruits, p. 392 (1883).
“ “ Targ., Annali di Agr., p. 395 (1884).
“ “ Hubbard, Ins. Aff. Orange, p. 19 (1885).
“ “ Comst., Intr. Ent., p. 146 (1888).
“ “ Mask., N. Z. Trans., xxiii, p. 8 (1890).
“ “ Morg., Spec. Bull. La. Exp. Sta., p. 58 (1893).
“ “ Craw, Bull. 68, Cal. Bd. Hort., p. 16 (1894).
“ “ “ 4th Bien. Rep. Cal. Bd. Hort., p. 95 (1894).
“ “ “ 5th “ “ “ “ “ p. 41 (1896).
“ “ Lounsb., Rep. Ent. Cape Good Hope, p. 71 (1896).
“ “ Starnes, Bull. 36, Ga. Exp. Sta., p. 27 (1897).
“ “ Berl. e Leon., Annali di Agr., p. 130 (1898).
“ “ de Charm., Pr. Soc. Amic. Scien., p. 35 (1899).
“ “ Gossard, Bull. 51, Fla. Exp. Sta, p. 112 (1900).
“ “ Marlatt, Yearbook U. S. Dep. Ag., p. 265 (1900).
“ “ Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 81 (1902).
Lepidosaphes “ Kirkaldy, Fauna Haw., iii, pt. 2, p. 111 (1902).

Habitat.—Middle and Southern United States; Cal.; Australia; Ceylon; India; China; Japan; Hawaiian Islands; Mauritius; S. Africa; S. America; Mexico.

On orange; lime; palms; Magnolia fuscata.

1396. Lepidosaphes grandilobis (Mask.).

Mytilaspis grandilobis Mask., N. Z. Trans., xxvi, p. 70 (1893).
Habitat.—Australia.
On Banksia.

1397. Lepidosaphes greeni (de Charm.).

Mytilaspis greeni de Charm., Pr. Soc. Amic. Scien., p. 33 (1899).
Habitat.—Mauritius.

1398. Lepidosaphes grisea (Mask.).

Mytilaspis grisea Mask., N. Z. Trans., xxii, p. 133 (1889).
Habitat.—Australia.
On Eucalyptus; Acacia.

1399. Lepidosaphes hibisci (de Charm.).

Mytilaspis hibisci de Charm., Pr. Soc. Amic. Scien., p. 32 (1899).
Habitat.—Mauritius.

1400. Lepidosaphes indentata (Green).

Mytilaspis indentata Green, Ann. Mag. N. H., (7), vi, p. 448 (1900).
Habitat.—Australia.

1401. Lepidosaphes intermedia (Mask.).

Mytilaspis intermedia Mask., N. Z. Trans., xxiii, p. 7 (1890).
Habitat.—New Zealand.
On Leptospermum scoparium.

1402. Lepidosaphes juglandis (Sign.).

Mytilaspis juglandis Sign. (non Fitch), Ann. Soc. Ent. Fr., (4), x, p. 95 (1870).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 124 (1883).
" " Morg., Ent. Mon. Mag., xxvi, p. 227 (1890).
" " Frank & Kruger, Schildlausbuch, p. 99 (1900).
Habitat.—France; Germany.
On butternut (Juglans cinerea).

1403. Lepidosaphes lactea (Mask.).

Mytilaspis lactea Mask., N. Z. Trans., xxvii, p. 48 (1894).
Habitat.—New Zealand.
On Fuchsia excorticata.

1404. Lepidosaphes lasianthi (Green).

Mytilaspis lasianthi Green, Jn. Bomb. N. H. Soc., xiii. p. 253 (1900).
Habitat.—Ceylon.
On Lasianthus strigosus; Croton.

1405. Lepidosaphes leptospermi (Mask.).

Mytilaspis leptospermi Mask., N. Z. Trans., xiv, p. 215 (1881).
" " " Ins. Nox. Agr. N. Z., p. 50 (1887).
Habitat.—New Zealand.
On Leptospermum scoparium.

1406. Lepidosaphes lidgetti (Ckll.).

Mytilaspis lidgetti Ckll., Victorian Naturalist, xvi, p. 14 (1899).
Habitat.—Australia.
On Eucalyptus rostrata; E. goniocalyx.

1407. Lepidosaphes machili (Mask.).

Mytilaspis machili Mask., N. Z. Trans., xxx, p. 230 (1898).
Habitat.—Japan.
On Machilus thunbergii.

1408. Lepidosaphes maideni (Mask.).

Mytilaspis maideni Mask., N. Z. Trans., xxix, p. 302 (1897).
Habitat.—Australia.
On Litsea dealbata.

1409. Lepidosaphes melaleucæ (Mask.).

Mytilaspis melaleucæ Mask., N. Z. Trans., xxviii, p. 389 (1896).
Habitat.—Australia.
On Melaleuca.

1410. Lepidosaphes metrosideri (Mask.).

Mytilaspis metrosideri Mask., N. Z. Trans., xii, p. 293 (1879).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 124 (1883).
" " Mask., Ins. Nox. Agr. N. Z., p. 50 (1887).
Habitat.—New Zealand.
On Metrosideros robusta.

1411. Lepidosaphes mexicana (Ckll.).

Mytilaspis mexicana Ckll., Ann. Mag. N. H., (7), i, p. 438 (1898).
Habitat.—Mexico.
On "Nettle-tree"; "Dragon's-blood"; roots of Ficus.

1412. Lepidosaphes mimosarum (Ckll.).

Mytilaspis mimosarum Ckll., The Entom., xxxvi, p. 45 (1903).
Habitat.—Mexico.
On Mimosa.

1413. Lepidosaphes minima (Newst.).

Mytilaspis minima Newst., Tr. Ent. Soc. Lond., p. 95 (1897).
Habitat.—Algeria.
On Ficus carica.

1414. Lepidosaphes myrthi (Bouché).

Aspidiotus myrthi Bouché, Stett. Ent. Zeit., xii, p. 112 (1851).
Mytilaspis " Ckll., The Entom., xxxiv, p. 93 (1901).
Habitat.—Southern Europe.
On Myrtus communis.

1415. Lepidosaphes newsteadi (Sulc).

Mytilaspis newsteadi Sulc, Sitzb. K. Bohm.Ges.Wiss.,No.xlix,pp.8,19 (1895).
Habitat.—Europe.
On Thea japonica.

Lepidosaphes newsteadi tokionis (Kuw.).

Mytilaspis newsteadi tokionis Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 81 (1902).
Habitat.—Japan.
On Codiæum.

1416. Lepidosaphes nigra (Ckll.).

Mytilaspis nigra Ckll., Biol. Centr. Amer., ii, pt. 2, p. 32 (1899).
Habitat.—Mexico.
On "Laurel-tree"; Yucca; Agave.

1417. Lepidosaphes nivea (Mask.).

Mytilaspis nivea Mask., N. Z. Trans., xxvii, p. 46 (1894).
Habitat.—Australia.
On Melaleuca nodosa.

1418. Lepidosaphes pallens (Mask.).

Mytilaspis pallens Mask., N. Z. Trans., xxii, p. 134 (1889).
Habitat.—N. S. Wales.
On Xanthorrhœa.

Lepidosaphes pallens alba (Mask.).

Mytilaspis pallens var. alba Mask., N. Z. Trans., xxviii, p. 388 (1896).
Habitat.—Australia.
On Xanthorrhœa.

1419. Lepidosaphes pallida (Green).

Mytilaspis pallida Green, Ind. Mus. Notes, iv, p. 5 (1896).
" gloverii var. pallida Green, Cocc. Ceylon, pt. i, p. 85 (1896).
" pallida Green, Jn. Bomb. N. H. Soc., xiii, p. 254 (1900).
Lepidosaphes " Kirkaldy, Fauna Haw., iii, pt. 2, p. 111 (1902).
Habitat.—Ceylon; Hawaiian Islands, from Japan.
On willow; Podocarpus.

Lepidosaphes pallida maskelli (Ckll.).

Mytilaspis pallida var.? Mask., N. Z. Trans., xxvii, p. 46 (1894).
" " var. maskelli Ckll., Am. Nat., xxxi, p. 704 (1897).
Habitat.—Hawaiian Islands, from Japan.
On Podocarpus.

1420. Lepidosaphes perlonga (Ckll.).

Mytilaspis perlonga Ckll., Psyche, viii, p. 202 (1898).
" " " Rev. Mus. Paul., iii, p. 42 (1898).
" " Hemp., " " " iv, p. 514 (1900).
Habitat.—Brazil.
On Baccharis dracunculifolia.

1421. Lepidosaphes philococcus (Ckll.).

Mytilaspis philococcus Ckll., Bull. Soc. Ent. Fr., xviii, p. 252 (1893).
" " " Biol. Centr. Amer., ii, pt. 2, p. 32 (1899).
Habitat.—Mexico.
On Yucca; Agave.

1422. Lepidosaphes phymatodidis (Mask.).

Mytilaspis phymatodidis Mask., N. Z. Trans., xii, p. 292 (1879).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 125 (1883).
" " Mask., Ins. Nox. Agr. N. Z., p. 51 (1887).
Habitat.—New Zealand.
On Phymatodes billardieri.

1423. Lepidosaphes pinnæformis (Bouché).

Aspidiotus pinnæformis Bouché, Stett. Ent.-Zeit., xii, p. 111 (1851).
Mytilaspis " Sign., Ann. Soc. Ent. Fr., (4), x, p. 97 (1870).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 125 (1883).
" " Dougl., Ent. Mon. Mag., xxiv, p. 21 (1887).
" " Morg., " " " xxvi, p. 229 (1890).
" " Mask., " " " xxviii, p. 70 (1892).
" " Ckll., Gard. Chron., (3), xiii, p. 548 (1893).
" " Newst., Mon. Brit. Cocc., i, p. 204 (1901).
Lepidosaphes " Kirkaldy, Fauna Haw., iii, pt. 2, p. 110 (1902).
Habitat.—England, (Kew Gardens); Australia; N. Zealand; Demerara; Hawaiian Islands; North America.
On Cymbidium pendulum; Croton.

1424. Lepidosaphes pyriformis (Mask.).

Mytilaspis pyriformis Mask., N. Z. Trans., xi, p. 194 (1878).
" " " " " xiv, p. 215 (1881).
" " " " " xvi, p. 121 (1883).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 125 (1883).
" " Mask., N. Z. Trans., xvii, p. 22 (1884).
" " " Ins. Nox. Agr. N. Z., p. 53 (1887).
Habitat.—New Zealand.
On Dysoxylum spectabile; Atherosperma; Coprosma; Rhipogonum; Pinus.

1425. Lepidosaphes(?) riccæ (Targ.).

Leucaspis riccæ Targ., Annali di Agr., No. 34, p. 160 (1881).
Chionaspis " " " " " p. 397 (1884).
" " " Boll. Soc. Tosc. di Orticultura, xiii, pp. 5, 12, 14 (1888).
Mytilaspis(?) " Ckll., in litt. (1902).
Habitat.—France; Greece.
On olive.

1426. Lepidosaphes ritsema-bosi (Leon.).

Mytilaspis ritsema-bosi Leon., Boll. Ent. Agr., viii, p. 120 (1901).
Habitat.—Europe.

1427. Lepidosaphes spinifera (Mask.).

Mytilaspis spinifera Mask., N. Z. Trans., xxvi, p. 69 (1893).
Habitat.—Australia.
On Acacia pendula.

Lepidosaphes spinifera major (Mask.).

Mytilaspis spinifera, *forma major* Mask., N. Z. Trans., xxx, p. 230 (1898).
" " var. major Ckll., Check List, Suppl., p. 397 (1899).
Habitat.—Australia.
On Acacia pendula.

1428. Lepidosaphes spinosa (Full.).

Mytilaspis spinosa Full., Tr. Ent. Soc. Lond., p. 469 (1899).
Habitat.—W. Australia.
On Melaleuca.

1429. Lepidosaphes striata (Mask.).

Mytilaspis striata Mask., N. Z. Trans., xxvii, p. 47 (1894).
Habitat.—Australia.
On Casuarina.

1430. Lepidosaphes townsendiana (Ckll.).

Mytilaspis townsendiana Ckll., The Entom., xxxvi, p. 46 (1903).
Habitat.—Mexico.
On "garabatillo."

1431. Lepidosaphes ulmi (Linn.).

(*Oyster-shell scale.*)

—— —— Reaum., Ins., iv, p. 69, pl. v, figs. 5, 6, 7 (1738).
Coccus ulmi Linn., Syst. Nat., Ed. x, i, p. 455 (1758).
Chermes arborum linearis Geoff., Abr. Ins., i, p. 509 (1762).
Coccus linearis Mod., Act. Goth., i, p. 22 (1778).
" arborum Schr., Enum. Ins. Austr., pp. 295, 585 (1781).
Chermes linearis Fourc., Ent. Paris., p. 229 (1785).
Coccus conchiformis Gmel., Syst. Nat., Ed. xiii, p. 222 (1789).
Chermes linearis Oliv., Ency. Meth., vii, p. 441 (1792).
Coccus conchiformis Bechst., Forstins., i, p. 289 (1804).
Diaspis linearis Costa, Faun. Reg. Nap., Cocc., p. 21 (1835).
Aspidiotus conchiformis Curt., Gard. Chron., p. 375 (1843).
Mytilaspis falciformis Baer., D' Alton, Zeit. für Zool., p. 168 (1849).
Aspidiotus pomorum Bouché, Stett. Ent. Zeit., xii, p. 110 (1851).
" pyrus-malus Kenn., Cleveland Ac. Sci. (1854).

Coccus conchiformis Fitch, 1st Rep. Ins. N. Y., p. 740 (1854).
Aspidiotus " " 3rd " " " p. 331 (1856).
" juglandis " " " " " p. 338 (1856).
" conchiformis True, Rep. Me. Bd. Agr., p. 173 (1858).
" " Brackett, Rep. Me. Bd. Agr., p. 165 (1860).
" " Judd, Amer. Agriculturalist, p. 178 (1863).
Chermes " Bdv., Ent. Hort., p. 315 (1867).
Diaspis " Targ., Studii sul. Cocc., p. 14 (1867).
Lepidosaphes " Shimer, Tr. Am. Ent. Soc., i, p. 373 (1868).
Aspidiotus conchiformis Cook, Rep. Mich. Bd. Agr., p. 168 (1868).
" " Riley, 1st Rep. Ins. Mo., p. 7 (1869).
" " " Am. Ent., ii, p. 110 (1870).
Mytilaspis " Sign., Ann. Soc. Ent. Fr., (4), x, p. 93 (1870).
" pomorum " " " " " " " p. 98 (1870).
" linearis " " " " " " " p. 96 (1870).
Aspidiotus conchiformis LeB., 1st Rep. Ins. Ill., p. 24 (1871).
" " " 2nd " " " p. 159 (1872).
" " Pack., Guide to Study of Ins., p. 528 (1872).
Mytilaspis " Riley, 5th Rep. Ins. Mo., p. 93 (1873).
" linearis " " " " " p. 93 (1873).
" pomorum " " " " " pp. 26, 93 (1873).
" pomicorticis " " " " " pp. 73, 95 (1873).
" ulmicorticis " Rep. Ia. Ag. Soc., p. 246 (1874).
" conchiformis Cook, 13th Rep. Mich. Bd. Agr., p. 126 (1874).
Aspidiotus " " Coun. Gent., xl, p. 455 (1875).
" " Tucker, " " xli, p. 181 (1876).
Mytilaspis pomicorticis Sign., Ann. Soc. Ent. Fr., (5), vi, p. 605 (1876).
Aspidiotus conchiformis Fern. C. H., Rep. Me. Bd. Ag., xxii, p. 61 (1877).
" " Glover, Rep. U. S. Dep. Ag., 1876, p. 43 (1877).
Mytilaspis pomorum Putn., Tr. Ia. Hor. Soc., p. 247 (1877).
" " Mask., N. Z. Trans., xi, p. 192 (1878).
Aspidiotus conchiformis Lint., Coun. Gent., xliii, p. 423 (1878).
" " Periam, Am. Ency. Agr., p. 699 (1881).
Mytilaspis pomicorticis " " " " p. 699 (1881).
" " Riley, Index to Reports Ins. Missouri, p. 85 (1881).
" pomorum Comst., Rep. U. S. Dep. Ag., 1880, p. 325 (1881).
" " Osborn, Tr. Ia. Hor. Soc., p. 212 (1882).
" pomicorticis Lint., 1st Rep. Ins. N. Y., p. 61, note (1882).
? " fraxini Altum, Forstzoologie, iii, pt. 2, p. 364 (1882).
Coccus arborum linearis Sign., Bull. Soc. Ent. Fr., (6), ii, p. clxxxiv (1882).
Mytilaspis " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 124 (1883).
" pomorum " " " " " " " p. 118 (1883).
" " Saund., Ins. Inj. to Fruits, p. 40 (1883).
" " Uhler, St. Nat. Hist., ii, p. 214 (1884).
" conchiformis Goethe, Jahrb. Nass. Ver. Nat., pp. 118, 129 (1884).

Mytilaspis pomorum Tucker, Coun. Gent., l, p. 607 (1885).
" " Hubbard, Ins. Aff. Orange. p. 15 (1885).
" " Dougl., Ent. Mon. Mag., xxiii, p. 27 (1886).
" " Koons, Rep. Conn. Bd. Ag., p. 70 (1886).
" " Cook, Am. Gard., vii, p. 265 (1886).
" linearis Dougl., Ent. Mon. Mag., xxiii, p. 27 (1886).
" pomorum Karsch, Ent. Nach., xiii, p. 349 (1887).
" " Fletcher, Rep. Can. Exp. Farms, p. 25 (1887).
" " Mask., Ins. Nox. Agr. N. Z., p. 51 (1887).
" " Harvey, Rep. Me. Exp. Sta., p. 157 (1888).
" " Weed, Bull. 3, (2), Ohio Exp. Sta., p. 28 (1888).
" pomicorticis McMillan, Bull. 2, Neb. Exp. Sta., p. 80 (1888).
" " Riley & How., Ins. Life, iii, p. 89 (1890).
" conchiformis " " " " " p. 89 (1890).
" linearis " " " " " p. 89 (1890).
" " Morg., Ent. Mon. Mag., xxvi, p. 226 (1890).
Aspidiotus (Mytilaspis) juglandis Pack., 5th Rep. U. S. Ent. Com., p. 338 (1890).
Mytilaspis pomorum " " " " " " p. 280 (1890).
" " Craw, Rep. Cal. Bd. Hort., p. 7 (1891).
" " French, Handb. Destr. Ins. Victoria, p. 77 (1891).
" " Garman, Bull. 80. Ky. Exp. Sta., p. 217 (1892).
" " Howard, Can. Ent., xxvi, p. 353 (1894).
" " " Ins. Life, vii, p. 256 (1894).
" " Smith, Rep. N. J. Exp. Sta., p. 494 (1894).
" " Howard, Yearbook U. S. Dep. Ag., p. 254 (1894).
" " Hopkins, Rep. W. Va. Exp. Sta., p. 533 (1894).
" " Lint., Bull. 13, N. Y. St. Mus., p. 269 (1895).
" " Weed, Bull. 31, N. H. Exp. Sta., p. 15 (1895).
" " Washb., Bull. 38, Ore. Exp. Sta., p. 9 (1895).
" " Hillman. Bull. 36, Nev. Exp. Sta., p. 34 (1897).
A. (Diaspidiotus) juglandis Ckll., Bull. 6, T. s., Dep. Ag., pp. 16, 18 (1897).
Mytilaspis pomorum Osborn, Contr. Ia. Ag. Coll., p. 4 (1898).
" " Targ., Annali di Agr., p. 133 (1898).
" " Britton, 22nd Rep. Conn. Exp. Sta., p. 273 (1898).
" " Chambliss, Bull. 4, Tenn. Exp. Sta., p. 146 (1898).
" " Fletcher, Evid. Com. Ag. Ont., p. 18 (1898).
" " Rolfs & Quaint., Cocc. Amer., Dec. i-ii, No. 11 (1898).
" " Bruner, Rep. Neb. St. Hor. Soc., p. 5 (1899).
" " Smith, Bull. 140, N. J. Exp. Sta., p. 5 (1899).
" " Cooley, 6th Rep. Mont. Exp. Sta., p. 85 (1899).
" " Newell, Bull. 43, Ia. Exp. Sta., p. 159 (1899).
" " Marlatt, Bull. 20, n. s., Dep. Ag., p. 66 (1899).
" " Hunter, Kan. Univ. Quar., viii, p. 14 (1899).
" " Lockhead, Rep. Ent. Soc. Ont., p. 67 (1899).
" " Harrington, " " " " p. 95 (1899).

Mytilaspis pomorum Harvey & Munson, Bull. 56, Me. Exp. Sta., p. 110 (1899).
" " " " Rep. Me. Exp. Sta., p. 110 (1899).
" " Ckll., Pr. Ac. N. Sci. Ph., p. 275 (1899).
" ulmi " " " " " " p. 275 (1899).
" pomorum Lockhead, Rep. Ont. Dep. Ag., p. 40 (1900).
" " Newst., Journ. Roy. Hor. Soc., xxiii, p. 18 (1900).
" " Fern. H. T., Mass. Crop. Rep., May, p. 31 (1900).
" " Beach, Lowe, Stewart, 18th Rep. N. Y. Exp. Sta., p. 416 (1900).
" conchiformis Frank & Kruger, Schildlausbuch, p. 99 (1900).
" ulmi King & Ckll., Can. Ent., xxxiii, p. 200 (1901).
Lepidosaphes pomorum Kirkaldy, Fauna Haw., iii, pt. 2. p. 111 (1902).

Habitat.—Canada; United States; Brazil; Europe; Algeria; Australia; New Zealand; Japan; Hawaiian Islands.

On elm; apple; pear; plum; currant; willow; birch; butternut; Cornus; ash; oak; linden; poplar; rose; wild cherry; Stillingia sebifera; Ailanthus glandulosus; Ceanothus americanus; Sassafras officinale; Æsculus glabra; Syringa persica; Cysticus, etc.

Lepidosaphes ulmi vitis (Goethe).

Mytilaspis pomorum var. vitis Goethe, Jahrb. Nass. Ver. Nat., p. 118 (1884).
" " " " Dougl., Ent. Mon. Mag., xxiii, p. 28 (1886).

Habitat.—England; Germany.

On grape-vine.

Lepidosaphes ulmi ulicis (Dougl.).

Mytilaspis ulicis Dougl., Ent. Mon. Mag., xxii, p. 249 (1886).
" " " " " " xxiii, p. 152 (1886).
" pomorum var. ulicis Newst., Mon. Brit. Cocc., i, p. 200 (1901).

Habitat.—England.

On furze (Ulex europæus).

Lepidosaphes ulmi candida (Newst.).

Mytilaspis pomorum var. candidus Newst., Ent. Mon. Mag., xxxvii, p. 82 (1901).
" " " " " Mon. Brit. Cocc., i, p. 201 (1901).

Habitat.—England.

On hawthorn.

Lepidosaphes ulmi japonica (Kuw.).

Mytilaspis pomorum var. japonica Kuw., Pr. Cal. Ac. Sci., (3), iii, p. 80 (1902).

Habitat.—Japan.

On Abies firma.

Genus **ISCHNASPIS** Dougl. Type, filiformis=longirostris.

Ischnaspis Dougl., Ent. Mon. Mag., xxiv, p. 21 (1887): Newst., Mon. Brit. Cocc., i, p. 209 (1901).

1432. Ischnaspis longirostris (Sign.).

Mytilaspis longirostris Sign., Bull. Soc. Ent. Fr., (6), ii, p. xxxv (1882).
Ischnaspis filiformis Dougl., Ent. Mon. Mag., xxiv, p. 21 (1887).
" " Ckll., " " " xxix. p. 17 (1893).
" " Mask., N. Z. Trans., xxvii, p. 52 (1894).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 40 (1896).
" longirostris Ckll., Check List, p. 336 (1896).
" filiformis Newst., Ent. Mon. Mag., xxxiv., p. 94 (1898).
" " " Jn. Roy. Hor. Soc., xxiii, p. 19 (1900).
" longirostris Hemp., Rev. Mus. Paul., iv, p. 509 (1900).
" filiformis Lefroy, Scale Ins. Less. Antil., p. 61 (1901).
" " Newst., Mon. Brit. Cocc., i, p. 210 (1901).

Habitat.—Great Britain (in conservatories); Brazil: New Zealand: Australia; Japan; Demerara; West Indies; Panama; Washington, D. C. (in hothouses).

On palms; palmetto: Pandanus: Latania; Magnolia grandiflora: Jasminum; Monstera; coffee, etc.

Genus **PARLATORIA** Targ. Type, lucasii=ziziphi.

Parlatoria Targ., Catalogue, p. 42 (1869): Sign., Ann. Soc. Ent. Fr., (4), ix, p. 450 (1869): Comst., Rep. U. S. Dep. Ag., 1880, p. 326 (1881); 2nd Rep. Dep. Ent. Corn. Univ., p. 112 (1883): Berl., Riv. Pat. Veg., iv, p. 79 (1895): Green, Coccidæ Ceylon, pt. ii, p. 162 (1899): Newst., Mon. Brit. Cocc., i, p. 139 (1901).
s. g. Websteriella Leon., Riv. Pat. Veg., viii, p. 208 (1900).
s. g. Apteronidia " " " " " p. 321 (1900).

1433. Parlatoria affinis Newst.

Parlatoria affinis Newst., Tr. Ent. Soc. Lond., p. 97 (1897).

Habitat.—Algeria.

On Fraxinus oxyphylla; Olea Europæa.

1434. Parlatoria aonidiformis Green.

Parlatoria aonidiformis Green, Coccidæ Ceylon, pt. ii, p. 168 (1899).

Habitat.—Ceylon.

On Nothopegia Colebrookiana.

1435. Parlatoria blanchardii (Targ.).

Coccus Blanchardii Targ., Catalogue. p. 32 (1869).
" " " Mem. Soc. Zool. Fr., v, pp. 69, 82 (1892).
Aonidia " " Bull. Soc. Ent. Ital., xxiii, p. 170 (1892).
Parlatoria victrix Ckll., The Entom., xxix, p. 52 (1896).
" " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 42 (1896).
" blanchardi subsp. victrix Ckll., Bull. 32, Ariz.Exp.Sta.,p.283(1899).
" " Ckll., Science, n. s., ix, p. 417 (1899).
" " Quaint. & Scott, Cocc. Amer., Dec. iii-iv, No.15 (1901).

Habitat.—Australia; Algeria; Sahara; Arizona, from Egypt.

On date-palm.

1436. Parlatoria calianthina Berl. e Leon.

Parlatoria calianthina Berl. e Leon., Riv. Pat. Veg., iii, p. 346 (1895).
" " " " Annali di Agr., p. 95 (1898).
" " " " Cherm. Ital., Fasc. iii, No. 59 (1898).
" " " " Riv. Pat. Veg., vii. pp. 259, 260 (1899).
Habitat.—Italy.
On rose; peach; apple; almond; olive.

1437. Parlatoria cingala Green.

Parlatoria cingala Green, Coccidæ Ceylon, pt. ii, p. 166 (1899).
Habitat.—Ceylon.
On Flacourtia; Scolopia.

1438. Parlatoria crotonis Dougl.

Parlatoria proteus var. crotonis Dougl., Ent. Mon. Mag., xxiii, p. 242 (1887).
" pergandei " " Ckll., Ins. Life, iv, p. 334 (1892).
" " " " " Ann. Mag. N. H., (6), xvi, p. 62 (1895).
" " " " " Bull. Bot. Dep. Jam., p. 107 (1897).
" " " " ". Ann. Mag. N. H., (7), iii, p. 62 (1899).
" proteus " " " Pr. Ac. N. Sci. Ph., p. 275 (1899).
" pergandii " " Newst., Journ. Roy.Hor.Soc.,xxiii,p.15(1900).
" proteus " " " Mon. Brit. Cocc., i, p. 146 (1901).
" crotonis Ckll., The Entom., xxxv, p. 59 (1902).
Habitat.—Antigua; Jamaica; Panama; Great Britain; Mass. (Harvard Botanic Gardens).
On Croton.

1439. Parlatoria dryandræ Full.

Parlatoria dryandræ Full., Notes on Cocc. W. Austr., p. 4 (1897).
" " " Tr. Ent. Soc. Lond., p. 467 (1899).
Habitat.—W. Australia.
On Dryandra floribunda.

1440. Parlatoria myrtus Mask.

Parlatoria myrtus Mask., N. Z. Trans., xxiii, p. 12 (1890).
" " " " " xxviii, p. 386 (1896).
Habitat.—S. Australia.
On Myrtus communis; "Laurustinus."

1441. Parlatoria mytilaspiformis Green.

Parlatoria mytilaspiformis Green, Cocc. Ceylon, pt. ii, p. 164 (1899).
Habitat.—Ceylon.
On Psychotria thwaitesii.

1442. Parlatoria pergandii Comst.

(*The Chaff scale.*)

Parlatoria pergandii Comst., Rep. U. S. Dep. Ag., 1880, p. 327 (1881).
" " " 2nd Rep. Dep. Ent. Corn. Univ., p. 113 (1883).

Parlatoria pergandii Saund., Ins. Inj. to Fruits. p. 401 (1883).
" " Hubbard, Ins. Aff. Orange, p. 37 (1885).
" " Morg.. Bull. 28, La. Exp. Sta., p. 992 (1893).
" " " Spec. Bull. La. Exp. Sta.. p. 62 (1893).
" " Berl. e Leon., Cherm. Ital., Fasc. i, No. 2 (1895).
" " Craw. 5th Bien. Rep. Cal. Bd. Hort., p. 41 (1896).
" " Ckll.. Bull. 6. T. s., Dep. Ag., p. 10 (1897).
" pergandei Rolfs & Quaint.. Cocc. Amer., Dec. i-ii. No. 8 (1898).
" pergandi Berl. e Leon.. Riv. Pat. Veg., vii. p. 268 (1899).
" proteus var. pergandei Ckll.. Check List, Suppl., p. 397 (1899).
" pergandii Hemp., Rev. Mus. Paul., iv, p. 510 (1900).
" " Marlatt, Yearbook U. S. Dep. Ag.. p. 270 (1900).
" " Hunter. Kan. Univ. Quar., ix, p. 105 (1900).
" " Frank & Kruger, Schildlausbuch, p. 104 (1900).
" " Newst.. Mon. Brit. Cocc.. i, p. 143 (1901).
" " Kuw., Pr. Cal. Ac. Sci.. (3), iii, p. 78 (1902).

Habitat.—D. C.: Fla.: La.: Ohio: Kan.: Cal.: Mex.: Japan: Hawaiian Islands: Algeria: Europe.

On orange: lemon: Japonica.

Parlatoria pergandii camelliæ Comst.

Parlatoria pergandii var. Camelliæ Comst., 2nd Rep. Dep. Ent. Corn. Univ.. p. 114 (1883).

Habitat.—Washington, D. C. (in conservatory).

On Camellia.

1443. Parlatoria petrophilæ Full.

Parlatoria petrophilæ Full., Tr. Ent. Soc. Lond., p. 468 (1899).

Habitat.—W. Australia.

On Petrophila linearis: Hakea ilicifolia.

1444. Parlatoria pittospori Mask.

Parlatoria pittospori Mask.. N. Z. Trans., xxiii, p. 11 (1890).

Habitat.—Australia.

On Pittosporum undulatum.

1445. Parlatoria proteus (Curt.).

Aspidiotus proteus Curt., Gard. Chron., p. 676 (1843).
Diaspis parlatoris Targ., Studii sul. Cocc., p. 14 (1867).
?Parlatoria orbicularis Targ., Catalogue, p. 42 (1869).
" proteus Sign.. Ann. Soc. Ent. Fr., (4), ix, p. 450 (1869).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 114 (1883).
" " Dougl., Ent. Mon. Mag., xxiii, p. 241 (1887).
" " Craw, Rep. Cal. Bd. Hort., p. 15 (1891).
" " Mask.. N. Z. Trans., xxv, p. 213 (1892).
?Aspidiotus targionii Del Guer., Il Naturalista Siciliano, No. 8 (1894).
? " " Berl.. Riv. Pat. Veg., iv, p. 185 (1895).

Parlatoria proteus Berl. e Leon., Cherm. Ital., Fasc. i, No. 2 (1895).
? " targionii Ckll., Check List, p. 335 (1896).
" proteus Mask., N. Z. Trans., xxix, p. 300 (1897).
" " Ckll., Bull. Bot. Dep. Jam., iv, p. 108 (1897).
" " Hunter, Kan. Univ. Quar., ix, pp. 105. 106 (1900).
" " Zimm., Bull. Inst. Bot. Buitenzorg, No. 10, p. 19 (1901).
" " Newst., Mon. Brit. Cocc., i, p. 140 (1901).

Habitat.—Europe; Australia; Japan; China; Formosa; Hawaiian Islands; Brazil; N. Y.: D. C.: Kan.

On Selenipedium; Macrozamia; Pinus insignis; Myrtus; Citrus; Camellia; Machilus; apple; date-palm.

Parlatoria proteus virescens Mask.

Parlatoria proteus var. virescens Mask., N. Z. Trans., xxix, p. 300 (1897).

Habitat.—China; Japan; Formosa.

On Myrtus; Camellia; Pyrus sinensis; rose.

Parlatoria proteus palmæ Mask.

Parlatoria proteus var. palmæ Mask., N. Z. Trans., xxx, p. 229 (1898).
" " " " Ckll., Science, n. s., ix, p. 417 (1899).

Habitat.—Australia.

On date-palms imported from Algeria?

1446. Parlatoria sinensis Mask.

Parlatoria sinensis Mask., Ent. Mon. Mag., xxxiii, p. 241 (1897).
" " " N. Z. Trans., xxx, p. 228 (1898).

Habitat.—China.

On orange.

1447. Parlatoria theæ Ckll.

Parlatoria theæ Ckll., Psyche, vii, Suppl., i, p. 21 (1896).
" " " Bull. 4, T. s., Dep. Ag., p. 55 (1896).

Habitat.—Japan; New York (imported on Japanese maple).

On tea-plant; Japanese maple.

Parlatoria theæ euonymi Ckll.

Parlatoria theæ var. euonymi Ckll., Am. Nat., xxxi, p. 591 (1897).

Habitat.—Japan.

On Euonymus.

Parlatoria theæ viridis Ckll.

Parlatoria theæ var. viridis Ckll., Bull. 4, T. s., Dep. Ag., p. 43 (1896).
" " " " " Psyche, vii, Suppl., i, p. 21 (1896).
" " " " Craw, 5th Bien. Rep. Cal. Bd. Hort., p. 42 (1896).
" " " " Ckll., Jn. N. Y. Ent. Soc., vii, p. 258 (1899).

Habitat.—Japan.

On Ilex pedunculosa.

1448. Parlatoria viridis Full.

Parlatoria viridis Full., Notes on Cocc. W. Austr., p. 4 (1897).
" " " Tr. Ent. Soc. Lond., p. 467 (1899).

Habitat.—W. Australia.

On Pittosporum.

1449. Parlatoria ziziphus (Lucas).

Coccus ziziphus Lucas, Bull. Soc. Ent. Fr., (3), i, p. xxviii (1853).
Chermes aurantii Bdv., Ent. Hort., p. 338 (1867).
Parlatoria lucasii Targ., Catalogue, p. 42 (1869).
" zizyphi Sign., Ann. Soc. Ent. Fr., (4), ix, p. 451 (1869).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 115 (1883).
" lucasii Targ., Annali di Agr., p. 398 (1884).
" " " Cocc. deg. Agr. Ital., p. 18 (1891).
" zizyphi Dougl., Ent. Mon. Mag., xxviii, p. 162 (1892).
" " Berl. e. Leon., Cherm. Ital., Fasc. i, No. 1 (1895).
" " " Riv. Pat. Veg., iv, pp. 84, 137 (1895).
" " " " " " " pp. 195, 224 (1896).
" " Mask., N. Z. Trans., xxviii, p. 386 (1896).
" " " " " xxix, p. 301 (1897).
" " Full., Notes on Cocc. W. Austr., pp. 4, 13 (1897).
" " Newst., Tr. Ent. Soc. Lond., p. 98 (1897).
" " Frank & Kruger, Schildlausbuch, p. 104 (1900).
" " Newst., Mon. Brit. Cocc., i, p. 148 (1901).

Habitat.—Europe; Algeria; Hawaiian Islands; Formosa; China; W. Australia; United States, on imported fruit.

On Zizyphus pinnachristi; date-palm; orange; lemon.

Generic Location Uncertain.

1450. **Orthezia edwardsii** Ashm., Can. Ent., x, p. 203 (1878).
" " Lounsb., 32nd Rep.Mass.Ag.Coll.,p.125(1895).
—— " Ckll., Check List, p. 326 (1896).

Habitat.—California.
" Probably the male of a Pseudococcus " (Ckll.).

Rhizobius
1451. **~~Rhizococcus~~ jujubæ** Buckton, Mon. Brit. Aphides, iv, p. 181(1883).
" " " Ind. Mus. Notes, iv, p. 277 (1899).
" " Ckll., The Entom., xxxiv, p. 127 (1901).

Habitat.—India.
On roots of Zizyphus jujuba.

1452. **Villigera frauenfeldi** Karsch, Wien. Ent. Zeit., i, p. 63 (1882).
Habitat.—China.
" Probably a Monophlebus " (Ckll.).

Species without Description or not Recognizable.

1453. Aspidiotus cymbidii Bouché, Stett. Ent. Zeit., iv, p. 296 (1884).
" " Ckll., Biol. Centr. Amer., ii, pt. 2, p. 30(1899).
Habitat.—China. On Cymbidium.

1454. Aspidiotus rhododendri "Wailes," Sign., Ann. Soc. Ent. Fr., (4), x, p. 109 (1870).

1455. Calypticus aterrimus Costa, Faun. Reg. Nap., Cocc., p. 11 (1835).
Lecanium " Sign., Ann. Soc. Ent. Fr.,(4),viii,p.844(1868).
Habitat.—Italy. On Quercus ilex.

1456. Ceroplastes crispata Targ., Catalogue, p. 35 (1869).
" " Sign., Ann. Soc. Ent. Fr., (5), ii, p. 46 (1872).
Habitat.—Europe?

1457. Chermes angræci Bdv., Ent. Hort., p. 337 (1867).
Lecanium " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 609 (1876).
" " Ckll., Gard. Chron., (3), xiii, p. 548 (1893).
Habitat.—Madagascar. On Angræcum sesquipedale.

1458. Chermes clematitis oblongus Geoff., Abr. Ins., p. 506 (1762).
" " Fourc., Ent. Paris., p. 228 (1785).
Coccus clematidis Gmel., Syst. Nat., Ed. xiii, p. 2220 (1789).
" " Ckll., The Entom., xxxiv, p. 92 (1901).
Habitat.—Europe. On Clematis.

1459. Chermes dionis Bdv., Ent. Hort., p. 327 (1867).
Habitat.—France. On Dion edule.

1460. Chermes fulchironia Bdv., Ent. Hort., p. 330 (1867).
Habitat.—France. On Fulchironia senegalensis.

1461. Chermes punctiformis Bdv., Ent. Hort., p. 330 (1867).
Habitat.—France. On orchids.

1462. Coccus aceris Fab., Ent. Syst., iv, p. 225 (1794).
Habitat.—Europe. On maple.

1463. **Coccus adonidum** Linn., Syst. Nat., Ed. xii, i. p. 740 (1766).
" " Fab., Syst. Ent., p. 743 (1775).
" " " Spec. Ins., ii, p. 393 (1781).
" " " Mant. Ins., ii, p. 318 (1787).
" " Gmel., Syst. Nat., Ed. xiii, p. 2215 (1789).
" " Fab., Ent. Syst., iv, p. 224 (1794).
" " " Syst. Rhyng., p. 307 (1803).
" " Ckll., Pr. Ac. N. Sci. Ph., p. 261 (1899).
Habitat.—America?; Southern Europe; Africa; Asia.
The description of *Coccus adonidum* by Linnæus is not that of a "mealy bug", but probably of some species of Orthezia, as stated by Prof. Cockerell.

1464. **Coccus alchimillæ** "Berg.," Walk., Cat. Brit. Mus., Hom., p. 1082 (1852).
Habitat.—Europe?

1465. **Coccus asari** Schr., Faun. Boica, ii, pt. 1, p. 146 (1801).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 609 (1876).
Habitat.—Europe. On Asarum europæum.

1466. **Coccus bassi** Targ., Studii sul Cocc., pp. 25, 27, 30 (1867).
" " " Catalogue, p. 32 (1869).
Habitat.—Mexico.

1467. **Coccus cambii** Ratz., Forstins., iii, p. 194 (1844).
Lecanium " Targ., Catalogue, p. 41 (1869).
" " Sign., Ann. Soc. Ent.Fr.,(5),vi,p.160 (1876).
Habitat.—Germany. On oak.
This may be a Kermes.

1468. **Coccus capensis** Linn., Syst. Nat., Ed. xii, p. 740 (1766).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 611 (1876).
Habitat.—South Africa. On Gnaphalium.

1469. **Coccus caudatus** Walk., Cat. Br. Mus., Hom., p. 1085 (1852).
" " Sign., Ann. Soc. Ent. Fr., (5). vi, p. 612 (1876).
Habitat.—Colombia. A Phenacoccus?

1470. **Coccus chlaeoon** Anderson, Lett. to Banks, No. 1 (1787).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 612 (1876).
Habitat.—India.

1471. **Coccus diacopeis** Anderson, Lett. to Banks, No. 7 (1789).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 613 (1876).
Habitat.—China. On Citrus sinensis.

1472. **Coccus diosmatis** Mod., Act. Goth., i, p. 21 (1778).
Lecanium " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 614 (1876).
Habitat.—Cape of Good Hope.

1473. **Coccus draparnaldi** Bory de St. Vincent, Journ. Hist. Nat. Bordeaux, iii, p. 77 (1798).

1474. **Coccus elioides** Costa, Faun. Reg. Nap., Cocc., pl. 6, fig. 3 (1835).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 614 (1876).
Habitat.—Italy.

1475. **Coccus erion** Anderson, Lett. to Banks, No. 4 (1789).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 615 (1876).
Habitat.—India. On Rosa sinensis; Ficus indica; Robinia; Cocos, etc.

1476. **Coccus folii-quercus** Sulzer, Gesch. Ins., p. 112 (1776).

1477. **Coccus fraxini** Chav., Ann. Soc. Ent. Fr., (2), vi, p. 142 (1848).
" " Sign., " " " " (5), vi, p. 616 (1876).
Habitat.—Italy. On Fraxinus rotundifolia; F. ornus.

1478. **Coccus hordeolum** Dalm., K. Vet. Akad. Handl., xlvi, p. 365 (1825).
Aspidiotus " Walk., Cat. Br. Mus., Hom., p. 1068 (1852).
Lecanium " Targ., Catalogue, p. 38 (1869).
Habitat.—Sweden.

1479. **Coccus hyperici** Pallas, Reise Russ. Reich., i, p. 21 (1771).
" hypericonis Gmel., Syst. Nat., Ed. xiii, p. 2219 (1789).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 617 (1876).
Habitat.—Russia. On Hypericum perforatus.

1480. **Coccus hystrix** Baer., Zeit. für Zool., p. 173 (1849).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 617 (1876).
Habitat.—France. On fir.

1481. **Coccus koleos** Anderson, Lett. to Banks, No. 6 (1789).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 618 (1876).
Habitat.—India. On Solanum.

1482. **Coccus microgenes** Anderson, Lett. to Banks, No. 5 (1789).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 620 (1876).
Habitat.—India. On Vitis vinifera.

1483. **Coccus narcodes** Anderson, Lett. to Banks (1789).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 621 (1876).
Habitat.—India. On "Wodier."

1484. **Coccus oogenes** Anderson, Lett. to Banks, No. 3 (1787).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 621 (1876).
Habitat.—India. On Hibiscus.

1485. **Coccus ovatus** Turton, Syst. Nat., ii, pt. 1, p. 716 (1801).

1486. **Coccus phalaridis** Linn., Syst. Nat., Ed. x, p. 456 (1758).
" " Fab., Syst. Ent., p. 744 (1775).
" " Licht., Ent. Mon. Mag., xiv, p. 34 (1877).
Habitat.—Europe. On Phalaris canariensis.

1487. **Coccus pilosellæ** Fab., Syst. Ent., p. 744 (1775).
" " Oliv., Ency. Meth., vi, p. 98 (1791).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 622 (1876).
Habitat.—Europe. On roots of Hieracium pilosellæ.

1488. **Coccus potentillæ** Mayer, Abh. Privatges. Böhmen, iv,p.184(1779).
Habitat.—Europe. On Potentilla.

1489. **Coccus poterii** Walk., Cat. Br. Mus., Hom., p. 1082 (1852).
Habitat.—England.

1490. **Coccus purpuratus** Dalm., K. Vet. Akad. Handl.,xlvi,p.363 (1825).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 623 (1876).
Habitat.—Sweden. A Pseudococcus?

1491. **Coccus salicis** Fitch, 4th Rep. Regents Univ. N. Y., p. 69 (1851).
Lecanium " Walk., Cat. Br. Mus., Hom., iv, p.1072 (1852).
" americanum Targ., Catalogue, p. 38 (1869).
Coccus salicis Lint. (reprint from Fitch),9th Rep.Ins.N.Y.,p.409(1893).
Lecanium " Riley, 9th Rep. Ins. N. Y., pp. 411, 413 (1893).
Habitat.—New York. On willow.

1492. **Coccus sinensis** Walk., Cat. Br. Mus., Hom., p. 1085 (1852).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 624 (1876).
Habitat.—China. On sugar-cane.

1493. **Coccus trichodes** Anderson, Lett. to Banks (1789).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 625 (1876).
Habitat.—India. On Psidium; Hibiscus; Solanum, etc.

1494. **Coccus uva** Mod., Act. Goth., i, p. 32 (1778).
" " Gmel., Syst. Nat., Ed. xiii, p. 2222 (1789).
Habitat.—Sweden. An Orthezia?

1495. **Coccus uvæ-ursi** Linn., Faun. Suec., p. 266 (1761).
" " " " Syst. Nat., Ed. xii, p. 742 (1766).
" arbuti " " " " " p. 742 (1766).
" " Oliv., Ency. Meth., vi, p. 98 (1791).
Habitat.—Europe. On roots of Arbutus uva-ursi.

1496. **Coccus xylostei** Schr., Faun. Boica, ii, pt. 1, p. 145 (1801).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 629 (1876).
On Lonicera xylosteum.

1497. **Diaspis asparagi** Giard, Bull. Soc. Ent. Fr., (7), iii, p. cxcix (1893).
Habitat.—Algeria. On Asparagus horridus.

1498. **Diaspis aurantii** Sign., Bull. Soc. Ent. Fr., (6), iii, p. lxiii (1883).
Habitat.—British Guiana. On orange.

1499. Diaspis vandalicus Galvez, no desc.
" " Reimer, Ins. Life, ii, p. 278 (1890).
" " Ckll., " " iii, p. 296 (1891).
" " " Ent. Mon. Mag., xxix, p. 38 (1893).
Habitat.—Cuba. On cocoanut leaves.

1500. Kermes camelliæ Bdv., Ent. Hort., p. 334 (1867).
Habitat.—France. On Camellia; tea.

1501. Lecanium asparagi Giard, Bull. Soc. Ent. Fr.,(7),iii,p.cxcix (1893).
Habitat.—Algeria. On Asparagus horridus.

1502. Lecanium australe Walk., Cat. Br. Mus., Hom., p. 1079 (1852).
" orbiculare Targ., Catalogue, p. 39 (1869).
" australe Sign., Ann. Soc. Ent. Fr., (5), vi, p. 610 (1876).
Habitat.—Tasmania.

1503. Lecanium capense Walk., Cat. Br. Mus., Hom., p. 1079 (1852).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 612 (1876).
Habitat.—Algoa Bay.

1504. Lecanium erythrinæ Iher., Rev. Mus. Paul., ii, p. 407 (1897).
" " Hemp., " " " iv, p. 438 (1900).
Habitat.—Brazil.

1505. Lecanium gigas Bremi Wolf., Verh. Schw. Nat. Ges., p. 41 (1847).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 616 (1876).
Habitat.—France. On oak. A Kermes?

1506. Lecanium pictum Targ., Catalogue, p. 38 (1869).
Habitat.—Europe?

1507. Lecanium planchonii Targ., Catalogue, p. 39 (1869).
Habitat.—Europe? On oak.

1508. Lecanium platycerii Pack., Rep. Mass. Bd. Ag., p. 260 (1869-70).
" " Comst., 2nd Rep. Dep. Ent. Corn. Univ., p. 134 (1883).
Habitat.—Mass. (in a greenhouse). On ferns.

1509. Lecanium tubuliferum Ckll., The Entom., xxxi, p. 132 (1898).
" " " Biol. Centr. Amer., ii, pt.2,p.11 (1899).
Habitat.—Mexico. An immature Kermes?

1510. Lecanium vaccinii=macrocarpum Goethe, Jahrb. Nass. Ver.Nat., p. 125 (1884).
" " " Karsch, Ent. Nach., xi, p. 380 (1885).
Habitat.—Germany.

1511. Lecanium vagabundum Först., Verh. d. Nat. Ver. pr. Rh., viii, p. 560 (1851).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 628 (1876).
" " Dougl., Ent. Mon. Mag., xxiii, p. 25 (1886).

Habitat.—Europe. This name included all the species of Eulecanium known to Förster.

1512. Lecanium virgatum Targ., Catalogue, p. 39 (1869).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 629 (1876).

Habitat.—Australia.

1513. Lecanium vulgare Kalt. (ex Först.), Die Pflanz., p. 213 (1874).
" " Sign., Ann. Soc. Ent. Fr., (5), vi, p. 629 (1876).

Habitat.—Europe. Several European species of Eulecanium were included under this name.

1514. Leucaspis monophyllus Murray, Bull. Soc. Ent. Fr., (6), ii, p. clxxxv (1882).

Habitat.—Europe. On pine. "Probably a Monophlebus" Ckll.

Insects Described as Coccids but which belong to other Families.

Ascelis multitudinea Tepp.	A Psyllid.
Aspidiotus bicarinatus Walk.	A Lepidopterous larva.
Aspidiotus gossypii Fitch.	An Aleyrodes.
Aspisarcus eucalypti Newp.	A Psyllid ?
Asterolecanium rhamni Kieffer.	A Psyllid.
Coccus ceratiformis Butler.	Not a Hemipteron.
Coccus cryptus Karvall.	A Hymenopteron.
Coccus laricis Bouché.	An Aphid.
Coccus(?) **lataniæ** Bdv.	An Aphid.
Coccus prænanthes Bdv.	An Aleyrodes.
Coccus strobi Baer.	An Aphid.
Coccus zosteræ Fab.	A Spirorbis ?
Lecanium complanatum Baer.	An Aleyrodes.

Corrections and Additions.

No. 19. Omit the habitats and food plant, as they are unknown.
" 25. Add On Eucalyptus.
Page 19. For **GUERINIA** read **GUERINIELLA. GUERINIA** is preoccupied having been used for a genus of the Diptera in 1830.
No. 33. Omit Brazil from the habitat.
" 34. For France read Attica, Greece, and add On Pinus halepensis.
" 35. Add Palæococcus hempeli Ckll., The Entom., xxxv, p. 233 (1902).
" 36. For in litt. read The Entom., xxxv, p. 233 (1902).
" 37. Add Palæococcus nudatus Ckll., The Entom., xxxv, p. 233 (1902).
" 39. Omit Australia and Hakea gibbosa.
Page 23. To the genus **WALKERIANA** add s.g. Aspidoproctus Newst., Pr. Zool. Soc. Lond., p. 948 (1900): Ckll., The Entom., xxxv, p. 257 (1902). Type, pertinax.
No. 50. For **braziliensis** read **brasiliensis.**
" 54. Add the subspecies **Icerya littoralis tonilensis** Ckll., The Entom., xxxv, p. 318 (1902). Habitat.—Mexico.
" 56. Omit the food plants.
" 59. Omit the habitat Trinidad, and for the food plant Pittospermum read Pittosporum.
" 62. Omit the habitat New Zealand.
" 64. For Europe read South Africa.
" 65. For East Indies read West Indies.
" 66. For **gallica** read **gallicus**, and add Margarodes gallicus Ckll., The Entom., xxxv, p. 258 (1902). On Polygonum aviculare ?
" 67. Add Margarodes hameli Ckll., The Entom., xxxv, p. 258 (1902).
" 69. Add Margarodes perrisii Ckll., The Entom., xxxv, p. 258 (1902).
" 71. Omit Europe from the habitat.
" 86. For **zeylanicus** read **zeylanica.**
" 90. Add On golden-rod; burdock; Impatiens; Eupatorium.
" 94. For Cheilanthus read Cheilanthes.
Page 34. Add No. 95½. **Orthezia galapagoensis** Kuw., Jn. N. Y. Ent. Soc., x, p. 28 (1902).
" 37. Eighth line, the reference Orthezia characias Riley, etc. belongs under No. 59.
No. 110. For France read Switzerland.
Page 38. To the genus Conchaspis add the original reference, Ckll., Bull. Bot. Dep. Jam., No. 40, Feb. [publ. March] (1893).

No. 131. Add Habitat, Australia. On Eucalyptus.

" 171. Add On bamboo: and under the subspecies **bambusulæ**, for India read West Indies.

No. 176. Prof. Cockerell thinks the true **fimbriatum** was not found in Australia.

" 177. For **grandis** read **grande**.

" 186. **Lecanium quercicola** Bouché, is not known, and all the references under this name, except the first, belong to No. 192. See Pr. Ac. N. Sci. Ph., p. 269 (1899). Transfer also all the habitats except Europe.

Page 54. Second line, for Asterolecanium variolosum, read Coccus variolosus: and in the fourth line, after variolosum, insert Boas, the author of the article. To the habitat add New Zealand, and to the food plants add, and other species of Quercus.

No. 207. Add New Mexico and Colorado to the habitat.

" 209. For Ciste salviafolia read Cistus salvifolius.

Page 57. For **AMORPHOCOCUS** read **AMORPHOCOCCUS**.

No. 256. Omit U. S. from the habitat.

" 276. For **cavellei** read **cavellii**.

" 279. Add Japan to the habitat.

" 289=538. Transferred to the genus **ERIUM** by Prof. Cockerell.

" 293. For Alaska read Dawson City, Canada, and add New Mexico.

" 303. Omit this number, the name being an error for No. 401.

" 311. For **formicola** read **formicicola**.

" 324. Prof. Cockerell thinks this was on a cultivated South American cactus in Germany.

" 327. Omit var. graminæ from food plant.

" 330. Omit India from habitat. Under the subspecies **simplex**, for xxix read xxx, and for 1897, read 1898. For Pittosporum undulatum read Eucalyptus.

" 333. For New Mexico read Georgia.

" 336. Eriococcus tricarinatus is not considered a synonym of **E. simplex dealbata**. The way it is printed in Tr. Ent. Soc. Lond., p. 442 (1899) is misleading. Prof. Cockerell has kindly called my attention to this fact.

" 342. For Europe read Royal Gardens, Kew, England.

" 346. For Opuntia coccinelliferi read Opuntia coccinellifera.

" 347. Add Colorado to the habitat. Under the subspecies **newsteadi**, for Colorado read Northern Mexico.

" 348. Omit New Mexico from the habitat.

" 354. Prof. Cockerell informs me that the reference in Can. Ent. is earlier than that in Rev. Mus. Paul., and therefore the species should be known as **Capulinia crateraformis.**

Page 85. For **SPHÆROCOCOPSIS** read **SPHÆROCOCCOPSIS.**

No. 366. Add Sphærococcus distichlium Ckll., in litt. (1902).

No. 407. Omit India from the habitat.
" 427. For New Mexico read Trinidad.
" 431. For Dactylopius read Ceroputo.
" 432. Omit Antigua from the habitat. Under the subspecies **mexicanus**, omit yuccæ var. from the first reference.
" 443. Omit Southern Alps.
" 445. Omit palm.
" 446. Omit Auckland.
" 464. Add Mexico to the habitat.
" 468. For Ckll. in the fourth reference, read Mask.
" 491. For England read Guernsey.
" 523. Omit New Mexico from the subspecies **kingii**.
" 570. The first reference is incorrect. **C. halophilus** was not described by A. Hardy in Cochenille in Algeria, but by J. Hardy. I cannot now give the reference to his description. Omit Algeria and France from the habitat, and for Statice armeria, read Statice; Armeria.
" 695. For **tuberculatus** read **tuberculata**.
" 718. Add Lichtensia parvula Ckll., Ann. Mag. N. H., (7), x, p. 467 (1902).
" 720. Omit Mass. from habitat, and Spiræa salicifolia and Prinos verticillatus from the food plants. The insect was incorrectly determined.
" 727, 757, 764, 765, 771, 776. Omit Europe from the habitats.
" 735. For Ckll. in third line, read Green. Prof. Cockerell states that this species is a synonym of No. 744, and that the so called C. ceriferus from Mexico is **C. dugesii.**
" 755. For the second reference, read Ceroplastes africanus var. cristatus; and in the third reference, for Ckll. read Green.
" 764. Omit British Guiana.
Page 156. First line, Ckll. alone is the authority for var. B.
No. 783. Omit British Guiana, Australia and Japan.
" 786. Add the original reference, Boll. Soc. Ent. Ital., xxxii, p. 229-252 (1900). In the reference to Science, for Del Guer. read Ckll.
" 832. For Hemp. read Ckll.
Page 165. Omit lounsburyi from the generic reference for Cryptinglisia.
No. 837. Omit Jamaica from the habitat, and lignum-vitæ from the food plants.
" 917. Add Coccus salicum Fab., Spec. Ins., ii, p. 394 (1781).
" 955. Add Lecanium pruinosum Tyr., Rep. Cal. Exp. Sta., p. 267 (1896).
Page 195. In the 14th and 15th lines, for **quercitronis** read **pruinosum**, and transfer the subspecies to No. 955.
No. 964. Omit New Mexico from the habitat.
Page 266. Omit the food plant "bark of Liquidambar" from **Aspidiotus juglans-regiæ pruni.**
No. 1261. For Cæsalpina read Cæsalpinia.
No. 1370. For (non Schir.), read (non Schr.).

It has been impossible in many cases to determine whether an imported species lives in the open air or only in greenhouses, when the fact was not stated by the author: and it is probable that the words, "in greenhouses," should have been added to more species included in this work.

The species with the habitat "California, at quarantine" may not have become established in that state, as the law required the plants on which the insects occurred to be fumigated or destroyed if they were to remain in California; but if they were directed to other states, they were forwarded to their destination.

The writer would be glad to have her attention called to any errors or important omissions that may be detected in this work, and also to receive papers or separata of articles on Coccidæ published later than March 1, 1903, in order that they may be catalogued in a Supplement should there be a demand for such a work.

Index.

Subfamily names are printed in Capitals. Generic and subgeneric names begin with a capital letter. Names of species and subspecies are entirely in lower case type. Synonyms are in italics.

HATCH EXPERIMENT STATION

—OF THE—

MASSACHUSETTS

AGRICULTURAL COLLEGE.

BULLETIN NO. 89.

I. ANALYSES OF MANURIAL SUBSTANCES SENT ON FOR EXAMINATION.

II. DISCUSSION OF TRADE VALUES OF FERTILIZING INGREDIENTS FOR 1903.

III. DISCUSSION ON THE ASH ANALYSES OF PLANTS.

IV. INSTRUCTIONS REGARDING THE SAMPLING OF MATERIALS TO BE FORWARDED FOR ANALYSIS.

MARCH, 1903.

The Bulletins of this Station will be sent free to all newspapers in the state and to such individuals interested in farming as may request the same.

AMHERST, MASS.
PRESS OF CARPENTER & MOREHOUSE,
1903.

HATCH EXPERIMENT STATION

OF THE

Massachusetts Agricultural College,

AMHERST, MASS.

STATION STAFF:

Henry H. Goodell, LL. D.,	*Director.*
William P. Brooks, Ph. D.,	*Agriculturist.*
George E. Stone, Ph. D.,	*Botanist.*
Charles A. Goessmann, Ph.D., LL.D.,	*Chemist* (Fertilizers).
Joseph B. Lindsey, Ph. D.,	*Chemist* (Foods and Feeding).
Charles H. Fernald, Ph. D.,	*Entomologist.*
Frank A. Waugh, M. S.,	*Horticulturist.*
J. E. Ostrander, C. E.,	*Meteorologist.*
Henry T. Fernald, Ph. D.,	*Associate Entomologist.*
Frederick R. Church, B. Sc.,	*Assistant Agriculturist.*
Ralph E. Smith, B. Sc.,	*Assistant Botanist.*
Henri D. Haskins, B. Sc.,	*Assistant Chemist* (Fertilizers).
James E. Halligan, B. Sc.,	*Assistant Chemist* (Fertilizers).
——— ———	*Assistant Chemist* (Fertilizers).
Edward B. Holland, M. S.,	*First Chemist* (Foods and Feeding).
Philip H. Smith, B. Sc.,	*Ass't Chemist* (Foods and Feeding).
——— ———	*Ass't Chemist* (Foods and Feeding).
George A. Drew, B. Sc.,	*Assistant Horticulturist.*
——— ———	*Assistant Horticulturist.*
Stephen C. Bacon,	*Observer.*

The co-operation and assistance of farmers, fruit-growers, horticulturists, and all interested, directly or indirectly, in agriculture, are earnestly requested. The Bulletins will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same. General bulletins, fertilizer analyses, analyses of feed-stuffs, and annual reports are published. Kindly indicate in application which of these are desired. Communications may be addressed to the

Hatch Experiment Station, Amherst, Mass.

DIVISION OF CHEMISTRY.

C. A. Goessmann.

I.

ANALYSES OF FERTILIZING SUBSTANCES SENT ON FOR FREE EXAMINATION.

WOOD ASHES.

1223–1227. I. Received from Concord, Mass.
II. Received from Williamsburg, Mass.
III. Received from Sunderland, Mass.
IV. Received from Waltham, Mass.
V. Received from Rochester, Mass.

	PER CENT.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	15.95	5.40	37.34	11.67	2.27
Potassium oxide,	5.40	4.60	1.68	5.52	4.80
Phosphoric acid,	1.68	1.22	.71	1.54	1.66
Calcium oxide,	29.84	28.68	25.92	28.24	35.59
Insoluble matter,	12.84	28.85	17.48	19.42	8.03

1228-1231. I. Received from Fall River, Mass.
II. Received from North Hatfield, Mass.
III. Lime ashes, received from Northampton, Mass.
IV. Lime ashes, received from Sunderland, Mass.

	PER CENT.			
	I.	II.	III.	IV.
Moisture at 100° C.,	2.37	20.45	none.	10.47
Potassium oxide,	3.46	4.34	.96	3.32
Phosphoric acid,	1.16	1.66	.26	1.66
Calcium oxide,	32.30	30.02	55.44	43.24
Insoluble matter,	24.38	12.28	3.05	1.10

1232-1234. I. Cotton Hull Ashes, received from Southwick, Mass.
II. Cotton Hull Ashes, received from Southwick, Mass.
III. Refuse Ashes from sawdust, etc., received from Townsend, Mass.

	PER CENT.		
	I.	II.	III.
Moisture at 100° C.,	6.10	4.02	13.92
Potassium oxide,	21.48	14.08	3.58
Phosphoric acid,	7.81	6.76	1.92
Calcium oxide,	8.48	4.98	34.76
Insoluble matter,	9.48	15.04	25.27

GROUND FISH, BONE AND TANKAGE.

1235-1238. I. Dry Ground Fish, received from Sunderland, Mass.
II. Dry Ground Fish, received from North Hatfield, Mass.
III. Fine Ground Bone, received from Sunderland, Mass.
IV. Garbage Tankage, received from Springfield, Mass.

	PER CENT.			
	I.	II.	III.	IV.
Moisture at 100° C.,	11.65	7.47	2.04	7.42
Total phosphoric acid,	6.72	9.34	25.48	6.06
Available phosphoric acid,	3.78	5.46	9.94	4.40
Insoluble phosphoric acid,	2.94	3.88	15.54	1.66
Nitrogen,	8.70	8.28	2.25	5.96

DISSOLVED BONE BLACK AND ACID PHOSPHATE.

1239-1240. I. Dissolved Bone Black, received from North Hatfield, Mass.
II. Acid Phosphate, received from Sunderland, Mass.

	PER CENT.	
	I.	II.
Moisture at 100° C.,	12.74	9.60
Total phosphoric acid,	17.66	15.76
Soluble phosphoric acid,	13.56	4.71
Reverted phosphoric acid,	1.74	8.95
Insoluble phosphoric acid,	2.36	2.10

COMPLETE FERTILIZERS.

1241-1243. I. Received from Sunderland, Mass.
II. Received from West Falmouth, Mass.
III. Received from Worcester, Mass.

	PER CENT.		
	I.	II.	III.
Moisture at 100° C.,	6.32	15.74	5.97
Total phosphoric acid,	6.48	9.46	10.88
Soluble phosphoric acid,	4.65	5.10	7.20
Reverted phosphoric acid,	1.31	3.98	2.18
Insoluble phosphoric acid,	.52	.38	1.50
Potassium oxide,	10.14	7.20	4.40
Nitrogen,	5.89	1.59	3.78

MISCELLANEOUS MATERIAL.

1244-1247. I. High Grade Sulphate of Potash, received from North Hatfield, Mass.
II. Nitrate of Soda, received from North Hatfield, Mass.
III. Cottonseed Meal, received from Hatfield, Mass.
IV. Acetylene Gas Tank Refuse, received from Hatfield, Mass.

	PER CENT.			
	I.	II.	III.	IV.
Moisture at 100° C.,	.63	1.00	7.15	4.20
Potassium oxide.	49.30	—	—	—
Nitrogen,	—	15.74	7.00	—
Calcium oxide,	—	—	—	*59.15

1248-1249. I. Cocoanut Fibre Pith, received from Taunton, Mass.
II. Sewage, received from Pittsfield, Mass.

	PER CENT.	
	I.	II.
Moisture at 100° C.,	6.20	37.81
Nitrogen,	.34	1.04

*The lime was present in form of Calcium Carbonate 31.99% and Calcium Hydrate 54.43%.

Potassium oxide,	.84	.44
Phosphoric acid,	.03	.40
Calcium oxide,	.57	1.24
Insoluble matter,	1.01	35.22
Organic and volatile matter,	96.22	—

SOILS.

1250-1252. I. Received from Longmeadow, Mass.
II. Received from Brockton, Mass.
III. Received from Waltham, Mass.

	PER CENT.		
	I.	II.	III.
Moisture at 100° C.,	15.82	3.14	25.37
Phosphoric acid,	.17	.18	.30
Potassium oxide,	.18	.10	.35
Nitrogen,	.29	.41	.57
Calcium oxide,	.46	.67	.62

II.

DISCUSSION OF TRADE VALUES OF FERTILIZING INGREDIENTS IN RAW MATERIALS AND CHEMICALS FOR 1903.

	CENTS PER POUND	
	1902	1903
Nitrogen in ammonia salts,	16.5	17.5
Nitrogen in nitrates,	15.0	15.0
Organic nitrogen in dry and fine ground fish, meat, blood, and in high-grade mixed fertilizers,	16.5	17.0
" " fine bone and tankage,	16.0	16.5
" " medium bone and tankage,	12.0	12.0
Phosphoric acid soluble in water,	5.0	4.5
" " soluble in ammonium citrate (reverted),	4.5	4.0
" " in fine ground fish, bone and tankage,	4.0	4.0

Phosphoric acid in cottonseed meal, castor pomace, ashes,	4.0	4.0
" " in coarse fish, bone and tankage,	3.0	3.0
" " insoluble (in water and in neutral citrate of ammonia) in mixed fertilizers,	2.0	2.0
Potash as Sulphate and in forms free from Chlorides,	5.0	5.0
Potash as Muriate (chloride),	4.25	4.25

The above schedule of trade values was adopted by representatives of the Massachusetts, Connecticut, Rhode Island, Maine, Vermont and New Jersey Experiment Stations at a conference held during the month of March, 1903, and is based upon the condition of the fertilizer market in centers of distribution in New England, New York and New Jersey during the six months preceding March, 1903, and refers to the current market prices of the leading standard raw materials, which furnish nitrogen, phosphoric acid and potash, and which enter largely into the manufacture of our commercial fertilizers.

The following is a list of such materials:—

Sulphate of ammonia,	Dissolved bone,
Nitrate of soda,	Ground phosphate rock,
Azotine,	Acid phosphate,
Dried blood,	Refuse bone black,
Cottonseed meal,	High grade sulphate of potash,
Castor pomace,	Muriate of potash,
Linseed meal,	Sulphate of potash-magnesia,
Dry ground fish,	Kainite,
Bone and tankage,	Sylvinite,
Dry ground meat,	Crude saltpetre.

A comparison of the market cost of the different essential ingredients of plant food for 1903 with the previous year shows the following variation: Nitrogen in form of ammonia salts is a cent higher per pound. The higher grades of organic nitrogen are a half cent higher in cost than for 1902. Water soluble and citrate soluble, or reverted, phosphoric acid shows a decrease in cost of one-half cent per pound. The cost of the other grades of nitrogen and phosphoric acid as well as the different forms of potash compounds remains the same as in the previous year.

Valuation. The approximate value of a compound fertilizer or any material used for fertilizing purposes is obtained by calculating the value of each of the three essential elements of plant food (nitrogen, phosphoric acid and potassium oxide, including the different forms of each wherever different forms are recognized in the table), in one hundred pounds of the fertilizer and multiplying each product by twenty to change it to a ton basis. The sum of these values will give the total approximate value of the fertilizer per ton at the principal places of distribution.

III.

DISCUSSION ON ASH ANALYSES OF PLANTS.

It is well understood by chemists that our current modes of ash analysis of plants possess quite frequently still some undesirable features. A too low temperature with an insufficient amount of air is apt to leave carbon behind, while, on the other hand, a too high temperature in the presence of carbon is apt to cause a partial volatilization of various mineral constituents; these facts are too well known to need any comment. The current publications of the average ash analyses of plants of former periods are known to suffer more or less from these features.

The question of an exact determination, qualitatively and quantitatively, of the ash constituents of plants, forces itself, from day to day, more and more upon the attention of agricultural chemists in consequence of the inquiries into the physiological action of mineral matter on plant growth. These circumstances require therefore the application of methods for their determination which will admit of no uncertainty, as it has become more and more apparent to investigators that the increase or decrease of any one of the mineral elements in plants often affects more or less the absolute and relative amount of a variety of organic compounds found in plants. As the amount of sugar, starch, protein substances, etc., in various plants raised for industrial purposes, controls their market value, a reliable system of special fertilization of plants, for special individual purposes, can only be devised when the modes of analyses are, beyond question, reliable.

Contributions regarding more exact modes of analyses of plants have deservedly received, of late, conspicuous attention by leading investigators as Tollens, Wislicenus and others.

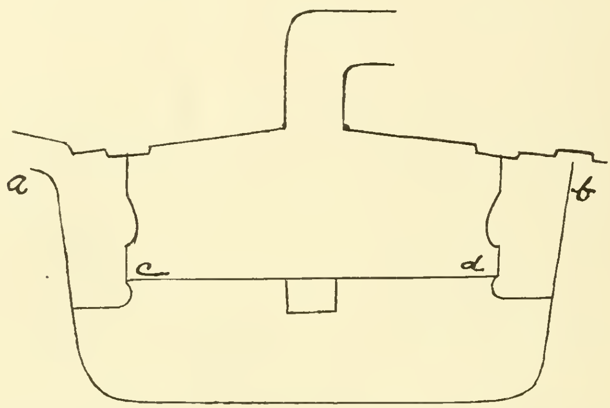
In view of the fact that ash analyses of plants forms a most important subject in agricultural chemistry, it needs no further argument that any new piece of apparatus, or any modification in the mode of analyses of the ashes of plants, which will facilitate the work, and secure at the same time greater accuracy, claims the serious consideration of agricultural chemists.

In the few subsequent pages I propose to give a short description of the apparatus at present in use in the Chemical Department, Division of Plant Foods and Fertilizers, Hatch Experiment Station of the Massachusetts Agricultural College, for the preparation and incineration of plants and agricultural products in general for ash analysis.

Preparation of material for ash analysis (Kugelmuehle.) For the preparation of plants and agricultural products for ash analysis we have adopted the "Kugelmuehle," an apparatus imported from Dresden, Germany. The merits of this apparatus were first observed by the writer when on a personal visit to Prof. H. Wislicenus at the Forstacademie in Tharand, Saxony, where the apparatus was in use giving much satisfaction.

The principal features of the apparatus are two very thick and heavy cylindrical porcelain vessels, about six and one-half inches high and five and one-half inches in diameter, which receive the sample to be ground. In each vessel are also placed twelve to fifteen roughly finished porcelain balls about four inches in circumference. A well fitting porcelain cover is subsequently firmly fastened in position, after which the vessels are placed on rubber covered, parallel wooden bars. Three of these bars are adjusted to run about three inches apart. The power is communicated to the middle bar by means of a belt passing over a pulley. As soon as the porcelain vessels are placed between these bars the power is communicated to the remaining two bars which causes them all to move in unison, turning, at the same rate of speed, the two porcelain vessels. The friction of the small porcelain balls, in the porcelain vessels, reduces the dried substance gradually to an impalpable powder. The use of this apparatus prevents loss of material in form of fine dust and excludes any possibility of contamination by iron. One-half horse power or even less is all that is necessary to successfully run the apparatus. The power may be obtained by an electric motor, water motor or a small hot air engine; the latter motive power was used by us and proved highly satisfactory.

Incineration of the sample for analysis. For this purpose an ordinary platinum dish, two and three-quarters inches in diameter, is used; the special contrivance itself being limited to the cover, thus enabling one to prepare and weigh out several samples in similar crucibles. The subsequent sketch of the cover will show the peculiar features of the apparatus.



The lines a. b. simply show the outlines of the platinum dish on which the cover is resting. The line c. d. shows a loose fitting sheet of platinum which prevents a direct draft into the funnel above; the platinum sheet being easily removed facilitates the cleaning of the cover. The cover needs only to lie loosely on the crucible; small unavoidable irregularities of the edge of the dish are therefore of no consequence.

During the combustion the cover can be taken off at any time for observation and stirring up of the substance. The air comes in around the edge gently, uniformly and well warmed. Oxygen can be mixed with the air of combustion at the proper moment in a very simple manner.

The funnel shaped cover is of pure platinum weighing about twenty-six grams and its construction is of such a nature as to allow of its being easily cleaned.

Our apparatus was imported by Messrs. Eimer & Amend, New York City, from Heraerus & Co., Hanau, Germany.

By means of this cover used on an ordinary incineration dish a perfectly white ash can be obtained at a temperature much lower than what is usually necessary for incineration. In fact the faintest dull red heat on the bottom of the dish will, in a few hours, produce perfect incineration, when using the cover.

ASH ANALYSES OF SAMPLES OF ONIONS.

The following statement of ash analyses refers to a series of samples of onions raised by Prof. Wm. P. Brooks, Agriculturist of the Hatch Experiment Station of the Massachusetts Agricultural College, with the aid of different manurial substances. They were kindly furnished by him to test the merits of the above apparatus and to furnish a practical illustration of the question under discussion. The results of analyses are in every instance controlled by duplicate determinations and refer to parts per hundred parts of dry matter. Onions dried at 100° C.

	Laboratory Number.							
	1.	2.	3.	4.	5.	6.	7.	8.
Sand,	1.470	1.570	.440	1.070	1.130	.836	1.100	1.500
Soluble Silica (SiO_2),	.163	.164	.314	.157	.069	.095	.204	.204
Iron and Alumina oxides ($Al_2Fe_2O_3$),	.370	.358	.325	.545	.469	.458	.470	.585
Calcium oxide (CaO),	3.610	3.750	3.720	3.650	3.530	3.400	3.450	3.480
Magnasium oxide (MgO),	2.010	2.320	2.220	2.100	2.070	2.150	2.260	2.280
Phosphoric acid (P_2O_5),	.628	.713	.749	.681	.789	.607	.690	.850
Sulphur (S),	.198	.226	.241	.262	.289	.234	.267	.243
Nitrogen,	1.960	2.030	2.520	2.390	2.150	2.090	2.200	2.520
Potassium oxide (K_2O),	2.300	2.380	1.360	2.130	2.680	1.790	2.030	1.160
Sodium oxide (Na_2O),	1.150	1.250	1.500	1.090	1.830	1.110	1.390	1.860

Analyses were made by D. L. Cleaves, resigned March 1. 1903.

IV.

INSTRUCTIONS REGARDING THE SAMPLING OF MATERIALS TO BE SENT ON FOR EXAMINATION WITH STATEMENTS OF CONDITIONS TO SECURE ANALYSES FREE OF CHARGE.

It is of the utmost importance that parties forwarding fertilizing substances for examination should take particular pains in sampling, packing and forwarding such materials, in order that the analyses obtained may represent the average composition of the goods sampled, that no addition or loss of moisture in transportation may happen, and that the package be addressed to the proper department.

All samples are received and entered in the order of their arrival at this office. Each sample is assigned a number and is taken up for investigation in the order in which it has been received.

All samples should be addressed to Dr. C. A. Goessmann, Chemical Department of the Hatch Experiment Station, Amherst, Mass., to prevent confusion and possible delay. Express charges must always be prepaid. **The name of the sender should be enclosed in an envelope and placed inside the receptacle** together with a statement of the nature of the material forwarded for analysis; whether it is an agricultural chemical, mixed fertilizer, a wood ash or the by-product of some manufacturing industry.

The receipt of all samples will be acknowledged by return mail and the results of analysis will be forwarded free of charge to all farmers as soon as completed.

The results of all analyses of samples made at the Station, free of charge, are considered at the disposal of the managers for publication if deemed advisable.

SAMPLING OF MATERIAL IN BULK.

In sampling such material as wood ashes, cotton hull ashes and in fact any material in bulk, portions should be taken from various parts of the heap and placed on a thick, smooth piece of paper and thoroughly mixed; from this mixture should be drawn a sample of about one pound which should be placed in a clean bottle, jar or tin can tightly stoppered and sealed in order to retain the moisture of the material unchanged.

SAMPLING OF MATERIAL IN BAGS.

In sampling material which is shipped in bags, portions should be drawn from at least ten per cent. of the number of bags present. A fair sample may be obtained by emptying about ten per cent of the bags present on a clean floor or other smooth surface and thoroughly mixing; small amounts are then taken from different parts of the heap and an average sample drawn as has been previously described.

SAMPLING OF SOILS.

The correct taking of representative soil samples, when such are desired for chemical investigation, is of the first importance, as without a properly taken sample, the results which a careful chemical analysis will show become of little value. The sample should be taken from different portions of the field and to a depth not exceeding the downward limit of the surface soil. After selecting a place where a sample is to be taken, pull up all growing vegetation and remove all surface matter which is not a part of the soil. Dig a hole in the soil about two feet square, making the sides smooth and clean by means of a sharp pointed shovel or other instrument; now place a sharp bladed shovel at the point of separation of the surface soil from the subsoil and by means of another flat bladed instrument shave off a portion (about two inches) from all four sides of the aperture, letting the soil fall into a shovel which is held in a proper position to receive the same. Place the soil in a suitable receptacle and proceed to take other samples in a like manner from several different parts of the field. The large bulk of soil which has thus been taken is now placed on a clean floor or on a large piece of thick paper and thoroughly broken up and mixed, after which an average sample is drawn and placed in a glass jar or bottle. The bottle is then securely stoppered and sealed, properly labelled and forwarded for the subsequent chemical examination.

A description of the soil should accompany the sample or be sent in a sealed letter, setting forth the locality, depth at which the sample was taken, nature of subsoil and depth, the method of fertilization and crop rotation which has been in practice, general fitness of land for cultivation and all other information that would be of interest or assistance to the chemist in formulating his report.

Care should be exercised,in sampling when the weather conditions are normal and no time should be lost between the drawing of the sample and the forwarding of same to the laboratory. This point applies with equal force to all materials forwarded for investigation.

STATEMENT OF CONDITIONS TO SECURE ANALYSES FREE OF CHARGE.

APPLICATION FOR FREE ANALYSIS OF FERTILIZERS AND FERTILIZING MATERIAL.

*Name of Material,*____

*Name of manufacturer or dealer,*______________________________

*Address of manufacturer or dealer,*____________________________

*Date of purchase,*____

*Price paid per ton,*______________________________________

*Whether bought for own use or for sale,*________________________

*Signature of Applicant,*__________________________________

*Post Office Address,*_______________________________

A printed copy of the above stated questions will be sent hereafter from this office *to every applicant for an analysis free of charge*, to be answered by him according to his best information, before his request can be considered.

The object of this course is to impart a more general interest in the results of this work of the Station and to assist in an efficient management of the official inspection of commercial fertilizers and fertilizing materials by making known the names of licensed as well as unlicensed dealers in our State.

The call for free analysis has gradually reached such proportions that the expenses necessarily incurred in the work have become a serious feature in the management of the financial resources at our disposal.

Only samples that have been properly taken, according to directions given above, will be accepted for analysis.

The Following Bulletins are Available for Distribution to Those Who May Desire Them.

No. 27. Tuberculosis in college herd; tuberculin in diagnosis; bovine rabies; poisoning by nitrate of soda.
No. 33. Glossary of fodder terms.
No. 35. Agricultural value of bone meal.
No. 41. On the use of tuberculin (translated from Dr. Bang).
No. 54. Fertilizer analyses.
No. 57. Fertilizer analyses.
No. 59. Fertilizer analyses.
No. 64. Analyses of concentrated feed stuffs.
No. 67. Grass thrips; treatment for thrips in greenhouses.
No. 68. Fertilizer analyses.
No. 69. Rotting of greenhouse lettuce.
No. 70. Fertilizer Analyses.
No. 72. Summer forage crops.
No. 75. Fertilizer analyses.
No. 76. The imported elm-leaf beetle.
No. 77. Fertilizer analyses.
No. 78. Concentrated feed stuffs.
No. 79. Growing China asters.
No. 80. Fungicides; insecticides; spraying calendar.
No. 81. Analyses of fertilizers and manurial substances; instructions to manufacturers, agents, etc.; discussion of trade values; treatment of barnyard manure with absorbents.
No. 82. Orchard management; cover crops in orchards; pruning orchards; report on fruits.
No. 83. Fertilizer analyses.
No. 84. Fertilizer analyses.
No. 85. Concentrated feeds.
No. 86. Orchard treatment for the San José scale. One year's experiments in Massachusetts.
No. 87. Cucumbers under glass.
Special bulletin,—The brown-tail moth.
Special bulletin,—The coccid genera Chionaspis and Hemichionaspis.
Index, 1888-95.
Annual Reports,—1898, 1899, 1900, 1901, 1902, 1903.

HATCH EXPERIMENT STATION

—OF THE—

MASSACHUSETTS

AGRICULTURAL COLLEGE.

BULLETIN NO. 90.

I. ANALYSES OF MANURIAL SUBSTANCES SENT ON FOR EXAMINATION.

II. ANALYSES OF LICENSED FERTILIZERS COLLECTED BY THE AGENT OF THE STATION DURING 1903.

JULY, 1903.

The Bulletins of this Station will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same.

AMHERST, MASS.
PRESS OF CARPENTER & MOREHOUSE,
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Neil F. Monahan, B. Sc.,	*Assistant Botanist.*
Henri D. Haskins, B. Sc.,	*First Assis't Chemist* (Fertilizers).
James E. Halligan, B. Sc.,	*Second Assis't Chemist* (Fertilizers).
Richard H. Robertson, B. Sc.,	*Third Assis't Chemist* (Fertilizers).
Edward B. Holland, M. S.,	*First Chemist* (Foods and Feeding).
Philip H. Smith, B. Sc.,	*Ass't Chemist* (Foods and Feeding).
William E. Tottingham, B. Sc.,	*Ass't Chemist* (Foods and Feeding).
Albert Parsons, B. Sc.,	*Inspector* (Foods and Feeding).
Joseph G. Cook, B. Sc.,	*Assistant in Foods and Feeding.*
George A. Drew, B. Sc.,	*Assistant Horticulturist.*
——— ———	*Assistant Horticulturist.*
Fred. F. Henshaw,	*Observer.*

The co-operation and assistance of farmers, fruit-growers, horticulturists, and all interested, directly or indirectly, in agriculture, are earnestly requested. The Bulletins will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same. General bulletins, fertilizer analyses, analyses of feed-stuffs, and annual reports are published. Kindly indicate in application which of these are desired. Communications may be addressed to the

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DIVISION OF CHEMISTRY.

C. A. GOESSMANN.

ANALYSES OF FERTILIZING SUBSTANCES FORWARDED BY FARMERS FOR FREE EXAMINATION.

WOOD ASHES.

1253-1257. I. Received from North Hadley, Mass.
II. Received from Springfield, Mass.
III. Received from North Hadley, Mass.
IV. Received from Hatfield, Mass.
V. Received from Conway, Mass.

	PER CENT.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	2.45	2.86	13.80	10.91	18.11
Potassium oxide,	8.15	2.48	4.28	5.93	5.53
Phosphoric acid,	1.54	.98	1.45	1.34	1.29
Calcium oxide,	34.58	33.74	30.67	26.03	30.59
Insoluble matter,	12.92	6.68	16.06	24.72	8.43

1258-1262. I. Received from North Amherst, Mass.
II. Received from Osterville, Mass.
III. Received from Colrain, Mass.
IV. Received from Fall River, Mass.
V. Received from Amherst, Mass.

	PER CENT.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	17.96	12.83	13.42	9.62	5.09
Potassium oxide,	5.53	4.96	4.72	4.68	6.20
Phosphoric acid,	1.36	1.54	1.65	1.38	1.33
Calcium oxide,	28.01	30.28	33.35	34.56	32.67
Insoluble matter,	14.05	14.76	11.75	12.01	9.74

1263–1267. I., II., III. and IV. Received from No. Amherst, Mass.
V. Received from Hatfield, Mass.

	PER CENT.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	24.07	33.16	27.30	21.31	22.04
Potassium oxide,	3.48	2.54	3.56	3.28	5.76
Phosphoric acid,	1.34	.46	1.44	1.38	1.36
Calcium oxide,	25.28	29.50	25.08	35.75	22.53
Insoluble matter,	20.03	11.31	1.40	5.08	21.22

1268-1272. I. and II. Received from Hatfield, Mass.
III. Received from South Acton, Mass.
IV. Received from Barre Station, Mass.
V. Received from Boston, Mass.

	PER CENT.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	22.66	20.36	16.77	30.04	10.35
Potassium oxide,	5.48	8.08	3.44	3.20	3.04
Phosphoric acid,	1.33	1.66	1.05	1.25	1.36
Calcium oxide,	22.33	25.99	29.37	29.07	27.60
Insoluble matter,	20.12	12.81	17.66	7.77	22.58

LIME ASHES AND FACTORY ASHES.

1273-1275. I. and II. Lime ashes, received from Sunderland, Mass.
III. Coal and wood ashes, received from Hanover, Mass.

	PER CENT.		
	I.	II.	III.
Moisture at 100° C.,	13.15	20.07	1.32
Potassium oxide,	2.80	.76	.44
Phosphoric acid,	.90	.03	1.15
Calcium oxide,	43.29	36.83	2.39
Insoluble matter,	3.92	13.31	80.94

TANKAGE AND GROUND BONE.

1276-1277. I. Tankage, received from Grafton, Mass.
II. Ground bone, received from Belchertown, Mass.

	PER CENT. I.	II.
Moisture at 100° C.,	22.19	5.45
Total phosphoric acid,	14.46	14.50
Available phosphoric acid,	8.16	5.14
Insoluble phosphoric acid,	6.30	9.36
Nitrogen,	4.73	4.27

COTTON SEED MEAL AND NITRATE OF SODA.

1278-1281. I. Cotton seed meal, received from No. Hatfield, Mass.
II. Cotton seed meal, received from Hatfield, Mass.
III. Cotton seed meal, received from No. Hadley, Mass.
IV. Nitrate of soda, received from West Millbury, Mass.

	PER CENT.			
	I.	II.	III.	IV.
Moisture at 100° C.,	6.10	7.08	9.77	.85
Nitrogen,	6.78	6.70	6.92	14.17

LIME COMPOUNDS.

1282-1284. I. Waste lime (plastering), received from Belchertown, Mass.
II. Waste lime from tannery, received from North Oxford, Mass.
III. Prepared lime, received from Amherst, Mass.

	PER CENT.		
	I.	II.	III.
Moisture at 100° C.,	7.20	1.10	none.
Phosphoric acid,	.22	*	*
Calcium oxide,	11.50	53.38	†69.48
Nitrogen,	*	.70	*
Magnesium oxide,	*	*	.50
Ferric and alumnic oxides,	*	*	1.50
Sodium oxide,	*	*	3.99
Insoluble matter,	66.50	4.34	*

*Not determined.
†About 60% of this lime was present as Calcium oxide (Ca O) and 9.48% was in form of Carbonate of lime.

PHOSPHATIC SLAG.

1285-1287. I. Received from Berlin, Mass.
II. Received from Waltham. Mass.
III. Received from Grafton, Mass.

	PER CENT.		
	I.	II.	III.
Moisture at 100° C.	none.	.34	.07
Total phosphoric acid.	14.74	21.78	14.82
Available phosphoric acid.	5.64	7.66	7.40
Insoluble phosphoric acid,	9.10	14.12	7.42
Calcium oxide.	36.99	32.34	*

GUANO AND MANURES.

1288-1290. I. Bat Guano, received from Boston, Mass.
II. New York horse manure, received from North Hadley. Mass.
III. Sheep manure and wool waste, received from West Millbury, Mass.

	PER CENT.		
	I.	II.	III.
Moisture at 100° C.,	4.72	71.68	7.13
Phosphoric acid,	14.00	.38	.64
Potassium oxide,	1.20	.59	2.20
Nitrogen,	1.70	.53	2.63
Calcium oxide,	11.20	*	*
Insoluble matter,	18.55	*	*

SUGAR BEET REFUSE AND CASSAVA WASTE.

1291-1292. I. Sugar beet refuse, received from New York City.
II. Cassava waste, received from Amherst, Mass.

	PER CENT.	
	I.	II.
Moisture at 100° C.,	7.70	9.03
Phosphoric acid,	none.	.06
Total potassium oxide,	9.72	.28

*Not determined.

Water soluble potassium oxide.	8.36	*
Total nitrogen,	6.39	.33
Organic nitrogen.	2.48	*
Nitrogen as nitrates.	3.86	*
Nitrogen as ammoniates,	.05	*
Calcium oxide,	none.	.61
Sodium oxide,	7.00	*
Sulphuric acid,	2.82	*
Chlorine.	1.87	*
Carbonic acid,	none.	*

COMPOUND FERTILIZERS.

1293-1296. I. and II. Received from South Lincoln, Mass.
III. and IV. Received from South Hadley Falls, Mass.

	PER CENT.			
	I.	II.	III.	IV.
Moisture at 100° C..	10.88	8.17	8.72	20.15
Total phosphoric acid,	19.06	12.02	.94	.92
Soluble phosphoric acid.	*	*	*	*
Reverted phosphoric acid,	13.30	6.72	.63	.69
Insoluble phosphoric acid,	5.76	5.30	.31	.23
Potassium oxide.	.06	9.32	1.84	1.37
Nitrogen.	5.00	3.83	.36	.47

1297-1299. I. Received from North Hadley, Mass.
II. Received from Amherst, Mass.
III. Received from Dighton, Mass.

	PER CENT.		
	I.	II.	III.
Moisture at 100 C.,	8.38	4.26	17.63
Total phosphoric acid,	9.60	6.60	9.68
Soluble phosphoric acid,	6.01	none.	4.20
Reverted phosphoric acid,	2.90	3.43	4.08
Insoluble phosphoric acid,	.69	3.17	1.40
Potassium oxide.	4.74	6.60	5.38
Nitrogen,	2.95	4.48	3.57
Calcium oxide,	*	19.03	*

*Not determined.

SOILS.

1300-1304. I., II., III., IV. and V. Received from Newbury, Mass.

	PER CENT.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	20.56	20.06	18.51	20.24	17.71
Phosphoric acid,	trace	.10	.13	.23	.14
Potassium oxide,	.13	.12	.13	.12	.12
Nitrogen,	.21	.22	.19	.22	.24
Calcium oxide,	.12	.23	14	.09	.12

1305–1309. I., II., III., IV. and V. Received from West Springfield, Mass.

	PER CENT.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	16.90	15.65	15.57	18.32	21.82
Phosphoric acid,	.29	.38	.43	.37	.40
Potassium oxide,	.29	.31	.31	.28	.31
Nitrogen,	.12	.17	.18	.19	.20
Calcium oxide,	.76	.90	.83	.83	.83

1310–1314. I., II., III., IV. and V. Received from West Springfield, Mass.

	PER CENT.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	15.50	23.37	21.75	16.95	21.20
Phosphoric acid,	.46	.41	.58	.29	.43
Potassium oxide,	.37	.30	.32	.22	.28
Nitrogen,	.24	.24	.22	.18	.28
Calcium oxide,	.91	.78	.93	.60	.70

1315–1319. I., II., III. and IV. Received from West Springfield, Mass.

V. Received from Cambridge, Mass.

	PER CENT.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	21.57	24.07	20.36	19.95	17.22
Phosphoric acid,	.39	.44	.46	.42	.24

Potassium oxide,	.30	.29	.25	.24	.15
Nitrogen,	.19	.19	.16	.17	.15
Calcium oxide,	.70	.83	.68	.66	.64

1320–1324. I., II., III., IV. Received from Harding P. O., Mass.
V. Received from Berlin, Mass.

	PER CENT.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	22.79	19.93	21.29	18.77	8.19
Phosphoric acid,	trace	trace	.03	trace	.13
Potassium oxide,	.09	.09	.10	.14	.27
Nitrogen,	.11	.10	.13	.11	.24
Calcium oxide,	.23	.33	.19	.27	.42

1325–1329. I., II. and III. Received from Boston, Mass.
IV. Received from Swift River, Mass.
V. Received from Framingham, Mass.

	PER CENT.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	13.75	19.24	10.54	21.75	21.97
Phosphoric acid,	.04	.21	.04	.07	.10
Potassium oxide,	.08	.15	.10	.18	.10
Nitrogen,	.11	.20	.10	.18	.10
Calcium oxide,	.10	.11	.14	.13	.19

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903 IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
72	Grass and Lawn Top Dressing,	American Agricultural Chemical Co., Boston,	Seekonk.
134	Grass and Lawn Top Dressing,	American Agricultural Chemical Co., Boston,	New Bedford.
174	Grass and Lawn Top Dressing,	American Agricultural Chemical Co., Boston,	Brockton.
330	Grass and Lawn Top Dressing,	American Agricultural Chemical Co., Boston,	Fitchburg.
381	Grass and Lawn Top Dressing,	American Agricultural Chemical Co., Boston,	Pittsfield.
84	Tobacco Starter and Grower,	American Agricultural Chemical Co., Boston,	Sunderland.
405	Tobacco Starter and Grower,	American Agricultural Chemical Co., Boston,	Greenfield.
473	Tobacco Starter and Grower,	American Agricultural Chemical Co., Boston,	Westfield.
57	Baker's A. A. Ammoniated Superphosphate,	Amer. Agric. Chem. Co. (H. J. Baker & Bro. Branch),	Fall River.
136	Baker's A. A. Ammoniated Superphosphate,	Amer. Agric. Chem. Co. (H. J. Baker & Bro. Branch),	New Bedford.
325	Baker's A. A. Ammoniated Superphosphate,	Amer. Agric. Chem. Co. (H. J. Baker & Bro. Branch),	Worcester.
58	Baker's Complete Potato Manure,	Amer. Agric. Chem. Co. (H. J. Baker & Bro. Branch),	Fall River.
157	Baker's Complete Potato Manure,	Amer. Agric. Chem. Co. (H. J. Baker & Bro. Branch),	New Bedford.
312	Baker's Complete Potato Manure,	Amer. Agric. Chem. Co. (H. J. Baker & Bro. Branch),	Worcester.
9	Bradley's X. L. Superphosphate,	Amer. Agric. Chem. Co. (Bradley Fertilizer Co. Branch),	Fall River.
192	Bradley's X. L. Superphosphate,	Amer. Agric. Chem. Co. (Bradley Fertilizer Co. Branch),	Weir.
54	Bradley's Comp. Manure for Potatoes and Vegetables,	Amer. Agric. Chem. Co. (Bradley Fertilizer Co. Branch),	Fall River.
181	Bradley's Comp. Manure for Potatoes and Vegetables,	Amer. Agric. Chem. Co. (Bradley Fertilizer Co. Branch),	Taunton.
324	Bradley's Comp. Manure for Potatoes and Vegetables,	Amer. Agric. Chem. Co. (Bradley Fertilizer Co. Branch),	Lowell.
67	Bradley's Potato Manure,	Amer. Agric. Chem. Co. (Bradley Fertilizer Co. Branch),	Fall River.
186	Bradley's Potato Manure,	Amer. Agric. Chem Co. (Bradley Fertilizer Co. Branch),	Weir.
326	Bradley's Potato Manure,	Amer. Agric. Chem. Co. (Bradley Fertilizer Co. Branch),	Lowell.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Total. Found.	Total. Guaranteed.	Available. Found.	Available. Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
72-134-174-330-381	Grass and Lawn Top Dressing,	7.17	4.18	3.91-4.73	2.21	3.63	1.00	6.84	6-9	5.84	5-7	2.46	2-3*
84-405-473	Tobacco Starter and Grower,	10.01	3.58	3.30-4.13	7.20	2.00	1.62	10.82	10-13	9.20	8-10	4.54	4-5*
57-136-325	Baker's A. A. Ammoniated Superphos.,	12.68	2.69	2.5-3.25	5.86	4.12	2.12	12.10	11-14	9.98	9-11	2.18	2-3
58-157-312	Baker's Complete Potato Manure,	9.01	4.08	3.30-4.13	3.94	2.74	1.76	8.44	7-10	6.68	6-10	10.58	10-12
9-192	Bradley's X. L. Superphosphate,	12.69	2.54	2.5-3.25	6.91	3.43	2.50	12.84	11-14	10.34	9-11	2.00	2-3
54-181-324	Bradley's Comp. Manure for Pot. and Veg.,	8.78	3.38	3.30-4.10	4.07	4.59	1.84	10.50	9-13	8.66	7-11	7.14	7-8
67-186-326	Bradley's Potato Manure,	9.95	2.50	2.5-3.25	4.22	3.02	1.40	8.64	8-11	7.24	6-8	5.14	5-6

*Sulphate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
141	Bradley's Potato Fertilizer,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	New Bedford.
215	Bradley's Potato Fertilizer,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Amesbury.
289	Bradley's Potato Fertilizer,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Worcester.
142	Bradley's Comp. Manure with 10% Potash,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Newburyport.
298	Bradley's Comp. Manure with 10% Potash,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Worcester.
461	Bradley's Comp. Manure with 10% Potash,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Southwick.
65	Church's Fish and Potash [D],	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Seekonk.
190	Church's Fish and Potash [D],	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Weir.
409	Church's Fish and Potash [D],	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Greenfield.
179	Bradley's Eclipse Phosphate,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Weir.
197	Bradley's Eclipse Phosphate,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Amesbury.
392	Bradley's Eclipse Phosphate,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Ayer.
262	Clark's Cove King Philip Alkaline Guano,	Am. Agric. Chem. Co. (Clark's Cove Fert. Co. Branch),	Hudson.
266	Clark's Cove Bay State Fertilizer G. G.,	Am. Agric. Chem. Co. (Clark's Cove Fert. Co. Branch),	Hudson.
427	Clark's Cove Bay State Fertilizer G. G.,	Am. Agric. Chem. Co. (Clark's Cove Fert. Co. Branch),	Springfield.
287	Clark's Cove Potato Fertilizer,	Am. Agric. Chem. Co. (Clark's Cove Fert. Co. Branch),	Hudson.
429	Clark's Cove Potato Fertilizer,	Am. Agric. Chem. Co. (Clark's Cove Fert. Co. Branch),	Springfield,
447	Clark's Cove Great Planet Manure,	Am. Agric. Chem. Co. (Clark's Cove Fert. Co. Branch),	Hudson.
356	Cumberland Potato Fertilizer,	Am. Agric. Chem. Co. (Cumb'd Bone Phos. Co. Branch),	Lanesboro.
382	Cumberland Superphosphate,	Am. Agric. Chem. Co. (Cumb'd Bone Phos. Co. Branch),	Lanesboro.
85	Darling's Blood, Bone and Potash,	Am. Agric. Chem. Co. (L. B. Darling Fert. Co. Branch),	Sunderland.
445	Darling's Blood, Bone and Potash,	Am. Agric. Chem. Co. (L. B. Darling Fert. Co. Branch),	N. Amherst.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Total. Found.	Total. Guaranteed.	Available. Found.	Available. Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
141-215-289	Bradley's Potato Fertilizer,...............	12.67	2.25	2.06-2.88	5.28	3.64	1.92	10.84	10-13	8.92	8-10	3.18	3-4
142-298-461	Bradley's Comp. Manure 10% Potash,.....	9.11	3.45	3.30-4.12	4.09	3.23	1.18	8.50	7-10	7.32	6-10	10.04	10-12
65-190-409	Church's Fish and Potash [D], ...	12.18	2.14	2.07-2.90	4.03	3.99	3.08	11.10	7.5-10.5	8.02	6-8	2.34	2-3
179-197-392	Bradley's Eclipse Phosphate,............	12.67	1.74	1.03-2.5	5.41	3.43	2.68	11.52	10-15	8.84	8-12	2.06	2-3
262	Clark's Cove King Philip Alkaline Guano,	11.74	1.33	1.03-2.5	5.18	3.94	2.78	11.90	10-15	9.12	8-12	2.44	2-3
266-427	Clark's Cove Bay State Fertilizer G. G.,...	11.79	2.24	2.06-2.88	6.31	2.87	2.40	11.58	10-13	9.18	8-10	1.82	1.5-2.5
287-429	Clark's Cove Potato Fertilizer,............	12.40	2.57	2.06-2.88	4.67	4.83	3.36	12.86	10-13	9.50	8-10	3.16	3-4
447	Clark's Cove Great Planet Manure,.......	9.50	3.45	3.30-4.12	4.58	3.44	3.42	11.44	9-13	8.02	8-11	6.78	7-8
356	Cumberland Potato Fertilizer, ...	11.44	2.45	2.06-2.88	6.12	3.04	1.54	10.70	10-13	9.16	8-10	3.20	3-4
382	Cumberland Superphosphate,.............	12.65	2.33	2.06-2.88	6.46	2.90	2.08	11.44	10-13	9.36	8-10	1.50	1.5-2.5
85-445	Darling's Blood, Bone and Potash,........	7.63	4.16	4.12-5	5.18	2.07	.61	7.86	8-11	7.25	7-9	7.85	7-8*

* Sulphate of potash, the source of potash.

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Laboratory No.	Name of Brand	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
411	Darling's Complete 10% Manure,	Am. Agr. Chem. Co. (L. B. Darling Fert. Co. Branch),	Harvard.
519	Darling's Complete 10% Manure,	Am. Agr. Chem. Co. (L. B. Darling Fert. Co. Branch),	So. Amherst.
440	Darling's Potato Manure,	Am. Agr. Chem. Co. (L. B. Darling Fert. Co. Branch),	No. Amherst.
527	Darling's Potato Manure,	Am. Agr. Chem. Co. (L. B. Darling Fert. Co. Branch),	So. Amherst.
444	Darling's Farm Favorite,	Am. Agr. Chem. Co. (L. B. Darling Fert. Co. Branch),	No. Amherst.
528	Darling's Farm Favorite,	Am. Agr. Chem. Co. (L. B. Darling Fert. Co. Branch),	So. Amherst.
66	Great Eastern General Fertilizer,	Am. Agr. Chem. Co. (Great Eastern Fert. Co. Branch),	Seekonk.
424	Great Eastern General Fertilizer,	Am. Agr. Chem. Co. (Great Eastern Fert. Co. Branch),	E. Longmeadow
451	Great Eastern Vegetable, Vine and Tobacco,	Am. Agr. Chem. Co. (Great Eastern Fert. Co. Branch),	Harvard.
505	Great Eastern Vegetable, Vine and Tobacco,	Am. Agr. Chem. Co. (Great Eastern Fert. Co. Branch),	No. Hadley.
140	Pacific Potato Special,	Am. Agr. Chem. Co. (Pacific Guano Co. Branch),	Bridgewater.
216	Pacific Potato Special,	Am. Agr. Chem. Co. (Pacific Guano Co. Branch),	Newburyport.
526	Pacific Potato Special,	Am. Agr. Chem. Co. (Pacific Guano Co. Branch),	So. Amherst.
161	Soluble Pacific Guano,	Am. Agr. Chem. Co. (Pacific Guano Co. Branch),	Newburyport.
522	Soluble Pacific Guano,	Am. Agr. Chem. Co. (Pacific Guano Co. Branch),	So. Amherst.
195	Pacific Nobsque Guano,	Am. Agr. Chem. Co. (Pacific Guano Co. Branch),	Newburyport.
397	Packers' Union Gardner's Comp. Manure,	Am. Agr. Chem. Co. (Packers' Union Fert. Co. Branch),	Greenfield.
503	Packers' Union Gardner's Comp. Manure,	Am. Agr. Chem. Co. (Packers' Union Fert. Co. Branch),	Amherst.
489	Packers' Union Potato Manure,	Am. Agr. Chem. Co. (Packers' Union Fert. Co. Branch),	Amherst.
59	Quinnipiac Potato Phosphate,	Am. Agr. Chem. Co. (Quinnipiac Co. Branch),	Fall River.
357	Quinnipiac Potato Phosphate,	Am. Agr. Chem. Co. (Quinnipiac Co. Branch),	Pittsfield.
449	Quinnipiac Potato Phosphate,	Am. Agr. Chem. Co. (Quinnipiac Co. Branch),	W. Springfield.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
411-519	Darling's Complete 10% Manure,..........	6.51	3.30	3.30-4.12	3.58	4.24	.54	8.36	7-10	7.82	6-8	9.96	10-11
440-527	Darling's Potato Manure,.................	8.18	3.03	2.48-3.3	4.67	2.08	.69	7.44	7-10	6.75	6-8	5.56	5-6
444-528	Darling's Farm Favorite,.................	8.46	2.29	2.06-2.88	5.25	4.63	1.10	10.98	9-12	9.88	8-10	3.16	3-4
66-424	Great Eastern General Fertilizer, ...	10.67	1.20	.82-1.65	3.94	4.66	3.10	11.70	10-14	8.60	8-11	4.22	4-5
451-505	Great Eastern Veg., Vine and Tobacco,...	11.16	2.61	2.06-2.88	5.82	3.62	3.54	12.98	10-13	9.44	8-10	6.46	6-7
140-216 526	Pacific Potato Special,..................	11.64	2.19	2.06-2.88	5.35	3.87	1.94	11.16	10-13	9.22	8-10	3.10	3-4
161-522	Soluble Pacific Guano,...................	10.56	2.67	2.06-2.88	5.05	4.11	2.60	11.76	10-13	9.16	8-10	1.64	1.5-2.5
195	Pacific Nobsque Guano, ...	12.30	1.49	1.03-2.5	5.56	3.34	2.64	11.54	10-15	8.90	8-12	2.12	2-3
397-503	Packers' Union Gardner's Comp. Manure,	8.50	2.40	2.4-3	4.45	2.71	1.34	8.50	7-10	7.16	6-8	10.82	10-12
489	Packers' Union Potato Manure, ...	12.78	2.37	2.06-2.88	1.19	7.59	1.82	10.60	10-13	8.78	8-10	6.34	6-7
59-357-449	Quinnipiac Potato Phosphate, ...	10.90	2.29	2.06-2.88	5.60	3.38	1.92	10.90	10-13	8.98	8-10	3.00	3-4

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
69	Quinnipiac Market Garden Manure,	Am. Agr. Chem. Co. (Quinnipiac Co. Branch),	Fall River.
73	Quinnipiac Market Garden Manure,	Am. Agr. Chem. Co. (Quinnipiac Co. Branch),	Seekonk.
373	Quinnipiac Market Garden Manure,	Am. Agr. Chem. Co. (Quinnipiac Co. Branch),	Pittsfield.
91	Read's Practical Potato Special,	Am. Agr. Chem. Co. (Read Fertilizer Co. Branch),	So. Deerfield.
158	Read's Practical Potato Special,	Am. Agr. Chem. Co. (Read Fertilizer Co. Branch),	Bridgewater.
416	Read's Practical Potato Special,	Am. Agr. Chem. Co. (Read Fertilizer Co. Branch),	Bridgewater.
541	Read's Practical Potato Special,	Am. Agr Chem. Co. (Read Fertilizer Co. Branch),	Greenfield.
126	Read's Vegetable and Vine Fertilizer,	Am. Agr. Chem. Co. (Read Fertilizer Co. Branch),	Hadley.
151	Read's Vegetable and Vine Fertilizer,	Am. Agr. Chem. Co. (Read Fertilizer Co. Branch),	So. Deerfield.
109	Standard Complete Manure,	Am. Agr. Chem Co. (Standard Fert. Co. Branch),	Bridgewater.
162	Tucker's Special Potato Fertilizer,	Am. Agr. Chem. Co. (H. F. Tucker Co. Branch),	So. Deerfield.
253	Tucker's Special Potato Fertilizer,	Am. Agr. Chem. Co. (H. F. Tucker Co. Branch),	Newburyport.
460	Tucker's Special Potato Fertilizer,	Am. Agr. Chem. Co. (H. F. Tucker Co. Boston),	Georgetown.
196	Wheeler's Bermuda Onion Grower,	Am. Agr. Chem. Co. (M. E. Wheeler & Co. Branch),	Westfield.
255	Wheeler's Bermuda Onion Grower,	Am. Agr. Chem. Co. (M. E. Wheeler & Co. Branch),	Newburyport.
350	Wheeler's Potato Manure,	Am. Agr. Chem. Co. (M. E. Wheeler & Co. Branch),	Georgetown.
355	Wheeler's Potato Manure,	Am. Agr. Chem. Co. (M. E. Wheeler & Co. Branch),	Gr. Barrington.
408	Wheeler's Potato Manure,	Am. Agr. Chem. Cô. (M. E. Wheeler & Co. Branch),	Pittsfield.
146	Williams & Clark's Royal Bone Phosphate.	Am. Agr. Chem. Co. (M. E. Wheeler & Co. Branch),	Greenfield.
218	Williams & Clark's Americus Complete Manure,	Am. Agr. Chem. Co. (Williams & Clark Fert. Co. Br'ch),	Newburyport.
286	Tobacco and Potato Special,	Am. Agr. Chem. Co. (Williams & Clark Fert. Co. Br'ch),	Newburyport.
320	Tobacco and Potato Special,	Abbott & Martin Rendering Co., Columbus, O.,	Hudson.
		Abbott & Martin Rendering Co., Columbus, O.,	Concord.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
69-73-373	Quinnipiac Market Garden Manure, ...	9.21	3.72	3.3-4.12	4.99	3.88	1.98	10.85	9-13	8.87	8-11	7.02	7-8
91-158-416-541	Read's Practical Potato Special, ...	6.71	1.07	.82-1.65	1.89	3.13	2.28	7.30	5-8	5.02	4-6	8.00	8-10
126-151	Read's Vegetable and Vine Fertilizer, ...	11.10	2.61	2.06-2.88	5.69	3.65	1.48	10.82	10-13	9.34	8-10	6.74	6-7
109	Standard Complete Manure, ...	8.88	3.23	3.30-4.12	3.52	5.03	2.79	11.34	9-13	8.55	8-11	7.22	7-8
162-253-460	Tucker's Special Potato Fertilizer, ...	11.98	2.29	2.06-2.88	3.81	5.72	2.05	11.58	10-13	9.53	8-10	3.00	3-4
196-255	Wheeler's Bermuda Onion Grower, ...	11.42	1.25	.82-1.65	3.58	4.82	3.58	11.98	10-14	8.40	8-11	4.04	4-5
350-355-408	Wheeler's Potato Manure, ...	12.03	2.46	2.06-2.88	5.09	3.73	4.46	13.28	10-13	8.82	8-10	3.04	3-4
146	Royal Bone Phosphate, ...	12.14	1.49	1.03-2.50	5.09	4.37	2.28	11.74	10-12	9.46	8-12	2.24	2-3
218	Americus Complete Phosphate, ...	8.53	2.23	2.06-2.88	3.33	4.79	4.92	13.04	10-13	8.12	8-10	1.54	1.5-2.5
286-320	Tobacco and Potato Special, ...	10.68	1.86	1.64-3.3	5.56	3.61	2.32	11.49	10-12	9.17	8-11	5.48	4-5

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
95	Abbott's Tobacco Fertilizer,	W. H. Abbott, Holyoke, Mass.,	E. Whately.
420	Abbott's Tobacco Fertilizer	W. H. Abbott, Holyoke, Mass.,	Fairview.
508	Abbott's Tobacco Fertilizer,	W. H. Abbott, Holyoke, Mass.,	Amherst.
224	Grain Grower,	Armour Fertilizer Works, Baltimore, Md.,	Danvers.
279	Grain Grower,	Armour Fertilizer Works, Baltimore, Md.,	Worcester.
410	Grain Grower,	Armour Fertilizer Works, Baltimore, Md.,	Harvard.
238	Ammoniated Bone with Potash,	Armour Fertilizer Works, Baltimore, Md.,	Danvers.
318	Ammoniated Bone with Potash,	Armour Fertilizer Works, Baltimore, Md.,	Worcester.
414	Ammoniated Bone with Potash,	Armour Fertilizer Works, Baltimore, Md.,	Harvard.
127	Complete Fertilizer,	Berkshire Fertilizer Co., Bridgeport, Conn.,	W. Bridgewater.
435	Complete Fertilizer,	Berkshire Fertilizer Co., Bridgeport, Conn.,	N. Amherst.
488	Complete Fertilizer,	Berkshire Fertilizer Co., Bridgeport, Conn.,	N. Hadley.
128	Potato and Vegetable Phosphate,	Berkshire Fertilizer Co., Bridgeport, Conn.,	W. Bridgewater.
436	Potato and Vegetable Phosphate,	Berkshire Fertilizer Co., Bridgeport, Conn.,	N. Amherst.
259	Market Garden Manure,	Joseph Breck & Sons, Boston, Mass.,	Boston.
6	Stockbridge's Top Dressing,	Bowker Fertilizer Co., Boston, Mass.,	Fall River.
20	Stockbridge's Top Dressing,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
257	Stockbridge's Top Dressing,	Bowker Fertilizer Co., Boston, Mass.,	Haverhill.
19	Bowker's Early Potato Manure,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
152	Bowker's Early Potato Manure,	Bowker Fertilizer Co., Boston, Mass.,	New Bedford.
33	Bowker's Potato and Vegetable Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
274	Bowker's Potato and Vegetable Fertilizer,	Bowker Fertilizer Co., Boston Mass.,	Lowell.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
95-420-508	Abbott's Tobacco Fertilizer,	7.81	3.81	4.5-5.5	.90	9.66	2.44	13.00	12-14	10.56	9-10	11.16	10-11*
224-279-410	Grain Grower,	10.91	2.07	1.65-2.47	6.43	2.25	1.40	10.08	—	8.68	8-10	2.14	2-3
238-318-414	Ammoniated Bone with Potash,	9.31	2.39	2.47-3.29	5.03	2.47	1.56	9.06	—	7.50	6-8	2.12	2-3
127-435-488	Complete Fertilizer,	9.14	2.82	2.5-3.	4.80	4.30	.72	9.82	10-12	9.10	8-10	6.38	6-8
128-436	Potato and Vegetable Phosphate,	7.20	2.06	1.7-2.5	3.26	4.16	1.22	8.64	8-10	7.42	6-8	5.14	4-6
259	Market Garden Manure,	10.74	2.98	2.47-3.3	6.08	4.77	2.61	13.46	11-14	10.85	9-11	2.3	2-3
6-20-257	Stockbridge's Top Dressing,	8.95	4.83	4.25-5.25	1.57	4.21	.80	6.58	6-8	5.78	4-6	6.12	6-7
19-152	Bowker's Early Potato Manure,	10.81	3.16	3-4	2.30	5.54	1.68	9.52	8-10	7.84	6-8	6.96	7-9
33-274	Bowker's Potato and Vegetable Fertilizer,	12.44	2.47	2.25-3.25	4.52	4.60	1.40	10.52	10-12	9.12	6-8	4.14	4-6

*Sulphate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
34	Bowker's High Grade Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
303	Bowker's High Grade Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Marlboro.
118	Hill and Drill Phosphate,	Bowker Fertilizer Co., Boston, Mass.,	Northampton.
205	Hill and Drill Phosphate,	Bowker Fertilizer Co., Boston, Mass.,	Boston.
361	Hill and Drill Phosphate,	Bowker Fertilizer Co., Boston, Mass.,	Pittsfield.
200	Lawn and Garden Dressing,	Bowker Fertilizer Co., Boston, Mass.,	Newburyport.
204	Lawn and Garden Dressing,	Bowker Fertilizer Co., Boston, Mass.,	Boston.
277	Lawn and Garden Dressing,	Bowker Fertilizer Co., Boston, Mass.,	Worcester.
241	Farm and Garden Phosphate,	Bowker Fertilizer Co., Boston, Mass.,	Haverhill.
384	Farm and Garden Phosphate,	Bowker Fertilizer Co., Boston, Mass.	North Adams.
243	Potato and Vegetable Phosphate,	Bowker Fertilizer Co., Boston, Mass.,	Haverhill
383	Potato and Vegetable Phosphate,	Bowker Fertilizer Co., Boston, Mass.,	North Adams.
8	High Grade Ammoniated Bone Superphosphate,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
407	High Grade Ammoniated Bone Superphosphate,	E. Frank Coe Co., New York City,	Greenfield.
24	Fish and Potash [F. P.]	E. Frank Coe Co., New York City,	Dighton.
433	Fish and Potash [F. P.]	E. Frank Coe Co., New York City,	E. Longmeadow
26	American Farmers' Market Garden Special,	E. Frank Coe Co., New York City,	Dighton.
202	American Farmers' Market Garden Special,	E. Frank Coe Co., New York City,	No. Amherst.
27	American Farmers' Corn King,	E. Frank Coe Co., New York City,	Dighton.
448	American Farmers' Corn King,	E. Frank Coe Co., New York City,	E. Longmeadow
530	American Farmers' Corn King,	E. Frank Coe Co., New York City,	Amherst.
1	Chemicals for Liquid Plant Food,	Eastern Chemical Co., Boston, Mass.,	Boston.
342	Chemicals for Liquid Plant Food,	Eastern Chemical Co., Boston, Mass.,	Boston.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
34-303	Bowker's High Grade Fertilizer,	14.08	2.56	2.25-3.25	4.80	4.21	1.05	10.06	10-13	9.01	6-9	6.46	4-6
118-205-361	Hill and Drill Phosphate,	12.39	2.45	2.25-3.25	4.84	4.90	2.02	11.76	11-13	9.74	9-11	2.06	2-3
200-204-277	Lawn and Garden Dressing,	12.35	3.26	3-4	2.62	4.31	1.13	8.06	8-10	6.93	4-8	4.92	5-6
241-384	Farm and Garden Phosphate,	13.29	1.75	1.5-2.5	5.16	3.64	1.92	10.72	10-13	8.80	6-10	2.04	2-3
243-383	Potato and Vegetable Phosphate,	13.28	1.54	1.5-2.5	5.88	3.02	1.64	10.54	11-13	8.90	7-11	2.12	2-4
8-407	High Grade Ammoniated Bone Superphos.,	10.19	2.14	1.85-2	5.76	3.45	2.28	11.49	10-11	9.21	9-11	2.52	2.25-3.*
24-433	Fish and Potash [F. P.],	11.10	2.57	2-3	5.09	2.57	2.32	9.98	7-9	7.66	6-8	2.62	2-3
26-202	Am. Farmers' Market Garden Special,	12.55	2.67	3.4-4	6.69	1.91	2.30	10.90	9.5-10.5	8.60	8-9	5.76	7-8
27-448-530	American Farmers' Corn King,	11.01	2.03	2.4-3	6.95	2.01	2.40	11.36	9.5-10.5	8.96	8-10	4.52	4-5*
1-342	Chemicals for Liquid Plant Food,	.94	12.41	16.3	22.04	.14	none	22.18	21.5	22.18	21.5	28.68	26.1†

*Sulphate of potash, the source of potash.
†Phosphate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
212	Clay's London Fertilizer,	R. & J. Farquhar & Co., Importers, Boston, Mass.,	Boston.
418	Clay's London Fertilizer,	R. & J. Farquhar & Co., Importers, Boston, Mass.,	Pittsfield.
3	Canada Unleached Wood Ashes,	F. E. Hancock, Walkerton, Ontario, Can.,	East Hadley.
81	Hardy's Complete Manure,	Hardy Packing Co., Chicago, Ill.,	Sunderland.
159	Hardy's Complete Manure,	Hardy Packing Co., Chicago, Ill.	Amesbury.
282	Hardy's Complete Manure,	Hardy Packing Co., Chicago, Ill.,	Leominster.
199	Hardy's Tobacco and Potato Special,	Hardy Packing Co., Chicago, Ill.,	Amesbury.
314	Hardy's Tobacco and Potato Special,	Hardy Packing Co., Chicago, Ill.,	Concord.
331	Hardy's Tobacco and Potato Special,	Hardy Packing Co., Chicago, Ill.,	Leominster.
344	Ferti Flora,	C. W. Hastings, Jamaica Plain, Mass.,	Boston.
168	Wood Ashes,	John Joynt, Lucknow, Ontario, Can.,	Boston.
309	Wood Ashes,	John Joynt, Lucknow, Ontario, Can.,	Boston.
358	Wood Ashes,	John Joynt, Lucknow, Ontario, Can.,	Worcester.
396	Success Fertilizer,	Lister's Agric. Chemical Works, Newark, N. J.,	Pittsfield.
474	Success Fertilizer,	Lister's Agric. Chemical Works, Newark, N. J.,	Greenfield.
401	Special Potato Fertilizer,	Lister's Agric. Chemical Works, Newark, N. J.,	Westfield.
459	Special Potato Fertilizer,	Lister's Agric. Chemical Works, Newark, N. J.,	Greenfield.
145	Swift's Potato Manure,	Lowell Fertilizer Co., Boston, Mass.,	Westfield.
341	Swift's Potato Manure,	Lowell Fertilizer Co., Boston, Mass.,	Bridgewater.
385	Swift's Potato Manure,	Lowell Fertilizer Co., Boston, Mass.,	Worcester.
403	Swift's Potato Manure,	Lowell Fertilizer Co., Boston, Mass.,	Williamstown.
150	Swift's Animal Brand,	Lowell Fertilizer Co., Boston, Mass.,	Ayer.
210	Swift's Animal Brand,	Lowell Fertilizer Co., Boston, Mass.	Bridgewater.
322	Swift's Animal Brand,	Lowell Fertilizer Co., Boston, Mass.,	Boston.
			Lowell.

Laboratory Number.	NAME OF BRAND.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaran-teed.	Found.	Guaran-teed.	Found.	Guaran-teed.
	Compound Fertilizers.												
212-418	Clay's London Fertilizer,	12.90	4.93	4-5	none	1.84	6.02	7.86	7-8	1.84	—	.18	—
3	Canada Unleached Wood Ashes,	12.24	—	—	—	—	—	1.39	1-2	—	—	6.11	5.50-7†
81-159-282	Hardy's Complete Manure,	14.85	2.86	3.29-4.11	4.16	3.58	.84	8.58	10-12	7.74	8-10	8.12	7-8
199-314-331	Hardy's Tobacco and Potato Special,	10.84	1.68	1.65-2.47	3.88	5.30	1.82	11.00	10-12	9.18	8-11	3.52	4-5
344	Ferti Flora,	83.16	2.87	3.25	3.50	—	—	3.50	3.66	3.50	3.66	3.16	3-3
168-309-358	Wood Ashes,	13.05	—	—	—	—	—	1.44	1.5-3.	—	—	5.56	5-8†
396-474	Success Fertilizer,	15.97	1.69	1.24-1.65	5.86	2.74	2.28	10.88	11-13	8.60	9-12	2.06	2-3
401-459	Special Potato Fertilizer,	12.42	1.75	1.65-2.47	5.88	2.59	2.05	10.52	9-11	8.47	8-11	3.48	3-4
145-341-385-403	Swift's Potato Manure,	6.34	1.70	1.64-2.46	3.75	3.85	1.58	9.18	8-10	7.60	7-9	4.26	4-5*
150-210-322	Swift's Animal Brand,	12.58	2.52	2.45-3.30	5.56	3.52	1.64	10.72	10-12	9.08	9-11	4.48	4-5

*Sulphate of potash, the source of potash.

†Carbonate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
170	Swift's Bone Fertilizer,	Lowell Fertilizer Co., Boston, Mass.,	Bridgewater.
264	Swift's Bone Fertilizer,	Lowell Fertilizer Co., Boston, Mass.,	Hudson.
307	Swift's Bone Fertilizer,	Lowell Fertilizer Co., Boston, Mass.,	Concord.
80	Tobacco Starter Improved,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Sunderland.
99	Tobacco Starter Improved,	Mapes Formula and Peruvian Guano Co., N. Y. City,	So. Deerfield.
104	Economical Potato Manure,	Mapes Formula and Peruvian Guano Co., N. Y. City,	So. Deerfield.
338	Economical Potato Manure,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Worcester.
380	Economical Potato Manure,	Mapes Formula and Peruvian Guano Co., N. Y. City,	Pittsfield.
108	Tobacco Ash Constituents,	Mapes Formula and Peruvian Guano Co., N. Y. City,	So. Deerfield.
79	Complete Tobacco Fertilizer,	Olds & Whipple, Hartford, Conn.,	Sunderland.
92	Complete Tobacco Fertilizer,	Olds & Whipple, Hartford, Conn.,	E. Whately.
475	Complete Tobacco Fertilizer,	Olds & Whipple, Hartford, Conn.,	Westfield.
220	Lawn Dressing,	Parmenter & Polsey Fertilizer Co., Peabody, Mass.,	Peabody.
222	Star Brand Superphosphate,	Parmenter & Polsey Fertilizer Co., Peabody, Mass.,	Peaboby.
236	P. & P. Grain Grower,	Parmenter & Polsey Fertilizer Co., Peabody, Mass.,	Peabody.
25	Potato and Vegetable Fertilizer,	Rogers Manufacturing Co., Rockfall, Conn.,	Dighton.
285	Potato and Vegetable Fertilizer,	Rogers Manufacturing Co., Rockfall, Conn.,	Leominster.
390	Potato and Vegetable Fertilizer,	Rogers Manufacturing Co., Rockfall, Conn.,	Greenfield.
272	High Grade Soluble Tobacco Manure,	Rogers Manufacturing Co., Rockfall, Conn.,	Leominster.
394	High Grade Soluble Tobacco Manure,	Rogers Manufacturing Co., Rockfall, Conn.,	Greenfield.
439	High Grade Soluble Tobacco Manure,	Rogers Manufacturing Co., Rockfall, Conn.,	No. Amherst.
295	High Grade for Oats and Top Dressing,	Rogers Manufacturing Co., Rockfall, Conn.,	Leominster.
399	High Grade for Oats and Top Dressing,	Rogers Manufacturing Co., Rockfall, Conn.,	Greenfield.
521	High Grade for Oats and Top Dressing,	Rogers Manufacturing Co., Rockfall, Conn.,	Amherst.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Total. Found.	Total. Guaranteed.	Available. Found.	Available. Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
170-264-307	Swift's Bone Fertilizer, ...	13.12	1.70	1.64-2.47	5.25	2.84	1.07	9.16	9-11	8.09	8-10	3.02	3-4
80-99	Tobacco Starter Improved,..............	14.35	4.50	4.12-4.94	2.21	4.79	2.26	9.26	8-10	7.00	6-8	1.66	1-2*
104-338-380	Economical Potato Manure,..............	10.95	3.31	3.29-4.12	2.17	4.11	.80	7.08	6-8	6.28	4-5	8.66	8-10*
108	Tobacco Ash Constituents,..............	10.38	.59	.50	—	5.43	1.48	6.91	5.70	5.43	—	17.34	15†
79-92-475	Complete Tobacco Fertilizer,............	9.08	5.30	4.53-5.35	.38	3.59	1.38	5.35	—	3.97	3-4	6.32	5.5-6.5†
220	Lawn Dressing,..........................	9.46	5.01	4.94-6.59	3.71	4.31	1.44	9.46	8-11	8.02	7-9	5.54	5-6
222	Star Brand Superphosphate,.............	12 45	1.96	1.64-2.46	2.66	5.16	2.74	10.56	8-11	7.82	7-9	3.20	2.5-3.5
236	P. & P. Grain Grower,..................	7.58	1.82	.82	3.52	5.16	2.10	10.78	8	8.68	7	2.06	2
25-285-390	Potato and Vegetable Fertilizer,..........	11.63	2.78	2.25-3.25	4.96	3.36	2.50	10.82	10-12	8.32	8-10	5.22	5-6
272-394-439	High Grade Soluble Tobacco Manure,....	7.79	5 43	5-6	1.28	6.42	2.20	9.90	8-10	7.70	6-8	10.84	11-12*
295-399-521	H. G. for Oats and Top Dressing, ...	6.59	6.71	6.30	1.38	6.60	2.92	10.90	9	7.98	7	6.88	7.5

*Sulphate of potash, the source of potash.
†Carbonate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
352	Hubbard's Corn Phosphate,	Rogers & Hubbard Co., Middletown, Conn.,	Gr. Barrington.
371	Hubbard's Potato Phosphate,	Rogers & Hubbard Co.. Middletown, Conn.,	Gr. Barrington.
467	Hubbard's Soluble Potato Manure,	Rogers & Hubbard Co., Middletown, Conn.,	Westfield.
61	Complete for Potatoes, Roots and Vegetables,	Russia Cement Co., Gloucester, Mass.,	Seekonk.
111	Complete for Potatoes, Roots and Vegetables,	Russia Cement Co., Gloucester, Mass.,	Hadley.
180	Complete for Potatoes, Roots and Vegetables,	Russia Cement Co., Gloucester, Mass.,	Taunton.
75	Essex XXX Fish and Potash,	Russia Cement Co., Gloucester, Mass.,	Seekonk.
76	Essex XXX Fish and Potash,	Russia Cement Co., Gloucester, Mass.,	Hadley.
187	Essex XXX Fish and Potash,	Russia Cement Co., Gloucester, Mass.,	Taunton.
89	Essex Special Tobacco Manure,	Russia Cement Co., Gloucester, Mass.,	Hadley.
119	Complete for Corn, Grain and Grass,	Russia Cement Co., Gloucester, Mass.,	Hadley.
176	Complete for Corn, Grain and Grass,	Russia Cement Co., Gloucester, Mass.,	Taunton.
456	Complete for Corn, Grain and Grass,	Russia Cement Co., Gloucester, Mass.,	E. Longmeadow
304	Ross Bros.' Lawn Dressing,	Ross Brothers, Worcester, Mass.,	Worcester.
93	Sanderson's-Formula "A,"	Sanderson Fertilizer and Chemical Co., New Haven,	E. Whately.
123	Sanderson's Formula "A,"	Sanderson Fertilizer and Chemical Co., New Haven,	Sunderland.
191	Sanderson's Formula "A,"	Sanderson Fertilizer and Chemical Co., New Haven,	No. Amherst.
478	Sanderson's Formula "A,"	Sanderson Fertilizer and Chemical Co., New Haven,	Southwick.
485	Sanderson's Formula "A,"	Sanderson Fertilizer and Chemical Co., New Haven,	Amherst.
112	Sanderson's Formula "B,"	Sanderson Fertilizer and Chemical Co., New Haven,	Sunderland.
463	Sanderson's Formula "B,"	Sanderson Fertilizer and Chemical Co., New Haven,	Southwick.
348	Old Reliable Superphosphate,	Sanderson Fertilizer and Chemical Co., New Haven,	Gr. Barrington.
42	Potato Manure,	Wilcox Fertilizer Works, Mystic, Conn.,	Dighton.
68	Potato Manure,	Wilcox Fertilizer Works, Mystic, Conn.	Seekonk.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
352	Hubbard's Corn Phosphate,	10.05	1.36	1-1.50	6.40	3.86	2.20	12.46	10-12	10.26	8-10	4.02	3.5-4
371	Hubbard's Potato Phosphate,	10.97	2.28	2-2.50	7.20	3.26	1.90	12.36	10-12	10.46	9-10	5.60	5-6
467	Hubbard's Soluble Potato Manure,	9.97	5.02	5-6	.42	8.90	4.58	13.90	10-12	9.32	7-8.5	5.72	5-6*
61-111-180	Complete for Potatoes, Roots and Veg'bles,	6.25	4.03	3.7-4.5	4.90	4.79	3.33	13.02	9-11	9.69	7-8	8.6	8.5-10*
75-76-187	Essex XXX Fish and Potash,	7.88	2.68	2.1-3	4.29	4.90	5.63	14.82	12-14	9.19	9-10.5	2.56	2.25-3.25
89	Essex Special Tobacco Manure,	4.90	4.51	4.5-5.5	3.24	4.28	3.76	11.28	8.5-9.5	7.52	7-8	11.16	11-12*
119-176-456	Complete for Corn, Grain and Grass,	9.57	3.70	3-4.1	3.24	4.80	3.70	11.74	9.5-11	8.04	7-8	9.56	9.5-11
304	Ross Bros.' Lawn Dressing,	12.39	2.63	2.5-3	—	3.39	2.53	5.92	6-8	3.39	—	5.74	5.5-6
93-123-191-478-485	Sanderson's Formula "A,"	9.08	3.68	3.3-4	4.13	2.82	1.97	8.92	10-12	6.95	6-8	6.72	6-8
112-463	Sanderson's Formula "B,"	7.56	4.08	3.3-4	2.92	4.55	3.35	10.82	10-12	7.47	6-8	6.14	6-8
348	Old Reliable Superphosphate,	12.41	2.24	2.5-3.33	4.86	2.38	1.38	8.62	10-12	7.24	7-8	2.12	2-3
42-68	Potato Manure,	15.35	2.83	2.05-2.88	1.38	5.22	5.30	11.90	7-9	6.60	6-8	4.64	4.5-5.5

*Sulphate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
43	Wilcox Dry Ground Fish Guano,	Wilcox Fertilizer Works, Mystic, Conn.,	Dighton.
513	Wilcox Dry Ground Fish Guano,	Wilcox Fertilizer Works, Mystic, Conn.,	Amherst.
44	Wilcox Potato, Onion and Tobacco Manure,	Wilcox Fertilizer Works, Mystic, Conn.,	Dighton.
512	Wilcox Potato, Onion and Tobacco Manure,	Wilcox Fertilizer Works, Mystic, Conn.,	Amherst.
276	Corn Success,	Whitman & Pratt Rendering Co., Dracut, Mass.,	Lowell.
535	Corn Success,	Whitman & Pratt Rendering Co., Dracut, Mass.,	Dracut.
536	Special for Corn, Potatoes, etc.,	A. H. Wood & Co., So. Framingham, Mass.,	S. Framingham.
537	Special for Market Garden and Top Dressing,	A. H. Wood & Co., So. Framingham, Mass.,	S. Framingham.
	Ground Bone and Tankage.		
219	Dow's Pure Ground Bone,	John C. Dow & Co., Boston, Mass.,	Boston.
367	Dow's Pure Ground Bone,	John C. Dow & Co., Boston, Mass.,	Boston.
55	Fine Ground Bone,	Hargraves Manufacturing Co., Fall River, Mass.,	Fall River.
131	Pure Bone Meal,	Thomas Hersom & Co., New Bedford, Mass.,	New Bedford.
532	Ground Bone,	D. M. Moulton, Monson, Mass.,	Monson.
2	Fine Ground Bone,	W. H. Warren, Northboro, Mass.,	Warren.
366	Ground Bone,	Sanford Winter, Brockton, Mass.,	Brockton.
395	Tankage,	J. M. Woodard & Bro., Greenfield, Mass.,	Greenfield.
	Cotton Seed and Linseed Meal.		
121	Prime Cotton Seed Meal,	American Cotton Oil Co., New York City,	Sunderland.
490	Prime Cotton Seed Meal,	American Cotton Oil Co., New York City,	N. Hadley.
497	Cleveland Flax Meal,	American Linseed Co., Chicago, Ill.,	Hatfield.
499	Cleveland Flax Meal,	American Linseed Co., Chicago, Ill.,	Hatfield.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs. Found.	Nitrogen in 100 lbs. Guaranteed.	Phosphoric Acid in 100 lbs. Soluble.	Reverted.	Insoluble.	Total. Found.	Total. Guaran-teed.	Available. Found.	Available. Guaran-teed.	Potassium Oxide in 100 lbs. Found.	Potassium Oxide in 100 lbs. Guaran-teed.	Mechanical Analyses. Fine Bone.	Fine Medium	Medium	Coarse Medium
	Compound Fertilizers.																
43-513	Wilcox Dry Ground Fish Guano,.........	10.07	8.90	8.5-10	—	3.80	2.68	6.48	6-9	3.80	4-6	—	—				
44-512	Potato, Onion and Tobacco Manure,.....	12.44	3.94	3.3-4.3	5.22	3.06	2.44	10.72	8-10	8.28	7-9	7.3	6-8*				
276-535	Corn Success, ...	6.66	3.25	2.47-3.29	4.03	6.72	1.15	11.90	10-13	10.75	8-10	2.84	3-4*				
536	Special for Corn, Potatoes, etc.,..........	6.25	2.92	2.47-3.30	5.73	2.61	2.18	10.52	10-11	8.34	6-8	6.06	5-6*				
537	Special Market Garden and Top Dressing,	6.34	6.65	6.59-7.41	1.34	5.22	4.50	11.06	9-11	6.56	5-7	10.12	10-11				
	Ground Bone and Tankage.																
219-367	Dow's Pure Ground Bone, ...	4.08	1.94	1.65-2.47	—	11.30	16.58	27.88	24-26	11.30	—			64.49	35.36	.15	—
55	Fine Ground Bone, ...	8.06	4.04	—	—	9.48	12.54	22.02	--	9.48	—			32.33	39.56	12.83	15.28
131	Pure Bone Meal,........................	3.36	2.19	2.22	—	13.07	15.81	28.88	27.04	13.07	10.46			71.66	14.47	8.44	5.43
532	Ground Bone, ...	7.56	4.76	4-5	—	8.08	13.30	21.38	21-22	8.08	—			5.00	14.77	21.55	58.68
2	Fine Ground Bone, ...	13.66	3.86	3.70	—	11.94	12.90	24.84	22.72	11.94	—			54.97	40.24	4.79	—
366	Ground Bone, ...	6.82	3.20	2-3	—	11.97	10.82	22.79	23-24	11.97	—			64.56	25.37	10.07	—
395	Tankage,...............................	5.69	5.70	4-5	—	10.90	8.36	19.26	19-20	10.90	—			35.26	19.03	17.08	28.63
	Cotton Seed and Linseed Meal.																
121-490	Prime Cotton Seed Meal,................	7.91	7.07	7	—	—	—	—	—	—	—			—	—	—	—
497-499	Cleveland Flax Meal, ...	9.42	5.73	6.08-6.4	—	—	—	—	—	—	—			—	—	—	—

*Sulphate of potash, the source of potash.

TRADE VALUES OF FERTILIZING INGREDIENTS IN RAW MATERIALS AND CHEMICALS FOR 1903.

	1902	1903
	CENTS PER POUND	
Nitrogen in ammonia salts,	16.5	17.5
" nitrates,	15.0	15.0
Organic nitrogen in dry and fine ground fish, meat, blood, and in high-grade mixed fertilizers,	16.5	17.0
" " " fine bone and tankage,	16.0	16.5
" " " medium bone and tankage,	12.0	12.0
Phosphoric acid soluble in water,	5.0	4.5
" " soluble in ammonium citrate,	4.5	4.0
" " in fine ground fish, bone and tankage,	4.0	4.0
" " in cottonseed meal, castor pomace and wood ashes,	4.0	4.0
" " in coarse fish, bone and tankage,	3.0	3.0
" " insoluble (in water and in neutral citrate of ammonia) in mixed fertilizers,	2.0	2.0
Potash as Sulphate, free from Chlorides,	5.0	5.0
" " Muriate (chloride),	4.25	4.25

The above schedule of trade values was adopted by representatives of the Massachusetts, Connecticut, Rhode Island, Maine, Vermont and New Jersey Experiment Stations at a conference held during the month of March, 1903, and is based upon the condition of the fertilizer market in centers of distribution in New England, New York and New Jersey during the six months preceding March, 1903, and refers to the current market prices of the leading standard raw materials, which furnish nitrogen, phosphoric acid and potash, and which enter largely into the manufacture of our commercial fertilizers.

The Following Bulletins are Available for Distribution to Those Who May Desire Them.

No. 27. Tuberculosis in college herd: tuberculin in diagnosis; bovine rabies: poisoning by nitrate of soda.
No. 33. Glossary of fodder terms.
No. 35. Agricultural value of bone meal,
No. 41. On the use of tuberculin (translated from Dr. Bang).
No. 54. Fertilizer analyses.
No. 57. Fertilizer analyses.
No. 59. Fertilizer analyses.
No. 64. Analyses of concentrated feed stuffs.
No. 67. Grass thrips; treatment for thrips in greenhouses.
No. 68. Fertilizer analyses.
No. 69. Rotting of greenhouse lettuce.
No. 70. Fertilizer Analyses.
No. 72. Summer forage crops.
No. 75. Fertilizer analyses.
No. 76. The imported elm-leaf beetle.
No. 77. Fertilizer analyses.
No. 78. Concentrated feed stuffs.
No. 79. Growing China asters.
No. 81. Analyses of fertilizers and manurial substances; instructions to manufacturers, agents, etc.: discussion of trade values; treatment of barnyard manure with absorbents.
No. 82. Orchard management: cover crops in orchards; pruning orchards; report on fruits.
No. 83. Fertilizer analyses.
No. 84. Fertilizer analyses.
No. 85. Concentrated feeds.
No. 86. Orchard treatment for the San José scale. One year's experiments in Massachusetts.
No. 87. Cucumbers under glass.
No. 89. Fertilizer analyses.
No. 90. Fertilizer analyses.
Special bulletin,—The brown-tail moth.
Special bulletin,—The coccid genera Chionaspis and Hemichionaspis.
Index, 1888-95.
Annual Reports,—1898, 1899, 1900, 1901, 1902, 1903.

HATCH EXPERIMENT STATION

—OF THE—

MASSACHUSETTS

AGRICULTURAL COLLEGE.

BULLETIN NO. 91.

INJURIES TO SHADE TREES FROM ELECTRICITY.

AUGUST, 1903.

The regular Bulletins of this Station will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same. Technical Bulletins are sent only to those persons interested in the subject treated of in each case.

AMHERST, MASS.:
PRESS OF CARPENTER & MOREHOUSE
1903.

HATCH EXPERIMENT STATION

OF THE

Massachusetts Agricultural College,

AMHERST, MASS.

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——— ———	*Assistant Horticulturist.*
Fred. F. Henshaw,	*Observer.*

The co-operation and assistance of farmers, fruit-growers, horticulturists, and all interested, directly or indirectly, in agriculture, are earnestly requested. The Bulletins will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same. General bulletins, fertilizer analyses, analyses of feed-stuffs, and annual reports are published. Kindly indicate in application which of these are desired. Communications may be addressed to the

Hatch Experiment Station, Amherst, Mass.

Division of Botany.

GEORGE E. STONE.

Injuries to Shade Trees from Electricity.

Within the last few years increased interest has been manifested in shade trees and in road side improvement. This interest has been stimulated in Massachusetts by landscape gardeners and, more particularly, by the Massachusetts Forestry Association, the Massaachusetts Horticultural Society, and the State Board of Agriculture. Village Improvement Societies which have been in existence in some towns for many years have also become more active and numerous, and their interest in tree planting has been fruitful of good results.

Shade trees have many adverse conditions to contend with, which are becoming more numerous each year, and are likely to increase with the development of our cities and towns along present lines. Many of these difficulties can be obviated, if attention is given to their care and normal conditions of growth. Others, however, are not so readily disposed of and hence the trees must frequently suffer.

Some of the detrimental factors are the following:

Interference with soil moisture and root respiration by paved and macadamized roads and sidewalks.

Destruction of the root system by excavations for buildings, sewers, water, gas and steam pipes.

Interference of the root system by earth fillings and regradings.

Abnormal physical and chemical conditions of soil made up of refuse material, and of unsuitable soil texture causing an insufficiency or over supply of soil moisture.

Effects of soil covers as affecting water supply, etc.

Injuries arising from horses' teeth, abrasions from teams, etc.

Effects of exposure to various obnoxious atmospheric gases and smoke.

Lack of aseptic and antiseptic treatment in cases of wounds arising from accidental or intentional pruning, or from injuries from horses' teeth, abrasions from teams, etc.

Interference to tree growth by telephone wires.

Electrical injuries due to contact with alternating and direct current wires.

Injuries due to leaks in gas mains, steam conduits, etc.

Fig. 1. Showing the destructive effect on the growth of a maple tree in contact with a mass of wires.

These factors, singly or in combination, constitute a menace to trees, and it is only by an understanding of the effects that we can comprehend their importance as agencies detrimental to tree development, and obtain a rational conception of the aetiology of disease. Some of these factors are so detrimental to tree development that the largest species will succumb in a relatively short time. In most cases, however, trees subject to adverse conditions linger along in a state of *malaise* or weak condition, thereby easily falling a prey to parasites.

Insect and fungous pests are frequently troublesome. They are however often secondary, that is they frequently occur as a result of some weakened condition of the tree, arising from either a single cause or combination of causes. Moreover the changes which take place in its environment due to the introduction or expulsion of birds and insects frequently disturb the beneficial relationship existing between them to such an extent as to render pests more obnoxious. The general hygienic conditions, however, that are characteristic of our cities are frequently so poor that the expectation of life of trees is frequently one-fourth to three-fourths of the normal.

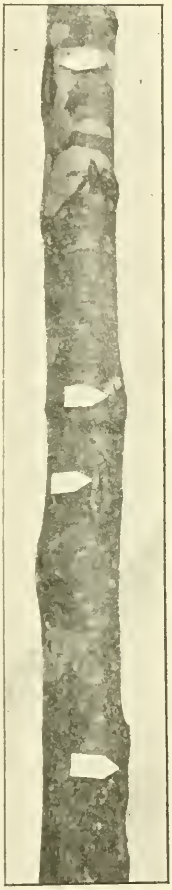

Fig. 2. Showing injury by linemen's spurs on a young maple tree.

The increase of electric railroads, electric lighting systems and telephone lines which have their wires located, usually adjacent to the tree belt necessitates a large amount of disfiguration by pruning, and the close proximity of wires to trees too frequently causes a serious injury to them, in other ways. A tree that has been severely pruned or disfigured by a mass of wires is scarcely better than none. The telephone companies are satisfied if they can cut their way through the tree, the electric companies often take in addition to this privilege that of burning their way through. There are numerous instances where trees are planted under a mass of wires which are responsible for malformation and restricted growth, and it is only a question of time when either the trees or the wires must give way. In cities, where it has become expedient to bury the wires, we have one solution of the problem, but in towns this expensive process is not practiced to any great extent. In case of telephone wires a greater use of the cable would obviate much trouble; electric light wires, however, cannot be disposed of in this manner. The best possible way to get rid of them and, in fact, all overhead wires, if they cannot be buried, is to locate them as much as possible in the rear of buildings on private property.

Electrical injuries to trees cause the most complaint There are two kinds of currents in use in towns and cities, namely, the alternating and the direct. The voltage of the former may range from 1200 to 10000 volts. That of the latter is usually about 500 volts. These two kinds of currents produce different physiological effects upon vegetable life; the alternating current being apparently less disastrous to plant life than the direct current, and when either is utilized at a certain strength it accelerates growth and development, or, in other words, it stimulates the plant.

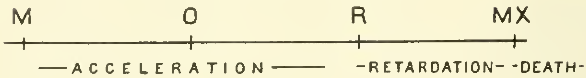

Fig. 3. Diagram showing range of electric current affecting plants. M—minimum. O—optimum, or current producing greatest stimulus. MX—maximum, or death current. R to MX—retardation current.

There is a minimum, optimum and maximum current. The minimum represents that strength of current which just perceptibly acts as a stimulus. The optimum that producing the greatest stimulus and the maximum that causing death. Between the optimum and the maximum there is a strength of current that causes retardation, this being represented between r and mx in figure 3.

The direct current stimulates less than the alternating, and on account of its polarizing effect, appears to cause more injury to vegetable life than the same strength of alternating current. Most of the injurious electrical effects to trees arising from trolley or electric light currents are, as a rule, local: that is, the current causes an injury at or near the point of contact of the wire to the tree. This injury is produced in moist or wet weather, when the tree is covered with a film of water. This provides favorable conditions for leakage, the current traversing the film of water on the tree to the ground.* The result of contact of a wire to a limb, under these conditions, causes a grounding of the current, and a burning of the limb of the tree due to arcing. The vital layer of the limb may become partially or entirely killed at the point of contact which may result in an ugly scar or greatly disfigure the tree. In a large number of tests made by the aid of sensitive instruments upon the connections of feed wires to trees by means of guy wires we have never found any leakage during fair weather, although such may occur in wet weather, especially when the voltage is considerable. Since the amount of current that can be passed through a tree depends upon the resistance and voltage it will be well to consider the resistance exhibited by some trees.

*NOTE.—It is not an uncommon thing during wet weather to observe cases of electrical shock produced by touching trunks of trees where leakage occurs. The writer has observed apple trees which were accidentally charged, by being in contact with uninsulated feed wires through guys, where the fruit was perfectly safe.

ELECTRICAL RESISTANCE OF TREES.

The electrical resistance exhibited by trees is quite large, otherwise considerable more injury might result when live wires carrying strong currents are brought in contact with them. The resistance offered by 10 feet of the trunk of a maple and elm tree, 12 in. and 18 in. in diameter respectively, is as follows:

TABLE SHOWING THE RESISTANCE OF DIFFERENT TISSUES OF THE MAPLE AND ELM TREE.

	Maple. (Ohms).	Elm. (Ohms).
Outer bark,		192000
Middle of inner bark (cortex),	29900	11300
Cambium (vital layer),	18000	10698
Wood, ¼ in. in from cambium,	138000	98700

These figures which are the result of only one test taken during the month of June show that trees possess considerable electrical resistance. Such resistances as are shown in the table are capable of cutting down tolerably high currents to an insignificant amount. As might be expected, the cambium or vital tissue and the inner bark, containing the phloem, show the least resistances. The resistance of the outer bark of the elm tree was reduced quite perceptibly after turning a hose on it for four hours. The bark, however, in the elm is more differentiated than in the maple, and the electrodes in the middle or inner bark test in the elm were pratically in the layer known as the phloem.

Experiments have shown that those layers containing large amounts of the sugar compounds have the smallest resistance, and since these layers which contain sugar are close to the cambium, one would naturally expect on this account to find the smallest resistance in them. These resistances were taken with a Wheatstone Bridge. Others have been estimated from the voltage and current passing through the tree. In all cases the electrodes or wires were driven into the tree so as to penetrate the wood. Some of these are as follows:

A maple tree, 18 in. in diameter, gave a resistance of 20000 ohms for 16½ ft. of its trunk. The same tree gave 11000 ohms for 7 ft. of the trunk, and 7000 ohms for one foot.

A pear tree, 2 ft. 8 in. high, 1¼ in. in diameter at the base, gave a resistance of 290000 ohms when the current passed from the root extremities to the top of the tree, or practically a distance of 3 ft.

A sunflower seedling, 17 in. high, and 3-16 in. in diameter, gave a resistance of 25000 ohms for 1 in. of stem, and 3 in. of the root, while a slightly larger plant of the same species gave 7500 ohms, for 1 in. of stem, and ½ in. of moist soil.

THE EFFECTS OF ALTERNATING CURRENTS.

Fig. 4, Showing the effects of electrical burning and strangulation.

The voltage and current of alternating systems employed for lighting purposes are much greater than those utilized by street railways, and the cases of burning of trees by alternating currents are probably more numerous than those produced by direct currents, for the reason that a larger number of these wires are in the tree belt. Some alternating feed wires in use carry enormous currents. The higher the current a wire carries, the more dangerous it is to trees, for insulation in such cases is less effective and hence arises more leakage and a greater possibility of burning. According to our observations, the effects of alternating currents on trees are local, that is, they produce injury only near the point of contact. This results in the death of that portion of the tree where the burning occurs, and if it is a leader or a large limb it frequently has to be sacrificed, much to the detriment of the tree. A portion of a tree below the point of contact is frequently affected, the extent of injury varying with the electrical potential of the wire, etc. In no instance, to our knowledge, has the alternating current caused the complete death of trees. It may, however, burn and disfigure young trees so badly that it practically amounts to complete destruction. The alternating current is, however, capable of killing plants, as we have frequently demonstrated in the laboratory, with a current from a 110 volt system. The current necessary, however, to accomplish this, generated considerable heat.

Fig. 5. Showing deep burning of a large limb, caused by an alternating wire of high potential. From Luke Doogue, City Forestry Dept., Boston.

Death in such cases resembles that from heat, as the maximum death temperature is quite similar in each case. The collapse of the plant in such cases is due to the heat generated, rather than to an electrical shock, inasmuch as it is possible to pass the same current through plants, under conditions where heat is not generated, without causing any damage to the tissues. It is generally believed that the arc light is injurious to trees. We have never been able to discover any injuries resulting from the use of the arc light, and we have observed hundreds of cases where the light was in close proximity to trees. Many plants will die, or linger along in a sickly condition, if subject to poor soil conditions, and given an insufficient supply of food material. Such cases of death, however, should not be attributed to the supposed injurious effects of the electric light.

EFFECTS OF DIRECT CURRENTS.

Most of the direct currents that trees have to contend with are those generated in operating electric railroads. The electro motive force generally employed on these circuits is about 500 volts. The feed wire not infrequently passes through the tree belt, and occasionally it comes into contact with the limbs of the trees. Although the voltage and current are less on this system than on the lighting system, electrical injuries are likely to prove fully as disastrous. The great majority of burns resulting from the direct current are similar to those produced by the alternating current, namely, they are largely local, that is, the burning predominates close to the point of contact with the wires. The feed wires cause no burning to the tree when brought in contact with it, except when the trees are moist in which case a grounding occurs. The very high resistance exhibited by plants, in general, furnishes a means of protection against death by electrical contact with ordinary currents applied in the usual way. Under peculiar conditions electrocution of trees has taken place. This subject, however, will be referred to later.

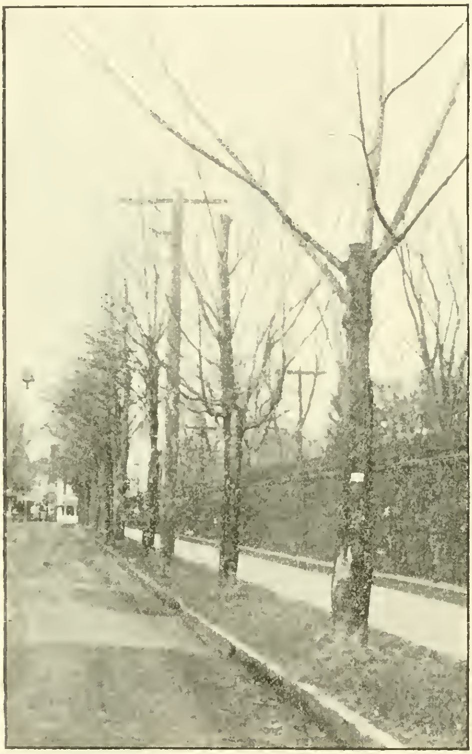

Fig. 6. Showing disfigurement of trees, caused by electric wires. From W. F. Gale, City Forester, Springfield, Mass.

A number of experiments have been made by us showing the amount of current that will pass through plants. These experiments have been made on large trees and small succulent plants. In a number of instances, a wire was passed from the tree to the rail or ground, and another wire was connected to a bare feed wire leading to some other portion of the tree, a milammeter being placed in the circuit to obtain the actual current. Electrodes, which were made of nails attached to the end of No. 18 insulated wires, penetrated into the wood. The results were as follows: 16½ ft. of a maple tree, 18 in. in diameter, gave 25 milliamperes, (1-40 amp.*), 7 ft. of the same tree gave a current of 45 milliamperes, (1-22 amp.) and 1 ft. of the trunk gave 70 milliamperes, (1-14 amp.). These experiments were made on a dry day, and no

*Ampere.

heat developed at the point of insertion of the wires or electrodes, neither was there any change in the reading of the milammeter after being connected for some minutes. The latter connection was left on the tree for several months. The attachment with the uninsulated feed wire, however, occasionally became misplaced, and the exact length of time when a definite contact was made is not known. There was a contact during periods of wet weather at which time there was always considerable heat developed where the positive wire was connected with the tree, but not enough to melt soft solder which connected the wires with the electrodes. Examination of the tree ten months later showed that a portion of the tissues near the electrodes had been killed. After removing the dead bark, an oval space, 6 by 11 in. was found to be dead about the positive electrode and a space about 1½ x 3 in. near the negative electrode. The burned area about the positive electrode was about 95 per cent more than occurred about the negative electrode. In each case it extended about twice as far above and below the point of contact as to the sides of the electrodes, thus showing a tendency of the current to travel in a vertical direction rather than laterally.

The immediate portions around the electrodes were more affected than those further remote. There was an area of tissue about 5 in. long between the large and small oval burning that was uninjured, showing that burning was confined about the area of the electrodes, and the current did not burn a groove from one pole to the other. The current traversing the film of water on the bark was necessarily small, at least not sufficient to do any damage at a short distance from the electrodes. The results obtained by passing a current for a brief period through 16 1-2 ft. and 7 ft. of the tree trunk showed no effect on the tissues. A young pear tree, 2 ft. 8 in. high, 1¼ in. in diameter at the base, which had been grown one year in a box, 14 by 16 by 9 inches, and provided with a copper plate in the bottom in direct contact with the roots, showed a current of 2.2 milliamperes, (1-454 amp.), when one electrode was connected with the copper plate, and the other with the top of the tree. Connections made with a poison ivy plant growing on a tree showed in most cases similar results when the electrodes were inserted into the stem 2 in. apart. A stem 3-4 in. in diameter gave a current equal to 4.4

milliamperes, (1-227 amp.). 1/2 in. in diameter. 25 milliamperes. (1-40 amp.), and on another of the same size. 50 milliamperes. (1-20 amp.). In the latter case. and some others not included here, the currents went down from the 50 milliamperes to nothing almost instantly. From these experiments it would appear that the current burned out the cambium. or vital layer of the stem. thus leaving the dry and highly resistant wood which was unable to transmit a current that was perceptible.

Some young sunflowers and tomato plants grown in 3 in. pots. with copper plates at the bottom. were treated from a direct current dynamo which generated an electro motive force of about 60 volts. The plants were from 6 in. to 2 1/2 ft. high, and 1/5 to 1/4 in. in diameter. The current passing through the soil and roots in 16 in. of stem of the Helianthus plant. 3-16 in. in diameter. gave a reading that was scarcely perceptible. When, however, it passed through only one inch of the stem and root to the copper plate at the bottom, the maximum current was 2.6 milliamperes, (1-384 amp.). This caused blackening and death of the tissues which were perceptible a few hours afterwards about the points of insertion of the electrodes on the stem. and the plant was girdled for about 2-3 of its circumference. Practically similar results were obtained with other sunflower plants treated in the same way. A sunflower, 30 in. high and 1-4 in. in diameter, subject to a current of 10 milliamperes for some minutes was not injured to any extent. In this case the current passed through about 1 in. of stem and 1/2 in. of soil. A young succulent tomato plant, 1/3 of an inch in diameter and 5 in. high. was instantly killed when treated in the same manner, with a current of 20 milliamperes. A current equal to 2 and 3 milliamperes of 30 to 60 seconds duration. accomplished the same result. In all the tomato plants considerable heat was developed. The tissues changed color, and the plants collapsed, although in one case where an alternating current was employed the collapsed plant lived for a number of days. as the vascular bundles. or water conducting tissues. were not injured.

There are certain instances, however, where large trees have been killed by direct currents employed by electric railroads. In some cases which have come under our observation, the escaping current had girdled trees at the base, a distance of 5 to 10 ft. in height, whereas, the point of contact of the feed wire to the limb. 16 or 18 ft. above, showed none of the characteristic burning effects. The general physiological effects in these cases were so different from

Fig. 7. Maple tree killed by direct current from a trolley system, carrying positive current through the rail, and return current through the feed wire in contact with branches. The largest amount of burning occurred slightly remote from the point opposite the rail, and in line with a large root, lying diagonally with, and just under the nearest rail.

Fig. 8. Elm tree killed by a direct current from an electric railroad system carrying positive current in the rail, and return current in the so-called feed wire in contact with the branches.

those usually of the kind, occurring as a result of the electrical contact of live wires with the trees, that it was quite evident something very unusual had taken place in these instances. On electric railroad systems, the positive current almost universally traverses the feed wire, and it is at the point of contact with the feed wire that most injury takes place. In all cases where trees were killed by electricity, this condition of things was reversed, namely, the positive current was conducted through the rail, and the return current through what is usually the feed wire. How common the practice has been of operating on this system, we cannot say. Nevertheless, it has been practiced, unintentionally perhaps, by various companies at one time and another. Such practice is responsible in some instances for the killing of shade trees adjacent to the rails. Undoubtedly the conditions at the base of the tree are much more favorable than near the limbs for extensive burning. The moisture condition of the soil and bark are such that the resistance, would be reduced and cause the current to spread over a large area. It is evldent in this case, at any rate, that the current had gained access to a large area of the cambium layer, thus girdling the tree to a considerable distance, that portion of the tree trunk towards the rails being more severely affected than that away from the track. There were no deep burning effects on the trunk, either above or below in any of these instances, as is quite customary when the positive wire comes into contact with the tree. The area, however, affected about the base of the tree was decidedly larger than that usually occurring when the positive or feed wires are brought into contact with limbs. Shortly after the trees were injured, the bark could be readily removed from the trunks, and later fell off. The trees killed were elms and maples, 18 in. or more in diameter, and in each case they were in the legitimate tree belt, being about three feet from the rails. These experiments and observations, pertaining to the effects of the direct current on plants, demonstrates that we have a variety of conditions to deal with, in considering the effects of electricity on trees.

A current can be increased in two ways, namely, by decreasing the resistance or increasing the voltage. If the voltage of the trolley system is increased to 5000, we would obtain a current equal to only 250 milliamperes in the experiment where we obtained 25 milliamperes, through 16½ ft. of the maple trunk; and it will require a voltage of 20000 to give one ampere current through this same tree under similar conditions. In like manner the resistance would have to be reduced from 20000 to 500 ohms, in this experiment, in order to obtain one ampere current. In the experiment where the wires were only one foot apart, the current was 70 milliamperes, and there was no evidence that a particle of heat developed during dry weather. The current that will kill a young succulent plant will not kill a tree, or cause it any injury, for example, a current of even three milliamperes or less will kill a young plant, whereas the same plant, when more matured, would require a much stronger current to kill it. From this it will appear that a current that will kill one plant in one stage of development, will not in another. There is therefore as great a range in current required to kill plants as there are stages of development or individual peculiarities, and it is impossible to state only in particular cases and under certain conditions, what a current of a definite strength is capable of doing. There are many factors which enter into a problem of this nature: such as the character of the plant juices which the current has to traverse, the area of cross section of the conducting tissue, and the conditions under which the current is applied. An electric current may pass through a wire of large diameter and cause no heating, whereas the same current passed through a very small wire will produce intense heat.

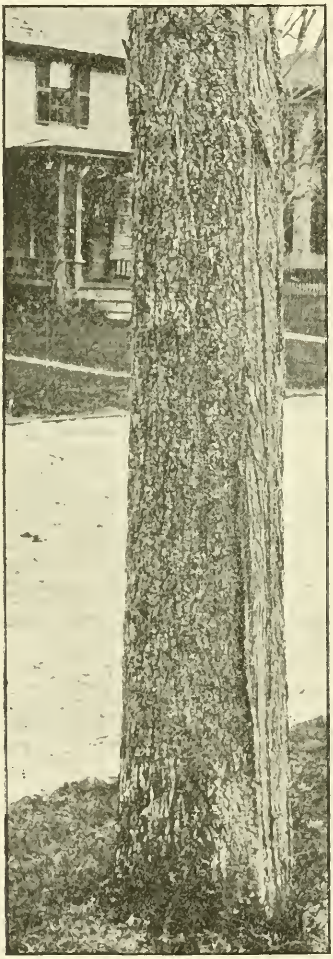

Fig. 9. Showing the characteristic grooves on the trunk of an elm tree caused by a feeble stroke of lightning.

A current has plenty of opportunity to spread in a tree, even if confined to a single tissue, hence, in order to obtain a current which will produce heat, it has to be quite strong in a large plant, whereas, in a small plant, heat will develop with less current. The amount of current required to kill a maple tree, 18 in. in diameter by burning will have to be comparatively strong, provided the current has to pass through a considerable portion of the tree. If the current, however, is confined in its action to a limited area where the amount of resistance is small, and where considerable heat can be developed, such as might be produced by passing it around the tree, or girdling it, disastrous results might follow from the use of not very strong currents, on account of its being confined to a limited vital area.

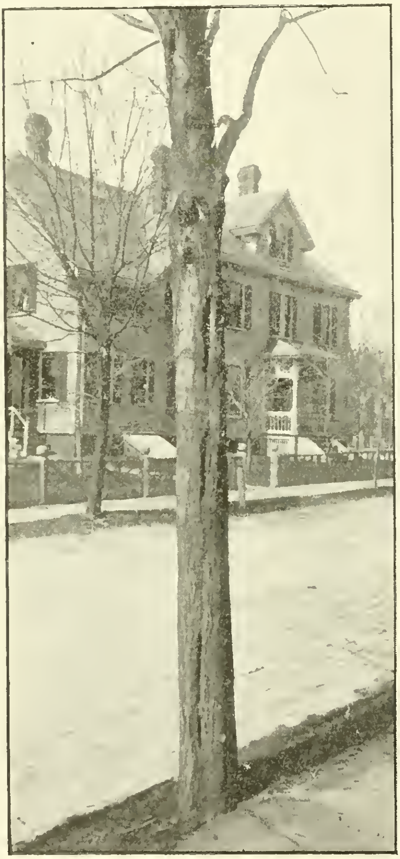

Fig. 10. Showing the effect of earth discharges through a tree, causing splitting of the trunk and destruction of limbs.

From these observations it is quite clear that, notwithstanding the high resistance of plants, and the limited amount of current, which it is possible to pass through, there may prevail a combination of conditions which may prove injurious or fatal to the organism. The negative results obtained by passing currents through trees, under certain conditions, does not necessarily prove that death from electrical injuries may not result. It might be possible for trees, in contact with uninsulated wires, to be subject to a strength of current which would not cause any perceptible burning but which would produce a retarding effect in the plants' activities thus resulting in a weakened condition of the tree. If, for example, a tree was subjected to a current of a strength equivalent to that represented between r and mx in Figure 3, page 6, (retardation current), it would be subject to over stimulation which might result in its becoming sickly and ultimately dying. Indeed, such a case might not only be possible, but is extremely probable, inasmuch as a few instances have come under our observation where trees were apparently dying from this cause, without any indications of burning. Such cases, however, are extremely rare. Then again lightning arresters, when placed near trees, may succeed in causing injury by discharges. This opinion, however, is merely conjectural, although it has the support of some observations. It is known that occasional leakage takes place through the soil, as is manifested by the behavior of sensitive instruments commonly used in laboratories. Probably the amount of ground leakage which may occur through imperfect rail connections, thus charging water and gas pipes and occasionally charging the soil, would not cause any perceptible injury to trees.

On the whole, the cases of killing trees by escaping electricity are very rare, and by no means so numerous as is generally believed. Because a large number of trees, adjacent to electric railroads, happen to become sickly, it must not be concluded that electricity is the cause of these abnormal conditions in all cases. In cities and towns, where most of the sickly specimens exist, there are various adverse conditions with which trees have to contend. It is, therefore, quite essential, in diagnosing diseased conditions that these various factors be taken into consideration before forming definite opinions as to the real cause responsible for their abnormal condition.

LIGHTNING.

The common effects of lightning strokes upon trees are so well known that it is not necessary to dwell upon them here. Lightning, however, does not always strike a tree in the same manner, or produce the same results, and the peculiar effects which it displays are often interesting. Sometimes trees are killed outright by lightning without displaying any of the common effects of shattering. Apparently in such cases the discharge is dispersed in such a way as not to cause visible mechanical injury to the tree. The girdling of a larger or smaller area of the living zone or cambium layer of the trunk would be sufficient to cause its death. Quite frequently this is accomplished by the discharge taking a spiral course. In a very large number of instances of lightning stroke neither death nor mechanical injury of importance takes place. Hundreds of trees are annually struck by lightning that are never recognized except by those who know how to interpret the small vertical lines or creases which subsequently make their appearance on the trunk. (See Figure 9.) There are many cases of lightning stroke that appear to offer examples of discharges from the earth. The effect of such discharges on the tree are quite characteristic and not at all similar to the ordinary forms of lightning strokes. Probably the nature of the soil conditions have much to do with such discharges, although it must be confessed that little light has been shed upon this subject. Our attention was called two years ago to some tree belts located in a town in the eastern part of the State, where lightning had apparently caused some damage. These trees are maples from 5 to 18 inches in diameter, growing in soil composed in most places of gravel containing apparently oxide of iron, and underneath this I am informed there is a stratum of quick sand.

Fig. 11. Showing the effect of earth discharges through the tree, causing splitting of the trunk and destruction of limbs.

A considerable number of the trees growing in this territory show the effects of earth discharges and in some cases they have been replaced for the third time only to be mutilated and disfigured by electrical discharges. These discharges occur during thunderstorms, and Mr. C. F. Jackson who has these trees under his supervision and has observed them for many years relates that the discharge gives rise to a dull characteristic report, resembling the effect of throwing a wet cloth on a hard surface. The discharge, however, does not affect the whole tree, but only part of it. Such for example, as one side of the trunk and one or more of the limbs, usually the lower ones on the same side as that portion of the trunk affected. The first indication of the discharges are shown by the wilting of the leaves of the affected limbs which results in their drying up and dying, with the subsequent loss of the limbs. In the course of time creases can be seen on the trunk showing the path of the discharge, and occasionally when the injury is considerable the bark falls off near that portion affected. The limbs, however, are not always killed, though frequently becoming split; (see Fig. 12) and a split-

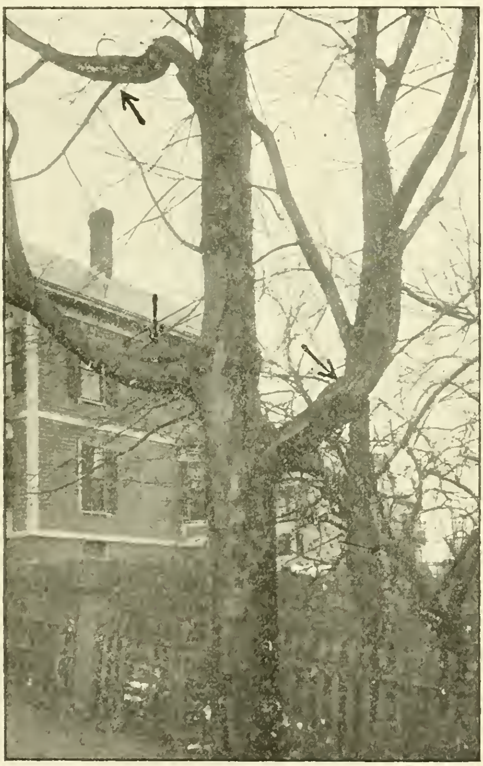

Fig. 12. Showing the effect of earth discharges through the tree, causing splitting of the trunk and destruction of limbs. The arrows indicate badly split limbs.

ting of the wood for some depth is now and then observed on the trunk along the path of discharge. Sometimes these earth discharges kill the tree, but in most cases only a disfigurement occurs, which, however, may be great enough to destroy its symmetry. A very much larger number of trees than people are aware of show earth discharges. In most cases of this kind the discharge affects one or more limbs; as the current seldom follows up the main trunk but discharges at the points of several branches. MacDougal* mentions some trees which appear to have been injured by earth discharges. Whether the chemical composition of the soil has any particular bearing upon earth discharges is not positively known. It is known, however, that there frequently exists great differences in the electrical potential between the earth and air during thunderstorms and that the electrical conditions of the clouds and earth may change instantly from negative to positive. Some observations made by Mr. A. C. Monahan in our laboratory with a Thomson self-recording quadrant electrometer and water dripping collector show that the electrical potential of the atmosphere varies from a negative charge of 75 volts to 300 positive at various times, at a distance of 30 feet from the ground, and it is also known that trees occasionally discharge sparks at their apices, showing that insignificant earth discharges occur through trees.

SUMMARY.

The adverse conditions with which shade trees have to contend, in cities and towns, constitute a serious drawback to their development.

A considerable amount of damage occurs to shade trees by wires, causing abrasions, destruction of limbs and leaders, burnings, and necessitating much injudicious pruning.

The greatest amount of damage caused to trees by alternating and direct currents is by local burnings. The higher the electro motive force (voltage), the more injury is likely to occur to trees.

There is practically little or no leakage from wires during dry weather. In wet weather, however, when a film of water is formed on the bark, more or less leakage is likely to occur, and if the

*(Journal of the N. Y. Bot. Gardens, Vol. III, No. 31, July, 1902.)

insulation is insufficient and contact with the tree exists, grounding takes place, and burning due to arcing, results.

No authentic cases have been observed by us where the alternating current, employed for lighting service, has killed trees, though there are authentic cases, extremely rare, where the direct current, used in operating street railroads, has killed large shade trees. This has been accomplished by reversing the polarity, causing the positive current to traverse the rail, and the return current the feed wire, which usually carries the positive.

The high resistance offered by trees and plants, in general, serves as a protection against death from an electrical contact.

The least resistance in trees occurs in the vital layer, (cambium), and those tissues adjacent to it.

Electric currents of whatever nature, when applied to plants of a certain intensity, act as a stimulus.

The physiological effect of the direct current on vegetable life differs from that of the alternating: the latter current acts more as a stimulus to the plant than the former.

There is evidence to support the idea that a current, of not sufficient strength to cause burning, may over stimulate the plant and cause a retardation of its activities which will subsequently result in death.

Earth discharges during thunderstorms are more common than generally supposed, and they are known to disfigure and cause the death of trees.

The Following Bulletins are Available for Distribution to Those Who May Desire Them.

No. 27. Tuberculosis in college herd: tuberculin in diagnosis; bovine rabies; poisoning by nitrate of soda.
No. 33. Glossary of fodder terms.
No. 35. Agricultural value of bone meal,
No. 41. On the use of tuberculin (translated from Dr. Bang).
No. 54. Fertilizer analyses.
No. 57. Fertilizer analyses.
No. 59. Fertilizer analyses.
No. 64. Analyses of concentrated feed stuffs.
No. 67. Grass thrips; treatment for thrips in greenhouses.
No. 68. Fertilizer analyses.
No. 69. Rotting of greenhouse lettuce.
No. 70. Fertilizer analyses.
No. 72. Summer forage crops.
No. 75. Fertilizer analyses.
No. 76. The imported elm-leaf beetle.
No. 77. Fertilizer analyses.
No. 78. Concentrated feed stuffs.
No. 79. Growing China asters.
No. 81. Analyses of fertilizers and manurial substances; instructions to manufacturers, agents, etc.: discussion of trade values; treatment of barnyard manure with absorbents.
No. 82. Orchard management: cover crops in orchards; pruning orchards; report on fruits.
No. 83. Fertilizer analyses.
No. 84. Fertilizer analyses.
No. 85. Concentrated feeds.
No. 86. Orchard treatment for the San José scale. One year's experiments in Massachusetts.
No. 87. Cucumbers under glass.
No. 89. Fertilizer analyses.
No. 90. Fertilizer analyses.
Special bulletin,—The brown-tail moth.
Special bulletin,—The coccid genera Chionaspis and Hemichionaspis.
Index, 1888-95.
Annual Reports,—1898, 1899, 1900, 1901, 1902, 1903.

HATCH EXPERIMENT STATION

—OF THE—

MASSACHUSETTS AGRICULTURAL COLLEGE.

BULLETIN NO. 92.

I. ANALYSES OF MANURIAL SUBSTANCES SENT ON FOR EXAMINATION.

II. ANALYSES OF LICENSED FERTILIZERS COLLECTED BY THE AGENT OF THE STATION DURING 1903.

NOVEMBER, 1903.

The regular Bulletins of this Station will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same. Technical Bulletins are sent only to those persons interested in the subject treated of in each case.

AMHERST, MASS.:
PRESS OF CARPENTER & MOREHOUSE
1903.

HATCH EXPERIMENT STATION

OF THE

Massachusetts Agricultural College,

AMHERST, MASS.

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——— ———	*Assistant Horticulturist.*
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The co-operation and assistance of farmers, fruit-growers, horticulturists, and all interested, directly or indirectly, in agriculture, are earnestly requested. The Bulletins will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same. General bulletins, fertilizer analyses, analyses of feed-stuffs, and annual reports are published. Kindly indicate in application which of these are desired. Communications may be addressed to the

HATCH EXPERIMENT STATION, Amherst, Mass.

DIVISION OF CHEMISTRY.

C. A. Goessmann.

ANALYSES OF FERTILIZING SUBSTANCES FORWARDED BY FARMERS FOR FREE EXAMINATION.

WOOD ASHES.

1330-1334. I. Received from North Hadley, Mass.
II. Received from Sunderland, Mass.
III. Received from Concord, Mass.
IV. Received from Whitinsville, Mass.
V. Received from North Amherst, Mass.

	Per Cent.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	9.54	4.17	15.86	9.95	13.06
Potassium oxide,	4.88	6.92	4.28	4.80	6.36
Phosphoric acid,	1.40	1.80	1.33	1.33	1.28
Calcium oxide,	25.99	30.77	28.84	30.65	30.48
Insoluble matter,	23.56	18.35	14.63	17.20	10.58

1335-1340. I and II. Received from South Deerfield, Mass.
III. Received from Boston, Mass.
IV. Received from South Acton, Mass.
V. Received from Boston, Mass.
VI. Received from Concord, Mass.

	Per Cent.					
	I.	II.	III.	IV.	V.†	VI.
Moisture at 100° C.,	20.78	23.31	3.52	15.46	1.09	17.37
Potassium oxide,	5.23	3.44	6.49	4.84	13.58	4.76
Phosphoric acid,	1.50	1.30	1.76	1.40	2.74	1.51
Calcium oxide,	26.03	24.22	*	32.35	28.96	31.10
Insoluble matter,	13.78	16.88	17.86	15.35	16.13	*

†Poplar wood ashes.
*Not determined.

LIME ASHES.

1341-1344. I, II and III. Received from Sunderland, Mass.
IV. Received from South Deerfield, Mass.

	Per Cent.			
	I.	II.	III.	IV.
Moisture,	10.90	13.38	23.16	18.52
Potassium oxide,	2.00	2.28	1.36	1.36
Phosphoric acid,	.59	.46	.49	.67
Calcium oxide,	32.42	44.49	38.06	35.42
Insoluble matter,	26.50	7.36	4.91	11.60

COMPOUND FERTILIZERS.

1345-1349. I and II. Received from Sunderland, Mass.
III. Received from Newburyport, Mass.
IV. Received from Malden, Mass.
V. Received from Sutton, Mass.

	Per Cent.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	4.39	10.36	4.43	6.90	6.76
Total phosphoric acid,	9.08	8.93	7.52	5.73	10.77
Soluble phosphoric acid,	—	5.77	5.16	3.04	4.86
Reverted phosphoric acid,	4.58	2.23	1.44	1.92	4.43
Insoluble phosphoric acid,	4.50	.93	.92	.77	1.48
Potassium oxide,	10.28	8.78	10.94	11.08	7.28
Nitrogen,	7.43	4.01	3.28	5.74	3.36

1350-1354. I. Received from Bedford, Mass.
II. Received from Westport, Mass.
III and IV. Received from Conway, Mass.
V. Received from Hatfield, Mass.

	Per Cent.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	8.37	11.74	7.04	5.70	4.65
Total phosphoric acid,	7.72	9.60	9.70	8.40	10.30
Soluble phosphoric acid,	3.81	5.50	1.15	.58	2.48
Reverted phosphoric acid,	2.73	3.10	5.40	5.44	5.13
Insoluble phosphoric acid,	1.18	1.00	3.15	2.38	2.69
Potassium oxide.	8.58	6.64	12.06	10.64	14.08
Nitrogen,	4.66	3.02	4.71	5.47	3.30

MISCELLANEOUS MATERIAL.

1355-1358. I. Cotton Waste, received from Concord, Mass.
II. Bone Dust, received from Sunderland, Mass.
III. Wool Waste, received from Byfield, Mass.
IV. Mill Refuse, received from Lawrence, Mass.

	Per Cent.			
	I.	II.	III.	IV.
Moisture at 100° C.,	6.06	5.06	50.27	3.10
Total phosphoric acid,	.08	17.80	.05	.29
Available phosphoric acid,	—	7.24	—	.24
Insoluble phosphoric acid,	—	10.56	—	.05
Potassium oxide,	.48	—	.61	11.78
Nitrogen.	.55	3.06	5.84	1.16

1359-1361. I. Dried Blood, received from Malden, Mass.
II. Peat, received from Springfield, Mass.
III. Cotton Seed Meal, received from Amherst, Mass.

	Per Cent.		
	I.	II.	III.
Moisture at 100° C.,	8.92	5.81	8.03
Phosphoric acid.	6.16	trace	—
Nitrogen,	9.83	1.88	6.92
Calcium oxide,	*	2.12	*

1362-1364. I. Manure, received from Amherst, Mass.
II. Peruvian Guano, received from New York City.
III. Belgian Phosphate, received from Concord, Mass.

	Per Cent.		
	I.	II.	III.
Moisture at 100° C.,	75.22	17.10	.21
Total phosphoric acid,	.17	21.26	9.54
Soluble phosphoric acid,	—	2.81	—
Reverted phosphoric acid,	—	10.47	—
Insoluble phosphoric acid,	—	7.98	9.54
Potassium oxide,	.40	4.20	*
Nitrogen,	.39	3.23	—
Calcium oxide.	*	*	41.27

SOILS.

1365-1367. I, II and III. Received from Amherst, Mass.

	Per Cent.		
	I.	II.	III.
Moisture at 100° C.,	9.98	5.48	8.47
Phosphoric acid,	.22	.14	.18
Potassium oxide,	.15	.07	.14
Nitrogen,	.16	.08	.10
Calcium oxide,	.31	.23	.23

* Not determined

II. Analyses of Commercial Fertilizers Collected During 1903, in the General Markets by the Agent of the Hatch Experiment Station of the Massachusetts Agricultural College.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
117	Dry Ground Fish,	American Agricultural Chem. Co., Boston, Mass.,	Sunderland.
538	Dry Ground Fish,	American Agricultural Chem. Co., Boston, Mass.,	Hadley.
194	High Grade Fertilizer with 10 per cent Potash,	American Agricultural Chem. Co., Boston, Mass.,	Newburyport.
11	Baker's Complete Strawberry Manure,	Am. Agric. Chem. Co. (H. J. Baker & Bro. Branch),	Fall River.
71	Bradley's Columbia Fish and Potash,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Fall River.
138	Bradley's Columbia Fish and Potash,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	New Bedford.
182	Bradley's Complete Manure for Corn and Grain,	Amer. Agric. Chem. Co. (Bradley Fert Co. Branch),	Boston.
268	Bradley's Complete Manure for Corn and Grain,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Worcester.
329	Bradley's Complete Manure for Corn and Grain,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Fitchburg.
206	Bradley's English Lawn Fertilizer,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Boston.
244	Bradley's English Lawn Fertilizer,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Haverhill.
231	Bradley's Seeding Down Manure,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Haverhill.
232	Bradley's Comp. Man. for Top Dres'ing, Grass and Grain	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Haverhill.
267	Bradley's Comp. Man. for Top Dres'ing, Grass and Grain	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Worcester.
163	Bradley's Corn Phosphate,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Amesbury.
270	Bradley's Corn Phosphate,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Marlboro.
378	Bradley's Corn Phosphate,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Pittsfield.
391	Bradley's Niagara Phosphate,	Amer. Agric. Chem. Co. (Bradley Fert. Co. Branch),	Ayer.
573	Clark's Cove Potato Manure,	Amer. Agric. Chem. Co. (Clark's Cove Fert. Co. Branch),	Amherst.
549	Crocker's Potato, Hop and Tobacco Fertilizer,	Am. Agric. Chem. Co. (Crocker Fert. & Chem. Co. Br'ch),	Amherst.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
117-538	Dry Ground Fish, ...	7.45	8.06	8.27-9	—	5.68	2.50	8.18	7-9	5.68	—	—	—
194	High Grade Fertilizer 10 per cent Potash,	8.68	2.34	2.4-3	4.00	3.44	2.30	9.74	7-10	7.44	6-8	10.22	10-12
11	Baker's Comp. Strawberry Manure,.......	8.95	2.50	2.4-3.3	4.09	3.15	2.30	9.54	7-10	7.24	6-8	10.00	10-12
71-138	Bradley's Columbia Fish and Potash,.....	11.41	2.05	1.65-2.4	4.52	2.80	2.68	10.00	6-9	7.32	5-7	2.74	2-3
182-268-329	Bradley's Comp. Manure, Corn and Grain,	11.14	3.14	3.3-4.12	7.10	5.78	1.94	14.82	13-16	12.88	12-14	2.78	3-4
206-244	Bradley's English Lawn Fertilizer,........	6.10	4.82	4.95-5.78	1.09	3.97	1.66	6.72	6-9	5.06	5-7	3.18	2.5-3.5*
231	Bradley's Seeding Down Manure, ...	13.20	2.26	2.5-3.25	6.50	2.54	3.68	12.72	11-14	9.04	9-11	2.18	2-3
232-267	Bradley's Comp. Top Dressing Grass, ...	6.51	4.69	4.95-5.78	1.32	4.16	1.36	6.84	6-9	5.48	5-7	3.16	2.5-3.5*
163-270-378	Bradley's Corn Phosphate,...............	10.16	2.11	2.06-2.88	4.71	3.91	3.10	11.72	10-13	8.62	8-10	1.52	1.5-2.5
391	Bradley's Niagara Phosphate, ...	12.97	1.06	.82-1.65	2.53	4.59	4.76	11.88	8-11	7.12	7-9	1.00	1-2
573	Clark's Cove Potato Manure,.............	10.98	2.29	2.5-3.25	3.65	3.05	2.10	8.80	8-11	6.70	6-8	5.36	5-6
549	Crocker's Potato, Hop and Tobacco Fert.,	13.24	2.03	2.06-2.88	5.76	3.34	2.00	11.10	10-13	9.10	8-10	3.18	3-4

*Sulphate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
546	Crocker's Corn Phosphate,	Am. Agric. Chem. Co. (Crocker Fert. & Ch. Co. Branch),	Amherst.
559	Crocker's A. A. Complete,	Am. Agric. Chem. Co. (Crocker Fert. & Ch. Co. Branch),	Amherst.
487	Darling's Tobacco Grower,	Am. Agric. Chem. Co. (L. B. Darling Fert. Co. Branch),	Amherst.
568	Great Eastern Northern Corn Special,	Am. Agric. Chem. Co. (Great Eastern Fert. Co. Branch),	Amherst.
548	Great Eastern Grass and Oats,	Am. Agric. Chem. Co. (Great Eastern Fert. Co. Branch),	Amherst.
556	Great Eastern Garden Special,	Am. Agric. Chem. Co. (Great Eastern Fert. Co. Branch),	Amherst.
552	Pacific High Grade General,	Am. Agric. Chem. Co. (Pacific Guano Co. Branch),	Amherst.
495	Packers' Union Animal Corn Fertilizer,	Am. Agric. Chem. Co. (Packers' Union Fert. Co. Br'ch),	Amherst.
547	Packers' Union Universal,	Am. Agric. Chem. Co. (Packers' Union Fert. Co. Br'ch),	Amherst.
554	Packers' Union Wheat, Oats and Clover,	Am. Agric. Chem. Co. (Packers' Union Fert. Co. Br'ch),	Amherst.
74	Quinnipiac Potato Manure,	Am. Agric. Chem. Co. (Quinnipiac Co. Branch),	Seekonk.
443	Quinnipiac Potato Manure,	Am. Agric. Chem. Co. (Quinnipiac Co. Branch),	No. Amherst.
359	Quinnipiac Climax Phosphate,	Am. Agric. Chem. Co, (Quinnipiac Co. Branch),	Pittsfield.
423	Quinnipiac Climax Phosphate,	Am. Agric. Chem. Co. (Quinnipiac Co. Branch),	W.Springfield.
468	Quinnipiac Climax Phosphate,	Am. Agric. Chem. Co. (Quinnipiac Co. Branch),	Southwick.
372	Quinnipiac Phosphate,	Am. Agric. Chem. Co. (Quinnipiac Co. Branch),	Pittsfield.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
546	Crocker's Corn Phosphate,	12.87	2.10	2.06-2.88	6.01	2.93	2.26	11.20	10-13	8.94	8-10	1.68	1.5-2.5
559	Crocker's A. A. Complete,	13.33	3 30	3.3-4.12	6 52	3.26	2.10	11.88	9-13	9.78	8-11	6.70	7-8
487	Darling's Tobacco Grower,	8.60	4 27	4.53-5.35	1.34	2.50	.38	4.22	5-8	3.84	4-6	10.76	10-11*
568	Great Eastern Northern Corn Special,	13.00	2.06	2 06-2.88	5.67	3.03	2.26	10.96	10-13	8.70	8-10	1.62	1.5-2.5
548	Great Eastern Grass and Oats,	11.12	—	—	8.87	3.74	.61	13.22	12-15	12.61	11-13	2.94	2-3
556	Great Eastern Garden Special,	13 06	3.35	3.3-4.12	6.84	3.32	1.94	12.10	9-13	10.16	8-11	6.64	7-8
552	Pacific High Grade General,	12.42	3.37	3.3-4.12	6.59	3.87	1.92	12.38	9-13	10.46	8-11	6.72	7-8
495	Packers' Union Animal Corn Fertilizer.	13 43	2.54	2.5-3.25	4.58	4.88	2.10	11.56	11-14	9.46	9-11	2.08	2-3
547	Packers' Union Universal,	10.74	1.01	.82-1.65	6.20	3.10	1.76	11 06	10-14	9.30	8-11	4.54	4-5
554	Packers' Union Wheat, Oats and Clover,	11.28	—	—	8.57	3.81	.66	13.04	12-15	12.38	11-13	2.60	2-3
74-443	Quinnipiac Potato Manure,	10.78	2.39	2.5-3.25	2.94	4.22	1.54	8.70	8-11	7.16	6-8	5.12	5-6
359-423-468	Quinnipiac Climax Phosphate,	12.11	1.25	1.03-2.5	5.50	3.16	2.94	11.60	10-15	8.66	8-12	2.00	2-3
372	Quinnipiac Phosphate,	13.71	2.52	2.5-3.25	5.22	4.26	2.26	11.74	11-14	9.48	9-11	2.22	2-3

*Sulphate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
425	Quinnipiac Corn Manure.	Am. Agric. Chem. Co. (Quinnipiac Co. Branch),	W.Springfield.
482	Quinnipiac Corn Manure,	Am. Agric. Chem. Co. (Quinnipiac Co. Branch),	Springfield.
524	Quinnipiac Corn Manure,	Am. Agric. Chem. Co. (Quinnipiac Co. Branch),	So. Amherst.
570	Quinnipiac Havana Tobacco Manure,	Am. Agric. Chem. Co. (Quinnipiac Co. Branch),	Amherst.
544	Quinnipiac Onion Manure,	Am. Agric. Chem. Co. (Quinnipiac Co. Branch),	Amherst.
169	Read's Farmers' Friend Superphosphate,	Am. Agric. Chem. Co. (Read Fertilizer Co. Branch),	Bridgewater.
400	Read's Standard Superphosphate,	Am. Agric. Chem. Co. (Read Fertilizer Co. Branch),	Greenfield.
539	Read's High Grade Farmers' Friend,	Am. Agric. Chem. Co. (Read Fertilizer Co. Branch(,	Hadley.
551	Standard Fertilizer,	Am. Agric. Chem. Co. (Standard Fert. Co. Branch),	Amherst.
555	Standard Guano,	Am. Agric. Chem. Co. (Standard Fert. Co. Branch),	Amherst.
558	Standard Special for Potatoes,	Am. Agric. Chem. Co. (Standard Fert. Co. Branch),	Amherst.
553	Tucker's Original Bay State,	Am. Agric. Chem. Co. (H. F. Tucker & Co. Branch),	Amherst.
14	Wheeler's Superior Truck Fertilizer,	Am. Agric. Chem. Co. (M. E. Wheeler & Co. Branch),	Seekonk.
354	Wheeler's Corn Fertilizer,	Am. Agric. Chem. Co. (M. E. Wheeler & Co. Branch),	Pittsfield.
413	Wheeler's Corn Fertilizer,	Am. Agric. Chem. Co. (M. E. Wheeler & Co. Branch),	Greenfield.
419	Wheeler's Corn Fertilizer,	Am. Agric. Chem. Co. (M. E. Wheeler & Co. Branch).	Gr.Barrington.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Total. Found.	Total. Guaranteed.	Available. Found.	Available. Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
425-482-524	Quinnipiac Corn Manure, ...	10.14	2.11	2.06-2.88	4.64	4.06	3.00	11.70	10-13	8.70	8-10	1.76	1.5-2.5
570	Quinnipiac Havana Tobacco Manure, ...	7.13	5.94	5.78-6.61	4.96	2.72	1.20	8.88	6-9	7.68	5-7	10.36	10-12*
544	Quinnipiac Onion Manure, ...	13.16	3.30	3.30-4.12	6.63	3.07	2.56	12 26	9-13	9.70	8-11	7.00	7-8
169	Read's Farmers' Friend Superphosphate, .	10.58	2.09	2.06-2.88	3.77	3.94	1.89	9.60	10-12	7.71	8-10	3.06	3-4
400	Read's Standard Superphosphate, ...	10.88	1.09	.82-1.65	3.52	3.22	5.20	11.94	10-14	6.74	8-11	4.02	4-5
539	Read's High Grade Farmers' Friend, ...	9.49	3.26	3.3-4.12	3.26	3.70	2.18	9.14	7-10	6.96	6-10	10.98	10-12
551	Standard Fertilizer, ...	13.34	2.12	2.06-2.88	5.95	2.67	2.56	11.18	10-13	8.62	8-10	1.96	1.5-2.5
555	Standard Guano, ...	11.29	1.12	1.03-2.5	5.88	2.82	2.46	11.16	10-15	8.70	8-12	2.40	2-3
558	Standard Special for Potatoes, ...	13.26	2.09	2.06-2.88	6.05	2.93	1.92	10.90	10-13	8.98	8-10	3.22	3-4
553	Tucker's Original Bay State, ...	13.08	2.06	2.06-2.88	5.99	2.17	2.92	11.08	10-13	8.16	8-10	1.64	1.5-2.5
14	Wheeler's Superior Truck Fertilizer, ...	8.93	3.54	3.30-4.12	4.64	5.54	1.70	10.88	9-13	9.18	8-11	7.14	7-8
354-413-419	Wheeler's Corn Fertilizer, ...	10.70	1.57	1.65-2.47	4.13	3.67	3.28	11.08	10-14	7.80	8-11	2.02	2-3

*Sulphate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
572	Wheeler's Grass and Oats,	Am. Agric. Chem. Co. (M. E. Wheeler & Co. Branch),	Amherst.
545	Wheeler's Havana Tobacco Grower,	Am. Agric. Chem. Co. (M. E. Wheeler & Co. Branch),	Amherst.
557	Williams & Clark's Potato Phosphate,	Am. Ag. Chem. Co. (Williams & Clark Fert. Co. Branch),	Amherst.
569	Williams & Clark's Potato Manure,	Am. Ag. Chem. Co. (Williams & Clark Fert. Co. Branch),	Amherst.
571	Williams & Clark's Corn Manure,	Am. Ag. Chem. Co. (Williams & Clark Fert. Co. Branch),	Amherst.
550	Williams & Clark's Prolific Crop Producer,	Am. Ag. Chem. Co. (Williams & Clark Fert. Co. Branch),	Amherst.
299	Harvest King,	Abbott & Martin Rendering Co., Columbus, Ohio,	Hudson.
421	Eagle Brand Fertilizer,	W. H. Abbott, Holyoke, Mass.,	Holyoke.
507	Eagle Brand Fertilizer,	W. H. Abbott, Holyoke, Mass.,	Amherst.
237	Bone, Blood and Potash,	Armour Fertilizer Works, Baltimore, Md.,	Danvers.
281	Bone, Blood and Potash,	Armour Fertilizer Works, Baltimore, Md.,	Worcester.
412	Bone, Blood and Potash,	Armour Fertilizer Works, Baltimore, Md.,	Harvard.
240	All Soluble,	Armour Fertilizer Works, Baltimore, Md.,	Danvers.
317	All Soluble,	Armour Fertilizer Works, Baltimore, Md.,	Worcester.
365	All Soluble,	Armour Fertilizer Works, Baltimore, Md.,	No. Adams.
249	High Grade Potato,	Armour Fertilizer Works, Baltimore, Md.,	Danvers.
310	High Grade Potato,	Armour Fertilizer Works, Baltimore, Md.,	Worcester.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
572	Wheeler's Grass and Oats,	11.44	—	—	8.55	3.29	.92	12.76	12-15	11.84	11-13	2.40	2-3
545	Wheeler's Havana Tobacco Grower,	10.20	2.37	2.4-3	3.94	3.34	2.08	9.36	7-10	7.28	6-8	10.38	10-12
557	Williams & Clark's Potato Phosphate,	10.91	2.34	2.5-3.25	3.56	3.50	2.00	9.06	8-11	7.06	6-8	5.60	5-6
569	Williams & Clark's Potato Manure,	13.54	2.11	2.06-2.88	5.80	3.39	1.79	10.98	10-13	9.19	8-10	3.24	3-4
571	Williams & Clark's Corn Manure,	12.99	2.05	2.06-2.88	5.67	3.53	1.98	11.18	10-13	9.20	8-10	1.90	1.5-2.5
550	Williams & Clark's Prolific Crop Producer,	13.14	1.15	.82-1.65	4.07	4.29	1.74	10.10	8-11	8.36	7-9	2.00	1-2
299	Harvest King,	11.5	1.51	1.2-2.	5.60	3.02	2.56	11.18	10-12	8.62	8-10	2.56	2-3
421-507	Eagle Brand Fertilizer,	6.25	2.35	3-4	.93	10.37	3.78	15.08	14-15	11.30	11-12	11.94	10-11*
237-281-412	Blood, Bone and Potash,	10.55	4.26	4.11-4.94	5.18	3.93	.77	9.88	10-12	9.11	8-10	6.28	7-8
240-317-365	All Soluble,	10.80	2.90	2.51-3.30	6.59	2.23	.98	9.80	—	8.82	8-10	4.36	4-5
249-310	High Grade Potato,	8.97	1.68	1.65-2.47	6.40	2.16	1.54	10.10	—	8.56	8-10	10.14	10-11

*Sulphate of potash. the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
165	Farquhar's Lawn and Garden Dressing,	Bartlett & Holmes,* Springfield, Mass.,	Boston.
211	Farquhar's Lawn and Garden Dressing,	Bartlett & Holmes,* Springfield, Mass.,	Boston.
455	Farquhar's Lawn and Garden Dressing,	Bartlett & Holmes,* Springfield, Mass.,	Amherst.
376	Ammoniated Bone Phosphate,	Berkshire Fertilizer Co., Bridgeport, Conn.,	Pittsfield.
437	Ammoniated Bone Phosphate,	Berkshire Fertilizer Co., Bridgeport, Conn.,	No. Amherst.
584	Beach's Advance Brand,	Beach Soap Co., Lawrence, Mass.,	Lowell.
246	Lawn and Garden Dressing,	Joseph Breck & Sons, Boston, Mass.,	Boston.
13	Stockbridge Potato and Vegetable,	Bowker Fertilizer Co., Boston, Mass.,	Fall River.
17	Stockbridge Potato and Vegetable,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
88	Stockbridge Potato and Vegetable,	Bowker Fertilizer Co., Boston, Mass.,	Northampton.
50	Stockbridge Onion Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
125	Stockbridge Onion Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Northampton.
32	Bowker's Soluble Animal Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
40	Bowker's Dry Ground Fish,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
531	Bowker's Dry Ground Fish,	Bowker Fertilizer Co., Boston, Mass.,	No. Hadley.
47	Bowker's Corn Phosphate,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
235	Bowker's Corn Phosphate,	Bowker Fertilizer Co., Boston, Mass.,	Haverhill.
364	Bowker's Corn Phosphate.	Bowker Fertilizer Co., Boston, Mass.,	No. Adams.
516	Bowker's Tobacco Starter,	Bowker Fertilizer Co., Boston, Mass.,	Amherst.
517	Bowker's Tobacco Ash Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Amherst.

*Succeeded by Chicopee Rendering Co.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
165-211-455	Farquhar's Lawn and Garden Dressing, ..	7.66	4.26	3.3-4.12	—	7.70	5.86	13.56	14-17	7.70	4-5	7.30	7-8
376-437	Ammoniated Bone Phosphate, ...	5.71	1.10	.82-1.65	4.39	3.31	2.32	10.02	10-12	7.70	8-10	2.56	2-3*
584	Beach's Advance Brand, ...	9.69	3.77	3.3-4.12	3.90	5.84	1.18	10.92	10-13	9.74	8-10	6.20	7-8
246	Lawn and Garden Dressing,............	6.01	4.54	4.12-4.94	1.73	3.59	.80	6.12	—	5.32	5-6	5.20	5-6
13-17-88	Stockbridge Potato and Vegetables,......	10.13	3.12	3-4	2.75	3.37	2.10	8.22	7-10	6.12	5-7	10.00	10-12
50-125	Stockbridge Onion Fertilizer, ...	9.64	4.36	4-5	2.30	2.80	1.28	6.38	6-8	5.10	4-5	5.80	5-6
32	Bowker's Soluble Animal Fertilizer,......	8.78	2.64	2-3	4.80	3.92	1.56	10.28	10-12	8.72	9-11	3.72	4-5
40-531	Bowker's Dry Ground Fish,............	8.08	7.33	8-10	—	3.84	2.20	6.04	4.58-5.50	3.84	—	—	—
47-235-364	Bowker's Corn Phosphate, ...	7.86	1.53	1.5-2.5	5.31	3.10	1.97	10.38	10-12	8.41	8-10	2.16	2-4
516	Bowker's Tobacco Starter, ...	10.56	2.56	2.25-3.25	6.63	2.15	2.28	11.06	10-12	8.78	8-10	3.48	3-4*
517	Bowker's Tobacco Ash Fertilizer, ...	8.73	2.15	3-4	—	6.60	1.86	8.46	—	6.60	5-7	14.56	13-15†

*Sulphate of potash, the source of potash.

†Carbonate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
41	Bristol Fish and Potash,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
432	Bristol Fish and Potash,	Bowker Fertilizer Co., Boston, Mass.,	Springfield.
52	Pure Unleached Hard Wood Ashes,	Bowker Fertilizer Co., Boston, Mass.,	Fall River.
175	Pure Unleached Hard Wood Ashes,	Bowker Fertilizer Co., Boston, Mass.,	Boston.
234	Pure Unleached Hard Wood Ashes,	Bowker Fertilizer Co., Boston, Mass.,	Haverhill.
78	Market Garden Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Northampton.
386	Market Garden Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Williamstown.
430	Market Garden Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Springfield.
228	Potash Bone,	Bowker Fertilizer Co., Boston, Mass.,	Haverhill.
245	Sure Crop Bone Phosphate,	Bowker Fertilizer Co., Boston, Mass.,	Haverhill.
283	Ten Per Cent Manure,	Bowker Fertilizer Co., Boston, Mass.,	Hudson.
313	Bone and Wood Ash Fertilizer,	Bowker Fertilizer Co., Boston, Mass.,	Lowell.
428	Bone and Wood Ash Fertilizer,	Bowker Fertilizer Co,, Boston, Mass.,	Springfield.
327	Blood, Bone and Potash,	Bowker Fertilizer Co., Boston, Mass.,	Lowell.
363	Complete Mixture,	Bowker Fertilizer Co., Boston, Mass.,	Williamstown.
446	Tobacco Ash Elements,	Bowker Fertilizer Co., Boston, Mass.,	Springfield.
452	Ammoniated Food for Flowers,	Bowker Fertilizer Co., Boston, Mass.,	Pittsfield.
480	Fish and Potash " D " Brand,	Bowker Fertilizer Co., Boston, Mass.,	Springfield.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
41-432	Bristol Fish and Potash,	9.43	1.50	1.5-2.5	2.88	6.34	2.78	12.00	8-10	9.22	—	2.20	2-3
52-175-234	Pure Unleached Hard Wood Ashes,	9.73	—	—	—	—	—	1.89	1-3	—	—	5.28	4.7†
78-386-430	Market Garden Fertilizer,	9.76	2.36	2.25-3.25	3.65	2.95	1.84	8.44	7-10	6.60	6-8	9.80	10-11
228	Potash Bone,	7.59	.87	.82-1.65	2.28	3.70	2.08	8.06	8-9	5.98	6-8	2.04	2-3
245	Sure Crop Bone Phosphate,	10.67	1.00	.75-1.00	4.93	3.57	2.14	10.64	11-12	8.50	6-9	1.92	2-4
283	Ten Per Cent Manure,	6.93	.78	.75-1.50	1.34	3.28	2.08	6.70	7-9	4.62	5-7	10.24	10-12
313-428	Bone and Wood Ash Fertilizer,	12.22	1.70	1.5-2.5	—	6.16	3.02	9.18	8-10	6.16	6-8	2.42	2-3
327	Blood, Bone and Potash,	10.35	3.93	4.12	1.98	4.04	3.24	9.26	—	6.02	8	7.02	7
363	Complete Mixture,	14.90	2.38	2-3	6.05	2.07	1.66	9.78	9-13	8.12	8-10	4.22	4-5
446	Tobacco Ash Elements,	2.95	—	—	—	6.00	5.60	11.60	—	6.00	6-7	15.18	15-18†
452	Ammoniated Food for Flowers,	9.16	2.42	2	—	5.70	6.06	11.76	6	5.70	3	3.22	2*
480	Fish and Potash "D" Brand,	6.35	2.34	2.25-3.25	1.02	3.02	4.64	8.68	8-10	4.04	—	2.02	2-3

*Sulphate of potash, the source of potash.

†Carbonate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
23	Special Onion Fertilizer,	E. Frank Coe Co., New York City,	Dighton.
29	Red Brand Excelsior Guano,	E. Frank Coe Co., New York City,	Dighton.
31	Potato Fertilizer,	E. Frank Coe Co., New York City,	Dighton.
56	Gold Brand Excelsior Guano,	E. Frank Coe Co., New York City,	Dighton.
398	Columbian Corn Fertilizer,	E. Frank Coe Co., New York City,	Greenfield.
472	Columbian Corn Fertilizer,	E. Frank Coe Co., New York City,	Westfield.
406	Special Potato Fertilizer,	E. Frank Coe Co., New York City,	Greenfield.
469	Special Potato Fertilizer,	E. Frank Coe Co., New York City,	Westfield.
471	Columbian Potato Fertilizer,	E. Frank Coe Co., New York City,	Westfield.
498	Tobacco and Onion Fertilizer,	E. Frank Coe Co., New York City,	No. Hadley.
28	American Farmers' Complete Potato,	E. Frank Coe Co., New York City,	Dighton.
214	Tankage, Bone and Potash,	Hardy Packing Co., Chicago, Ill.,	Amesbury.
328	Tankage, Bone and Potash,	Hardy Packing Co., Chicago, Ill.,	Concord.
470	Tankage, Bone and Potash,	Hardy Packing Co., Chicago, Ill.,	Westfield.
438	Potato Manure,	Lister's Agricultural Chemical Works, Newark, N. J.,	No. Amherst.
450	High Grade Special for Spring Crops,	Lister's Agricultural Chemical Works, Newark, N. J.,	Agawam.
458	High Grade Special for Spring Crops,	Lister's Agricultural Chemical Works, Newark, N. J.,	Westfield.
477	Animal Bone and Potash,	Lister's Agricultural Chemical Works, Newark, N. J.,	Westfield.
479	Special Corn Fertilizer,	Lister's Agricultural Chemical Works, Newark, N. J.,	Agawam.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Total. Found.	Total. Guaranteed.	Available. Found.	Available. Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
23	Special Onion Fertilizer, ...	10.38	1.16	.82-1.65	6.63	1.65	1.46	9.74	9-10	8.28	7-9	6.90	8-9*
29	Red Brand Excelsior Guano, ...	6.82	3.06	3.4-4.	7.71	1.59	1.82	11.12	10.5-11	9.30	9-10.5	6.00	6-7*
31	Potato Fertilizer, ...	9.49	2.42	2.4-3.	6.52	1.50	1.84	9.86	8-9	8.02	7-9	7.30	8-9*
56	Gold Brand Excelsior Guano, ...	7.01	3.01	2.4-3.3	7.91	1.81	1.38	11.10	9-10	9.72	7.5-9	6.04	6-7*
398-472	Columbian Corn Fertilizer, ...	11.25	1.35	1.23-1.5	7.80	2.22	1.54	11.56	10.5-11	10.02	8.5-10.5	4.08	2.5-3
406-469	Special Potato Fertilizer, ...	9.61	1.84	1.65-2	6.75	2.17	1.72	10.64	9.5-10.5	8.92	8-9.25	4.38	4-5*
471	Columbian Potato Fertilizer, ...	9.55	1.40	1.2-1.5	7.27	1.97	2.00	11.24	9.5-10.5	9.24	8.5-10	2.82	2.5-3.5*
498	Tobacco and Onion Fertilizer, ...	7.03	3.40	3-4	4.90	2.44	2.44	9.78	7-9	7.34	6-7	7.24	8-9*
28	American Farmers' Complete Potato, ...	11.93	1.71	1.6-2	6.78	1.80	1.58	10.16	8.5-9.5	8.58	7-9	5.56	6-7
214-328-470	Tankage, Bone and Potash, ...	10.20	1.21	1.24-2.06	5.03	4.89	1.82	11.74	10-12	9.92	8-10	2.14	2-3
438	Potato Manure, ...	9.31	3.54	3.30-4.12	4.03	4.05	3.40	11.48	9-12	8.08	8-10	8.04	7-8
450-458	High Grade Special for Spring Crops, ...	9.36	1.76	1.65-1.80	4.90	3.40	1.84	10.14	10-13	8.30	8-10	10.06	10-10.50
477	Animal Bone and Potash, ...	12.67	—	—	4.96	5.78	1.64	12.38	11	10.74	10	2.00	2
479	Special Corn Fertilizer, ...	12.99	1.69	1.65-2.47	6.46	2.26	2.44	11.16	9-11	8.72	8-11	3.00	3-4

*Sulphate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
171	Swift's Potato Phosphate,	Lowell Fertilizer Co., Boston, Mass.,	Bridgewater.
288	Swift's Potato Phosphate,	Lowell Fertilizer Co., Boston, Mass.,	Hudson.
329	Swift's Potato Phosphate,	Lowell Fertilizer Co., Boston, Mass.,	Worcester.
388	Swift's Potato Phosphate,	Lowell Fertilizer Co., Boston, Mass.,	Ayer.
167	Swift's Lawn Dressing,	Lowell Fertilizer Co., Boston, Mass.,	Boston.
300	Swift's Lawn Dressing,	Lowell Fertilizer Co., Boston, Mass.,	Hudson.
315	Swift's Market Garden Manure,	Lowell Fertilizer Co., Boston, Mass.,	Concord.
402	Swift's Market Garden Manure,	Lowell Fertilizer Co., Boston, Mass.,	Ayer.
177	Vegetable Manure or Complete for Light Soils,	Mapes Formula and Peruvian Guano Co., New York,	Taunton.
183	The Mapes' Potato Manure,	Mapes Formula and Peruvian Guano Co., New York,	Taunton.
269	The Mapes' Potato Manure,	Mapes Formula and Peruvian Guano Co., New York,	Worcester.
184	Complete Manure for General Use,	Mapes Formula and Peruvian Guano Co., New York,	Taunton.
292	Complete Manure for General Use,	Mapes Formula and Peruvian Guano Co., New York,	Worcester.
188	Grass and Grain Spring Top Dressing,	Mapes Formula and Peruvian Guano Co., New York,	Worcester.
302	Grass and Grain Spring Top Dressing,	Mapes Formula and Peruvian Guano Co., New York,	Leominster.
203	Mapes' Cereal Brand,	Mapes Formula and Peruvian Guano Co., New York,	Taunton.
340	Mapes' Cereal Brand,	Mapes Formula and Peruvian Guano Co., New York,	Worcester.
273	Mapes' Corn Manure,	Mapes Formula and Peruvian Guano Co., New York,	Leominster.
280	Mapes' Corn Manure,	Mapes Formula and Peruvian Guano Co., New York,	Worcester.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
171-288-339-388	Swift's Potato Phosphate,	7.40	2.47	2.47-3.30	5.73	2.85	1.38	9.96	9-10	8.58	8-10	6.12	6-7*
167-300	Swift's Lawn Dressing,	8.48	3.62	4.11-4.94	1.70	5.28	1.92	8.90	8-10	6.98	7-9	5.90	5-6
315-402	Swift's Market Garden Manure,	8.27	4.03	4.10-4.94	3.01	4.03	1.56	8.60	8-11	7.04	7-9	6.40	6-7*
177	Vegetable Manure,	10.75	5.07	4.94-6.59	1.54	4.64	3.08	9.26	8-10	6.18	6-8	6.88	6-8*
183-269	The Mapes' Potato Manure,	10.80	3.70	3.71-4.12	2.75	4.96	2.35	10.06	8-10	7.71	8	7.22	6-8*
184-292	Complete Manure for General Use,	13.53	3.38	3.29-4.12	2.43	5.73	3.46	11.62	10-12	8.16	8-10	4.22	4-5
188-302	Grass and Grain Spring Top Dressing,	10.81	4.82	4.94-5.76	2.17	4.81	2.20	9.18	6-8	6.98	5	7.06	7-8
203-340	Mapes' Cereal Brand,	20.52	1.82	1.65-2.47	2.85	4.79	1.80	9.44	8.0	7.64	6-8	3.00	3.50
273-280	Mapes' Corn Manure,	14.37	2.57	2.47-2.88	3.11	6.15	2.56	11.82	10-12	9.26	8-10	6.50	6-7

*Sulphate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
278	Average Soil Complete Manure,	Mapes Formula and Peruvian Guano Co., New York,	Worcester.
284	Complete Manure "A" Brand,	Mapes Formula and Peruvian Guano Co., New York,	Leominster.
301	Complete Manure "A" Brand,	Mapes Formula and Peruvian Guano Co., New York,	Worcester.
305	Fruit and Vine Manure,	Mapes Formula and Peruvian Guano Co., New York,	Worcester.
334	Cauliflower and Cabbage Manure,	Mapes Formula and Peruvian Guano Co., New York,	Fitchburg.
374	Lawn Top Dressing,	Mapes Formula and Peruvian Guano Co., New York,	Pittsfield.
393	Tobacco Manure (Wrapper Brand),	Mapes Formula and Peruvian Guano Co., New York,	Greenfield.
583	New England Corn Phosphate,	New England Fertilizer Co., Boston,	Amherst.
582	New England Potato Fertilizer,	New England Fertilizer Co., Boston,	Amherst.
22	Ammoniated Bone Phosphate,	National Fertilizer Co., Bridgeport, Ct.,	Dighton.
154	Ammoniated Bone Phosphate,	National Fertilizer Co., Bridgeport, Ct.,	New Bedford.
296	Ammoniated Bone Phosphate,	National Fertilizer Co., Bridgeport, Ct.,	Leominster.
30	Complete Root Fertilizer,	National Fertilizer Co., Bridgeport, Ct.,	Dighton.
63	Complete Root Fertilizer,	National Fertilizer Co., Bridgeport, Ct.,	Seekonk.
36	Market Garden Fertilizer,	National Fertilizer Co., Bridgeport, Ct.,	Dighton.
97	Market Garden Fertilizer,	National Fertilizer Co., Bridgeport, Ct.,	So. Deerfield.
263	Market Garden Fertilizer,	National Fertilizer Co., Bridgeport, Ct.,	Leominster.
113	Chittenden's Fish and Potash,	National Fertilizer Co., Bridgeport, Ct.,	No. Hadley.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
278	Average Soil Complete Manure,	15.04	4.28	4.12-4.94	2.21	4.24	1.59	8.04	8-9	6.45	7-8	6.12	5-6*
284-301	Complete Manure "A" Brand,	13.79	2.47	2.47-3.29	2.53	7.41	3.28	13.22	12-16	9.94	10-12	3.06	2.5-3.5
305	Fruit and Vine Manure,	10.20	2.00	1.65-2.47	3.49	4.03	1.58	9.10	7-9	7.52	5-7	11.28	10-12*
334	Cauliflower and Cabbage Manure,	9.29	4.02	4.12-4.94	2.28	4.72	3.20	10.20	6-8	7.00	6-8	5.56	6-8
374	Lawn Top Dressing,	11.31	2.55	2.47-2.88	.87	1.81	1.54	4.22	3.5-4.5	2.68	—	3.10	2.5-3.5
393	Tobacco Manure (Wrapper Brand,)	8.51	5.92	6.18	—	2.94	2.12	5.06	4.50	2.94	—	10.32	10.50*
583	New England Corn Phosphate,	8.83	1.74	1.64	4.67	3.62	1.63	9.92	9	8.29	8	3.40	3
582	New England Potato Fertilizer,	6.04	1.66	1.64	4.09	3.07	1.84	9.00	8	7.16	7	4.34	4*
22-154-296	Ammoniated Bone Phosphate,	11.53	1.76	1.65-2.47	5.67	2.67	1.90	10.24	10-12	8.34	8-10	2.36	2-3
30-63	Complete Root Fertilizer,	11.80	3.50	3.3-4.1	6.65	2.36	1.33	10.34	10-12	9.01	8-10	6.34	6-7
36-97-263	Market Garden Fertilizer,	12.01	2.38	2.47-3.3	6.31	2.61	1.28	10.20	9-10	8.92	7-10	6.60	6-8
113	Chittenden's Fish and Potash,	6.43	3.07	3-4	4.64	1.86	2.00	8.50	6-8	6.50	—	4.20	4-5*

*Sulphate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
148	Potato Phosphate,	National Fertilizer Co., Bridgeport, Ct.,	Dighton.
156	Potato Phosphate,	National Fertilizer Co., Bridgeport, Ct.,	New Bedford.
368	Potato Phosphate,	National Fertilizer Co., Bridgeport, Ct.,	Gt. Barrington.
476	Complete Tobacco Fertilizer,	National Fertilizer Co., Bridgeport, Ct.,	Westfield.
501	Complete Tobacco Fertilizer,	National Fertilizer Co., Bridgeport, Ct.,	No. Hadley.
566	Corn, Oats and Wheat Fish Guano,	The Ohio Farmers' Fertilizer Co., Columbus, Ohio.	Harvard.
567	Potato and Tobacco Special,	The Ohio Farmers' Fertilizer Co., Columbus, Ohio.,	Harvard.
562	Complete for Top Dressing,	R. T. Prentiss, Holyoke, Mass.,	Holyoke.
230	P. & P. Potato Fertilizer,	Parmenter & Polsey Fertilizer Co., Peabody, Mass.,	Peabody.
233	A. A. Brand,	Parmenter & Polsey Fertilizer Co., Peabody, Mass.,	Peabody.
247	Special Fertilizer for Strawberries,	Parmenter & Polsey Fertilizer Co., Peabody, Mass.,	Peabody.
248	Special Potato Fertilizer,	Parmenter & Polsey Fertilizer Co., Peabody, Mass.,	Peabody.
258	Plymouth Rock Brand,	Parmenter & Polsey Fertilizer Co., Peabody, Mass.,	Gloucester.
560	Market Garden Fertilizer,	Benjamin Randall, Boston, Mass.,	Boston.
561	Farm and Field,	Benjamin Randall, Boston, Mass.,	Boston.
333	High Grade Grass and Grain Fertilizer,	Rogers Manufacturing Co., Rockfall, Ct.,	Leominster.
514	High Grade Grass and Grain Fertilizer,	Rogers Manufacturing Co., Rockfall, Ct.,	Amherst.
336	Fish and Potash,	Rogers Manufacturing Co., Rockfall, Ct.,	Fitchburg.
375	Fish and Potash,	Rogers Manufacturing Co., Rockfall, Ct.,	Pittsfield.
415	Fish and Potash,	Rogers Manufacturing Co., Rockfall, Ct.,	Greenfield.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
148-156-368	Potato Phosphate,	12.54	2.18	2.06-2.88	6.69	2.37	1.38	10.44	10-12	9.06	8-10	5.88	6-7
476-501	Complete Tobacco Fertilizer,	8.53	3.58	3.3-4.10	6.69	2.75	1.38	10.82	10-12	9.44	8-11	5.40	5.4-6.48*
566	Corn, Oats and Wheat Fish Guano,	13.89	1.25	1.24-2.47	5.22	3.86	2.26	11.34	10-12	9.08	8-10	2.34	2-3
567	Potato and Tobacco Special,	8.55	1.93	1.65-2.47	4.41	4.87	2.64	11.92	10-12	9.28	8-10	4.12	4-5
562	Complete for Top Dressing,	13.25	5.78	5.77-6.59	6.69	.83	—	7.52	9-11	7.52	9-12	6.16	8-10
230	P. & P. Potato Fertilizer,	6.55	1.55	1.65-2.47	2.28	4.80	2.44	9.52	7-10	7.08	6-8	6.86	6-6.50
233	A. A. Brand,	8.02	4.96	4.53-5.76	4.73	3.46	1.05	9.24	8-11	8.19	7-9	8.64	8-10
247	Special Fertilizer for Strawberries,	8.28	2.69	2.47-3.29	3.71	6.63	2.18	12.52	10-13	10.34	9-11	6.06	6-7*
248	Special Potato Fertilizer,	8.36	3.58	3.29-4.12	3.84	3.86	2.58	10.28	9-13	7.70	8-11	7.42	7-9
258	Plymouth Rock Brand,	4.88	3.03	2.47-3.29	2.62	6.92	2.14	11.68	9-13	9.54	8-11	4.80	4-4.25*
560	Market Garden Fertilizer,	15.49	3.30	3.25-4.	4.29	3.53	2.38	10.20	—	7.82	8-10	4.80	4-5
561	Farm and Field,	14.88	2.01	2-3	1.15	4.03	3.58	8.76	—	5.18	6-8	3.42	2-3
333-514	H. G. Grass and Grain Fertilizer.	5.32	3.10	3-4	—	6.56	11.48	18.04	16-17	6.56	—	14.60	12.5-14.
336-375-415	Fish and Potash,	10.72	3.26	3.25-4.5	2.02	2.48	2.02	6.52	6-8	4.50	4-5	4.18	3.75-4.50

*Sulphate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
337	Corn and Onion Manure,	Rogers Manufacturing Co., Rockfall, Ct.,	Leominster.
362	Corn and Onion Manure,	Rogers Manufacturing Co., Rockfall, Ct.,	Pittsfield.
379	Corn and Onion Manure,	Rogers Manufacturing Co., Rockfall, Ct.,	Williamstown.
441	Tobacco Starter,	Rogers Manufacturing Co., Rockfall, Ct.,	N. Amherst.
529	Tobacco Starter,	Rogers Manufacturing Co., Rockfall, Ct.,	Amherst.
542	All Round Fertilizer,	Rogers Manufacturing Co., Rockfall, Ct.,	Amherst.
579	Hubbard's Fertilizer for Oats and Top Dressing,	The Rogers & Hubbard Co., Middletown, Ct.,	Amherst.
578	Hubbard's Grass and Grain Fertilizer,	The Rogers & Hubbard Co., Middletown, Ct.,	Amherst.
574	Hubbard's Soluble Corn Manure,	The Rogers & Hubbard Co., Middletown, Ct.,	Amherst.
575	Hubbard's Soluble Tobacco Manure,	The Rogers & Hubbard Co., Middletown, Ct.,	Amherst.
580	Hubbard's Phosphate for All Soils and All Crops,	The Rogers & Hubbard Co., Middletown, Ct.,	Amherst.
576	Hubbard's '02 Top Dressing Phosphate,	The Rogers & Hubbard Co., Middletown, Ct.,	Amherst.
64	Essex Rhode Island Special for Potatoes and Roots,	Russia Cement Co., Gloucester, Mass.,	Seekonk.
98	Essex Dry Ground Fish,	Russia Cement Co., Gloucester, Mass.,	Hadley.
124	Essex Market Garden and Potato Manure,	Russia Cement Co., Gloucester, Mass.,	Sunderland.
198	Essex Odorless Lawn Dressing,	Russia Cement Co., Gloucester, Mass.,	Taunton.
453	Essex Flower Food,	Russia Cement Co., Gloucester, Mass.,	Springfield.
506	Essex Flower Food,	Russia Cement Co., Gloucester, Mass.,	No. Adams.
565	Essex Corn Fertilizer,	Russia Cement Co., Gloucester, Mass.,	Harvard.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs. Found.	Nitrogen in 100 lbs. Guaranteed.	Phosphoric Acid in 100 lbs. Soluble.	Reverted.	Insoluble.	Total. Found.	Total. Guaranteed.	Available. Found.	Available. Guaranteed.	Potassium Oxide in 100 lbs. Found.	Potassium Oxide in 100 lbs. Guaranteed.
	Compound Fertilizers.												
337-362-379	Corn and Onion Manure,	10.00	3.69	3.6-4.	1.22	4.12	3.58	8.92	8-9	5.34	6-7	7.76	7-8
441-529	Tobacco Starter,	5.63	2.77	2.5-3.5	.90	4.06	6.34	11.30	8-10	4.96	6-7	5.58	5-6*
542	All Round Fertilizer,	11.44	1.70	1.65-2.65	4.90	2.56	1.64	9.10	10-12	7.46	8-10	3.08	2-3
579	Hubbard's for Oats and Top Dressing,	6.15	8.13	9.32	—	4.32	6.22	10.54	8.25	4.32	—	7.48	9
578	Hubbard's Grass and Grain Fertilizer,	7.55	2.23	2.5-3.	—	8.90	7.22	16.12	16.5-18	8.90	—	11.62	12.5-13
574	Hubbard's Soluble Corn Manure,	14.82	2.45	2.5-3.3	2.72	5.30	2.58	10.60	8-10	8.02	6-8	6.54	8.9
575	Hubbard's Soluble Tobacco Manure,	11.00	4.23	5-6	1.34	7.68	5.48	14.50	10-12	9.02	7.4-8.5	8.38	10-11*
580	Hubbard's for All Soils and All Crops,	14.05	2.93	2.3-3.	5.69	4.19	2.60	12.48	12-14	9.88	10-12	5.76	3-3.5
576	Hubbard's '02 Top Dressing Phosphate,	11.63	3.95	4.5-5.5	3.26	3.90	1.76	8.92	6-8	7.16	4.5-5.5	4.44	4.5-5.5
64	Essex Rhode Island Special,	9.29	2.94	3-3.5	4.32	3.76	3.54	11.62	9-11	8.08	7-8	7.02	6.5-7
98	Essex Dry Ground Fish,	9.10	7.29	8-10	—	7.82	8.70	16.52	11-13	7.82	—	—	—
124	Essex Market Garden and Potato Manure,	8.88	2.08	2-2.5	2.28	5.76	5.86	13.90	10-12	8.04	8-10	5.46	5-6
198	Essex Odorless Lawn Dressing,	4.86	3.93	3.7-4.5	—	5.14	7.02	12.16	8-10	5.14	6-7	7.76	7-8*
453-506	Essex Flower Food,	2.69	3.74	—	.81	3.59	6.52	10.92	—	4.40	—	8.88	—*
565	Essex Corn Fertilizer,	6.27	2.50	2-2.5	2.56	5.84	4.46	12.86	10.5-13	8.40	8.5-10	2.88	3-3.5

*Sulphate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Compound Fertilizers.		
543	Essex Tobacco Starter,	Russia Cement Co., Gloucester, Mass.,	Hadley.
271	A 1 Superphosphate,	Russia Cement Co., Gloucester, Mass.,	Hudson.
353	Potato Manure,	Sanderson Fertilizer and Chem. Co., New Haven, Ct.,	Ashley Falls.
369	Corn Superphosphate,	Sanderson Fertilizer and Chem. Co., New Haven, Ct.,	Ashley Falls.
465	Special with 10 per cent Potash,	Sanderson Fertilizer and Chem. Co., New Haven, Ct.,	Southwick.
45	Fish and Potash,	Wilcox Fertilizer Works, Mystic, Ct.,	Dighton.
70	Fish and Potash,	Wilcox Fertilizer Works, Mystic. Ct.,	Seekonk.
515	Fish and Potash,	Wilcox Fertilizer Works, Mystic, Ct.,	Amherst.
510	High Grade Tobacco Fertilizer,	Wilcox Fertilizer Works, Mystic, Ct.,	Amherst.
511	High Grade Fish and Potash,	Wilcox Fertilizer Works, Mystic, Ct.,	Amherst.
534	Potato Plowman,	Whitman & Pratt Rendering Co., Dracut, Mass.,	Amherst.
533	All Crops,	Whitman & Pratt Rendering Co., Dracut, Mass.,	Amherst.
	Chemicals.		
4	Plain Superphosphate,	Amer. Agric. Chem. Co., Boston, Mass.,	Fall River.
5	Muriate of Potash,	Amer. Agric. Chem. Co., Boston, Mass.,	Fall River.
133	Muriate of Potash,	Amer. Agric. Chem. Co., Boston, Mass.,	New Bedford.
144	Muriate of Potash,	Amer. Agric. Chem. Co., Boston, Mass.,	New Bedford.
518	Muriate of Potash,	Amer. Agric. Chem. Co., Boston, Mass.,	So. Amherst.
7	Nitrate of Soda,	Amer. Agric. Chem. Co., Boston, Mass.,	Fall River.
15	Nitrate of Soda,	Amer. Agric. Chem. Co., Boston, Mass.,	Seekonk.
129	Nitrate of Soda,	Amer. Agric. Chem. Co., Boston, Mass.,	New Bedford.
155	Nitrate of Soda,	Amer. Agric. Chem. Co., Boston, Mass.,	New Bedford.
442	Nitrate of Soda,	Amer. Agric. Chem. Co., Boston, Mass.,	No. Amherst.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Potassium Oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Compound Fertilizers.												
543	Essex Tobacco Starter,	10.23	2.81	2.5-3	6.84	3.62	2.92	13.38	12-14	10.46	9-11	3.90	2.5-3*
271	A 1 Superphosphate,	4.64	1.49	1-1.25	1.57	4.34	7.19	13.10	9-11	5.91	7-8	1.96	2-2.50
353	Potato Manure,	6.70	1.65	1.75-2.5	3.07	3.33	2.18	8.58	9-10	6.40	5-6	6.36	6-7
369	Corn Superphosphate,	7.94	1.79	1.75-2.5	4.93	2.49	1.54	8.96	10-12	7.42	7-8	2.72	2-3
465	Special with 10 per cent Potash,	7.73	4.26	2.5-3.5	.70	1.63	1.92	4.25	9-10	2.33	5-6	6.42	10-12
45-70-515	Fish and Potash,	18.29	2.74	2.46-3.29	1.45	4.32	4.09	9.86	6-8	5.77	5-7	3.80	3-5
510	High Grade Tobacco Fertilizer,	14.66	3.54	3.3-4.3	.32	4.60	1.02	5.94	7-10	4.92	5-7	8.26	7-9*
511	High Grade Fish and Potash,	21.24	3.50	3.3-4.3	3.17	2.87	1.46	7.50	6-8	6.04	5-7	4.26	4-6
534	Potato Plowman,	8.13	3.54	4	4.00	5.36	1.90	11.26	8	9.36	—	7.44	7*
533	All Crops,	10.22	2.81	3	4.13	3.53	4.46	12.12	9	7.66	—	4.08	4
	Chemicals.												
4	Plain Superphosphate,	9.02	—	—	6.84	6.34	2.22	15.40	13.5-16	13.18	12-14	—	—
5-133-144-518	Muriate of Potash,	2.42	—	—	—	—	—	—	—	—	—	48.92	50-55
7-15-129-155-442	Nitrate of Soda,	2.07	15.17	15.8	—	—	—	—	—	—	—	—	—

*Sulphate of potash, the source of potash.

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Chemicals.		
60	Dissolved Bone Black,	American Agricultural Chemical Co., Boston, Mass.,	Fall River.
143	Dissolved Bone Black,	American Agricultural Chemical Co., Boston, Mass.,	New Bedford.
265	Dissolved Bone Black,	American Agricultural Chemical Co., Boston, Mass.,	Fitchburg.
242	Double Manure Salts,	American Agricultural Chemical Co., Boston, Mass.,	Boston.
308	High Grade Sulphate of Potash,	American Agricultural Chemical Co., Boston, Mass.,	Boston.
335	High Grade Sulphate of Potash,	American Agricultural Chemical Co., Boston, Mass.,	Worcester.
96	Castor Pomace,	H. J. Baker & Bro., New York City,	E. Whately.
484	Castor Pomace,	H. J. Baker & Bro., New York City,	Hatfield.
464	Old Gold Brand Cotton Seed Meal,	T. H. Bunch, Little Rock, Ark.,	Southwick.
48	Nitrate of Soda,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
209	Nitrate of Soda,	Bowker Fertilizer Co., Boston, Mass.,	Boston.
18	Muriate of Potash,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
172	Muriate of Potash,	Bowker Fertilizer Co., Boston, Mass.,	Boston.
254	Muriate of Potash,	Bowker Fertilizer Co., Boston, Mass.,	Haverhill.
166	Sulphate of Ammonia,	Bowker Fertilizer Co., Boston, Mass.,	Boston.
207	Dissolved Bone Black,	Bowker Fertilizer Co., Boston, Mass.,	Boston.
227	Superphosphate,	Bowker Fertilizer Co., Boston, Mass.,	Haverhill.
251	High Grade Sulphate of Potash,	Bowker Fertilizer Co., Boston, Mass.,	Haverhill.
319	Kainit,	Bowker Fertilizer Co., Boston, Mass.,	Concord.
321	Dried Blood,	Bowker Fertilizer Co., Boston, Mass.,	Concord.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs. Found.	Nitrogen in 100 lbs. Guaranteed.	Phosphoric Acid in 100 lbs. Soluble.	Reverted.	Insoluble.	Total. Found.	Total. Guaranteed.	Available. Found.	Available. Guaranteed.	Potassium Oxide in 100 lbs. Found.	Potassium Oxide in 100 lbs. Guaranteed.
	Chemicals.												
60-143-265	Dissolved Bone Black,	12.80	—	—	12.09	3.21	1.56	16.86	16-20	15.30	15-18	—	—
242	Double Manure Salts,	.77	—	—	—	—	—	—	—	—	—	27.56	25.94-27.02
308-335	High Grade Sulphate of Potash,	.36	—	—	—	—	—	—	—	—	—	50.16	48-50
96-484	Castor Pomace.	5.94	4.76	4.74-5.77	—	—	—	—	—	—	—	—	—
464	Old Gold Brand Cotton Seed Meal,	6.78	6.36	7	—	—	—	—	—	—	—	—	—
48-209	Nitrate of Soda,	1.88	15.27	15-16	—	—	—	—	—	—	—	—	—
18-172-254	Muriate of Potash,	1.87	—	—	—	—	—	—	—	—	—	50.52	50-55
166	Sulphate of Ammonia,	.78	20.40	19-20	—	—	—	—	—	—	—	—	—
207	Dissolved Bone Black,	12.22	—	—	11.30	4.16	1.22	16.68	—	15.46	15	—	—
227	Superphosphate,	6.17	—	—	2.09	11.03	2.10	15.22	15-17	13.12	13-15	—	—
251	High Grade Sulphate of Potash,	.85	—	—	—	—	—	—	—	—	—	49.40	48-52
319	Kainit,	2.70	—	—	—	—	—	—	—	—	—	11.20	12-13
321	Dried Blood,	10.71	7.99	8.24	—	—	—	—	—	—	—	—	—

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Chemicals.		
103	Cotton Seed Meal, Magnolia Brand,	Chas. M. Cox & Co., Boston, Mass.,	Sunderland.
387	Nitrate of Soda,	Lowell Fertilizer Co., Boston, Mass.,	Ayer.
100	Vegetable Potash,	Olds & Whipple, Hartford, Ct.,	E. Whately.
491	Vegetable Potash,	Olds & Whipple, Hartford, Ct.,	N. Hadley.
223	Acid Phosphate,	Parmenter & Polsey Fertilizer Co., Peabody, Mass.,	Peabody.
225	Nitrate of Soda,	Parmenter & Polsey Fertilizer Co., Peabody, Mass.,	Peabody.
226	High Grade Sulphate of Potash,	Parmenter & Polsey Fertilizer Co., Peabody, Mass.,	Peabody.
252	Muriate of Potash,	Parmenter & Polsey Fertilizer Co., Peabody, Mass.,	Peabody.
87	High Grade Sulphate of Potash,	Russia Cement Co., Gloucester, Mass.,	Hadley.
107	Nitrate of Soda,	Russia Cement Co., Gloucester, Mass.,	Hadley.
189	Nitrate of Soda,	Russia Cement Co., Gloucester, Mass.,	Taunton.
349	High Grade Sulphate of Potash,	Sanderson Fertilizer and Chemical Co., New Haven, Ct.,	Ashley Falls.
	Tankage and Bone.		
332	Fine Ground Bone,	American Agricultural Chemical Co., Boston, Mass.,	Fitchburg.
457	Fine Ground Bone,	American Agricultural Chemical Co., Boston, Mass.,	Springfield.
523	Fine Ground Bone,	American Agricultural Chemical Co., Boston, Mass.,	So. Amherst.
130	Abattoir Bone Dust,	American Agricultural Chemical Co., Boston, Mass.,	New Bedford.
135	Abattoir Bone Dust,	American Agricultural Chemical Co., Boston, Mass.,	New Bedford.
201	Abattoir Bone Dust,	American Agricultural Chemical Co., Boston, Mass.,	Weir.
323	Abattoir Bone Dust,	American Agricultural Chemical Co., Boston, Mass.,	Worcester.

Laboratory Number.	NAME OF BRAND.	Moisture.	Nitrogen in 100 lbs. Found.	Nitrogen in 100 lbs. Guaranteed.	Phosphoric Acid in 100 lbs. Soluble.	Reverted.	Insoluble.	Total. Found.	Total. Guaran-teed.	Available. Found.	Available. Guaran-teed.	Potassium Oxide in 100 lbs. Found.	Potassium Oxide in 100 lbs. Guaran-teed.
	Chemicals.												
103	Cotton Seed Meal.	7.56	6.77	7	—	—	—	—	—	—	—	—	—
387	Nitrate of Soda,	1.43	15.68	15.64	—	—	—	—	—	—	—	—	—
100-491	Vegetable Potash.	6.11	—	—	—	—	—	—	—	—	—	25.44	25.
223	Acid Phosphate,	10.30	—	—	14.90	1.70	—	16.60	—	16 60	—	—	—
225	Nitrate of Soda,	2.89	15.27	15-16	—	—	—	—	—	—	—	—	—
226	H. G. Sulphate of Potash,	1.20	—	—	—	—	—	—	—	—	—	48.04	48-52
252	Muriate of Potash.	2.51	—	—	—	—	—	—	—	—	—	47.44	—
87	H. G. Sulphate of Potash.	1.39	—	—	—	—	—	—	—	—	—	48.40	48-52
107-189	Nitrate of Soda.	2.11	15.67	15 64	—	—	—	—	—	—	—	—	—
349	H. G. Sulphate of Potash,	.83	—	—	—	—	—	—	—	—	—	48.44	48.63-51.33
	Tankage and Bones.												
332-457-523	Fine Ground Bone,	2.59	2.25	2.47-3.29	—	8.32	17.42	25.74	22-25	8.32	—		
130-135-201-323	Abattoir Bone Dust,	9.89	2.71	1.65-2.47	—	12.96	12.30	25.26	14-18	12.96	—		

Mechanical Analysis.

Laboratory Number.	Fine Bone.	Fine Med.	Med.	Coarse Med.
332-457-523	44.64	28.04	17.42	9.90
130-135-201-323	24.54	35.65	28.03	11.78

II. ANALYSES OF COMMERCIAL FERTILIZERS COLLECTED DURING 1903, IN THE GENERAL MARKETS BY THE AGENT OF THE HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Laboratory No.	Name of Brand.	Name of Manufacturer.	Sampled at
	Tankage and Bone.		
504	Animal Brand,	W. H. Abbott, Holyoke, Mass.,	Hatfield.
509	Animal Brand,	W. H. Abbott, Holyoke, Mass.,	Holyoke.
221	Bone Meal,	Armour Fertilizer Works, Baltimore, Md.,	Danvers.
377	Bone Meal,	Armour Fertilizer Works, Baltimore, Md.,	No. Adams.
164	Farquhar's Pure Ground Bone,	Bartlett & Holmes,* Springfield, Mass.,	Boston.
426	Farquhar's Pure Ground Bone,	Bartlett & Holmes,* Springfield, Mass.,	Springfield.
431	Tankage,	Bartlett & Holmes,* Springfield, Mass.,	Springfield.
35	Bowker's Fresh Ground Bone,	Bowker Fertilizer Co., Boston, Mass.,	Dighton.
110	Bowker's Fresh Ground Bone,	Bowker Fertilizer Co., Boston, Mass.,	Northampton.
193	Bowker's Fresh Ground Bone,	Bowker Fertilizer Co., Boston, Mass.,	Taunton.
153	Meat and Bone,	Thomas Hersom & Co., New Bedford, Mass.,	New Bedford.
53	Swift's Lowell Ground Bone,	Lowell Fertilizer Co., Boston, Mass.,	Fall River.
173	Swift's Lowell Ground Bone,	Lowell Fertilizer Co., Boston, Mass.,	Boston.
275	Swift's Lowell Ground Bone,	Lowell Fertilizer Co., Boston, Mass.,	Worcester.
404	Swift's Lowell Ground Bone,	Lowell Fertilizer Co., Boston, Mass.,	Ayer.
389	Fine Knuckle Bone Flour,	The Rogers Manufacturing Co., Rockfall, Ct.,	Greenfield.
577	Hubbard's Raw Knuckle Bone Flour,	The Rogers & Hubbard Co., Middletown, Ct.,	Amherst.
581	Hubbard's Strictly Pure Fine Bone,	The Rogers & Hubbard Co., Middletown, Ct.,	Amherst.
213	Ground Bone,	Salisbury Cutlery Handle Co., Salisbury, Ct.,	Boston.
360	Ground Bone,	Salisbury Cutlery Handle Co., Salisbury, Ct.,	Pittsfield.
147	Pure Ground Bone,	Thomos L. Stetson, Randolph, Mass.,	Brockton.
178	Pure Ground Bone,	Thomas L. Stetson, Randolph, Mass.,	Boston.
483	Pure Ground Bone,	Thomas L. Stetson, Randolph, Mass.,	Amherst.

* Succeeded by Chicopee Rendering Co.

Laboratory Number.	Name of Brand.	Moisture.	Nitrogen in 100 lbs.		Phosphoric Acid in 100 lbs.							Mechanical Analysis.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Total. Found.	Total. Guaranteed.	Available. Found.	Available. Guaranteed.	Fine Bone.	Fine Medium.	Medium.	Coarse Medium.
	Tankage and Bone														
504-509	Animal Brand,	8.89	3.02	3-4	.87	10.31	7.88	19.06	17-19	11.18	12-14	48.89	22.32	15.30	13.49
221-377	Bone Meal,	5.02	2.99	2.47-3.29	—	11.34	14.66	26.00	24-28	11.34	—	44.09	33.51	17.89	4.51
164-426	Farquhar's Pure Ground Bone,	3.60	2.19	2-3	—	10.24	16.86	27.10	27-29	10.24	—	72.13	27.31	.48	.08
431	Tankage,	7.38	4.48	4.12-4.94	—	10.32	7.48	17.80	17-18	10.32	—	50.70	37.10	11.64	.56
35-110-193	Bowker's Fresh Ground Bone,	7.66	2.56	2.47-3.29	—	5.80	16.06	21.86	18-22	5.80	—	29.95	29.76	22.20	18.09
153	Meat and Bone,	10.12	5.16	4.66	—	10.30	6.44	16.74	18.83	10.30	8-11	11.37	49.54	34.30	4.79
53-173-275-404	Swift's Lowell Ground Bone,	10.66	2.72	2.47-3.29	—	10.48	15.78	26.26	25-28	10.48	—	27.37	47.84	24.79	—
389	Fine Knuckle Bone Flour,	8.98	3.75	3.8-4.8	—	8.38	17.70	26.08	24-26	8.38	—	47.05	43.32	9.49	.14
577	Hubbard's Raw Knuckle Bone Flour,	7.59	3.86	3.82-4.	—	8.02	18.08	26.10	24.7-25.6	8.02	—	68.67	31.07	.26	—
581	Hubbard's Strictly Pure Fine Bone,	3.82	3.69	3.79-4.	—	9.18	11.18	20.36	22-23	9.18	—	22.19	52.42	24.94	.45
213-360	Ground Bone,	8.82	4.00	—	—	8.06	17.56	25.62	—	8.06	—	35.03	30.50	26.09	8.38
147-178-483	Pure Ground Bone,	8.44	4.20	4.20	—	9.53	13.20	22.73	20.66	9.53	—	15.62	24.76	38.46	21.16

TRADE VALUES OF FERTILIZING INGREDIENTS IN RAW MATERIALS AND CHEMICALS FOR 1903.

	1902	1903
	CENTS PER POUND	
Nitrogen in ammonia salts,	16.5	17.5
" nitrates,	15.0	15.0
Organic nitrogen in dry and fine ground fish, meat, blood, and in high-grade mixed fertilizers,	16.5	17.0
" " " fine bone and tankage,	16.0	16.5
" " " medium bone and tankage,	12.0	12.0
Phosphoric acid soluble in water,	5.0	4.5
" " soluble in ammonium citrate,	4.5	4.0
" " in fine ground fish, bone and tankage,	4.0	4.0
" " in cottonseed meal, castor pomace and wood ashes,	4.0	4.0
" " in coarse fish, bone and tankage,	3.0	3.0
" " insoluble (in water and in neutral citrate of ammonia) in mixed fertilizers,	2.0	2.0
Potash as Sulphate, free from Chlorides,	5.0	5.0
" " Muriate (chloride),	4.25	4.25

The above schedule of trade values was adopted by representatives of the Massachusetts, Connecticut, Rhode Island, Maine, Vermont and New Jersey Experiment Stations at a conference held during the month of March, 1903, and is based upon the condition of the fertilizer market in centers of distribution in New England, New York and New Jersey during the six months preceding March, 1903, and refers to the current market prices of the leading standard raw materials, which furnish nitrogen, phosphoric acid and potash, and which enter largely into the manufacture of our commercial fertilizers.

HATCH EXPERIMENT STATION

OF THE

MASSACHUSETTS AGRICULTURAL COLLEGE.

BULLETIN NO. 93.

CONCENTRATED FEEDS.

DECEMBER, 1903.

The regular Bulletins of this Station will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same. Technical Bulletins are sent only to those persons interested in the subject treated of in each case.

AMHERST, MASS.:
PRESS OF CARPENTER & MOREHOUSE
1903.

HATCH EXPERIMENT STATION

OF THE

Massachusetts Agricultural College,

AMHERST, MASS.

STATION STAFF:

Henry H. Goodell, LL. D.,	*Director.*
William P. Brooks, Ph. D.,	*Agriculturist.*
George E. Stone, Ph. D.,	*Botanist.*
Charles A. Goessmann, Ph.D., LL.D.,	*Chemist* (Fertilizers).
Joseph B. Lindsey, Ph. D.,	*Chemist* (Foods and Feeding).
Charles H. Fernald, Ph. D.,	*Entomologist.*
Frank A. Waugh, M. S.,	*Horticulturist.*
J. E. Ostrander, C. E.,	*Meteorologist.*
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——— ———	*Assistant Horticulturist.*
——— ———	*Assistant Horticulturist.*
Fred. F. Henshaw,	*Observer.*

The co-operation and assistance of farmers, fruit-growers, horticulturists, and all interested, directly or indirectly, in agriculture, are earnestly requested. The Bulletins will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same. General bulletins, fertilizer analyses, analyses of feed-stuffs, and annual reports are published. Kindly indicate in application which of these are desired. Communications may be addressed to the

Hatch Experiment Station, Amherst, Mass.

Division of Foods and Feeding.

CONCENTRATED FEEDS.

JOSEPH B. LINDSEY.[1]

TABLE OF CONTENTS.

A. THE NEW FEED LAW.

The particular attention of manufacturers, jobbers, local dealers and consumers is called to the following law:

[CHAP. 122.][2]

AN ACT TO REGULATE THE SALE OF CONCENTRATED COMMERCIAL FEED STUFFS.

Be it enacted, etc., as follows:

Statements to be attached to packages.

SECTION 1. Every lot or parcel of concentrated commercial feed stuff, as defined in section two of this act, used for feeding farm live stock, sold, or offered or exposed for sale within this Commonwealth, shall have affixed thereto, in a conspicuous place on the outside thereof, a plainly printed statement, clearly and

[1] With the coöperation of E. B. Holland, P. H. Smith and W. E. Tottingham.
[2] Acts and Resolves of Massachusetts for 1903.

tru y certifying the name, brand or trademark under which the article is sold for feeding purposes, the name and address of the manufacturer, importer or dealer, the net weight of the package, and the minimum percentage of crude protein, reckoning one per cent of nitrogen equal to six and one-fourth per cent of protein, and crude fat which it contains; the several constituents to be determined by the methods adopted by the Association of Official Agricultural Chemists of the United States. If the feed stuff is sold in bulk, or if it is put up in packages belonging to the purchaser, the agent or the dealer shall, upon request of the purchaser, furnish him with the certified statement described in this section.

Defines feed stuffs included in law.

SECTION 2. The term "concentrated commercial feed stuff," as used in this act, shall include cottonseed meals, linseed meals, pea meals, bean meals, peanut meals, cocoanut meals, gluten meals, gluten feeds, maize feeds, starch feeds, sugar feeds, dried distillers' grains, dried brewers' grains, dried beet refuse, malt sprouts, malt refuse, hominy feeds, cerealine feeds, rice meals, oat feeds, corn and oat feeds, corn, oat and barley feeds, chop feeds, corn bran, ground beef or fish, scraps, meat and bone meals, mixed feeds—except as otherwise provided in section three of this act,—clover meals, condimental stock and poultry foods, patented, proprietary or trade-marked stock and poultry foods, and all other materials of a similar nature not included in section three of this act.

Defines feed stuffs exempt from law.

SECTION 3. The term "concentrated commercial feed stuff," as used in this act, shall not include hays and straws, the whole seeds nor the unmixed meals made directly from the entire grains of wheat, rye, barley, oats, Indian corn, buckwheat and broom corn. Neither shall it include wheat bran or wheat middlings not mixed with other substances but sold separately as distinct articles of commerce, nor wheat bran and wheat middlings mixed together, not mixed with any other substances, and known in the trade as "Mixed Feed," nor pure grains ground together unmixed with other substances.

Penalty for violation of previous sections.

SECTION 4. Any manufacturer, importer, agent or other person selling, offering or exposing for sale any concentrated feed stuff included in section two of this act, without the printed statement required by section one of this act, or with a label stating that the said feed stuff contains substantially a larger percentage of either crude protein or crude fat than is actually present therein, shall be fined fifty dollars for the first offence and one hundred dollars for each subsequent offence.

Director or deputy required to collect and analyze samples. Penalty for interference. Results to be published.

SECTION 5. The director of the Hatch experiment station of the Massachusetts Agricultural College is hereby authorized, in person or by deputy, to enter any premises where feed stuffs are stored and to take a sample, not exceeding two pounds in weight, from any lot or package of any commercial feed stuff used for feeding any kind of farm live stock as defined in section two or of excepted materials named in section three of this act, which may be in possession of any manufacturer, importer, agent or dealer. Any sample so taken shall be put in a suitable vessel, and a label signed by the director or his deputy shall be placed on or within the vessel, stating the name or brand of the feed stuff or material sampled, the guaranty, the name of the manufacturer, importer or dealer, the name of the person, firm or corporation from whose stock the sample was taken, and the date and place of taking: *provided, however*, that whenever a request to that effect is made the sample shall be taken in duplicate and carefully sealed in the presence of the person or persons in interest, or their representative, in which case one of the said duplicate samples shall be signed and retained by the person or persons whose stock was sampled. Any person who shall obstruct the director or his deputy while in the discharge of his duty under this act shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined not less than twenty-five dollars nor more than one hundred dollars for each offence. The aforesaid director shall cause at least one analysis of each feed stuff collected as herein provided, to be made annually. Said analysis may include determinations of crude protein, of crude fat, and of such other ingredients as it is deemed advisable at any time to determine. Said director shall cause the results of the analysis of the sample to be published from time to time in station bulletins, special circulars, or elsewhere, together with such additional information concerning the character, composition and use thereof as circumstances may require.

Adulteration of whole or ground grain or standard by-products; penalty.

SECTION 6. Any person who shall adulterate any whole or ground grain with milling or manufacturing offals, or with any foreign substance whatever, or adulterate any bran or middlings, or mixtures of wheat bran and wheat middlings known in the trade as "Mixed Feed," or any other standard by-product made from the several grains or seeds with any foreign substance whatever, for the purpose of sale, unless the true composition, mixture or adulteration thereof is plainly marked or indicated upon the package containing the same or in which it is offered for sale; and any person who knowingly sells or offers for sale any whole or ground grain, bran or middlings, or mixture of wheat bran and wheat middlings known in the trade as "Mixed Feed," or other standard by-product, which have been so adulterated, unless the true composition, mixture or adulteration is plainly marked or indicated upon the package containing the same or in which it is offered for sale, shall on conviction be fined not less than twenty-five dollars or more than one hundred dollars for each offence, and such fines shall be paid into the treasury of the Commonwealth.

Director to prosecute violators of Act.

SECTION 7. The director of the Hatch experiment station upon ascertaining any violations of this act for the first time shall forthwith notify the manufacturers or importers in writing, giving them not less than thirty days thereafter in which to comply with the requirements of this act. In case of second or subsequent violations by the same person or persons, or in case after a lapse of thirty days the requirements of this act remain uncomplied with, it shall be the duty of the director of the said station to prosecute the person or persons violating any provision of this act, and for this purpose the director may, if necessary, employ experts, and may further designate some person connected with the said station, or some other suitable person, to make complaints in its behalf; and in making complaints for violations of this act the persons so designated shall not be required to enter into any recognizance or to give security for the payment of costs: *provided, however*, that there shall be no prosecution in relation to the quality of any unadulterated commercial feed stuff if the same shall be found to be substantially equivalent to the statement of analysis made by the manufacturers or importers.

SECTION 8. This act shall not affect persons manufacturing, importing or purchasing feed stuffs for their own use and not to sell in this state.

SECTION 9. The term "importer," for all the purposes of this act, shall be taken to include all who procure or sell concentrated commercial feed stuffs.

SECTION 10. To defray the expenses of making the analyses and of carrying out the regulations provided for or made by under this act the sum of three thousand dollars shall be allowed for the present year from the treasury of the Commonwealth, payable in semi-annual payments.

SECTION 11. Section twenty and so much of any other section of chapter fifty-seven of the Revised Laws as is inconsistent with this act are hereby repealed.

SECTION 12. This act shall take effect on the first day of July in the year nineteen hundred and three. [*Approved March 2, 1903.*]

INTERPRETATIONS.

Bulk Sales. For sales in bulk from the wholesaler or jobber to the retailer, plainly printed cards tacked to the outside and inside of the car, stating brand, name and address of the manufacturer and guaranty of protein and fat meet the legal requirements. The retailer must have similar statements to furnish the purchaser upon request for the same. In most cases the cards from the car tacked up in a conspicuous place on or near the bin will probably suffice. If the retailer bags the feed in his own sacks and so offers the same for sale, tags must be attached as in the case of other feeds.

Feeds Exempt. It has not been deemed necessary to assume any oversight of the sale of wet brewers' grains, wet malt refuse, wet yeast refuse and similar products. Hays and straws; the grains—wheat, rye, barley, oats, Indian corn, buckwheat and broom corn—when whole, ground separately or ground together; wheat bran, wheat middlings and wheat mixed feed (bran and middlings) are exempt under section 3 of the law, but this exemption only applies when these products are free from other substances.

Poultry meals and scratching grains composed solely of the grains mentioned above, free from other seeds, by-products, and materials like charcoal, grit, shells, etc., are also exempt.

Unground wheat screenings are considered exempt; ground wheat screenings, however, must conform to the law.

B. FEED STANDARDS.

A standard for comparison is always necessary in passing accurate judgment on the quality of concentrated feed stuffs. The percentages of protein and fat serve as an index of the character of such feeds in the majority of cases. To be of *standard quality*, the various concentrates should maintain the following percentages of protein and fat in addition to a good physical and mechanical condition.

	FEED STUFF.	PROTEIN.	FAT.
Protein Feeds.	*Cottonseed meal,*	43	9
	N. P. linseed meal,	38	2
	O. P. linseed meal,	32	6
	Gluten meal,	35	2
	Gluten feed,	25	3
	Germ-oil meal,	25	10
	Dried distillers' grains,	32	10
	Malt sprouts,	25	1
	Dried brewers' grains,	22	5
	Wheat middlings (flour),	18–20	5
	Wheat middlings (standard),	17–19	5
	Mixed feed,	16–18	4.5
	Wheat bran,	15–17	4.5
	Dairy feed (H–O),	17–19	4–5
	Oat middlings,	16	6
	Rye feed,	15	3
Starchy (Carbohydrate) Feeds.	*Ground oats,*	11	4
	Ground wheat,	11	2
	Barley meal,	11	1.5
	Rye meal,	10	1.5
	Corn meal,	9	3–4
	Hominy meal,	10.5	8
	Provender,	10	4
	Corn and oat feed,	8–10	3–5
	Fortified oat feed (Quaker dairy),	12–14	3–5
	Oat feed,	5–8	2
Poultry Feeds.	*Meat scraps,*	50	12–15
	Meat and bone meal,	35	10
	Bone meal,	25	—
	Poultry meal (ground grains),	13–16	4–5
	Chick and scratching grains,	9–11	2–3
	Clover meal,	12	2

C. RESULTS OF THE INSPECTION.

The samples herein reported were collected largely during the summer and early fall. The inspector visited 224 grain dealers in 108 towns. There have been collected and examined 437 brands, and 772 samples, distributed as follows:

	Brands.	Samples.		Brands.	Samples.
Cottonseed meal,	18	67	Corn meal,	—	18
Linseed meal,	10	26	Hominy meal,	17	32
Gluten meal,	3	9	Corn and oat feed,	39	76
Gluten feed,	9	32	Oat feed,	9	22
Dried distillers' grains,	7	23	Miscellaneous feeds,	10	11
Malt sprouts,	4	4	Animal products,	38	55
Wheat by-products,	184	278	Poultry meal,	10	17
Dairy feeds,	10	15	Scratching grains,	11	18
Oat middlings,	2	3	Clover meal,	7	7
Rye feed,	6	6	Condimental feeds,	43	44

The new law makes possible the employment of a regular inspector who is kept steadily at work in different sections of the state. The consumer has, as it were, a special agent constantly at work to protect his interests. If any feed is found of an especially deceptive or fraudulent nature, the local grain dealer will be immediately informed of the fact.

I. Protein Feeds.

COTTONSEED MEAL.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
		%	%	%	%	%	%
American Cereal Co., Chicago, Ill.							
Sunflower, ... Geo. A. Stevens	Worcester .	6.44	43.05	43.00	8.09	9.00	—
Sunflower, ... Wm. P. Griffen	Pittsfield ...	6.15	42.11	43 00	10.06	9.00	—
Sunflower, ... John S. Wolfe & Co. ...	Pittsfield ...	6.59	44.10	43.00	9.90	9.00	—
Sunflower, ... Noble & Norton	Springfield .	6.98	43.22	43.00	9.97	9.00	—
American Cotton Oil Co., New York, N.Y.							
Burnham Bros.	Gloucester .	7.71	42.91	43.00	7.93	9.00	—
Potter Bros.	N. Adams ..	6.15	42.29	43.00	11.70	9.00	—
Arthur D. Potter	Orange	7.35	47.21	43.00	9.42	9.00	—
R. W. Biggs & Co., Memphis, Tenn.							
Canary, ... W. P. Whittemore ...	Boston	8.10	45.85	43.00	9.54	9.00	—
Canary, ... J. B. Bridges & Co. ...	Deerfield ..	6.03	44.31	43.00	8.24	9.00	—
Canary, ... J. B. Bridges & Co. ...	Deerfield ..	6.95	46.50	43.00	11.72	9.00	—
Canary, ... E. A. Cowee	Worcester .	6.59	42.11	43.00	8.69	9.00	—
J. W. Doon & Son	Natick	8.69	46.12	43.00	9.30	9.00	—
F. W. Brode & Co., Memphis, Tenn.							
Owl, ... J. L. Brown	Fitchburg ..	9.25	45.19	43.00	8.48	9.00	—
Owl, ... Sykes, Hodge, Arnold	N. Adams ..	5.84	44.57	43.00	10.16	9.00	—
Owl, ... H. P. Howland	Spencer ...	8.33	43.17	43.00	9.71	9.00	—
T. H. Bunch, Little Rock, Ark.							
Old Gold, ... Lummis & Parker	Danvers ...	9.00	44.27	43.00	9.64	9.00	—
Old Gold, ... W. K. Gilmore & Son	Wrentham .	8.46	43.66	43.00	9.78	9.00	—
Chapin & Co., St. Louis, Mo.							
Green Diamond, A. F. Butler	Adams	6.68	45.85	43.00	8.86	9.00	—
Green Diamond, G. F. Wetherbee	Gardner ...	6.62	44.84	43.00	9.44	9.00	—
Green Diamond, G. F. Wetherbee	Gardner ...	9.15	43.92	43.00	9.21	9.00	—
Green Diamond, Prentice & Son	Milford ...	8.93	42.46	43.00	9.68	9.00	—
J. Cushing & Co.	Fitchburg ..	5.55	44.18	—	7.04	—	—
Chas. M. Cox Co., Boston, Mass.							
Magnolia, ... W. E. Livingston Co. .	Lowell	9.01	43.96	43.00	8.43	9.00	—
Magnolia, ... W. W. McIntyre	Marlboro ..	8.97	44.57	43.00	9.27	9.00	—
Magnolia, ... S. A. Eastman	Milford	7.97	42.20	43.00	10.78	9.00	—
Magnolia, ... W. H. Smith	Northamp'n	9.15	43.17	43.00	8.16	9.00	—
J. B. Frost	Shelburne .	6.50	45.68	—	9.11	—	—
J. G. Falls & Co., Memphis, Tenn.							
Southern Beauty, J. Paull & Co.	Taunton ..	9.14	43.13	43.00	9.96	9.00	—
Sunflower, ... H. C. Puffer Co.	Springfield .	7.42	46.33	43.00	8.88	9.00	—
Hayley & Hoskins, Memphis, Tenn.							
H & H, ... E. A. Briggs & Co. ...	Attleboro ..	8.22	44.18	43.00	10.48	9-10	—
H & H, ... Wm. P. Griffen	Pittsfield ..	8.69	42.69	43.00	7.41	9-10	—
H & H, ... Noble & Morton	Springfield .	6.79	43.05	43.00	7.59	9-10	—
Humphreys, Godwin & Co., Memphis, Tenn							
Dixie, ... G. R. Hastings & Son.	Boylston ..	8.15	42.83	43.00	8.66	9.00	—
Dixie, ... J. Cushing & Co.	Fitchburg ..	7.71	43.66	43.00	10.05	9.00	—
Dixie, ... F. A. Walker	N. Adams ..	7.35	45.24	43.00	10.14	9.00	—
Dixie, ... Daly Bros.	Uxbridge ..	9.00	43.70	43.00	10.03	9.00	—
Dixie, ... P. W. Eaton & Co. ...	Williamst'n	7.78	46.82	43.00	8.55	9.00	—
Dixie, ... J. B. Garland & Son ..	Worcester .	8.75	43.39	43.00	10.30	9.00	—

COTTONSEED MEAL. (CONTINUED)

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
		%	%	%	%	%	%
Hunter Bros., St. Louis, Mo.							
J. Cushing & Co.	Fitchburg ..	7.99	44.62	43.00	10.32	9.00	—
J. Cushing & Co.	Hudson	8.11	44.22	43.00	10.35	9.00	—
J. B. Garland & Son. .	Worcester .	6.25	45.19	43.00	10.20	9.00	—
T. Skelton Jones & Co., Macon, Ga.							
Georgia Pride,.. F. F. Woodward & Co.	Fitchburg ..	7.65	43.92	43.00	9.20	9.00	—
Geo. B. Robinson Jr., New York, N. Y.							
H. C. Puffer Co.	Springfield .	7.72	45.72	43.00	7.78	9.00	—
H. C. Puffer Co.	Springfield .	8.26	45.94	43.00	7.99	9.00	—
Sledge & Wells Co., Memphis, Tenn.							
Star, ... Chas. H. Cox	Haverhill ..	6.33	42.38	43.00	8.78	9.00	—
Star, ... F. W. Sawtelle & Co. .	Hyde Park .	8.72	43.05	43.00	8.50	9–10	—
Star, ... Edward C. Paull	Taunton ...	9.19	43.83	43.00	9.61	9–10	—
J. E. Soper & Co., Boston, Mass.							
J. W. Raymond	Concord ...	6.46	46.46	—	10.23	—	—
Edward C. Paull	Taunton ...	7.92	43.70	43.00	10.55	9–10	—
Edward C. Paull	Taunton ...	8.17	44.89	—	9.53	—	—
C. L. Beals & Co.	Winchendon	7.78	43.39	43.00	11.19	9–10	—
City Mills	Holyoke ...	6.94	45.86	41.00	8.76	9.00	—
Unknown.							
R. O. .... H. C. Bowen & Son...	Cheshire ...	6.54	48.48	—	9.61	—	—
Below standard.							
American Cereal Co., Chicago, Ill.							
Sunflower,...... Noble & Morton	Springfield .	6.72	38.96	43.00	9.05	9.00	—
Sunflower,...... Noble & Morton	Springfield .	8.40	37.29	43.00	7.80	9.00	10.67
Sunflower,...... A. N. Whittemore & Co.	Worcester .	8.44	38.13	43.00	8.72	9.00	9.41
S. D. Viets Co.	Springfield .	8.27	38.21	43.00	7.55	9.00	—
American Cotton Oil Co., New York, N.Y.							
S. P. Puffer	Amherst ...	7.68	41.15	43.00	9.01	9.00	—
Potter & Co.	Athol	9.03	41.11	43.00	9.36	9.00	—
R. W. Biggs & Co., Memphis, Tenn.							
J. A. Sullivan	Northamp'n	8.13	40.50	43.00	8.69	9.00	—
Chapin & Co., St. Louis, Mo.							
Green Diamond, G. C. Huckins	Grafton	9.71	41.77	43.00	11.12	9.00	—
Green Diamond, H. C. Puffer Co.	Springfield .	8.22	39.62	43.00	9.14	9.00	—
J. G. Falls & Co., Memphis, Tenn.							
Sunflower,...... J. W. Wilder	Springfield .	9.37	41.24	43.00	8.68	9.00	—
Hayley & Hoskins, Memphis, Tenn.							
H & H, ... Haverhill Milling Co...	Haverhill ..	8.46	40.76	43.00	9.76	9–10	—
Sledge & Wells Co., Memphis, Tenn.							
Star, ... Prentiss, Brooks & Co.	Holyoke ...	8.49	41.81	43.00	8.35	9–10	—
Star, ... S. D. Viets Co.	Springfield .	6.55	41.51	43.00	7.21	9–10	—
Southern Cotton Oil Co., New York, N.Y.							
Jefts & Spear	Holden	8.39	39.66	7.50[1]	7.27	—	—
Highest	....	9.71	48.48	—	11.72	—	—
Lowest	....	5.55	37.29	—	7.04	—	—
Average	....	7.79	43.42	—	9.23	—	—

[1] As Ammonia equivalent to 38.57% protein.

LINSEED MEAL.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
		%	%	%	%	%	%
1. New Process.							
American Linseed Co., Chicago, Ill.							
Cleveland Flax.. S. A. Eastman	Milford ...	9.61	37.08	38.00	3.83	1.00	—
Cleveland Flax.. C. B. Sawin & Son ...	Southboro .	9.70	36.33	38-40	3.19	1-3	—
G. F. Wetherbee	Gardner ...	10.79	35.67	38-40	2.07	1-3	—
W. E. Livingston Co.	Lowell	9.00	36.33	38-40	3.33	1-3	—
J. B. Garland & Son ..	Worcester .	9.11	35.32	38-40	2.73	1-3	—
Fine Ground.... Geo. A. Stevens	Worcester .	9.14	36.59	37.5-40	4.00	1-3	—
Average, ...	....	9.56	36.22	—	3.19	—	—
2. Old Process.							
American Linseed Co., Chicago, Ill.							
Haverhill Milling Co ..	Haverhill ..	8.01	35.58	32-36	6.89	5-7	—
W. E. Livingston Co.	Lowell	9.18	34.05	32-36	6.86	5-7	—
Arthur D. Potter	Orange	7.17	34.93	32-36	8.43	5-7	—
Chapin & Co., Boston, Mass.							
Export, ... Torrence, Vary & Co.	Lynn	9.78	32.34	36.00	7.12	7.00	—
Hunter Bros., St. Louis, Mo.							
J. Cushing & Co.	Fitchburg ..	7.97	34.18	34.00	10.21	6.50	—
Kelloggs & Miller, Amsterdam, N. Y.							
M. C. Richmond	Adams	9.92	33.57	36.70	9.31	7.83	—
W. N. Potter & Co. ...	Charlemont	7.00	34.57	36.70	8.68	7.83	—
Mann Bros. Co., Buffalo, N. Y.							
W. D. Manvell	Sheffield ...	9.87	34.01	34.15	7.73	6.05	—
Metzger Seed & Oil Co., Toledo, Ohio.							
W. N. Potter & Co ...	Charlemont	8.52	35.85	—	6.12	—	—
F. F. Woodward & Co.	Fitchburg ..	9.45	32.38	32-36	7.50	5-7	—
Cutler Co.	W. Brookf'd	9.64	31.11	32-36	8.11	5-7	—
Midland Linseed Co., Minneapolis, Minn.							
Prentiss, Brooks & Co.	Easthamp'n	8.07	32.87	32.5-37.5	11.04	5.5-8.5	—
W. N. Potter & Sons .	Greenfield .	8.50	32.52	32.5-37.5	8.95	5.5-8.5	—
H. Bruckman	Lawrence .	9.21	33.17	—	8.94	—	—
W. N. Potter's Sons & Co.	Northamp'n	8.88	32.52	—	8.39	—	—
J. A. Sullivan	Northamp'n	8.02	34.01	—	9.62	—	—
Union Linseed Co., Troy, N. Y.							
Cow, ... F. A. Walker	N. Adams .	9.85	34.40	22.09	8.69	6.32	—
Cow, ... F. A. Walker	N. Adams .	10.82	33.87	22.09	8.87	6.32	—
Slightly below standard.							
Metzger Seed & Oil Co., Toledo, Ohio.							
H. C. Puffer Co.	Springfield .	9.69	30.32	32-36	7.98	5-7	—
M. J. Jencks	Webster ...	9.85	30.19	32-36	8.06	5-7	—
Highest	....	10.82	35.85	—	11.04	—	—
Lowest	....	7.00	30.19	—	6.12	—	—
Average	....	8.97	33.32	—	8.38	—	—

GLUTEN MEAL.

Manufacturer or Jobber, Brand and Retailer.	Sampled at :	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
		%	%	%	%	%	%
Atlantic Starch Works, Westport, Conn.							
Atlantic[1], ... Cutler Grain Co.	Framing'am	9.06	45.68	38-40	1.86	1-2	—
National Starch Co., Chicago, Ill.							
King[2], ... E. A. Cowee	Hudson	8.62	34.89	—	1.60	—	—
Chas. Pope Glucose Co., Chicago, Ill.							
Cream, ... H. C. Bowen & Son ..	Cheshire ...	9.58	37.60	34.12	2.04	3.20	—
Cream .... H. C. Bowen & Son ..	Cheshire ...	10.71	36.46	34.12	2.37	3.20	—
Cream, ... Haverhill Milling Co. .	Haverhill ..	8.16	43.61	34.12	0.74	3.20	—
Cream, ... John Shea	Lawrence .	11.19	35.76	34.12	2.01	3.20	—
Cream, ... H. C. Puffer Co.	Springfield .	9.41	35.93	34.12	2.07	3.20	—
Cream, ... J. B. Garland & Son ..	Worcester .	11.10	36.38	34.12	1.54	3.20	—
Below standard.							
National Starch Co., Chicago, Ill.							
King[2], ... J. W. Raymond	Concord ...	10.59	31.50	—	1.05	—	—
Highest	....	11.19	45.68	—	2.37	—	—
Lowest	....	8.16	34.89	—	0.74	—	—
Average	....	9.82	37.53	—	1.70	—	—

GLUTEN FEED.

Manufacturer or Jobber, Brand and Retailer.	Sampled at :	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
Glucose Sugar Refining Co., Chicago, Ill.							
Buffalo. .... J. L. Holley estate	Amherst ...	9.38	24.57	28-30	2.46	3-5	—
Buffalo, ... J. H. Bosworth	Chicopee ..	8.52	24.57	28.00	3.99	3.00	—
Buffalo. .... Howe Bros.	Gardner ...	8.07	26.33	28.00	4.22	3.00	—
Buffalo. .... G. F. Wetherbee	Gardner ...	9.27	25.67	28.00	2.52	3.00	—
Buffalo, ... Chas. H. Cox	Haverhill ..	6.13	26.20	—	4.38	—	—
Buffalo, ... C. G. Burnham	Holyoke ...	9.18	24.88	28.00	2.91	3.00	—
Buffalo. .... Noble & Morton	Springfield .	8.42	27.82	28.00	2.67	3.00	—
Buffalo, ... E. A. Cowee	Worcester .	7.39	27.69	28.00	3.75	3.00	—
R. M. Gould	W.Brookf'd	8.24	24.09	28.50	2.70	2.50	—
Illinois Sugar Refining Co., Chicago, Ill.							
Pekin, ... Prentice & Son	Milford ...	7.85	26.63	28.00	4.42	3.00	—
Pekin. .... C. L. Beals & Co.	Winchend'n	9.78	25.19	28.00	3.85	3.00	—
Pekin, ... J. B. Garland & Son ..	Worcester .	9.98	26.29	28.00	2.59	3.00	—
Pekin, ... A.N.Whittemore & Co.	Worcester .	8.35	24.31	28.00	2.74	3.00	—
B. W. Brown	Concord ...	8.34	25.94	—	3.18	—	—
National Starch Co., Chicago, Ill.							
Queen, ... G. H. Huckins	Grafton	9.85	24.62	—	2.49	—	—
Queen. .... John S. Wolfe & Co ..	Pittsfield ...	7.44	24.18	27.10	2.35	3.20	—
New York Glucose Co., New York, N. Y.							
Globe. .... E. A. Briggs & Co. ...	Attleboro ..	9.04	24.79	27.00	2.70	3.12	—
Globe. .... A. E. Lawrence & Son	Ayer	8.32	25.50	27.00	2.38	3.12	—
Globe. .... G. F. Wetherbee.	Gardner ...	6.39	26.67	27.00	3.35	3.12	—
Globe. .... W.N.Potter'sSons& Co	Northamp'n	9.36	24.88	27.00	3.20	3.12	—

[1] Wheat gluten.
[2] Withdrawn from the market.

GLUTEN FEED. (CONTINUED)

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
		%	%	%	%	%	%
Noyes & Colby, Boston, Mass.							
J. W. Raymond	Concord ...	9.34	25.94	—	4.37	—	—
Unknown.							
H. C. Bowen & Son ..	Cheshire ...	9.51	26.29	—	3.21	—	—
Below standard.							
Flint Mill Co., Milwaukee, Wis.							
Flint, ... E. E. Cole	Billerica ...	8.28	20.84	28.50	3.66	3.00	—
Glucose Sugar Refining Co., Chicago, Ill.							
Buffalo, ... U. W. Boyden	Foxboro ...	9.34	23.92	27.00	3.72	3.00	—
Illinois Sugar Refining Co., Chicago, Ill.							
Pekin, ... C. B. Benedict	G. Barring'n	8.37	23.48	28.00	3.47	3.00	—
Pekin, ... P. W. Eaton & Co.	Williamst'n	9.87	23.30	28.00	4.20	3.00	—
National Starch Co., Chicago, Ill.							
Nebraska, ... Geo. B. Pope & Co. ..	Waltham ..	9.05	20.62	—	2.49	—	—
Queen, ... G. H. Huckins	Grafton	9.15	19.92	—	3.10	—	—
Queen, ... Mackenzie & Winslow	Fall River .	10.13	23.26	—	2.70	—	—
Queen, ... Briggs & Co.	Taunton ...	8.55	23.57	—	2.45	—	—
New York Glucose Co., New York, N. Y.							
Globe, ... J. Cushing & Co.	Winchend'n	8.72	23.57	27.00	2.57	3.38	—
Highest	....	10.13	27.82	—	4.42	—	—
Lowest	....	6.13	19.92	—	2.35	—	—
Average	....	8.70	24.69	—	3.18	—	—

GERM OIL MEAL.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
Glucose Sugar Refining Co., Chicago, Ill.							
Cutler Bros.	Wakefield .	9.91	22.33	25.00	9.25	10.50	—

DISTILLERS' GRAINS.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
J. W. Biles Co., Cincinnati, Ohio.							
Fourex, ... G. D. Meserve	Easthamp'n	7.69	31.55	33.00	9.72	11.00	—
Fourex, ... W. N. Potter & Sons .	Greenfield .	7.16	32.25	33.00	9.80	11.00	—
Fourex, ... W. N. Potter's Sons & Co.	Hadley	18.60	32.02	33.00	10.27	11.00	—
Fourex, ... O. D. Wilder	Lowell	7.36	33.17	33.00	10.80	11.00	—
Fourex. .... Potter Bros.	N. Adams ..	7.69	32.95	33.00	12.93	11.00	—
Fourex, ... Arthur D. Potter	Orange	7.78	31.06	33.00	10.26	11.00	—
Fourex, ... E. D. Ammidon	Southbri'ge	8.08	31.24	33.00	9.50	11.00	—
Chapin & Co., Boston, Mass.							
Ajax Flakes, ... B. W. Brown	Concord ...	6.86	31.41	—[1]	12.60	—[1]	—
Ajax Flakes, ... A. H. Wood & Co. ...	Framingh'm	7.63	32.87	34-36	13.47	12-14	—
Ajax Flakes, ... C. G. Burnham	Holyoke ...	7.83	31.15	—[1]	15.95	—[1]	—
Ajax Flakes, ... C. O. Parsons	Northam't'n	8.08	31.64	34-36	11.59	12-14	—
Ajax Flakes, ... C. L. Beals & Co.	Winchend'n	8.84	31.41	34-36	13.41	12-14	—
Manhattan, ... H. C. Puffer Co.	Springfield,.	6.90	32.29	—	8.34	—	—

[1]Guaranty Protein and Fat 46%.

DISTILLERS' GRAINS. (CONTINUED)

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
		%	%	%	%	%	%
Merchants Distilling Co., Terre Haute, Ind.							
Merchants, ...Wm. J. Meek	Fall River .	7.31	32.73	—[1]	14.63	—[1]	—
Below standard.							
J. W. Biles Co., Cincinnati, Ohio.							
Fourex.....J. W. Doon & Son	Natick	7.76	29.71	33.00	12.85	11.00	—
Chapin & Co., Boston, Mass.							
Ajax Flakes.....W. F. Tay, ...	Barre	7.05	28.43	34-36	12.80	12-14	—
Ajax Flakes,....Prentiss, Brooks & Co.	Westfield ..	7.81	30.41	34-36	7.35	12-14	—
Robert E. Hall & Co., Cincinnati, Ohio.							
A. A. A. A., ...C. S. Barber	Bernardst'n	7.65	29.22	33.00	10.93	11.00	—
A. A. A. A., ...City Mills	Holyoke ...	7.78	27.87	33.00	10.56	11.00	—
A. A. A. A.. ....Taft Bros..............	Uxbridge ..	8.03	30.10	33.00	11.12	11.00	—
A. A. A. A.. ....J. Cushing & Co.	Winchend'n	7.95	29.39	33.00	10.61	11.00	—
Unknown.							
R. M. Gould	W. Brookf'd	7.85	29.22	—	11.34	—	—
Highest	....	18.60	33.17	—	15.95	—	—
Lowest	....	6.86	27.87	—	7.35	—	—
Average	....	8.17	31.00	—	11.40	—	—

RYE DISTILLERS' GRAINS.

Atlas Feed & Milling Co., Peoria, Ill.							
Economy Gluten.A. H. Wood & Co. ..	Framingh'm	10.21	19.44	—[2]	7.35	—[2]	—

MALT SPROUTS.

E. P. Mueller, Chicago, Ill.							
A.N.Whittemore & Co.	Worcester .	11.29	25.41	26.25	1.53	1.91	—
D. W. Ranlet, Boston, Mass.							
M.. ....G. M. Foster	Lowell	12.25	25.54	—	1.29	—	—
F. B.. ....F. M. Keefe	Waltham ..	9.57	28.17	—	1.09	—	—
Below standard.							
Unknown.							
W. W. McIntyre	Marlboro ..	10.74	22.90	—	1.44	—	—
Average	....	10.96	25.51	—	1.34	—	—

YEAST REFUSE.

Ne Plus Ultra Yeast Co., Spencer, Mass.							
A. A. Putney & Son ..	Brookfield .	10.60	22.99	—	5.77	—	—

[1]Guaranty Protein and Fat 46%.
[2]Guaranty Protein and Fat 30%.

WHEAT MIDDLINGS.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
		%	%	%	%	%	%
1. Flour.							
American Cereal Co., Chicago, Ill.							
Red dog, Tiger, J. B. Brown	Fitchburg	10.81	19.57	—	4.19	—	—
Andrews & Co., Minneapolis, Minn.							
Fancy, F. A. Walker	N. Adams	11.17	18.03	—	5.10	—	—
Berger-Anderson Co., Milwaukee, Wis.							
Badger, A. T. Butler	Adams	12.21	18.56	—	3.90	—	—
Eckhart & Swan Milling Co., Chicago, Ill.							
Foundry, E. A. Cowee	Hudson	11.70	18.12	—	4.13	—	—
G. E. Gee Grain Co., Minneapolis, Minn.							
White Mountain Cream, City Mills Co.	Holyoke	10.38	19.66	—	5.68	—	—
Hecker-Jones-Jewell Milling Co., N. Y.							
Red dog, Eastern Grain Co.	Bridgewat'r	10.34	19.22	—	4.64	—	—
Fancy White, M. C. Richmond	Adams	11.34	18.12	—	4.28	—	—
Fancy, C. W. Shaw	Springfield	11.53	19.39	—	5.33	—	—
Northwest. Consol. Mill. Co., Minneapolis.							
XXX Comet, H. H. Capen	Spencer	11.49	19.66	—	5.12	—	—
G. R. Hastings & Son	Boylston	10.46	19.09	—	5.47	—	—
Pillsbury-Washburn Co., Minneapolis.							
Red dog, G. M. Foster	Lowell	10.87	19.22	—	5.41	—	—
XX Daisy, Jefts & Spear	Holden	10.61	19.88	—	5.87	—	—
Washburn-Crosby Co., Minneapolis, Minn.							
Adrian, H. H. Capen	Spencer	11.72	18.12	—	3.79	—	—
H. Wehmann & Co., Minneapolis, Minn.							
Red dog, Pirate, E. H. Smith	Northboro	11.28	18.47	—	4.35	—	—
Red dog, Pirate, Cutler Co.	W. Brookf'd	11.97	19.18	—	4.85	—	—
E. S. Woodworth & Co., Minneapolis, Minn.							
Snow's Cream, H. C. Bowen & Son	Cheshire	12.31	17.86	—	4.18	—	—
Unknown.							
Amazon, F. A. Dodge	Grafton	12.55	17.72	—	3.83	—	—
Cheshire, Geo. A. Stevens	Worcester	10.84	19.39	—	5.16	—	—
Red dog, J. Wadsworth & Co.	Northboro	11.73	17.99	—	4.24	—	—
Below standard.							
Duluth Universal Mill Co., Duluth, Minn.							
Red dog, Duluth, A. N. Whittemore & Co.	Worcester	11.34	15.40	—	3.82	—	—
Unknown.							
Red dog L, Cummings, Chute & Co.	Woburn	12.43	14.92	—	3.14	—	0.91
N. S., Robinson & Jones	Natick	11.73	16.59	—	3.71	—	—
Highest		12.55	19.88	—	5.87	—	—
Lowest		10.34	14.92	—	3.14	—	—
Average		11.40	18.37	—	4.55	—	—

WHEAT MIDDLINGS. (CONTINUED)

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein		Fat		Fiber
			Found	Guar.	Found	Guar.	
		%	%	%	%	%	%
2. Standard.							
American Cereal Co., Chicago, Ill.							
Ballard's Shipstuff, S. P. Puffer & Son.	Amherst....	9.66	19.04	—	4.45	—	—
Tiger, ...J. L. Brown	Fitchburg ..	10.75	19.92	—	5.92	—	—
Ballard & Ballard Co., Louisville, Ky.							
Shipstuff, ...R. C. Snow	Ware	11.75	18.65	—	4.68	—	—
Shipstuff, ...Cutler Co............	W.Brookfi'd	10.51	19.13	—	4.71	—	—
Seymour Carter, Hastings, Minn.							
Snowball Flour,.W.N.Potter'sSons&Co.	Northamp'n	11.46	18.51	—	4.90	—	—
Cataract City Milling Co., Niagara, N. Y.							
Niagara, ...Wallace Bros.........	Clinton.....	10.88	16.99	—	5.27	—	—
L. Christian & Co., Minneapolis, Minn.							
Choice Flour,...Prentice & Son.......	Milford	11.72	17.42	—	4.77	—	—
G. B. Brown..........	Ipswich	11.72	18.16	—	5.36	—	—
Chas. M. Cox Co., Boston, Mass.							
Puritan Flour...Ham & Miller...... ..	Palmer.....	9.88	16.73	—	5.04	—	—
J. G. Davis Co., Rochester, N. Y.							
Choice, ...J. P. Adams..........	G.Barring'n	10.74	18.21	—	5.73	—	—
Dow & King, Pittsfield, Ill.							
A. E. Lawrence & Son	Ayer.......	11.59	17.46	—	4.71	—	—
Freeman Milling Co., W. Superior, Wis.							
White, ...A. A. Prentiss & Co...	Athol	12.00	17.16	—	4.90	—	—
White,.........Oscar Shumway.......	Webster....	11.74	17.20	—	5.20	—	—
Great Western Cereal Co., Chicago. Ill.							
Choice No. 2,...Frank A. Walker, ...	N.Adams...	10.88	17.51	—	5.79	—	—
Hecker-Jones-Jewell Milling Co., N. Y.							
Hecker's,.......Eastern Grain Co.	Bridgewater	9.91	16.85	—	5.04	—	—
Hecker's,.......Millbury Grain Co.....	Millbury ...	10.86	17.34	—	4.36	—	—
Hunter Bros., St. Louis, Mo.							
Howe Bros.	Gardner....	10.06	17.25	—	3.52	—	—
Prentiss, Brooks & Co.	Westfield...	12.49	17.81	—	4.44	—	—
Imperial Mill Co., Duluth, Minn.							
S ....A. J. Goddard	N.Brookfi'd	12.20	16.28	—	5.09	—	—
New Prague F. M. Co., New Prague, Minn.							
C. D. Holbrook Co....	Palmer.....	11.95	17.68	—	5.37	—	—
New York City Milling Co., New York, N.Y.							
Manhattan, ...Highland Mills	Newton	11.14	18.03	—	5.51	—	—
Northwest Consol. Mill. Co., Minneapolis.							
Flour, ...Potter Bros. & Co	N. Adams..	10.72	18.56	—	5.59	—	—
N.W. Elevator & Mill Co., Toledo, Ohio.							
Taylor's, ...A. Culver & Co.	Rockland ..	11.37	17.68	—	4.38	—	—

WHEAT MIDDLINGS. (CONTINUED)

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
		%	%	%	%	%	%
Pillsbury-Washburn Co., Minneapolis.							
A.,.............J. B. Bridges & Co. ...	Deerfield...	11.52	18.30	—	5.22	—	—
A.,.............Norton & Warren.....	Warren	11.37	17.72	—	5.22	—	—
B.,.............G. R. Hastings & Son.	Boylston ...	11.83	16.37	—	5.04	—	—
B.,.............Lummis & Parker.....	Danvers....	11.67	16.23	—	4.88	—	—
B.,.............G. F. Wetherbee......	Gardner....	12.49	17.42	—	4.70	—	—
B.,.............A. J. Goddard.........	N. Brookfi'd	10.59	16.37	—	5.66	—	—
Royal Milling Co., Minneapolis, Minn.							
Ben Hur,.......Hale Knight..........	Newburyp't	11.44	16.06	—	5.11	—	—
Henry Russell, Albany, N. Y.							
A. T. Butler..........	Adams	10.05	20.93	—	4.75	—	—
Sheffield-King Mill. Co., Minneapolis.							
Fine,...........H. A. Crossman	Needham ..	11.19	18.21	—	5.28	—	—
Sleepy Eye Mill. Co., Sleepy Eye, Minn.							
Shorts,..........A. A. Prentiss & Co...	Athol	11.96	19.48	—	5.43	—	—
Shorts..........Potter Grain Co......	Shelburne..	12.85	18.92	—	5.03	—	—
F. W. Stock & Sons, Hillsdale, Mich.							
Millbury Grain Co. ...	Millbury ...	11.52	17.81	—	4.88	—	—
M..............D. W. Manvell	Sheffield ...	13.16	17.68	—	4.75	—	—
Thompson Milling Co., Lockport, N. Y.							
A. A. Prentiss & Co...	Athol	12.14	16.90	—	5.47	—	—
Geo. Tileston Milling Co., St. Cloud, Minn.							
Fancy,.........Potter Bros. & Co.....	N. Adams ..	11.54	18.03	—	6.08	—	—
Valley City Mill. Co., Grand Rapids, Mich.							
James Lally, Jr.........	Milford	11.69	16.14	—	4.45	—	—
Washburn-Crosby Co. Minneapolis, Minn.							
Flour,..........J. L. Holley Est... ...	Amherst ...	10.99	18.83	—	5.54	—	—
Flour,..........H. H. Capen,..........	Spencer....	12.62	19.62	—	4.62	—	—
H. H. Capen..........	Spencer....	12.92	18.12	—	5.23	—	—
C. L. Beals & Co......	Winchend'n	12.33	18.21	—	5.14	—	—
Winnebago Mills, Winnebago City, Minn.							
F. F. Woodward & Co.	Fitchburg ..	11.03	19.88	—	5.58	—	—
Unknown.							
Shorts,.........J. Cushing & Co.......	Fitchburg ..	10.95	16.50	—	5.23	—	—
Shorts,.........J. Wadsworth & Co. ..	Northboro..	11.62	16.94	—	5.58	—	—
F. M. ....P. W. Eaton & Co.....	Williamst'n.	9.93	17.11	—	5.52	—	—
J. M. B. S. ....Burnham Bros.	Gloucester .	11.19	18.51	—	5.88	—	—
S..............Butman & Cressey....	Lynn.......	11.97	16.67	—	5.11	—	—
T..............C. H. Cox	Haverhill ..	9.89	17.42	—	4.90	—	—
G. D. Meserve........	Easthamp'n	10.79	16.67	—	3.99	—	—
J. S. Nason & Co......	Westboro ..	10.85	16.85	—	5.46	—	—
Below standard.							
J. Hale & Sons, Lyons, Mich.							
G. R. Drake..........	W. Bridgew'	11.85	15.32	—	3.58	—	—
Hope Mills, Versailles, Ky.							
Shipstuff ....J. H. Nye	Brockton ..	8.53	13.38	—	5.13	—	7.03

WHEAT MIDDLINGS. (CONTINUED)

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein		Fat		Fiber
			Found	Guar.	Found	Guar.	
		%	%	%	%	%	%
Pillsbury-Washburn Co., Minneapolis.							
B., ... D. W. Manvell	Sheffield ...	11.47	15.53	—	5.19	—	—
Unknown.							
White, ... D. B. Hodgkins Sons .	Gloucester .	11.47	15.58	—	4.38	—	—
S. A. Eastman........	Milford	10.82	12.95	—	4.35	—	3.71
Highest	....	13.16	20.93	—	6.08	—	—
Lowest..............	....	8.53	12.95	—	3.52	—	—
Average............	....	11.30	17.48	—	5.04	—	—

MIXED FEED.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
Acme Milling Co., Indianapolis, Ind.							
Acme,.......... G. D. Meserve........	Easthamp'n	9.98	17.68	—	4.47	—	—
Acme,.......... E. W. Pierce.........	Lawrence..	9.93	17.81	—	4.70	—	—
Acme,.......... R. M. Gould	W.Brookf'd	10.07	17.46	—	4.54	—	—
Alma Roller Mills, Alma, Mich.							
Alma, ... Wallace Lord	Athol	9.57	16.99	—	4.69	—	—
American Cereal Co., Chicago, Ill.							
Beaver Winter,. Noble & Morton	Springfield .	9.93	17.99	—	4.46	—	—
Beaver Winter,. Weld & Beck.........	Southbri'ge	10.33	18.07	—	4.34	—	—
Buckeye,....... Mackenzie & Winslow	Fall River..	10.05	16.94	17.75	4.48	4.70	—
Buckeye,....... Prentice & Son.......	Milford	9.37	17.25	17.75	4.62	4.70	—
Buckeye,....... P. W. Eaton & Co.....	Williamst'n.	10.99	16.55	17.75	4.51	4.70	—
C. B. Benedict........	G.Barring'n	9.91	17.25	—	4.47	—	—
Annan, Burg & Co., St. Louis, Mo.							
Diamond, ... Moses H. Rolfe	Newburyp't	10.18	16.10	—	5.12	—	—
Diamond, ... Sykes,Coal &GrainCo.	N. Adams..	10.12	18.38	—	4.20	—	—
Ansted & Burk Co., Springfield, Ohio.							
F. H. Crane & Sons ..	Quincy.....	9.96	16.59	—	4.18	—	—
A. B. Bacon, Spencer, Mass.							
Extra,.......... A. B. Bacon..........	Spencer....	8.57	17.68	—	4.70	—	—
Blish Milling Co., Seymour, Ind.							
Millbury Grain Co. ...	Millbury ...	8.16	18.30	—	4.84	—	—
C. W. Bransford, Owensboro, Ky.							
Potter Grain Co.......	Shelburne..	8.78	17.90	—	4.63	—	—
Seymour Carter, Hastings, Minn.							
Croesus, ... J. H. Bosworth	Chicopee...	9.37	17.25	—	4.79	—	—
Croesus, ... Lamb Bros. & Co.	Orange.....	9.25	17.34	—	4.73	—	—
Croesus, ... E. D. Ammidon	Southbridge	8.98	17.55	—	4.96	—	—
Chapin & Co., Boston, Mass.							
Erie Winter, ... J. B. Garland & Son ..	Worcester..	9.25	17.86	—	4.39	—	—
Model,......... E. D. Ammidon	Southbridge	10.15	15.32	—	4.76	—	—
Ozark, ... C. S. Barber..........	Bernardston	8.11	19.00	—	4.97	—	—
Vermont,....... E. D. Ammidon	Southbridge	9.92	17.38	—	4.33	—	—
3, ... C. S. Barber..........	Bernardston	11.03	17.51	—	4.26	—	—

MIXED FEED. (CONTINUED)

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
		%	%	%	%	%	%
Cornerstone Mills, Red Wing, Minn.							
Crown Winter, . A. T. Butler	Adams	9.59	17.90	—	4.51	—	—
Crown Winter, . Mackenzie & Winslow	Fall River..	9.83	18.03	—	4.49	—	—
Chas. M. Cox Co., Boston, Mass.							
Columbia,.......S. R. Carter	Berlin......	8.75	16.23	—	5.56	—	—
Columbia,......William Baylies.......	N. Bedford.	9.61	15.93	—	5.61	—	—
Columbia,......H. C. Puffer Co.	Springfield .	9.38	15.93	—	5.33	—	—
Columbia,......G. R. Drake	W.Bridgew'	9.07	16.14	—	5.54	—	—
Kentucky, ...E. A. Cowee	Worcester..	11.71	17.11	—	4.56	—	—
Samoset, ...W. P. Whittemore....	Boston	10.16	17.81	—	4.84	—	—
Samoset, ...C. B. Sawin & Son....	Southboro..	9.14	17.95	—	5.05	—	—
Samoset, ...Whitman G. & C. Co..	Whitman...	9.59	17.64	—	4.99	—	—
Diamond Milling Co., Grand Forks, N.D.							
Diamond, ...G. M. Foster	Lowell	9.27	16.50	—	5.02	—	—
S. A. Eastman, Milford, Mass.							
Milford,........S. A. Eastman........	Milford	8.29	17.90	—	5.11	—	—
Eldred Mill Co., Jackson, Mich.							
City Mills	Holyoke....	10.07	15.27	—	4.32	—	—
Empire Mills, Hannibal, Mo.							
Crown Winter,.. H. K. Webster & Co.	Lawrence ..	9.41	17.20	—	4.34	—	—
Genesee Mills, Flint, Mich.							
D. F. Howard	Ware	10.14	16.46	—	4.35	—	—
F. Diehl & Son	Wellesley ..	10.09	15.75	—	4.19	—	—
Gregory, Cook & Co., Duluth, Minn.							
Commander,....Moses H. Rolfe	Newburyp't	9.62	17.07	—	5.54	—	—
Commander,.... F. A. Fales & Co......	Norwood...	10.30	16.67	—	5.43	—	—
J. Hale & Sons, Lyons, Mich.							
Acme,..........G. R. Drake	W.Bridgew'r	11.37	16.46	—	3.89	—	—
Rodney J. Hardy & Sons, Boston, Mass.							
Berkshire, ...E. A. Cowee..........	Worcester..	10.40	17.64	—	4.91	—	—
Isaac Harter Milling Co., Toledo, Ohio.							
F. A. Lincoln.........	Worcester..	10.10	17.25	—	4.47	—	—
Hecker-Jones-Jewell Milling Co., N. Y.							
.Manhattan,.. H. P. Howland.......	Spencer	9.61	16.76	—	4.68	—	—
H. Manhattan,.. C. G. Jordan..........	Weymouth .	10.99	16.41	—	4.84	—	—
Wm. S. Hills Co., Boston, Mass.							
M. .... ChandlerGrainMill.Co.	Lawrence ..	8.47	16.46	—	4.56	—	—
Hope Mills, Versailles, Ky.							
MosesH. Rolfe	Newburyp't	9.66	15.93	—	4.42	—	—
Hunter Bros., St. Louis, Mo.							
Sunshine, ...Wm. E. Hathaway....	N. Bedford.	10.91	17.90	—	4.37	—	—
Sunshine, ...Hale Knight..........	Newburyp't	9.80	16.06	—	4.53	—	—
Sunshine, ...Edward C.Paull.......	Taunton....	10.08	18.16	—	4.68	—	—
Winner, ...A. L. Clark..........	Leominster .	9.09	15.79	—	4.78	—	—
J. Cushing & Co.......	Fitchburg ..	10.89	18.12	—	4.17	—	—

MIXED FEED. (CONTINUED)

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
		%	%	%	%	%	%
Imperial Mill Co., Duluth, Minn.							
Boston, ...J. Cushing & Co.......	Fitchburg ..	9.38	16.90	—	4.91	—	—
Boston, ...Oscar Shumway	Webster....	9.72	16.46	—	5.08	—	—
J. E. M. Milling Co., Frankfort, Ky.							
Kyome, ...Alvin Hollis..........	Weymouth .	9 74	17.99	—	4.33	—	—
Kehlor Bros., St. Louis, Mo.							
Rex, ...Prentiss, Brooks & Co.	Holyoke ...	9.78	17.03	—	4.35	—	—
Rex, ...J. W. Doon & Son....	Natick	9.62	16.28	—	4.17	—	—
Rex, ...Norton & Warren	Warren	9.83	17.51	—	4.22	—	—
Haverhill Milling Co. .	Haverhill...	10.85	18.30	—	4.02	—	—
W. K. Gilmore & Sons	Walpole....	10.54	17.42	—	4.31	—	—
Kent & Senour, Shelbyville, Ind.							
Shelby Mills,...Torrence, Vary & Co..	Lynn.......	9.40	16.90	—	4.01	—	—
Lawrenceburg Mills, Lawrenceburg, Ind.							
Snowflake, ...Millbury Grain Co. ...	Millbury ...	9.02	18.03	—	4.56	—	—
Snowflake, ...Dennison Plummer Co.	N. Bedford.	9.07	15.58	—	4.69	—	—
Lexington Roller Mills Co., Lexington, Ky.							
Lexington, ...F. A. Fales & Co.	Norwood...	9.61	16.76	—	4.52	—	—
Listman Mill Co., La Crosse, Wis.							
Fancy, ...A. B. Bacon..........	Spencer....	8.29	18.83	—	5.06	—	—
John F. Meyer & Sons, St. Louis, Mo.							
Model, ...C. B. Sawin & Son....	Southboro..	8.77	16.67	—	4.38	—	—
R. P. Moore Milling Co., Princeton, Ind.							
King, ...James Lally, Jr........	Milford	7.97	18.78	—	4.94	—	—
King, ...Briggs & Co.	Taunton ...	10.20	18.34	—	4.71	—	—
King. ....C. L. Beals & Co......	Winchend'n	10.85	18.30	—	4.77	—	—
M. Neal, Massilon, Ohio.							
Winter, ...Noble & Morton......	Springfield .	9.93	16.23	—	4.13	—	—
Noblesville Milling Co., Noblesville, Ind.							
N. M. Co's., ...J. Cushing & Co.......	Fitchburg,..	11.60	17.16	—	4.55	—	—
N. M. Co's., ...C. B. Benedict........	G.Barring'n	9.63	17.55	—	4.63	—	—
N. M. Co's., ...Taft Bros.............	Uxbridge ..	10.91	17.34	—	4.54	—	—
Pillsbury-Washburn Co., Minneapolis.							
Fancy. ....Bosworth & Wood....	Leominster.	10.38	18.03	—	5.31	—	—
Fancy, ...Cutler Co.............	W.Brookf'd	10.16	17.51	—	4.98	—	—
Royal Milling Co., Minneapolis, Minn.							
Ben Hur, ...S. Slater & Sons......	Webster ...	10.07	17.90	—	5.49	—	—
Henry Russell, Albany, N. Y.							
Choice, ...E. Brown.............	Conway	8.71	17.64	—	5.22	—	—
Choice, ...C. L. Beals & Co.	Winchend'n	10.74	17.11	—	5.37	—	—
Schultz, Banjan & Co., Beardstown, Ill.							
Duchess, ...W. F. Tay	Barre	10.30	16.46	—	4.89	—	—
Sparks Milling Co., Alton, Ill.							
Bran & Middlings, Wallace Bros.	Clinton.....	11.50	18.12	—	4.17	—	—
Bran & Middlings, A. L. Clark	Leominster.	10.76	18.12	—	4.28	—	—

MIXED FEED. (CONTINUED)

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein		Fat		Fiber
			Found	Guar.	Found	Guar.	
		%	%	%	%	%	%
Star & Crescent Milling Co., Chicago, Ill.							
U. W. Boyden........	Foxboro ...	11.25	17.34	—	4.57	—	—
Haverhill Milling Co. .	Haverhill...	11.46	17.60	—	4.31	—	—
Haverhill Milling Co. .	Haverhill...	10.16	17.38	—	4.58	—	—
G. P. Rogers	Worcester..	11.93	17.90	—	4.37	—	—
Stratton & Co., Concord, N. H.							
Vietor Grain Co.......	Lawrence ..	11.36	17.38	—	4.51	—	—
Thornton & Chester Mill., Buffalo, N. Y.							
C. G. Burnham........	Holyoke....	10.26	16.19	—	5.41	—	—
City Mills Co.........	Holyoke....	8.12	16.99	—	5.35	—	—
E. A. Briggs & Co.....	N. Attleboro	10.88	16.10	—	5.33	—	—
Valier & Spies Milling Co., St. Louis, Mo,							
Marine Star,.... S. A. Eastman........	Hopkinton .	10.52	17.46	—	4.99	—	—
Marine Star,.... E. D. Smith..........	Westfield ..	10.86	18.38	—	4.76	—	—
ValleyCityMillingCo.,GrandRapids,Mich.							
Farmer's Favorite, C. A. Pierce........	Hinsdale ...	8.76	16.85	—	4.71	—	—
Voigt Milling Co., Grand Rapids, Mich.							
Voigt's Winter, . H. W. Kimball........	Westboro ..	10.53	15.79	—	4.57	—	—
Washburn-Crosby, Minneapolis, Minn.							
Superior,....... W. F. Tay............	Barre	9.68	17.60	—	5.68	—	—
Washington Flour Mill., Washington, Mo.							
C. H. Cox............	Haverhill ..	11.21	18.60	—	4.53	—	—
WhitmanGrain&CoalCo., Whitman, Mass.							
Whitman Grain & Coal	Whitman...	11.88	15.32	—	4.19	—	—
E.S. Woodworth & Co., Minneapolis, Minn.							
Snow's, ... G. M. Foster	Lowell	11.01	17.60	—	4.74	—	—
Zenith Mills, Kansas City, Mo.							
A. H. Wood & Co.....	Framingh'm	8.82	17.51	—	4.70	—	—
Unknown.							
H. M. Co.,...... H. E. Noyes & Son...	Lowell	10.97	18.12	—	4.43	—	—
S. M. Co's.,..... Merriam & Rolph.....	Fitchburg ..	10.35	18.12	—	4.39	—	—
S. M. Co's.,..... A. Millot..............	Taunton....	10.29	18.03	—	4.32	—	—
Kansas, ... Potter & Co...........	Athol	11.59	18.38	—	4.11	—	—
P., ... O. D. Wilder.........	Lowell	11.72	18.56	—	3.95	—	—
Perfection, ... Henry Houghton	Sutton	9.70	17.29	—	4.91	—	—
Royal, ... J. Wadsworth & Co. ..	Northboro .	10.71	16.32	—	4.34	—	—
Triple Extra, ... J. B. Garland & Son ..	Worcester..	10.66	16.81	—	5.20	—	—
W. S. M., ... Hawes & Pierce......	Foxboro....	10.17	18.38	—	4.41	—	—
W. S. M., J. O. Ellison & Co.....	Haverhill...	11.02	17.99	—	4.39	—	—
J. P. Adams	G.Barringt'n	10.88	17.46	—	4.84	—	—
Potter Grain Co.......	Shelburne ..	11.41	17.20	—	4.50	—	5.74
H. H. Capen	Spencer	9.86	16.72	—	5.27	—	8.89
J. S. Nason & Co......	Westboro ..	9.60	18.07	—	5.71	—	—
W. G. Davis Co.......	Westfield...	11.33	17.77	—	4.42	—	—

MIXED FEED. (CONTINUED)

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein		Fat		Fiber
			Found	Guar.	Found	Guar.	
		%	%	%	%	%	%
Adulterated.							
J. H. Cressey & Co., Boston, Mass.							
Mascot, ...J. O. Ellison..........	Haverhill...	7.37	12.25	--	3.39	—	13 08
William S. Hills Co., Boston, Mass.							
Chandler Grain Mill. Co.	Lawrence ..	7.46	10.23	—	2.63	—	16.70
Unknown.							
Ideal, ...D. F. Howard'........	Ware	10.98	12.86	—	3.67	—	14.98
Kentucky, ...H. C. Puffer Co.......	Springfield .	11.20	13.16	—	3.28	—	13.63
Ky. Winter Dairy, J. W. Wilder	Springfield .	10.04	13 69	—	3.30	—	12.95
U. W. Boyden........	Foxboro ...	10.51	11.98	—	3.43	—	15.24
Wheat feed with admixtures.							
E. A. Cowee, Worcester, Mass.							
Hampshire, ...E. A. Cowee	Worcester..	9.90	10.67	14.98	4.05	7.68	6.95
Diamond Mills, Buffalo, N. Y.							
Belmore Mills, .. Noble & Morton......	Springfield .	10.23	13.30	12.75	3.54	2.96	15.79
Kentucky Milling Co., Henderson, Ky.							
Jersey, ...G. B. Brown	Ipswich	10.32	13.04	11.56	3.50	3.65	13.65
Jersey, ...S. D. Viets Co........	Springfield .	10.94	13.30	11.56	3.29	3.65	13.79
Jersey, ...J. S. Nason & Co......	Westboro ..	9.87	11.67	11.56	3.16	3.65	16.69
A. Waller & Co., Henderson, Ky.							
Blue Grass......Potter & Co...........	Athol	8.52	11.19	12.59	2.97	3.19	16.35
Blue Grass, ...Oscar Shumway	Webster ...	8.86	10.75	12.59	2.66	3.19	14.95
Highest	....	11.93	19 00	—	5.71	—	—
Lowest..............	....	7.37	10.23	—	2.63	—	—
Average[1]	....	10.03	17.28	—	4.68	—	—

WHEAT BRAN.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
Alton Milling Co., Alton, Iowa.							
W. H. Smith	Northamp'n	9.35	17.20	—	4.58	—	—
American Cereal Co., Chicago, Ill.							
Dennison, Plummer Co.	N. Bedford.	10.87	14.97	—	4.30	—	—
Ballard & Ballard Co., Louisville, Ky.							
Ballard's, ...ChandlerGrainMill.Co.	Lawrence ..	9.09	17.99	—	4.39	—	—
Barber Milling Co., Minneapolis, Minn.							
Star, ...E. C. Paull...........	Taunton ...	9.04	16.90	—	5.08	—	—
Bay State Milling Co., Winona, Minn.							
W. N. Potter & Sons .	Greenfield..	10.12	16.02	—	4.89	—	—
Norton & Warren	Warren	10.78	15.79	—	5.08	—	—
Berger-Anderson Co., Milwaukee, Wis.							
Badger, ...A. T. Butler..........	Adams.....	10.50	17.86	—	4.17	—	—

[1]Adulterated and Wheat Feed with Admixtures excluded from the average.

WHEAT BRAN. (CONTINUED)

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
		%	%	%	%	%	%
L. G. Campbell, Blooming Prairie, Minn.							
John W. Hunt........	Lynn.......	11.34	15.58	—	4.91	—	—
Seymour Carter, Hastings, Minn.							
Clover leaf,.....J. H. Bosworth	Chicopee ..	10.43	16.10	—	4.72	—	—
Cataract City Mill Co., Niagara Falls, N.Y.							
Niagara, ...Highland Mills.......	Newton	10.21	16.06	—	5.23	—	—
Chapin & Co., Boston, Mass.							
3, ...C. S. Barber..........	Bernardst'n	9.70	17.72	—	4.56	—	—
Geo. C. Christian, Minneapolis, Minn.							
Jersey, ...S. A. Eastman........	Milford	9.42	15.84	—	5.19	—	—
Daisy Roller Mills, Milwaukee, Wis.							
Daisy, ...S. D. Viets Co.	Springfield .	9.40	16.81	—	4.48	—	—
J. G. Davis Co., Rochester, N. Y.							
John S. Wolfe........	Pittsfield ...	10.07	16.02	—	5.39	—	—
J. Hale & Sons, Lyons, Mich.							
G. R. Drake..........	W.Bridgew'	11.28	16.67	—	4.00	—	—
H. L. Halliday, Cairo, Ill.							
Winter, ...H. Bruckmann	Lawrence ..	10.86	16.02	—	4.27	—	—
Hecker-Jones-Jewell Milling Co., N. Y.							
Millbury Grain Co.....	Millbury ...	10.00	16.06	—	4.72	—	—
C. G. Jordan..........	Weymouth .	11.41	15.84	—	4.79	—	—
Home & Export Mill Co., Goodhue, Minn.							
S. L. Davenport	Grafton	10.57	14.88	—	4.79	—	—
Hunter Bros., St. Louis. Mo.							
W. E. Livingston Co. .	Lowell	10.93	16.81	—	5.09	—	—
Wilson & Holden.....	Worcester..	10.29	17.90	—	4.89	—	—
Imperial Mill Co., Duluth, Minn.							
Duluth Imperial, J. L. Brown	Fitchburg ..	11.10	15.97	—	5.07	—	—
Duluth Imperial, F. A. Walker	N. Adams..	10.25	16.37	—	5.09	—	—
Duluth Imperial, A. J. Goddard	N.Brookfi'ld	10.35	16.28	—	5.18	—	—
Listman Mill Co., LaCrosse, Wis.							
Elmco, ...Ham & Co............	Woburn....	9.56	16.85	—	4.90	—	—
New Prague F.M.Co., New Prague, Minn.							
Paul Vigeant & Co....	Lowell	11.01	18.03	—	5.55	—	—
M. J. Jencks..........	Webster ...	10.19	16.50	—	4.95	—	—
New York City Milling Co., New York.							
Independence,..J. S. Nason & Co.....	Westboro ..	11.49	15.62	—	4.47	—	—
Northwest.Consol. Mill.Co., Minneapolis.							
G. R. Hastings & Son.	Boylston ...	10.33	15.62	—	5.05	—	—
W.N. Potter's Sons Co.	Northamp'n	10.72	16.02	—	4.80	—	—
Arthur D. Potter	Orange.....	10.02	15.58	—	4.92	—	—
H. H. Capen	Spencer	9.50	16.06	—	4.91	—	—

WHEAT BRAN. (CONTINUED)

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
		%	%	%	%	%	%
N.W. Elevator & Mill Co., Toledo, Ohio.							
Chas. S. Gwinn	Hamilton	11.95	15.97	—	4.23	—	—
Norton & Warren	Warren	10.75	16.50	—	4.24	—	—
Pillsbury-Washburn Co., Minneapolis.							
Howe Bros.	Gardner	10.89	15.32	—	4.98	—	—
Jefts & Spear	Holden	10.97	15.36	—	4.94	—	—
A. L. Clark	Leominster	11.20	15.36	—	4.50	—	—
Reichert Milling Co., Freeberg, Ill.							
Extra, E. A. Briggs & Co.	N. Attleboro	10.36	17.29	—	4.89	—	—
Russell-Miller Milling Co., Minneapolis.							
Atkins & Cartland	Lynn	11.37	15.58	—	4.95	—	—
Sheffield-King Milling Co., Minneapolis.							
Fancy, Albert Dodge	Gloucester	12.12	16.50	—	4.94	—	—
Sleepy Eye Milling Co., Sleepy Eye, Minn.							
Sleepy Eye, Hale Knight	Newburyp't	10.91	16.67	—	4.81	—	—
E. O. Stanard Milling Co.							
X Winter, Highland Mills	Newton	10.69	17.90	—	4.45	—	—
Staunton Milling Co., Staunton, Ill.							
Winter, A.N. Whittemore & Co.	Worcester	10.46	17.03	—	4.06	—	—
S. Stewart, Morris, Minn.							
Morris City Mills, J. O. Ellison & Co.	Haverhill	11.38	15.44	—	4.97	—	—
F. W. Stock & Sons, Hillsdale, Mich.							
B., D. W. Manvell	Sheffield	10.19	16.19	—	4.30	—	—
Geo. Tileston Mill. Co., St. Cloud, Minn.							
Fancy, E. H. Smith	Northboro	11.87	14.70	—	4.95	—	—
Valley City Mill. Co., Grand Rapids, Mich.							
Michigan Winter, Hale Knight	Newburyp't	11.77	16.02	—	4.53	—	—
Voigt Milling Co., Grand Rapids, Mich.							
Winter, H. W. Kimball	Westboro	10.74	16.19	—	4.65	—	—
Wabashaw Milling Co., Wabashaw, Minn.							
Griswold & Adams	Dalton	8.01	19.13	—	3.88	—	—
Washburn-Crosby Co., Minneapolis.							
Coarse, Haverhill Milling Co.	Haverhill	11.65	15.05	—	5.03	—	—
Coarse, City Mills	Holyoke	10.45	15.93	—	4.91	—	—
Coarse, W. G. Davis Co.	Westfield	10.44	15.93	—	4.94	—	—
F. F. Woodward & Co., Fitchburg, Mass.							
H., W. C. S. Wood	Norton	9.37	16.59	—	4.92	—	—
E. S. Woodworth & Co., Minneapolis.							
Snow's Flaky, H. Bruckmann	Lawrence	11.80	15.88	—	4.75	—	—
Unknown.							
A., Wm. E. Hathaway	N. Bedford	11.60	17.42	—	5.04	—	—
A. B. C. Fancy, J. M. Judge	Amherst	11.49	17.38	—	5.02	—	—

WHEAT BRAN. (CONTINUED)

Manufacturer or Jobber, Brand and Retailer.	Sampled at :	Water	Protein		Fat		Fiber
			Found	Guar.	Found	Guar.	
		%	%	%	%	%	%
Unknown.							
E., ... G. D. Meserve	Easthamp'n	9 83	17.07	—	4.01	—	—
H. W. E., ... G. P. Rogers	Worcester . .	11.12	18.42	—	4.36	—	—
J. M., ... Burnham Bros.	Gloucester .	10.95	16.50	—	4.84	—	—
J. M., ... Ham & Co.	Woburn	11.18	16.50	—	4.77	—	—
Kansas, ... Ropes Bros.	Danvers	10.23	16 94	—	4.67	—	—
Shorts W.. . . . . W. H. Garland	Gloucester .	11.74	19.35	—	4.07	—	—
White, ... D. B. Hodgkins Sons .	Gloucester .	11.09	16.14	—	4.27	—	—
White, ... Norton & Warren	Warren	10.74	16.76	—	4.60	—	—
J. S. Nason & Co.	Westboro . .	10.48	15.27	—	5.15	—	—
Geo. A. Stevens	Worcester . .	9.50	14.70	—	5.30	—	—
Slightly below standard.							
Canada, ... J. E. Dodge	Lowell	9.90	13.69	—	4.27	—	10.14
Canada, ... Geo. P. Rogers	Worcester . .	8 96	14.13	—	4.27	—	8.53
O. D. Wilder	Lowell	10.53	14.21	—	5.07	—	9.75
Potter Grain Co.	Shelburne .	9.79	14.09	—	5.21	—	9.50
Highest	. . . .	11.95	19 35	—	5.55	—	—
Lowest	. . . .	8.01	13.69	—	3.88	—	—
Average	. . . .	10.55	16.27	—	4.75	—	—

DAIRY FEEDS.

1.							
J. Bibby & Sons, Liverpool, England.							
Bibby's Cake, . . . M. L. Wilbur	Lexington . .	10.79	20.01	—	8.47	—	—
Buffalo Cereal Co., Buffalo, N. Y.							
Creamery, ... C. A. Ketchum & Co. .	Salem	9.74	17.95	20.00	4.81	5.50	9.69
Creamery, ... E. A. Cowee	Worcester . .	9.30	19.57	20.00	5.13	5 00	—
H-O Co., Buffalo, N. Y.							
H-O . . . . H. E. Noyes & Son . . .	Lowell	9.35	17.86	18.00	4.31	4 50	—
H-O . . . . Ropes Bros.	Salem	9.45	16.99	18.00	4.27	4.50	12.68
H-O, ... Prentiss, Brooks & Co.	Westfield . . .	9.02	17.46	18.00	4.01	4.50	—
G. F. Howard, Ware, Mass.							
G. F. Howard	Ware	10.18	19.31	—	3.23	—	—
2.							
Blomo Manufacturing Co., New York, N.Y.							
Blomo, ... W. P. Griffen	Pittsfield . . .	11.78	18.42	15.00	1.37	1.40	—
E. P. Mueller, Chicago, Ill.							
Molasses Grains, Marlboro Grain Co. . .	Marlboro . . .	12.90	18.38	—[1]	2.37	—[1]	—
Molasses Feed, . Moses H. Rolfe	Newburyp't	16.10	17.46	21.81	2.40	2.73	—
Wogan Bros., New Orleans, La.							
Nutrene, ... Hale Knight	Newburyp't	11.84	12.42	17.00	2.25	5.00	—
Nutrene, ... D. F. Howard	Ware	10.73	16.37	—	3.09	—	—

[1]Guaranty Protein and Fat 32%.

OAT MIDDLINGS.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
		%	%	%	%	%	%
Norton-Chapman Co., Boston, Mass.							
A. Red Oats, ... F. Diehl & Son	Wellesley ..	8.33	17.20	—	7.17	—	—
A. H. Wood & Co.....	Framingh'm	7.62	18.47	—	6.71	—	—
Unknown.							
O, ... Jacob Burkhardt......	Beverly	7.02	17.86	—	7.37	—	—
Average.............	....	7.66	17.84	—	7.08	—	—

RYE FEED.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
Bosworth & Wood, Leominster, Mass.							
Bosworth & Wood....	Leominster.	10.99	15.18	—	2.93	—	—
Chas. M. Cox Co., Boston, Mass.							
CharlemontCo-opAsso.	Charlemont	10.48	15.53	—	3.39	—	—
Oneonta Milling Co., Oneonta, N. Y.							
W. N. Potter & Co....	Charlemont	11.39	15.05	14.75	3.23	3.50	4.93
Unknown.							
C. G. Burnham	Holyoke....	11.69	15.14	—	3.13	—	—
Average	....	11.14	15.23	—	3.17	—	—

RYE BRAN.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
Geo. T. Callanan, Castleton, N. Y.							
Geo. C. Turner & Co. .	Chester	11.46	13.16	—	2.21	—	3.21
W. N. Potter & Sons, Greenfield, Mass.							
C. G. Burnham	Holyoke....	12.11	13.69	—	2.07	—	—
Average.............	....	11.79	13.43	—	2.14	—	—

CALF MEAL.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
J. W. Barwell, Waukegan, Ill.							
Blatchford's, ... W. N. Potter & Sons .	Greenfield..	9.03	24.57	26.00	4.49	5.00	—
Blatchford's, ... Potter Bros. & Co.....	N. Adams..	9.30	24.62	26.00	4.85	5.00	—
Average.............	....	9.17	24.60	—	4.67	—	—

II. Starchy (Carbohydrate) Feeds.

CORN.

Manufacturer or Jobber, Brand and Retailer.	Sampled at :	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
		%	%	%	%	%	%
Whole Corn.							
Highland Mills	Newton	12.13	8.74	—	3.95	—	—
Northern, Hale Knight	Newburyp'rt	10.58	11.14	—	5.07	—	—
Western, Hale Knight	Newburyp'rt	11.62	8.74	—	3.89	—	—
Corn Meal.							
E. A. Briggs & Co.	N. Attleboro	12.75	8.60	—	3.70	—	—
H. A. Crossman	Needham	11.81	9.04	—	3.67	—	—
Cutler Co.	Wilbraham	12.60	8.69	—	3.69	—	—
J. W. Doon & Son	Natick	12.30	8.86	—	4.04	—	—
Highland Mills	Newton	14.50	8.08	—	4.63	—	—
Highland Mills	Newton	12.86	8.39	—	3.44	—	—
C. D. Holbrook Co.	Palmer	11.84	8.78	—	3.66	—	—
Lemaire Bros.	Taunton	13.59	8.69	—	3.17	—	—
Edward C. Paull	Taunton	14.39	8.12	—	3.86	—	—
E. W. Pierce	Lawrence	14.45	8.43	—	3.45	—	—
H. K. Webster	Lawrence	12.47	8.65	—	3.58	—	—
H. K. Webster	Lawrence	12.20	8.65	—	3.69	—	—
G. F. Wetherbee	Gardner	13.15	8.25	—	3.39	—	—
O. D. Wilder	Lowell	13.41	8.25	—	3.48	—	—
Highest		14.50	11.14	—	5.07	—	—
Lowest		10.58	8.08	—	3.17	—	—
Average		12.74	8.71	—	3.79	—	—
Siftings from Cracked Corn.							
Moses H. Rolfe	Newburyp'rt	14.90	6.67	—	1.83	—	—

HOMINY MEAL.

Manufacturer or Jobber, Brand and Retailer.	Sampled at :	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
American Cereal Co., Chicago, Ill.							
J. L. Holley Est.	Amherst	10.30	10.27	—	6.95	—	—
D. B. Hodgkins Sons	Gloucester	11.70	11.14	—	7.59	—	—
American Hominy Co.							
D., City Mills Co.	Holyoke	10.08	9.97	—	7.51	—	—
Buffalo Cereal Co., Buffalo, N. Y.							
Howard's, J. B. Bridges & Co.	Deerfield	9.01	9.74	10.50	7.57	8.50	—
Yellow, H. B. Howland	Spencer	9.77	10.58	10.50	8.85	8.50	—
O. D. Wilder	Lowell	6.16	10.49	13.00	7.93	8.50	—
D. B. Hodgkin's Sons	Gloucester	9.55	9.88	10.50	8.40	8.50	—
J. B. Frost	Shelburne	6.66	10.40	10.50	7.90	8.50	—
E. A. Cowee	Worcester	8.81	9.70	10.50	7.74	8.50	—
Chapin & Co., Boston, Mass.							
Green Diamond, A. Dodge & Son	Beverly	11.17	10.09	11.00	7.28	8-9	—
Green Diamond, Geo. F. Wetherbee	Gardner	7.79	9.65	11.00	7.29	8-9	—
Marshall, Potter & Co.	Athol	10.77	10.18	11.00	7.87	8-9	—
Niagara White, Potter Grain Co.	Shelburne	9.20	10.01	11.00	8.01	8.00	—
B. W. Brown	Concord	7.66	10.40	—	8.94	—	—
Coarse, B. W. Brown	Concord	9.40	9.61	—	4.11	—	—

HOMINY MEAL. (CONTINUED)

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
		%	%	%	%	%	%
Chas. M. Cox Co., Boston, Mass.							
Wirthmore...... A. L. Clark............	Leominster .	8.37	9.97	10.5-12	7.00	7.5-9	—
Wirthmore,..... J. B. Frost	Shelburne ..	7.73	10.44	10.5-12	7.99	7.5-9	—
Arthur D. Potter......	Orange.....	11.07	9.83	11.40	7.46	9.15	—
Cumberland Mills, Nashville, Tenn.							
Howe Bros.	Gardner....	8.06	11.58	—	10.01	—	—
Evans Milling Co., Indianapolis Ind.							
J. P. Adams..........	G.Barringt'n	9.80	10.58	—	9.03	—	—
Hunter Bros., St. Louis, Mo.							
W. E. Livingston Co. .	Lowell	10.43	10.88	11.02	8.67	7.70	—
J. B. Garland & Son...	Worcester..	10.14	10.36	11.02	9.26	7.70	—
Miner-Hillard Mill. Co., Wilkes-Barre, Pa.							
Steam cooked,.. S. R. Carter	Berlin......	8.77	9.97	12.00	6.83	9.00	—
Steam cooked,.. J. W. Wilder	Springfield .	9.45	9.88	12.00	6.65	9.00	—
B. W. Brown.........	Concord....	8.49	9.83	—	7.10	—	—
Patent Cereals Co., Geneva, N. Y.							
J. B. Bridges & Co....	Deerfield...	6.77	12.20	11.46	9.94	9.30	—
Hawes & Pierce	Foxboro ...	8.23	10.53	11.46	8.89	9.30	—
J. E. Soper & Co., Boston, Mass.							
Blue Ribbon, ... M. F. Wilbur	Lexington .	9.52	10.40	11.36	7.90	9.30	—
Blue Ribbon,... A. N. Wittemore &Co.	Worcester..	7.23	10.67	11.36	8.44	9.30	—
Suffern, Hunt & Co., Decatur, Ill.							
D. W. Manvel........	Sheffield ...	10.61	10.44	11.02	8.53	7.70	—
Cutler Co.............	W.Brookfi'd	11.21	10.27	11.02	8.03	7.70	—
Below standard.							
Chapin & Co., Boston, Mass.							
Green Diamond, W. F. Tay............	Barre	11.39	8.78	11.00	6.58	8-9	7.19
Highest	....	11.70	12.20	—	10.01	—	—
Lowest...............	....	6.16	8.78	—	4.11	—	—
Average..............	....	9.23	10.27	—	7.88	—	—

PROVENDER.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
E. W. Bailey & Co., Montpelier, Vt.							
Seth J. Reed..........	Amherst ...	12.80	9.48	—	3.98	—	—
C. S. Barber..........	Bernardst'n.	12.46	9.00	—	3.39	—	—
E. E. Cole............	Billerica....	11.44	9.35	—	3.30	—	—
No. 1,.......... E. A. Cowee..........	Worcester..	11.24	10.53	—	3.67	—	—
J. Cushing & Co.	Winchend'n	12.08	9.21	—	3.72	—	—
Cutler Co.............	Framingh'm	11.87	10.01	—	3.72	—	—
Potter Grain Co.......	Shelburne .	12.30	9.26	—	3.63	—	—
Smith, Northam & Co., Hartford, Conn.							
Renfrew & Son	Pittsfield ...	11.45	9.79	9.00	3.55	4.00	—
Average..............	....	11.97	9.58	—	3.62	—	—

CORN AND OAT FEED.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
		%	%	%	%	%	%
American Cereal Co., Chicago, Ill.							
Victor, ...Howe Bros.	Gardner....	9.91	8.51	9.00	4.06	4.00	—
Victor, ...Geo. F. Wetherbee...	Gardner....	8.19	9.61	9.00	4.30	4.00	—
Victor, ...H. C. Puffer Co.......	Springfield .	10.78	8.91	9.00	3.19	4.00	—
Victor, ...M. J. Jencks..........	Webster ...	9.93	8.30	9.00	3.98	4.00	11.38
H. C. Bowen & Sons, Cheshire, Mass.							
H. C. Bowen & Son...	Cheshire ...	12.90	8.34	—	2.98	—	—
Buffalo Cereal Co., Buffalo, N. Y.							
XXX ....John F. Shine	Dedham ...	9.63	9.21	9.50	5.51	4.50	—
Jacob Burkhardt, Beverly, Mass.							
Colonial, ...H. T. Cressey	Beverly	9.68	10.97	—	5.58	—	—
David Connor, Nashua, N. H.							
David's Stock,..W. A. Dickinson......	Lowell	10.17	9.13	—	3.97	—	—
David's Stock,..E. A. Cowee..........	Worcester..	6.22	10.79	11.83	7.07	9.18	—
E. A. Cowee, Worcester, Mass.							
No. 2, ...E. A. Cowee..........	Worcester..	10.67	9.83	—	4.82	—	—
Diamond Elev. & Mill. Co., Minneapolis.							
O. O. Yellow, ...W. G. Johnson	Montague ..	10.24	10.84	10.51	5.99	5.75	—
O. O. Yellow, ...P. W. Eaton & Co. ...	Williamst'n.	10.87	10.53	10.51	5.47	5.75	—
O. O. White.....J. L. Brown...........	Fitchburg ..	10.47	10.32	10.51	5.31	5.75	—
Edward Ellsworth & Co., Buffalo, N. Y.							
De-Fi, ...Frank E. Smith.......	Amherst ...	10.56	9.30	8.30	2.88	3.00	—
De-Fi, ...S. D. Viets Co.	Springfield .	10.39	9.04	8 30	3.32	3.00	—
De-Fi, ...F. M. Keefe..........	Waltham...	9 47	9.35	8.30	2.50	3.00	—
R. M. Gould..........	W.Brookf'ld	10.37	9.09	8.30	2.84	3.00	15.06
Great Western Cereal Co., Chicago. Ill.							
Boss,...........Briggs & Co.	Taunton....	9.58	8.91	8.50	4.84	4.00	—
G't. Western[1]...T. J. McDonald	Lowell	8.86	8.51	12.25	2.23	3.20	—
G't. Western[1]...Geo. B. Pope.........	Waltham...	7.55	8.04	12.25	2.38	3.20	—
G't. Western[1]...W. K. Gilmore & Son.	Wrentham .	8.69	8.47	12.25	2.01	3.20	—
Excelsior, ...E. E. Cole............	Billerica....	8.31	10.27	9.00	6.65	4.20	—
Excelsior, ...G. F. Wetherbee	Gardner....	6.19	9.44	8.21	4.68	4.58	—
W. H. Haskell & Co., Toledo, Ohio.							
Haskell's Oat, ..J. B. Brown...........	Fitchburg ..	9.04	8.12	12.00	5.29	6.25	10.39
Haskell's Oat, ..Butman & Cressey....	Lynn.......	10.85	8.86	12.00	5.86	6.25	—
Haskell's Oat, ..S. A. Eastman........	Milford	10.08	8.34	—	5.69	—	—
Haskell's Stock, A. A. Prentiss & Co...	Athol	8.57	9.09	10.00	6 43	6.25	—
Haskell's Stock, Wallace Bros.........	Clinton.....	8.35	9 00	10.00	6.35	6.25	—
Haskell's Stock, C. G. Burnham.......	Holyoke ...	9.16	8.34	10.00	5.63	6.25	8.53
Haskell's Stock, J.. F. Robinson	Mansfield ..	9.17	8.60	10.00	5.94	6.25	—
Husted Mill. & Elev. Co., Buffalo, N. Y..							
Monarch Chop,.C. G. Burnham	Holyoke....	10.80	8.12	10.04	3.50	4.14	11.33
Monarch Chop,.Potter Bros. & Co.....	N. Adams ..	9.41	8.51	10.04	3.41	4.14	—
Lackawanna Mill.&Elev.Co.,Buffalo,N.Y.							
Lackawanna, ...F. F. Woodward & Co.	Fitchburg ..	11.84	10.84	10.93	2.08	3.48	—
Lackawanna, ...F. F. Woodward & Co.	Fitchburg ..	11.19	9.48	10.93	2.77	3.48	—
New Occidental Mill Co., Minneapolis.							
I. X. L.,........A.N.Whittemore & Co.	Worcester..	9.73	9.88	10.02	4.72	4.67	—
I. X. L.,........A.N.Whittemore & Co.	Worcester..	7.00	11.41	9.42	5.10	4.31	—

[1]Withdrawn from the market.

CORN AND OAT FEED. (CONTINUED)

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein		Fat		Fiber
			Found	Guar.	Found	Guar.	
		%	%	%	%	%	%
Elmer C. Packard, Brockton Mass.							
Ground Oats,... Elmer C. Packard	Brockton...	10.25	10.40	—	3.88	—	—
Paine Bros. Co., Milwaukee, Wis.							
Puritan,........ Geo. F. Wetherbee...	Gardner....	10.91	7.19	8.50	1.81	3.25	—
Potter Grain Co., North Adams, Mass.							
Potter Grain Co.......	N. Adams..	10.82	8.65	8.50	3.66	3.50	—
M. C. Richmond, Adams, Mass.							
M. C. Richmond......	Adams	9.84	10.71	—	5.57	—	—
Strong-Lefferts Co., New York, N. Y.							
Lenox,......... City Mills Co.........	Holyoke ...	10.75	8.69	9.88	3.97	3.27	—
Lenox,......... City Mills Co.........	Holyoke ...	9.80	7.19	9.88	3.30	3.27	12.43
Lenox,......... Bradley Bros.........	Pittsfield ...	11.29	8.16	9.88	3.82	3.27	—
Lenox,......... Bradley Bros.........	Pittsfield ...	9.72	8.08	9.88	4.29	3.27	—
Highest	....	12.90	11.41	—	7.07	—	—
Lowest	....	6.19	7.19	—	1.81	—	—
Average	....	9.73	9.17	—	4.31	—	—

FORTIFIED OAT FEEDS.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Fiber
American Cereal Co., Chicago, Ill.							
Quaker Dairy,.. H. C. Black & Son ...	Greenfield..	8.27	14.00	14.00	3.88	3.50	14.30
Quaker Dairy,.. Arthur D. Potter	Orange.....	5.94	14.79	14.00	3.75	3.50	—
Quaker Dairy,.. Arthur D. Potter	Orange.....	8.14	14.13	14.00	4.00	3.50	—
Quaker Dairy,.. M. J. Jencks..........	Webster....	8.65	14.57	14.00	4.22	3.50	—
Schumachers, .. J. Cushing & Co........	Fitchburg ..	6.25	12.86	13.00	5.29	5.00	—
Schumachers, .. Merriam & Rolph	Fitchburg ..	9.42	11.72	13.00	4.65	5.00	9.46
Schumachers, .. H. C. Black & Co.	Greenfield..	9.18	12.07	13.00	4.84	5.00	—
Schumachers, .. Jefts & Spear.........	Holden.....	9.34	11.41	13.00	4.32	5.00	8.95
Schumachers, .. E. A. Cowee	Worcester..	8.23	12.86	13.00	5.48	5.00	—
Schumachers, .. E. A. Cowee..........	Worcester..	9.20	11.93	13.00	4.78	5.00	—
H. C. Black & Sons, Greenfield, Mass.							
Horse Prov., ... H. C. Black & Son....	Greenfield..	11.25	11.54	—	3.91	—	—
Buffalo Cereal Co., Buffalo, N. Y.							
Horse Feed,.... G. M. Foster.........	Lowell	9.55	11.19	12.00	4.49	4.50	10.42
Horse Feed..... E. A. Briggs & Co.....	N.Attleboro	10.18	11.58	12.00	4.48	4.50	—
Dairy........... C. A. Ketchum & Co. .	Salem......	9.01	13.77	14.00	3.88	4.25	13.44
M. L. Crittenden, Buffalo, N. Y.							
Empire,........ E. A. Cowee..........	Worcester..	8.53	14.62	—	5.57	—	—
J. B. Garland & Son, Worcester, Mass.							
A. Red Tag,.... J. B. Garland & Son ..	Worcester..	6.89	13.16	12.75	4.77	3.50	—
A. Red Tag,.... J. B. Garland & Son ..	Worcester..	8.99	11.84	12.75	5.48	3.50	—
B. Red Tag,.... J. B. Garland & Son ..	Worcester..	6.33	10.75	11.50	3.90	3.25	—
B. Red Tag,.... J. B. Garland & Son ..	Worcester..	8.50	11.19	10.50	4.97	3.25	—
H-O Co., Buffalo, N. Y.							
H-O Horse, ... H. C. Black & Son....	Greenfield..	10.60	11.84	12.00	3.96	4.50	8.92
H-O Horse, ... H. E. Noyes & Son...	Lowell	10.29	12.55	12.00	4.43	4.50	—
H-O Horse, ... A. B. Bacon...........	Spencer....	10.11	12.11	12.00	4.25	4.50	—
H-O Horse, ... S. D. Viets Co.........	Springfield .	10.68	12.02	12.00	4.38	4.50	—
H-O Horse, ... R. M. Gould..........	W.Brookf'ld	10.52	11.80	12.00	4.35	4.50	—
Highest	....	11.25	14.79	—	5.57	—	—
Lowest	....	5.94	10.75	—	3.75	—	—
Average	....	8.92	12.51	—	4.50	—	—

OAT FEED.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein		Fat		Fiber
			Found	Guar.	Found	Guar.	
		%	%	%	%	%	%
American Cereal Co., Chicago, Ill.							
Vim, ...A. A. Prentiss & Co...	Athol	8.32	7.73	7.50	3.05	2.75	—
Vim, ...Torrence, Vary & Co..	Lynn.......	8.42	5.49	7.50	1.89	2.75	—
Vim, ...C. D. Holbrook Co....	Palmer.....	7.42	6.93	7.50	2.48	2.75	—
Vim, ...W. P. Griffen.........	Pittsfield ...	8.05	5.05	—	2.17	—	27.37
Vim, ...L. A. Snow...........	Upton	7.51	8.69	7.50	2.83	2.75	—
Buffalo Cereal Co., Buffalo, N. Y.							
Standard, ...C. O. Parsons.........	Northamp'n	7.46	7.81	7.00	3.08	3.00	—
Chas. M. Cox Co., Boston, Mass.							
O. M. Regular, .U. W. Boyden........	Foxboro ...	6.02	6.54	—	3.80	—	—
O. M. Regular, .Hale Knight..........	Newburyp't	6.77	6.14	—	3.47	—	24.16
O. M. Regular, .C. D. Holbrook Co. ..	Palmer.....	5.92	6.32	—	3.56	—	—
O. M. Regular, .J. B. Garland & Son..	Worcester..	5.45	6.19	—	3.47	—	—
Great Western Cereal Co., Chicago, Ill.							
Cream,[1] ....J. S. Nason & Co......	Westboro ..	9.59	6.32	8.25	1.85	4.14	—
Cream,[1] ....Wm. J. Meek.........	Fall River..	8.89	7.68	6.97	1.88	2.83	—
Royal, ...H. C. Bowen & Son ..	Cheshire ...	9.01	5.88	8.25	1.40	4.14	—
Royal, ...J. B. Garland & Son ..	Worcester..	5.22	6.76	7.60	2.25	2.80	—
Royal, ...Jacob Burkhardt......	Beverly	8.83	7.28	7.53	2.24	2.65	—
Royal, ...O. B. Burnham	Beverly	9.03	7.02	7.53	2.12	2.65	24.15
Royal, ...John Notter	N. Bedford.	8.96	8.30	7.53	2.67	2.65	—
Rodney J. Hardy & Sons, Boston, Mass.							
Magnolia, ...O. F. Metcalf & Sons.	Franklin ...	10.25	6.49	—	1.91	—	—
Norton-Chapman Co., Boston, Mass.							
Argyle,.........J. S. Nason & Co.	Westboro ..	8.76	5.93	6.97	1.51	2.83	—
J. E. Soper & Co., Boston, Mass.							
Boston,.........W. H. Garland.......	Gloucester .	8.99	7.90	6.97	2.08	2.83	—
Unknown.							
Oat Dust, ...Cutler Bros...........	Wakefield ..	10.05	10.67	—	2.43	—	—
Lenoxdale Mill.......	Lenox......	6.95	7.54	—	3.56	—	—
Highest	....	10.25	10.67	—	3.80	—	—
Lowest	....	5.22	5.05	—	1.40	—	—
Average	....	7.99	7.03	—	2.53	—	—

MISCELLANEOUS FEEDS.

Unknown.							
Barley Feed, ...Cutler Bros...........	Wakefield..	9.99	13.82	—	4.00	—	—
J. B. Garland & Son, Worcester, Mass.							
Barley Meal,....J. B. Garland & Son ..	Worcester..	10.64	13.56	—	1.91	—	—
Cerealine M'f'g. Co., Indianapolis, Ind.							
Cerealine, ...John Shea	Lawrence ..	9.10	14.83	—	7.97	—	—
Cerealine, ...Victor Grain Co.......	Lawrence ..	11.05	12.99	—	6.56	—	6.46

[1] Withdrawn from the market.

MISCELLANEOUS FEEDS. (CONTINUED)

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein		Fat		Fiber
			Found	Guar.	Found	Guar.	
		%	%	%	%	%	%
Hale Knight, Newburyport, Mass.							
Corn Bran,.....Hale Knight..........	Newburyp't	9.40	8.69	—	4.38	—	—
Mellin's Food Co., Boston, Mass.							
Dried Grain, ...Geo. B. Pope & Co. ..	Waltham...	8.53	13.42	—	3.09	—	—
Phoenix Milling Co., Petersburg, Va.							
Peanut Bran,...James Lally Jr.	Milford	9.93	9.48	7.70	3.21	2.30	—
J. W. Ellsworth & Sons, New York, N.Y.							
G'd Peanut Shells, Briggs & Co.	Taunton ...	9.70	2.46	—	0.48	—	—
Henry Rang & Sons, Chicago, Ill.							
Rice Middlings. Jaquith & Co.	Woburn....	8.90	6.76	7.50	4.02	7.00	23.36
Unknown.							
Rye Meal,.......A. M. Thompson......	Worcester..	12.22	10.79	—	1.89	—	—
Natural Food Co., Niagara Falls, N. Y.							
Shredded Wheat Ref.. S. R. Carter....	Berlin......	9.13	11.10	—	1.73	—	—

III. Poultry Feeds.

MEAT SCRAPS.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein		Fat		Fiber
			Found	Guar.	Found	Guar.	
		%	%	%	%	%	%
1. Beef.							
American Agricultural Chemical Co., N.Y.							
Hull Coal & Grain Co.	Lee	9.15	50.54	—	13.24	—	—
Bowker Co., Boston, Mass.							
J. E. Lamb	Greenfield	9.23	51.65	30.00	13.45	20.00	—
W.E. Livingston	Lowell	8.53	54.28	30.00	15.04	20.00	—
D. W. Manvel	Sheffield	9.66	59.37	30.00	17.73	20.00	—
C. L. Beals & Co.	Winchend'n	8.27	53.22	30.00	15.02	20.00	—
Joseph Breck & Sons, Boston, Mass.							
E. D. Palmer & Co.	Dedham	10.14	46.55	50-55	14.61	15-17	—
L. B. Darling Fert. Co., Pawtucket, R. I.							
Bryant & Soule	Middleboro	7.50	47.38	50.00	16.96	16.00	—
John C. Dow Co., Boston, Mass,							
S. R. Carter	Berlin	10.44	52.61	—	13.35	—	—
J. W. Doon & Son	Natick	8.55	46.07	50-55	15.48	15-17	—
W. D. Higgins, Framingham, Mass.							
J. F. Ray	Franklin	10.19	48.31	40-50	17.01	15-20	—
Boston Branch	Mansfield	6.84	45.45	—	12.41	—	—
Joseph W. Kirchner, Pittsfield, Mass.							
D. Dresser	Lee	9.03	51.24	—	24.31	—	—
Lowell Fertilizer Co., Boston, Mass.							
Swift's Lowell, City Mills	Holyoke	8.27	54.09	40-50	16.15	15-20	—
Swift's Lowell, J. B. Cover & Co.	Lowell	8.88	51.51	40-50	15.65	15-20	—
A. Lord & Co., Chelsea, Mass.							
M. J. Curley Est.	Wakefield	8.14	46.50	—	17.18	—	—
George E. Marsh Co., Lynn, Mass.							
W. C. S. Wood	Norton	9.85	50.24	—	13.52	—	—
C. A. Ketchum & Co.	Salem	9.97	54.28	—	12.19	—	—
N.E. Dressed Meat & Wool Co., Boston.							
Coarse, J. W. Day & Co.	Lynn	9.48	67.91	58-62	13.16	10-19	—
Fine, J. W. Day & Co.	Lynn	8.72	64.50	58-62	17.04	10-19	—
Parmenter & Polsey Fert. Co., Peabody.							
P. & P., No. 1, O. B. Burnham	Beverly	6.91	46.90	—	21.16	—	—
P. & P., A. Dodge	Beverly	8.41	45.85	—	24.69	—	—
Unknown.							
E. D. Ammidon	Southbri'ge	9.14	58.67	—	12.05	—	—
Below standard.							
A. Lord & Co., Chelsea, Mass.							
Bosworth & Wood	Leominster.	8.99	40.76	—	18.25	—	—
Highest		10.44	67.91	—	24.69	—	—
Lowest		6.84	40.76	—	12.05	—	—
Average		8.88	51.65	—	16.07	—	—
2. Mutton.							
N.E. Dressed Meat & Wool Co., Boston.							
Geo. B. Pope & Co.	Waltham	6.82	36.86	—	17.72	—	—

MEAT AND BONE MEAL.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein		Fat		Fiber
			Found	Guar.	Found	Guar.	
		%	%	%	%	%	%
Armour Fertilizer Works, Chicago, Ill.							
F. A. Walker	N. Adams	6.86	55.42	—	13.37	—	—
Ropes Bros	Salem	7.03	52.17	—	13.27	—	—
C. A. Bartlett, Worcester, Mass.							
Bartlett's O. K., F. Diehl & Sons	Wellesley	7.39	57.43	—	11.25	—	—
Joseph Breck & Sons, Boston, Mass.							
Cyrus Jones	Lynn	6.87	32.43	—	10.00	—	—
Bowker Co., Boston, Mass.							
J. Cushing & Co	Fitchburg	4.85	34.01	—	9.02	—	—
H. C. Puffer Co	Springfield	5.69	33.57	—	8.87	—	—
Bradley Fertilizer Co., Boston, Mass.							
Superior, G. F. Greene Coal Co.	Brockton	4.61	30.89	—	7.77	—	—
Superior, W. N. Potter & Sons	Greenfield	5.23	34.31	—	7.59	—	—
Superior, Hull Coal & Grain Co.	Lee	6.94	47.08	—	9.00	—	—
Chicopee Rend'g Co., Springfield, Mass.							
Bartlett's O. K., E. D. Ammidon	Southbri'ge.	5.18	33.57	—	15.32	—	—
Bartlett's O. K., Geo. P. Rogers	Worcester	12.02	33.70	27-30	14.75	12-15	—
John C. Dow Co., Boston, Mass.							
Favorite, E. H. Smith	Northboro	7.32	30.62	32-35	10.08	10-12	—
Lowell Fertilizer Co., Boston, Mass.							
Swift's Lowell, J. B. Cover & Co	Lowell	9.49	50.63	50.00	12.50	10.00	—
Swift's Lowell, Prentice & Son	Milford	11.34	51.91	—	9.68	—	—
Parmenter & Polsey Fert. Co., Peabody.							
P. & P., O. B. Burnham	Beverly	5.79	35.58	—	8.80	—	—
D. W. Romaine, New York, N. Y.							
Lamb Bros. & Co.	Orange	4.59	39.36	45.00	17.35	15.00	—
E. A. Cowee	Worcester	4.60	42.73	45.00	15.75	15.00	—
Whitman&PrattRend'gCo.,Dracut,Mass.							
J. B. Cover & Co	Lowell	5.26	38.87	32-35	14.05	10-15	—
Below standard.							
Beach Soap Co., Lawrence, Mass.							
Star, A. D. Thomas	Palmer	4.60	26.99	30.00	9.18	10.00	—
Star, C. L. Beals & Co	Winchendon	4.72	23.65	30.00	11.25	10.00	—
W. D. Higgins, Framingham, Mass.							
O. F. Metcalf & Sons.	Franklin	5.71	25.89	—	25.53	—	—
Frank S. Platt Co., New Haven, Conn.							
N. Paquin & Sons	Fall River	6.00	27.69	51-55	10.30	10-16	—
Highest		12.02	57.43	—	25.53	—	—
Lowest		4.59	23.65	—	7.59	—	—
Average		6.46	38.11	—	12.03	—	—

FISH.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein		Fat		Ash
			Found	Guar.	Found	Guar.	
		%	%	%	%	%	%
International Glue Co., Boston, Mass.							
Red Star, ... Mackenzie & Winslow	Fall River..	10.74	40.63	—	0.96	—	—
Red Star, ... City Mills	Holyoke ...	8.68	46.50	—	1.17	—	—
Average	....	9.71	43.57	—	1.07	—	—

BONE MEAL.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Ash
Beach Soap Co., Lawrence, Mass.							
Star, ... Geo. A. Stevens	Worcester..	2.73	10.79	10.00	7.26	8.00	—
Bowker Co., Boston, Mass.							
W. G. Johnson	Montague .	8.80	25.01	20.00	0.42	—	—
L. B. Darling Fert. Co., Pawtucket, R. I.							
E. D. Ammidon	Southbridge	7.25	25.19	—	5.97	—	—
Lowell Fertilizer Co., Boston, Mass.							
Swift's Edible, . J. B. Cover & Co......	Lowell	2.98	16.23	—	11.58	—	—
Swift's Lowell, . D. W. Manvel	Sheffield ...	4.92	15.32	2.47-3.29[1]	5.05	—	—
Rogers & Hubbard Co., Middletown, Conn.							
Raw knuckle, ... Prentiss, Brooks & Co.	Holyoke ...	7.53	24.70	3.50-4.00[2]	1.72	—	—
Whitman & Pratt Rend'g Co., Dracut, Mass.							
Green cut, ... E. H. Smith	Northboro .	8.22	25.80	—	9.60	—	—
Highest	....	8.80	25.80	—	11.58	—	—
Lowest	....	2.73	10.79	—	0.42	—	—
Average	....	6.06	20.43	—	5.94	—	—

POULTRY MEAL.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Ash
American Cereal Co., Chicago, Ill.							
American, ... J. H. Bosworth	Chicopee ...	12.56	14.97	14.00	5.87	4.50	—
American, ... Mackenzie & Winslow	Fall River..	12.26	13.30	14.00	5.77	4.50	2.83
American, ... J. L. Brown	Fitchburg ..	11.67	13.86	14.00	5.58	4.50	—
Buffalo Cereal Co., Buffalo, N. Y.							
Buffalo, ... C. A. Ketchum & Co..	Salem	10.73	15.93	17.00	5.07	5.50	2.64
Buffalo, ... E. A. Cowee	Worcester..	10.75	16.23	17.00	4.85	5.50	—
J. W. Day & Co., Lynn, Mass.							
Meat Mash, ... J. W. Day & Co	Lynn	9.57	12.16	—	4.00	—	29.81
C. H. Felker & Co., Brockton, Mass.							
O. K., ... C. H. Felker & Co. ...	Brockton ...	11.60	15.67	—	4.13	—	4.57
Green Chicken F'd Co., Marblehead, Mass.							
Mash, ... C. A. Ketchum & Co. .	Salem	6.99	11.45	—	2.74	—	29.03

[1] As Nitrogen equivalent to 15.44—20.53% Protein.
[2] As Nitrogen equivalent to 21.85—25.01% Protein.

POULTRY MEAL. (CONTINUED)

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Ash
		%	%	%	%	%	%
H-O Co., Buffalo, N. Y.							
Chick Feed, ...Frank E. Smith	Amherst ...	9.62	14.21	—	9.13	—	1.69
H-O, ...C. B. Benedict........	G. Barring'n	9.70	15.58	17.00	5.42	5.50	2.79
H-O, ...H. C. Black & Son ...	Greenfield..	10.21	16.32	17.00	5.27	5.50	—
H-O, ...H. K. Webster & Co. .	Lawrence ..	10.51	16.23	17.00	4.97	5.50	—
H-O, ...Bosworth & Wood....	Leominster.	8.99	16.02	17.00	5.33	5.50	—
H-O, ...A. B. Bacon..........	Spencer....	9.05	16.63	17.00	5.30	5.50	—
Cyrus Jones, Lynn, Mass.							
Mash, ...Cyrus Jones	Lynn.......	8.06	12.20	—	3.81	—	—
Ropes Bros., Salem, Mass.							
Hash, ...Ropes Bros...........	Salem......	10.60	15.71	—	4.72	—	5.19
Spratts Patent, America, Newark, N. Y.							
Chick Meal[1], ...Vietor Grain Co.......	Lawrence ..	8.93	21.02	—	3.75	—	—
Highest	....	12.56	21.02	—	9.13	—	—
Lowest..............	....	6.99	11.45	—	2.74	—	—
Average.............	....	10.11	15.15	—	5.04	—	—

CHICK AND SCRATCHING GRAINS.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Ash
Cyphers Incubator Co., Boston, Mass.							
Cyphers, ...Hawes & Pierce	Foxboro....	9.63	10.53	—	2.48		17.97
Cyphers. ....J. B. Cover & Co.	Lowell	10.02	10.79	—	2.80		—
A. Dodge, Gloucester, Mass.							
A. Dodge	Gloucester .	10.79	11.72	—	2.74		6.11
C. H. Felker & Co., Brockton, Mass.							
E. L. Lothrop & Son..	W.Bridgew'r	10.88	11.02	—	4.26		1.99
A. C. Griffen, Pittsfield, Mass.							
O. K.,..........H. C. Black & Son....	Greenfield..	8.39	9.21	—	3.36		21.32
O. K.,..........A. C. Griffen	Pittsfield ...	7.25	10.88	—	4.54		—
H-O Co., Buffalo, N. Y.							
H-O, ...H. C. Black & Son....	Greenfield..	9.90	11.45	12.00	3.67	3.00	—
H-O,...........M. J. Curley Est.......	Wakefield..	10.89	11.28	12.00	3.89	3.00	1.78
Ropes Bros., Salem, Mass.							
Ropes Bros...........	Danvers....	10.30	12.11	—	4.30		2.01
Ross Bros., Worcester, Mass.							
Wyandotte,.....J. E. Lamb...........	Greenfield..	9.66	7.63	—	2.22		24.45
Wyandotte,.....Prentice & Son.......	Milford	10.14	7.95	—	2.13		—
Wyandotte,.....F. Diehl & Son.......	Wellesley ..	10.18	8.12	—	2.46		—
Smith, Northam & Co., Hartford, Conn.							
F. W. Sawtelle & Co..	Hyde Park.	10.13	11.14	—	2.86		—

[1]Cracked Cooked Biscuit.

CHICK AND SCRATCHING GRAINS. (CONTINUED)

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Ash
		%	%	%	%	%	%
H. K. Webster & Co., Lawrence, Mass.							
High Grade,.... Vietor Grain Co........	Lawrence ..	11.61	11.80	—	3.63	—	1.59
High Grade,.... H. K. Webster & Co...	Lawrence ..	11.74	12.20	—	3.21	—	—
Highest	....	11.74	12.20	—	4.54	—	—
Lowest	....	7.25	7.63	—	2.13	—	—
Average	....	10.10	10.52	—	3.24	—	—
Unknown.							
Kaffir Corn, ... Sykes Coal &Grain Co.	N. Adams..	12.64	10.32	—	3.46	—	—
W. Screenings,. D. F. Howard	Ware	10.08	15.79	—	4.23	—	—
W. Screenings,. E. W. Kenneson & Co.	Worcester..	10.58	14.21	—	3.56	—	—

CLOVER MEAL.

Manufacturer or Jobber, Brand and Retailer.	Sampled at:	Water	Protein Found	Protein Guar.	Fat Found	Fat Guar.	Ash
Bennett & Millett Co., Gouverneur, N.Y.							
Pioneer,........ J. W. Doon & Son	Natick	9.56	13.56	—	2.08	—	—
Joseph Breck & Sons, Boston, Mass.							
Cut Clover,..... J. F. Robinson........	Mansfield ..	10.84	12.42	—	2.15	—	—
Cyphers Incubator Co., Buffalo, N. Y.							
Ropes Bros...........	Salem......	10.90	10.32	—	1.49	—	—
D. & D. Milling Co., Fayetteville, N. Y.							
D. & D.,........ City Mills Co.	Holyoke....	11.92	17.38	—	1.64	—	—
Ross Bros., Worcester, Mass.							
C. C. M., ... Lamb Bros. & Co.	Orange.....	10.20	11.84	—	2.05	—	—
Unknown.							
S. A. Eastman,........	Hopkinton .	8.90	12.42	—	1.79	—	—
H. C. Puffer & Co.....	Springfield .	8.52	12.64	—	3.02	—	—
Average.............	....	10.12	12.94	—	2.03	—	—

D. WHAT THE RESULTS MEAN.

I. Protein Feeds.

Cottonseed and linseed meals. *Pages 10-11.*

Sixty-seven samples of *cottonseed meal* were collected and tested and the results tabulated in the preceding tables. Almost every sample was properly marked and guaranteed and all were free from serious adulteration, a fact worthy of especial mention. Fourteen samples ran from 2 to 5 per cent below the regular 43 per cent guaranty. It is hoped that manufacturers and jobbers will be more particular in the future in this respect. It is stated on good authority that considerable capital has been invested recently in equipment for grinding cottonseed hulls fine to mix with high grade meal. Considerable of this mixture is being shipped into Canada, though thus far this season none of the product has been found in Massachusetts. Consumers are cautioned to buy only guaranteed meals. A dark-colored cottonseed meal is not necessarily adulterated. The dark color may be due to bald seed which breaks up readily the hulls passing into the meal, to heating of the seed which discolors the product or to over-cooking of the meat. Cottonseed meal at present prices forms one of the very cheapest sources of protein.

None of the twenty-six samples of *linseed meal* collected were found to contain any adulteration and all but four were properly guaranteed. The six samples of new process meal failed to maintain the protein guaranty of 38 per cent. The wholesale price of linseed is noticeably less than formerly, now being $24.50 a ton in car lots. If it can be bought at retail at a proportionate price it can be regarded as an economical feed.

Gluten products. *Pages 13-14.*

But little *gluten meal* was found. The Chicago had been temporarily withdrawn owing to the burning of the mill where it was manufactured, and the King gluten meal has been permanently taken from the market.

Germ oil meal was temporarily out of the market but will be again offered. *Gluten feed* was fairly well distributed. It ran 2 to 3 per cent below its guaranty, due primarily to the poor quality of the corn crop of 1902. A few samples containing only 19 to 21 per cent of protein were collected. The cause of this especially low protein percentage is probably due, partly to poor corn and partly to the imperfect separation of the starch. It is believed that manufacturers place too high a guaranty on gluten feed. It rarely contains 28 per cent of protein, and a guaranty of 25 or possibly 26 per cent would be more nearly correct.

Distillers' by-products. *Pages 14-15.*

Distillers' dried grains are finding a considerable market. They are of a bulky nature and a valuable and economical addition to high grade protein feeds. Scarcely any of the several prominent brands offered met the protein guaranty of 33 per cent by from 2 to 3 per cent, due perhaps, as was the case with gluten feed, to the general inferior condition of the corn. *The manufacturers and jobbers will have to determine whether it will be possible in the future to* maintain their guaranty. Consumers should be sure, before purchasing, that feeds of this character are properly guaranteed.

Four samples of *malt sprouts* were found, of which three were unguaranteed. Malt sprouts may be considered a satisfactory source of protein for milk production if properly fed. They are highly esteemed by German feeders. *They should always be bought on a guaranty of 25 per cent protein, as such material can be easily adulterated.*

The one sample of yeast refuse was unguaranteed, and contained 23 per cent protein. It should prove a valuable protein feed, if dried before it becomes too sour.

Wheat by-products. *Pages 16-26.*

Wheat offal was very generally distributed and its character on the whole may be regarded with satisfaction. All of the several grades—middlings, mixed feed and bran—showed rather less protein and fat than those collected a year ago, due in all probability to the poorer quality of the 1902 wheat crop.

Two samples of *red dog* flour contained only 14.92 and 15.40 per cent protein and one lot of *standard middlings* showed but 12.95 per cent protein, much below what is usually found in materials of this character.

Mixed feed is a mixture of varying proportions of bran and middlings. Generally speaking the higher the percentage of protein, the more middlings, and the better the feed. Six samples of unguaranteed mixed feed were adulterated with ground corn cobs, and contained only 10.23 to 13.69 per cent of protein. Genuine mixed feed should not contain over 8.5 per cent of fiber, while these adulterated feeds contained from 13 to nearly 17 per cent. Local dealers were notified of this condition and *are cautioned against offering material of this kind unless it is labeled in accordance with section 6 of the new feed law.*

Six samples of "mixed feed" consisting of bran and middlings together with a foreign admixture and containing from 10.75 to 13.30 per cent of protein were also collected. While they met their guarantees in most cases, the character of the admixture was incorrectly stated, or not stated at all. They were found to contain ground corn cobs or similar material. One sample of so-called mixed feed consisted of wheat bran, wheat middlings and white corn. It should have been properly marked.

Attention is again called to the fact that the term "mixed feed" employed by millers for a mixture of wheat bran and middlings is in the judgment of the writer an unfortunate one. It is believed that the term "mixed wheat feed" or pure wheat bran and middlings would be preferable. Millers are strongly urged for their own protection to place a protein and fat guaranty upon such mixtures.

Wheat bran was of the usual good character. There is a tendency on the part of some mills to mix the ground screenings with the bran, a practice not to be endorsed.

Canada bran showed only 14 per cent of protein, due probably to the difference in the milling process, the starchy matter not being thoroughly removed. It is rather heavier than western bran, of a flaky nature, and is preferred by many feeders.

Miscellaneous dairy feeds. *Pages 26-27.*

Bibby's dairy cake composed principally of ground cottonseed, cereals such as barley and wheat, molasses, fenugreek and salt, has a pleasant taste and smell and is highly relished by farm animals. It should have about the same feeding value as flour middlings but the price asked for it—$34 to $36 per ton—renders it very expensive. The *H-O dairy feed* and the *Buffalo creamery feed* are fortified oat feeds. They nearly maintained their guarantees. Such mixtures at the usual price are likely to prove expensive as compared with unmixed feeds, such as cottonseed meal, gluten feeds and flour middlings.

Blatchford's calf meal composed of linseed and cottonseed meals, cereals, carob bean and fenugreek, has been tested at this station and found satisfactory as a partial milk substitute for young robust calves. The price asked, $3.50 a hundred pounds, is not considered extravagant.

Blomo feed, *molasses feed*, *oat middlings* and *rye feeds* are spoken of under *New Feeds*.

II. Starchy Feeds.

Corn and hominy meals. *Pages 28-29.*

Corn meal showed rather less protein than usual, due to the rather inferior character of the 1902 corn crop. No adulteration was observed.

Thirty-two samples of hominy put out by 12 different manufacturers were collected. They averaged 10.27 per cent protein and 7.88 per cent fat In company with corn meal, hominy was rather below the average of former years, in both ingredients. It is believed that 10.50 per cent protein and 8 per cent fat would be the proper minimum guarantees. At the prevailing market prices hominy is one of the most economical starchy feeds. It was free from adulteration.

Provenders. True provender consists of a mixture of ground or cracked oats and cracked corn or corn meal and should contain 10 per cent protein and 4 per cent fat. A number of samples were collected of local millers and averaged 9.58 per cent protein and 3.62 per cent fat. They are to be preferred to mixtures of oat offal and poor corn.

Corn and oat feeds. *Pages 30-31.*

These are mixtures of oat offal and corn or hominy meal, in many cases fortified with a little flour middlings or red dog, to bring up the protein percentage. They varied in composition from 7.19 to 11.41 per cent of protein with an average of 9.17 per cent, and from 1.81 to 7.07 per cent fat, averaging 4.31 per cent. Judging from the number of brands in the market, they are profitable feeds to manufacture, and offer a convenient way of disposing of the oat offal. They are sold at from $1.15 to $1.40 a hundred pounds. In the writer's judgment, the best of the feeds is worth 10 per cent less than corn meal. *The Great Western dairy feed*, now said to be withdrawn from the market, was very noticeably below the guaranty. *Haskell's oat* and *Haskell's stock feeds*, fell decidedly below the guaranty of the maker, especially in protein. The same may be said of *Lenox stock feed*, put out by the Strong-Lefferts Company.

Fortified oat feeds. *Page 31.* These feeds consist principally of oat feed or offal together with more or less corn, to which has been added some red dog or other feed to bring up the protein guaranty. They averaged 12.51 per cent protein and 4.50 per cent of fat. The most important brands are Quaker dairy, Schumacher's and H-O horse feed. Most of them are presumably intended as substitutes for true provenders for feeding horses and are offered at from $1.20 to $1.40 a hundred pounds. It is for the consumer to decide whether he prefers true provender to those feeds for his horses, and the high grade protein concentrates to these mixtures for his dairy stock.

Oat feeds. *Page 32.* This material as is well known is the offal from the oat meal mills. It is believed that it is not so generally distributed as formerly, being used more as a filler or admixture in other brands of mixed feed stuffs. It contains from 50 to 65 per cent of hulls, averages 7 per cent of protein and 2.50 per cent fat, and is retailed for 80 cents to $1.25 a hundred pounds. While this material has unquestionably a certain feeding value, *it is considered to be the most expensive feed*—quality considered—on the market. Why should the farmer buy it? Certainly not for the protein it contains! Possibly because he thinks oat hulls a good milk producer!

Miscellaneous feeds. *Pages 32-33.* Under this heading are included a number of feeds, none of which have an extended sale. Two samples of cerealine feed, a corn by-product from the manufacture of cerealine flakes, were collected. This is a desirable starchy feed, but not worth any more than hominy meal. Mellen's food refuse may be considered a fairly satisfactory starchy feed at $1.00 a hundred pounds. Shredded wheat refuse should also be a very satisfactory feed at $1.20 to $1.30 a hundred pounds. The price asked, $1.45 a hundred pounds was too high. Peanut bran and peanut shells are practically worthless as feed stuffs. Rice middlings, because of the large percentage of fiber, is an unsatisfactory feed. Barley meal is equal to corn meal in feeding value.

III. Poultry Feeds.

There is a large variety of poultry feeds on the market at the present time, the number seeming to increase with the growing importance of the poultry industry.

Meat scraps. *Page 34.*

Most of these scraps are guaranteed to contain 50 per cent of protein and from 10 to 20 per cent of fat, and practically met this guaranty, the average percentages found for the 23 samples being 51.65 per cent protein and 16.07 per cent fat. The balance of the material besides meat and fat, consists of water (10 per cent) and bone (25 per cent). The cost of these scraps at retail during the summer and early autumn was $2.40 a hundred. Such material, if free from taint, furnishes one of the most satisfactory animal foods for poultry.

Meat and bone meals. *Page 35.*

These meals, as their name signifies, are composed of refuse meat and bone. They varied considerably more in guaranty and composition than did the scraps ; some manufacturers guaranteeing 50 per cent protein, others 30 per cent, while many brands were without guaranty. *Consumers are especially cautioned to note the guaranty accompanying the package*, for obviously a brand containing 50 per cent protein is very much cheaper than one containing but 30 per cent. The less meat and the more bone the meal contains, the less its value. The three samples of fish meal were of good quality.

Bone meals. *Page 36.*

The seven samples of bone meal were without foreign admixture. Some brands were made from bone that had been steamed under pressure for the purpose of removing the glue and contained less nitrogenous matter than those that had been kettle-rendered. The latter are more desirable for animal feeding.

Poultry meals. *Pages 36-37.*

These meals are mixtures of ground corn and wheat to which has been added some nitrogenous by-product, such as animal matter or linseed and gluten meals, to increase the amount of protein. Several were found to contain from 5 to 25 per cent of grit. The average price asked($1.80 a hundred) was excessive. A mixed meal containing a higher percentage of protein than is found in the cereals should prove a satisfactory feed for young poultry and for egg production. Poultrymen can prepare such a meal for themselves at a cost of from $1.30 to $1.50 a hundred according to the following formulae either of which may be used for the morning mash with satisfactory results :

1.	2.
45 pounds corn meal.	70 pounds bran.
45 pounds ground oats.	70 pounds fine middlings.
10 pounds beef scraps.	70 pounds corn meal.
Approximate cost $1.50 a hundred.	Approximate cost $1.30 a hundred.

Spratt's patent chick meal consisted of cereals and some nitrogenous by-product made into the form of a biscuit and baked. It probably would prove a satisfactory food for young chickens, but its price ($6.00 a hundred) would render its continued use very expensive.

Chick and scratching grains. *Pages 37-38.*

These combinations consisted of oats, wheat, cracked corn, buckwheat, millet seed and in some cases linseed and barley. Some of the feeds contained in addition, wheat screenings, charcoal, oyster shells and grit. In several of the feeds the shells and grit constitute one-fourth of the mixture. It is generally possible to determine the character of these mixtures with the eye. The average retail price was $2.00 a hundred pounds. It is believed that poultrymen can prepare such feeds much cheaper for themselves by purchasing cracked corn, wheat, barley and buckwheat of the local miller or grain dealer and doing their own mixing. *It is not economy to pay two cents a pound for shells, grit and charcoal.* The number of these grain mixtures on the market has increased very noticeably within the last few years. The one sample of *Kaffir corn* found was of average quality. Experiments with poultry have proved it to be about as digestible as Indian corn.

Clover meals. *Page 38.*

The seven samples of clover meals averaged 12.94 per cent of protein. Some of them were not pure ground clover hay, but hay made from different grasses containing a large admixture of clover and cut when in very late bloom. The price asked, ($1.80 a hundred) was entirely out of proportion to their value. Clover should be cut just as the blossoms appear in order to secure the maximum amount of digestible nutrients.

E. NEW FEEDS.

Dried blood and prepared tankage for cattle feeding.

Dried blood and "digester" tankage especially prepared for cattle feeding are being freely advertised by the large packing houses in the West.

Dried blood guaranteed to contain 85 per cent protein, is being tested at the present time by this station as a source of protein for milk production. While the experiment is not completed, the results thus far indicate that the protein it contains is equal pound for pound to the digestible protein in cottonseed meal.

Prepared tankage guaranteed to contain 60 per cent protein, consists of slaughter house offal,—refuse meat, bones, intestines, etc.,—which has been cooked under considerable steam pressure in large tanks or digesters. It is especially recommended as a food for pigs, and also for cattle. The Iowa and Indiana stations have found one part tankage and five parts corn to be quite superior to corn alone as a food for pigs. At the present time retail prices have not been established in Massachusetts. It is the intention of this department to give further attention to such feed stuffs.

Blomo feed for horses. Under this name a feed for horses has recently been placed upon the market. It is composed of blood, molasses and ground corn stalks or similar material, is guaranteed to contain 15 per cent of protein, and costs at the rate of $1.50 a hundred pounds. Such substances as blood and molasses have been found by experimenters to be quite satisfactory feeds for animals. It is intended to test this feed the present winter.

Dried brewers' grains and molasses. This mixture consisted of dried brewers' grains and malt sprouts to which has been added what molasses the dried grains would absorb. The feed was of rather a sticky nature but could be easily handled. It contained about 18 per cent protein and 35 per cent of water soluble material. The price asked, $1.15 a hundred pounds at retail—could not be considered very excessive, and the material should make a satisfactory dairy feed, providing the grains are of good quality, (e. g. dried when fresh) and the mixture could be depended upon to run even in composition.

Biles Union grains. This feed is composed principally of distillers' dried grain, hominy meal and malt sprouts. The manufacturers also claim some mill feed as well as small quantities of cottonseed and linseed meals. The feed is bulky, fails to show the presence of any cheap filler and the price asked($28 a ton at retail)is not much in excess of its real value. It is believed that feeders can prepare practically as satisfactory grain rations for rather less money by doing their own mixing.

Rye feed, a mixture of rye bran and rye middlings, while not strictly a new feed, is by no means as common as wheat by-products.

The three samples averaged 15.23 per cent protein and contained but little fiber; a sample tested several years since proved to be 82 per cent digestible. It was worth the price asked, $1.15 a hundred pounds.

Rye bran, is not as bulky as wheat bran and would be considered rather more of a starchy than a protein feed. The price,—$1.15 a hundred—was reasonable, but the rye feed would be considered more economical.

Oat middlings, an entirely different product from oat feed, averaged 17.84 per cent protein and 7.08 per cent fat. It should be fully equal to fine wheat middlings in feeding and economic value.

Sugar beet by-products.

Alma dried molasses-beet-pulp as its name implies, consists principally of sugar beet pulp, to which has been added beet molasses and the mixture thoroughly dried. It is a starchy feed and is not economical as a source of protein, containing only from 7 to 9 per cent. The sample examined had some 25 per cent of water soluble material (molasses) and had at least two-thirds of the feeding value of corn meal. This department is now testing its feeding value.

Sugar beet-pulp, also being offered, is the wet residue from the beet factories. It contains 90-92 per cent water, has a feeding value of about $2.00 a ton *delivered on the farm*, and can be fed to advantage only by nearby residents of beet factories.

F. WHAT CONCENTRATES SHALL THE FARMER PURCHASE?

Quality of milk not changed by concentrates.

Concentrates do not permanently affect the percentage composition of the milk. Feeds having a high fat percentage, such as cottonseed meal and distillers' dried grains may temporarily increase the fat and cream percentage, but the milk shortly returns to its normal composition. The richness of the milk in fat depends primarily on the breed and individuality of the cow and also upon the stage of lactation. The only way to make more cream and more butter is to make more milk.

Is there a best grain ration?

There is no "best" grain ration. Some feeds are better suited than others for milk production, and some are decidedly more economical. It would, of course, be out of place in a publication of this kind to attempt to specify which is the most *economical* grain or grain mixture for the reason that the market is subject to frequent and sudden changes and what may be true to-day might be incorrect a week or month hence.

Character of nutrients needed.

In selecting concentrates, the purpose for which they are needed as well as their cost, should be kept steadily in mind. Experiments have clearly demonstrated that the dairy cow of 800 to 1000 pounds live weight, yielding 10 to 14 quarts of milk daily, needs from 14 to 16 pounds of actual digestible matter a day, and of this quantity, 2 to 2½ pounds should be protein, the balance being carbohydrate or starchy material. Now the farm produces principally one-sided or starchy feeds, such as hay, roots and corn. A combination of hay, silage and corn meal will furnish all the digestible matter that is needed in the daily ration, but the combination will be lacking in protein. It is advisable and necessary therefore, in order to produce milk to the best advantage, to purchase feeds *rich in protein* to make up the deficiency. A grain ration made up of protein feeds will also produce manure 10 to 15 per cent more valuable than one composed of hay, silage and corn meal.

Poor economy for farmers to buy starch.

It is poor economy for the farmer *to purchase* starchy feeds, since he can produce them more economically. Milk producers, on the other hand, who *buy all of their grain* will find it advisable to have one-third of their ration consist of corn or hominy meals in order to furnish the necessary digestible matter.

Economic concentrates.

Experience and experiments have taught the writer that the most economical and satisfactory concentrates to make up the protein deficiency are cottonseed meal, gluten meal and gluten feed, dried distillers' grains, flour middlings, dried brewers' grains and malt sprouts. Linseed is also satisfactory and at present economical. Wheat bran, because of the relatively small amount of protein it contains is an expensive protein feed. It is, however, valuable as a diluter for the more concentrated articles, and has a satisfactory effect on the bowels. It is hardly the part of economy to have the grain ration consist of over one-third bran, and many feeders will endeavor to get along without it by using corn silage or distillers' grains as a diluter. If starchy feeds are needed purchase corn, hominy or barley meals. In regard to the so-called " mixed feed " adulterated with corn cobs, the various oat offals containing large quantities of oat hulls, and other inferior feeds, the only advice that can be given is, *do not be tempted to purchase them.*

G. A TALK ABOUT GRAIN MIXTURES.

Quarts vs. pounds. Many farmers are prone to estimate the value of the different grains in quarts rather than in pounds. Thus a quart of bran, weighing a trifle more than one-half pound, is compared in feeding value with a quart of cottonseed meal weighing 1.4 pounds and the feeding effect noted on this basis. That this is an unfair method of comparison is self-evident. Feed stuffs should always be compared pound for pound, and in making up a grain mixture, a definite number of pounds of one feed should be mixed with a definite weight of another. The weight of a quart of the mixture can be ascertained, and for practical purposes a certain number of quarts—equivalent to a definite number of pounds—may then be fed daily.

Amount of grain daily. There is a wide difference of opinion among feeders as to the amount of grain that it is profitable to feed daily, and in fact no exact rule can be laid down. Generally speaking, cows weighing 800 to 1000 pounds, that are producing 12 or more quarts of milk a day, can profitably utilize 6 to 8 pounds of grain in 24 hours in addition to the ordinary roughage ration. When milk or cream brings a low price, it might be better management to increase the roughage and decrease the grain to 4 or 5 pounds daily, and on the other hand, where the demand for milk is good and the feeding and productive capacity of the cow is known, 10 and even in some instances 12 pounds can be fed to advantage. Heavy milking Holsteins will often use double these amounts when fresh.[1] As the period of lactation advances and the animal fails to respond to the maximum ration, the quantity of concentrates can be somewhat reduced in accordance with the judgment of the feeder.

1. It is believed that the amount of grain needed by the Holstein for the production of a given weight of milk has not been studied as accurately as it should be and that excessive quantities are often fed.

Grain mixtures should be bulky.

It is unwise to feed heavy nitrogenous concentrates unless diluted with some bulky feed, for the reason that they are likely to be imperfectly chewed, digested and assimilated, and are frequent causes of digestive disturbances. Wheat bran, distillers' grains, malt sprouts and even chopped hay or silage will serve as proper distributers. In the types of grain mixtures given below, one-third wheat bran has been used in most of the combinations. Some very successful feeders maintain that the most satisfactory rations should contain one-half bran, but the writer is of the opinion that such a mixture would be too expensive for the average feeder. Grain rations should be so compounded that a quart of the combination should not weigh over one pound or even a little less.

Types of grain mixtures for dairy animals.

The following mixtures are offered as types, any one of which it is believed will prove satisfactory.

1.

100 lbs. bran.
100 lbs. flour middlings.
150 lbs. gluten feed.
Mix and feed 7 quarts daily.

2.

100 lbs. bran or mixed wheat feed.
150 lbs. gluten feed.
Mix and feed 9 quarts daily.

3.

100 lbs. bran.
100 lbs. flour middlings.
100 lbs. cottonseed, linseed or gluten meal.
Mix and feed 7 to 8 quarts daily.

4.

100 lbs. dried distillers' grains.
75 lbs. flour middlings.
Mix and feed 6 quarts daily.

5.

100 lbs. cottonseed or gluten meal.
150 lbs. corn and cob or hominy meal.
100 lbs. bran.
Mix and feed 7 to 8 quarts daily.

6.

100 lbs. dried distillers' grains.
100 lbs. corn and cob or hominy meal.
Mix and feed 5 to 6 quarts daily.

The types suggested are intended for cows weighing from 800 to 1000 pounds yielding from 12 to 14 quarts of milk daily. For cows producing less than 12 quarts of milk the amount can be somewhat reduced. For heavy milking Holstein cows the quantity in many cases can be doubled or increased according to the judgment of the feeder. Owing to the present high prices for grain, many farmers will prefer to increase the roughage somewhat and decrease the daily grain ration.

In suggesting the above, the writer has endeavored to present combinations that will furnish both the required protein and bulk. Many other satisfactory mixtures are possible. Thus one may combine 100 pounds of cottonseed meal and 150 pounds of corn meal, or 100 pounds of cottonseed meal and 100 pounds of gluten feed and feed 3½ quarts daily, *mixed with silage.*

WHAT A FEW PROMINENT DAIRYMEN ARE FEEDING.

1. Elmer D. Howe, Marlboro, Mass.

Grain.	Quarts.	Pounds.	*Roughage.*	Pounds.
Bran,	4.00	2.0	Silage,	30-40
Cottonseed meal,	3.00	4.2	Hay,	10
Total grain,	7.00	6.2		

The above daily for cows giving 10 quarts or more milk. Dry cows and strippers get only bran.

2. N. I. Bowditch, Framingham, Mass.

Grain.	Quarts.	Pounds.	*Roughage.*	Pounds.
Buffalo gluten feed,	—	125	Silage,	25
Mixed wheat feed,	—	200	Hay,	9

7 to 12 pounds (9 to 15 quarts) of the grain mixture are fed daily. If silage is poorly eared, 75 pounds of corn meal is added to the above mixture.

3. W. B. Barton, Dalton, Mass.

Grain.	Quarts.	Pounds.	*Roughage.*
Winter bran,	5.00	2.5	Forty pounds apple pomace or corn silage and what hay the animals will eat clean.
Cottonseed meal,	1.75	2.5	
Total grain,	6.75	5.00	

Mr. Barton values pomace highly and mixes the grain with it.

4. W. C. Jewett, Worcester, Mass.

Grain.	Quarts.	Pounds.	*Roughage.*
Biles Fourex,	4.00	3.0	½ bushel wet brewers' grains.
Gluten feed,	2.00	2.5	1 bushel silage.
			2 feedings of hay.
Total grain,	6.00	5.5	

The above dairymen produce market milk and have had many years of experience. They evidently consider it economical to feed from 5 to 12 pounds of mixed grain daily, depending upon their local conditions. Note that the high grade protein feeds—cottonseed meal, distillers' grains, gluten feed and bran—are used in preference to low grade feed stuffs.

FARMERS AND DAIRYMEN!!

1. Are you striving to improve your herd?
2. Do you keep a pure bred sire, obtained from a herd having a reputable milk and butter record?
3. Would it not be well to try and breed a herd of uniform color, as well as of approved dairy form and capacity?
4. Do you know how much milk and butter each of your cows is producing yearly?
5. Are you trying to find out which cows are the money makers and which the money losers?

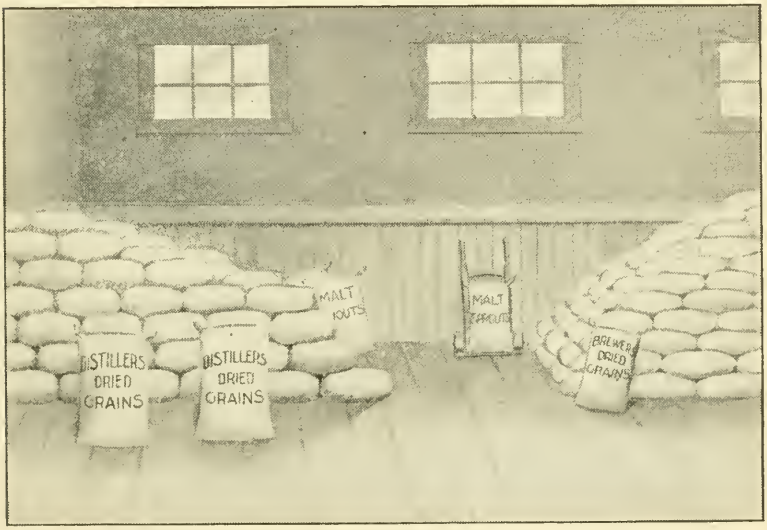
HATCH EXPERIMENT STATION

OF THE

MASSACHUSETTS AGRICULTURAL COLLEGE.

BULLETIN NO. 94.

DISTILLERY AND BREWERY BY-PRODUCTS.



MARCH, 1904.

The regular Bulletins of this Station will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same. Technical Bulletins are sent only to those persons interested in the subject treated of in each case.

AMHERST, MASS.:
PRESS OF CARPENTER & MOREHOUSE
1904.

HATCH EXPERIMENT STATION

OF THE

Massachusetts Agricultural College,

AMHERST, MASS.

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The co-operation and assistance of farmers, fruit-growers, horticulturists, and all interested, directly or indirectly, in agriculture, are earnestly requested. The Bulletins will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same. General bulletins, fertilizer analyses, analyses of feed-stuffs, and annual reports are published. Kindly indicate in application which of these are desired. Communications may be addressed to the

HATCH EXPERIMENT STATION, Amherst, Mass.

Department of Foods and Feeding.

DISTILLERY AND BREWERY BY-PRODUCTS.

JOSEPH B. LINDSEY.*

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(f) Method of Feeding the Grains.

(a) Character of the Product.

Distillers' dried grains are the kiln dried residue from the manufacture of alcohol, spirits and whiskey from the several cereals. Briefly stated, the process of manufacture consists in treating the ground grains with a solution of malt, thus converting the starch into sugar, and by the addition of yeast, changing the sugar into alcohol, which is distilled. The residue or distillery slop is dried immediately in especially constructed driers, and put on the market as a cattle feed. It consists chiefly of the hulls, germ and protein of the cereals. The dried product is of a yellowish-brown color, and has a more or less sour taste and smell because of the fermenta-

*With the co-operation of E. B. Holland and P. H. Smith.

tion, or a burnt flavor and odor from overheating. If carefully dried at once by modern machinery, it should be free from any decided acid or burnt taste. The grains are bulky because of the hulls. The finer portions contain the higher percentage of the more valuable nutrients. The grains are classified as follows, according to the source from which they are derived:

I. Alcohol and spirit grains.
II. Bourbon whiskey grains.
III. Rye whiskey grains.

The grains produced by *alcohol* and *spirit distilleries* are the highest in quality, and of the most uniform grade, corn being practically the only grain used. The grains produced by *whiskey distilleries* vary according to the proportion of corn, rye and malt in their mashes. The larger the proportion of corn, and the smaller that of rye and malt (small grain, so called), the higher the grade of dry grains produced. The so called *rye grains* contain the smallest amount of protein and are the least valuable.

The present annual output of distillers' dried grains is in the vicinity of 60,000 tons, and until recently it has been largely exported and consumed in Germany. During the last few years a considerable amount of the best grades has been sold in Massachusetts under the trade names of Biles Fourex, Hall's AAAA, Ajax Flakes, Atlas Gluten Meal, Manhattan Gluten Feed and Merchants Distillers' Grains.

(b) Composition of the Grains.

	Sample used.	Average of seven samples.	Buffalo gluten feed for comparison.
	%	%	%
Water	9.75	8.84	10.00
Ash	1.54	1.75	2.08
Protein	35.36	32.14	26.73
Fiber	12.97	10.98	7.17
Extract matter	29.74	34.86	51.49
Fat	10.64	11.43	2.53
Total	100.00	100.00	100.00

The sample used in the present experiment was taken from a car lot, and it contained rather more protein than the average. The grains are relatively rich in fiber, because of the hulls; poor in ash, and rich in protein and fat. They are classified as a high grade protein feed.

(c) Digestibility of the Grains.

	Sample used, 3 trials.	Average of 16 trials with 6 samples.	Av'rge of 5 samples of gluten feed for comparison.
	%	%	%
Dry matter	73	79	85
Protein	71	73	85
Fiber	77	97	76
Extract matter	70	80	89
Fat	95	95	83

The above tests were all made at this station with sheep, and showed the grains to have a high average digestibility. From 200 to 250 grams of distillers' grains were usually fed with 600 grams of hay, the digestion coefficients of which had been previously determined. The fiber in the different samples of grains showed marked variations in digestibility in common with all feeds of a similar character. While it is generally recognized that nitrogenous feed stuffs do not affect the digestibility of the coarse fodders they supplement, it seems reasonable to suppose that in these experiments the addition of the grains to the hay ration resulted in increasing the digestibility of the fiber in the hay, which accounts in the majority of cases for the apparently very high digestion fiber coefficient obtained for the grains. Admitting this to be the case, the fact still remains that while the digestive coefficient for the fiber of the distillers' grains has proved to be of rather an uncertain quantity, it must be regarded as relatively high.

(d) Feeding Experiment with Cows.

*Biles Fourex vs. Buffalo Gluten Feed.**

Object of the Experiment:—The object of this trial was to note whether the animals ate the grains freely, and the effect upon their general condition; the comparative yield of milk, milk solids and milk fat with the two rations, and the consequent economy of distillers' grains as a dairy feed; and the effect, if any, of distillers' grains upon the flavor and keeping quality of the milk.

Plan of the Experiment:—Six comparatively fresh cows were divided as evenly as possible into two lots of three each. In the first half three of the cows received the distillers' grain ration for a period of six weeks (two weeks of which were preliminary) at the same time the other three received the Buffalo gluten feed ration. In the second half the conditions were reversed.

DURATION OF THE EXPERIMENT.

Dates.	Distillers' grain ration. (cows).	Buffalo gluten feed rat'n (cows).
Oct. 15 through Nov. 11.	Brighty, May, Roda.	Blanche, Doliska, Dora.
Nov. 26 through Dec. 24.	Blanche, Doliska, Dora.	Brighty, May, Roda.

General Care and Feeding of the Animals:—The experiment was carried out in the station barn, especially set apart for such work. Each animal was kept in a roomy stall, well carded and turned daily into a yard for exercise. The daily feed was given in two portions, and water was kept constantly before each animal. The cows were in good condition and quite contented.

Weighing the Animals:—The animals were weighed on three consecutive days at the beginning and end of each half of the trial.

Sampling Feeds:—The coarse fodders were sampled three times during each half of the trial, dry matter determinations made immediately and composite samples analyzed. Small samples of the grains were taken daily and placed in glass-stoppered bottles.

*Buffalo gluten feed has essentially the same amount of total digestible nutrients as has the distillers' grains, and is recognized as a very satisfactory feed for dairy animals; hence it was selected as a suitable product with which to compare the grains.

Sampling Milk:—The milk of each cow was sampled twice daily for five consecutive days of each week of the trial, and preserved with formaline in tightly corked bottles. The method of sampling consisted in mixing the freshly drawn milk with an especially constructed mixer, and immediately removing a small dipper full.

AVERAGE DAILY RATION CONSUMED BY EACH COW.
(*Pounds.*)

Character of Ration.	First cut hay.*	Rowen.	Biles Fourex grains.	Buffalo gluten feed.	Wheat bran.
Distillers' grains	10.7	10.7	3.7	—	3
Buffalo gluten feed	10.6	10.7	—	3.7	3

Some of the cows received more hay and rowen than others; likewise, some received three pounds of the distillers' grains or Buffalo gluten, and some four pounds daily, depending upon the size and milk producing capacity.

DRY MATTER AND DIGESTIBLE NUTRIENTS IN THE DAILY RATIONS.†
(*Pounds.*)

Character of Ration.	Dry Matter.	Digestible organic nutrients.				Nutritive ratio.
		Protein.	Carbohydrates	Fat.	Total.	
Distillers' grains	24.50	3.02	11.44	0.75	15.21	1:4.4
Buffalo gluten feed	24.53	2.95	12.19	0.46	15.60	1:4.5

*Largely Kentucky blue grass.
†Calculated.

The lot of distillers' grains used was especially high in protein, containing some 8½ per cent more than the Buffalo gluten. This increase was largely equalized by the higher digestibility of the protein in the latter feed. The Buffalo gluten feed also contained more digestible starchy matter. The calculated amount of total digestible nutrients in the daily ration was nearly the same in each case. These rations may be considered a trifle narrow.

HERD GAIN IN LIVE WEIGHT.

Character of Ration.	*Pounds.*
Distillers' grains	95
Buffalo gluten feed	71

It is evident that the cows received rather more food than was necessary for a normal milk yield, which resulted in a slight increase in weight. Though the gain was larger in the distillers' grains period, the difference may be considered of minor importance.

HERD YIELD OF MILK AND MILK INGREDIENTS.
(*Pounds*).

Character of Ration.	Total milk.	Daily per cow.	Total milk solids.	Total milk fat.	Butter equivalent. (85 %)
Distillers' grains	4338.4	25.83	604.48	207.00	243.4
Buffalo gluten feed	4079.8	24.28	574.50	198.30	233.2

The amount of milk and butter produced was slightly in favor of the distillers' grains ration (4 to 6 per cent), but the difference was not at all excessive.

AVERAGE COMPOSITION OF THE HERD MILK.

Character of Ration.	Total solids.	Fat.
	%	%
Distillers' grains	13.93	4.77
Buffalo gluten feed	14.08	4.86

The composition of the milk during the two periods may be considered practically identical.

FOOD COST OF MILK AND BUTTER.

Character of Ration.	Total cost of milk.	Cost 100 pounds milk.	Cost 100 pounds butter.
Distillers' grain	$41.18	$0.95	$16.92
Buffalo gluten feed	$41.10	$1.01	$17.60

The difference, though not large, is in favor of the distillers' grains.

DRY MATTER AND DIGESTIBLE MATTER REQUIRED TO PRODUCE MILK AND BUTTER.

(*Pounds*).

Character of Ration.	Dry matter required to produce:			Digestible organic matter required to produce:		
	100 pounds milk.	1 pound milk solids.	1 pound milk fat.	100 pounds milk.	1 pound milk solids.	1 pound milk fat.
Distillers' grains	94.86	6.81	19.89	58.91	4.23	12.35
Buffalo gluten feed	100.99	7.17	20.78	64.22	4.56	13.21

It is evident that it required from 4 to 6 per cent. more dry matter and from 7 to 9 more digestible matter to make milk, milk solids and milk fat with the Buffalo gluten than with the distillers' grain ration.

APPROXIMATE FERTILIZER INGREDIENTS IN TOTAL RATIONS.

Distillers' Grain Ration.

117.2	lbs. nitrogen valued at	$19.92
64.4	" potash "	3.22
27.7	" phosphoric acid valued at	1.11
	Total	$24.25

Buffalo Gluten Feed Ration.

108.7	lbs. nitrogen valued at	$18.48
63.5	" potash "	3.18
28.2	" phosphoric acid valued at	1.13
	Total	$22.79

The distillers' grain ration contained about 7 per cent more nitrogen than the Buffalo gluten feed ration, due to the excess of protein in the distillers' grains, and similar quantities of potash and phosphoric acid. This proportion would hold true in the manures produced by the two rations.

(e) Effect of Distillers' Grains on Flavor and Keeping Quality of the Milk.

Samples of each cow's milk were frequently taken and preserved immediately in sterilized glass-stoppered bottles. It was not possible to detect any objectionable flavor or odor in the fresh milk produced by the cows receiving the distillers' grains.

Within a few hours after milking, 25 cubic centimeters of the cooled milk were titrated, against $\frac{1}{10}$ normal soda, 4 to 5 cubic centimeters of which were required to neutralize the natural milk acidity. Slight differences were observed in the amount required to neutralize the milk produced by the different cows, but no variation was noted that could in any way be attributed to the effect of the distillers' grains. The milk was allowed to stand for 72 hours in the laboratory, the temperature of which was about 70° Fahr. during the day and 60° Fahr. at night, and was tested for acidity at intervals during this time. For the first 48 hours very little increase in acidity was noted; the milk continued to have a sweet but slightly old taste. During the last 24 hours the acidity began to increase slowly at first and rapidly towards the end of the period. Curdling generally began when 8-10 c. c. of alkali were required to neutralize 25 c. c. of milk, and samples that required 15 c. c. of alkali had a pronounced sour taste and smell. The older the samples, the more pronounced became the cheesy taste and odor. The milk from the cows fed distillers' grains did not sour any quicker than that produced by the cows receiving the Buffalo gluten ration, nor could any particular odor be observed that could be attributed to the effect of the former feed.

The Walther and Gerber test was also applied. This test consists in placing 30 cubic centimeters of milk in a sterilized glass cylinder, the mouth of which is plugged with cotton batting, and maintaining the milk at a temperature of 45° C. for 12 hours. If souring does not take place within this time, the milk is considered satisfactory. The milk from the cows on both rations was kept at a temperature of 35° C. and 45° C. for the required time without coagulation or showing any tendency to sour.

In this connection attention should be called to the fact that condensed milk manufacturers will not accept milk made from any food that has undergone fermentation. They state "that experience has shown that such foods do impart the objectionable flavors and odors, also that they seriously affect the keeping quality; and they furthermore make a dangerous milk for use among infants, children or invalids, and are oftentimes the cause of trouble among adults in normal health."

So far as the present experiment is concerned, it is believed that the healthfulness of the milk for all ordinary purposes was not impaired by the feeding of reasonable quantities of distillers' grains. It is understood that practically all of the grains now upon the market are made from distillery slop that has been dried immediately after the distillation of the alcohol. It is unquestionably true that partly decomposed foods of any kind do impart a bad flavor and odor to milk, and quite likely are the cause of digestive disturbances, especially in case of infants, young children and invalids. Whether fermented residues that have not undergone any putrefactive changes would produce similar effects, seems questionable. It is believed that much of the bad flavor and odor found in ordinary milk is absorbed from an impure atmosphere, rather than from the feed given the cow. The subject is worthy of careful study on the part of the experiment stations.

(f) Method of Feeding the Grains.

(I) *For Dairy Cows.*

Naturally the chief use for this product will be as a food for dairy animals. While most cows will eat the straight product, it is better to feed from 2 to 4 pounds daily mixed with other grains. Distillers' grains are bulky, and in this respect may take the place of bran. Many combinations are possible; a few are suggested below:

1.
100 pounds distillers' grains.
75 " flour middlings.
Mix and feed (7 lbs.) 7–8 qts. daily.

2.
100 pounds distillers' grains.
75 " corn or hominy meal.
Mix and feed (7 lbs.) 7 qts. daily.

3.
100 pounds distillers' grains.
50 " mixed wheat feed.
50 " corn or hominy meal.
Mix and feed (7 lbs.) 9 qts. daily.

4.
150 pounds distillers' grains.
50 " cottonseed meal.
50 " bran or mixed feed.
Mix and feed (7 lbs.) 9 qts. daily.

The above rations are intended for average sized cows, producing 10–12 quarts of milk daily. The quantity fed can be increased or decreased according to the capacity of the animal to utilize it. Heavy milking Holsteins will profitably utilize from one-half as much again to double the quantity. Ration 4 contains the most digestible protein, and ration 1 the next largest amount. The usual roughage ration for the above mixtures will consist of what hay the animal will eat clean (20–24 pounds),* or 1 bushel corn silage and 12–16 pounds of hay daily.

(II) *For Other Stock.*

Distillers' grains may be used as a partial grain ration for young stock, beef cattle and horses.

For growing stock a mixture of ¼ distillers' grains, ½ bran and ¼ corn meal; for fattening cattle, ⅓ distillers' grains and ⅔ corn meal; for hard worked horses, ¼ distillers' grains, ¼ bran and ½ cracked corn and oats.

*Ten pounds of corn stover may be used in place of 8–9 pounds of hay.

Conclusions.

1. Distillers' dried grains containing 32 per cent or more of protein have been found to have a high average digestibility, and may be classed among the most satisfactory and economic protein feeds.

2. The present experiment has shown it to be fully equal, if not rather superior, to standard gluten feed in its nutritive value, and without objectionable effect on the health of the animal.

3. Its bulky nature enhances its value as a grain feed for all kinds of stock.

4. The flavor and keeping quality of the milk appeared in no way to be affected when this food constituted ½ of the daily grain ration.

5. From 2 to 4 pounds daily is the usual feed for dairy animals, preferably mixed with other grains.

B. BREWERS' DRIED GRAINS.

(a) Character of the Product.
(b) Composition of the Grains.
(c) Digestibility of the Grains.
(d) Feeding Experiment with Cows.
(e) Effect of Brewers' Grains on Flavor and Keeping Quality of the Milk.
(f) Method of Feeding the Grains.

(a) Character of the Product.

Brewers' dried grains are the kiln dried residue from beer manufacture, and consists of some of the starch and allied substances, together with the hull, germ and gluten of the barley. Most of the true starch is removed by the action of malt and yeast. Grains that have been dried immediately are of a yellowish-gray color, and have a faint aromatic smell. Dark brown colored grains have been injured before being dried, or have been heated at too high a temperature, thus causing decomposition. The dried grains are fed quite extensively in Europe and in many portions of the United States. European investigators consider *freshly dried grains* as healthful as untreated barley, oats or corn. There are at present some 40 breweries in Massachusetts. The residue is practically all sold undried to farmers living in the immediate vicinity. The comparatively small amount of the dried grains consumed in this State comes from the vicinity of New York and Chicago.

(b) Composition of the Grains.

	Sample used.	Average of 5 samples.	Wheat bran for comparison.
	%	%	%
Water	14.06	8.00	10.00
Ash	3.22	3.80	6.40
Protein	23.26	23.10	16.00
Fiber	14.58	10.80	10.00
Extract matter	38.82	49.40	53.00
Fat	6.06	4.90	4.60
Total	100.00	100.00	100.00

The sample used was bright in color and of good quality. It contained rather more water than the average. Brewers' grains are moderately rich in both protein and fat, and contain relatively a large amount of fiber, due to the presence of the barley hulls. The extract matter consists largely of what are termed pentosans, and not of true starch.

(c) Digestibility of the Grains.

	Sample used, 3 trials.	Average of 2 trials with another sample.	Average 12 German trials with 4 samples.	Wheat bran for comparison.
	%	%	%	%
Dry matter	61	62	63*	62
Protein	82	79	73	77
Fiber	47	53	40	21
Extract matter	56	59	62	69
Fat	88	91	86	66

The sample tested showed an average digestibility. Brewers' grains may be regarded as moderately digestible, having about the same degree of digestibility as wheat bran. The protein and fat have relatively high digestion coefficients, while only about one-half of the fiber and extract matter are utilized by the animal.

(d) Feeding Experiment with Cows.

Brewers' Dried Grains vs. Wheat Bran.

The experiment was completed with eight cows, but owing to the unusual loss in weight and wide variations in percentage of fat in the milk of the cow Pearl, her record was omitted, and the results with seven cows are presented.

Object of the Experiment:—The trial was conducted to note the effect of brewers' grains on the general condition of the cows; its value for the production of milk as compared with a like quantity of wheat bran; and its influence, if any, on flavor and keeping quality of the milk.

Plan of the Experiment:—The cows were divided into two lots, and fed by the reversal method, as described in detail under the distillers' grain experiment. The care and weighing of the animals, method of feeding and sampling of milk were the same as in that experiment.

*Organic matter.

DURATION OF THE EXPERIMENT.

Dates.	Brewers' grain ration. (cows).	Wheat bran ration. (cows).
Jan. 14 through Feb. 10....	Blanche, Brighty, Daisy, Linnie.	Dora, May, Roda.
Feb. 20 through Mar. 19....	Dora, May, Roda.	Blanche, Brighty, Daisy, Linnie.

AVERAGE DAILY RATION CONSUMED BY EACH COW.
(*Pounds*).

Character of Ration.	First cut hay.*	Corn silage.	Brewers' grains.	Wheat bran.	Gluten feed.
Brewers' grains...............	12.1	26.3	4.3	—	3
Wheat bran...................	12.6	26.2	—	4.4	3

The amount of each feed stuff making up the two daily rations was essentially the same during both periods. Some of the cows received 4 pounds of brewers' grains or bran, and some received 5 pounds.

DRY MATTER AND DIGESTIBLE NUTRIENTS IN THE DAILY RATION.†
(*Pounds*.)

Character of Ration.	Dry Matter.	Digestible organic nutrients.				Nutritive ratio.
		Protein.	Carbo-hydrates	Fat.	Total.	
Brewers' grains......	21.79	2.35	11.62	0.56	14.53	1:5.48
Wheat bran.........	22.31	2.10	12.16	0.46	14.72	1:6.28

*Largely Kentucky blue grass.
†Calculated.

The amount of total digestible nutrients fed daily in each ration was practically the same during both periods. The brewers' grain ration contained rather more protein and a little less carbohydrate material than did the bran ration.

HERD GAIN IN LIVE WEIGHT.

Character of Ration.	*Pounds.*
Brewers' grains	110.
Wheat bran	61.

The gain was rather more during the brewers' grain period, but the difference was not marked.

HERD YIELD OF MILK AND MILK INGREDIENTS.
(*Pounds*).

Character of Ration.	Total milk.	Daily per cow.	Total milk solids.	Total milk fat.	Butter equivalent. (85 %).
Brewers' grains	4198.43	21.42	616.59	224.72	264.38
Wheat bran	4070.58	20.77	602.49	222.70	262.00

The brewers' grain ration produced a slightly larger yield of milk (3 %) and milk ingredients (1 to 2 %) than did the bran ration, but the difference was not much more than would be allowed for a reasonable experimental error.

AVERAGE COMPOSITION OF THE HERD MILK.

Character of Ration.	Total solids.	Fat.
	%	%
Brewers' grains	14.69	5.35
Wheat bran	14.80	5.47

The average composition of the milk produced during both periods was quite similar. While the brewers' grain ration produced slightly more milk, it was a trifle more dilute than that produced by the bran ration. The difference, however, has no significance.

FOOD COST OF MILK AND BUTTER.

Character of Ration.	Total cost of milk.	Cost 100 pounds milk.	Cost 100 pounds butter.
Brewers' grains	$43.76	$1.04	$16.55
Wheat bran	$44.52	$1.09	$17.00

DRY AND DIGESTIBLE MATTER REQUIRED TO PRODUCE MILK AND BUTTER. (*Pounds*).

Character of Ration.	Dry matter required to produce:			Digestible matter required to produce:		
	100 pounds milk.	1 pound milk solids.	1 pound milk fat.	100 pounds milk.	1 pound milk solids.	1 pound milk fat.
Brewers' grains	101.73	6.93	19.01	67.89	4.62	12.68
Wheat bran	107.44	7.26	19.64	70.91	4.79	12.96

The differences are in favor of the brewers' grain ration, but are not especially pronounced.

APPROXIMATE FERTILIZER INGREDIENTS IN TOTAL RATIONS.*
(*Pounds*).

Brewers' Grain Ration.

108.34 lbs. nitrogen valued at	$17.88
63.74 " potash "	2.70
24.55 " phosphoric acid valued at	0.99
Total	$21 57

Wheat Bran Ration.

98.47 lbs. nitrogen valued at	$16.24
69.79 " potash "	2.96
33.80 " phosphoric acid valued at	1.36
Total	$20.56

*Average figures taken for percentage of potash and phosphoric acid.

The brewers' grain ration contained about 10 per cent more nitrogen and a little less potash and phosphoric acid than the bran ration, and this would hold true in the manure produced by the two rations. The total fertilizer ingredients in the former ration have a 5 per cent greater money value than in the latter.

(e) Effect of Brewers' Grains on Flavor and Keeping Quality of the Milk.

The milk from each of the cows was tested a number of times by the same methods as described under distillers' grains (page 10). It was not possible to detect any objectionable flavor due to the use of the dried grains, neither did the milk from the brewers' dried grains ration sour any quicker than that from the wheat bran ration. It is believed that fresh brewers' grains that have been dried immediately by modern methods, when fed in moderate quantities, have no bad effect on the character of the milk product.*

(f) Method of Feeding the Grains.

Brewers' dried grains are used largely as a feed for milch cows, and may be fed in quantities varying from 2 to 5 pounds daily, preferably mixed with other grains. They are comparatively bulky and will serve as a distributer for the heavier concentrates. A few desirable mixtures are given below:

1.	2.
100 lbs. brewers' grains.	250 lbs. brewers' grains.
75 " gluten feed.	125 " corn meal.
Mix and feed (7 lbs.) 9 qts. daily.	Mix and feed (7½ lbs.) 10 qts. daily.
3.	**4.**
200 lbs. brewers' grains.	200 lbs. brewers' grains.
100 " flour middlings.	100 " corn meal.
50 " cottonseed meal.	50 " cottonseed meal.
Mix and feed (7 lbs.) 9 qts. daily.	Mix and feed (7 lbs.) 9 qts. daily.

The mixtures are intended for cows weighing about 1000 pounds and producing 10–12 quarts of milk daily. The quantity may be increased or diminished, depending upon the size of the animal, together with the daily yield and richness of the milk. The roughage should be the same as described under distillers' grains (page 12).

*See possible exception to the use of all fermented by-products on page 11.

Brewers' Grains for Horses:—The dried grains may constitute from 1/3 to 1/2 by weight of the daily grain ration for horses, the balance consisting of corn or corn and oats. They will prove cheaper than oats and quite satisfactory, especially for hard-worked horses in need of an extra amount of protein.

Wet Brewers' Grains:—The wet grains contain 75–77 pounds of water in 100, and are practically all sold to farmers living in the immediate vicinity of the brewery, at prices ranging from 7 to 10 cts. a bu. Assuming that 33 bushels weigh a ton, the cost would be from two and one-half to four dollars at the brewery, to which the cost of cartage should be added. Four tons of wet grains contain nutritive material equivalent to that found in one ton of dry grains, or 1.1 tons wheat bran, or in three-fourths ton of gluten feed. With this data at hand, the purchaser of this material can calculate at what price he can secure an equal amount of nutrients in the various dry feed stuffs. The writer has not had any experience in feeding wet grains, but believes that 25 pounds is a fair allowance daily for average sized cows.* In addition, two to four pounds of dry grain may be fed daily, such as a mixture of equal parts by weight of (1) mixed wheat feed and gluten feed; (2) wheat bran and fine middlings; or (3) wheat bran and corn meal.

The succulency of the wet grains is a factor not to be overlooked in estimating the value of the feed. It is not believed that the wet brewers' grains are an objectionable feed stuff, when fed in a fresh condition and in moderate quantities. It must be remembered, however, that they are likely to spoil easily excepting when the temperature is low, and the partly decomposed grains would not be considered suitable for producing first-class milk. When milk is intended for the use of infants, young children or invalids, it is better not to use the wet grains.

Conclusions.

1. Brewers' dried grains contain about 1/3 more protein and a little less carbohydrate material than wheat bran. Each feed stuff contains about the same quantity of total digestible nutrients.

*It is understood that 50 or more pounds are frequently fed daily. It is believed, however, that the smaller quantity is preferable when the grains are fed continuously, and it is desired to retain the same animals in the herd from year to year.

2. In the present feeding experiment, the brewers' grains ration produced slightly more live weight, milk and milk ingredients than did the bran ration. The former ration required rather less dry and digestible matter to produce a definite quantity of milk, milk solids and milk fat. The cost of producing milk and butter was also slightly in favor of the brewers' grains.

3. If corn meal had been fed as a part of each ration in place of gluten feed, in order to secure the maximum feeding effect of the protein contained in the brewers' grains and wheat bran, it is believed that the difference in favor of the brewers' grains would have been more pronounced.

4. Brewers' dried grains did not show any objectionable effect either on the general condition of the animal or on the flavor and keeping quality of the milk.

5. From 2 to 5 pounds daily is the usual allowance for dairy animals, preferably mixed with other grains. The dried grains are as bulky as bran, and serve as a distributer of the heavier concentrates.

6. Brewers' dried grains may be regarded as a satisfactory and economical protein feed for both horses* and dairy animals.

C. MALT SPROUTS.

(a) Character of the Product.
(b) Composition of the Sprouts.
(c) Digestibility of the Sprouts.
(d) Feeding Experiment with Cows.
(e) Method of Feeding the Sprouts.

(a) Character of the Product.

Malt used in the manufacture of beer is prepared by moistening barley and allowing it to sprout in a warm atmosphere, thus producing a ferment called diastase, which readily converts starch into

*Conclusions of American and foreign investigators. The writer has fed brewers' dried grains to horses with satisfactory results.

sugar. After the sprouting process has continued a number of days, the barley is dried, the sprouts removed by machinery and sold for cattle feed. Sprouts of first quality are about ¼ of an inch long, thread-like in appearance, slightly curled, of a yellow or brownish-yellow color, and form a crisp, porous and bulky mass. Dark brown sprouts have either undergone fermentation previous to drying, or have been dried at too high a temperature, and are not desirable. Moist sprouts are also to be avoided. Thus far their use has not been general in Massachusetts, about 300 to 500 tons being consumed in the State yearly.

(b) Composition of the Sprouts.

	Sample used.	Average of 5 recent samples.
	%	%
Water	10.68	11.00
Ash	4.40	5.80
Protein	25.33	27.10
Fiber	14.57	11.90
Extract matter	43.96	42.60
Fat	1.06	1.60
Total	100.00	100.00

The sprouts are characterized by a fairly high percentage of protein, considerable fiber and but little fat. While the nitrogenous matter in the sprouts is usually designated as true protein, it is well known that from ¼ to ⅓ of the nitrogen exists in the form of amids. In the present sample, an exceptionally large percentage of its nitrogen (42.3 per cent) was in the form of amids.* Amid bodies are sources of heat and energy, but they cannot produce flesh nor milk casein, hence a considerable proportion of the nitrogenous matter in malt sprouts is less valuable than that in most grains and by-products.

*In the process of growth the plant elaborates the nitrates of the soil first into amid bodies—partially developed protein—and finally into the completed product or true protein, which is largely deposited in the seed. When the seed begins to sprout, the true protein is converted back into the soluble amids to enable the young sprout to utilize it. Amids may be defined, so far as their use in the plant is concerned, as transportable protein.

(c) Digestibility of the Sprouts.

	Sample used. Sheep III.	Average of 7 German trials with 3 samples.
	%	%
Dry matter	78	81*
Protein	76	78
Fiber	102	85
Extract matter	78	86
Fat	60	50

The experiment was conducted with 3 sheep, but as sheep I and II digested so much less fiber and extract matter than is customary, only the results with sheep III are reported. The present single test agrees reasonably well with the German trials, and shows that malt sprouts may be classed with those feeds having a fairly high digestibility.

(d) Feeding Experiment with Cows.

Malt Sprouts vs. Gluten Feed.

Object of the Experiment :—The object of the trial was to note the feeding value of sprouts for the production of milk, and its nutritive and economic value as a grain feed ; and the quantity that could be safely fed and the best method of feeding.

Plan of the Experiment:—Four cows, two of which had been in milk for over a year and two new milch the autumn previous, were divided into lots of two each and fed by the reversal method. All four received the same basic ration of hay, rowen and corn meal. During the first half of the trial, two of the cows received 3 pounds of gluten feed, and the other two 1½ pounds of gluten feed and 2 pounds of malt sprouts daily. In the second half the rations were reversed. In reality, 2 pounds of malt sprouts were fed against 1½ pounds of gluten feed, as these quantities contained theoretically the same amounts of digestible nutrients, and should produce similar results. It was the intention to feed a larger amount of sprouts, but the animals refused to eat more. It is possible that if the sprouts had been fed in winter, and the animals had been fresh in milk, they would have taken three pounds daily.

*Organic matter.

DURATION OF THE EXPERIMENT.

Dates.	Malt sprouts ration.	Gluten feed ration.
May 6 through May 26.........	Red II, Ruth.	Linnie, Pearl.
June 3 through June 23.........	Linnie. Pearl.	Red II, Ruth.

The periods proper lasted 3 weeks, with a preliminary period of one week between them.

Care of the Animals, etc.—The general method of conducting the experiment, weighing cows, sampling feeds and milk, was the same as described under the distillers' grains experiment (page 6).

AVERAGE DAILY RATION CONSUMED BY EACH COW.

Character of Ration.	First cut hay.*	Rowen.	Wheat bran.	Corn meal.	Malt sprouts.	Gluten feed.
Malt sprouts.....................	10.1	10.6	2	1	2	1.5
Gluten feed......................	9.7	10.3	2	1	—	3.0

DRY MATTER AND DIGESTIBLE NUTRIENTS IN THE DAILY RATIONS.†
(*Pounds*).

Character of Ration.	Dry matter.	Digestible organic nutrients.				Nutritive ratio.
		Protein.	Carbo-hydrates	Fat.	Total.	
Malt sprouts.........	24.16	2.57	11.76	.45	14.78	1:5
Gluten feed.........	23.11	2.51	11.48	.46	14.45	1:5

*Largely Kentucky blue grass.
†Calculated.

The nutrients in the rations were practically identical, and amply sufficient for cows of an average weight of 950 pounds and producing 18 pounds of milk daily. In fact, it is thought the cows would have done as well on ½ pound less protein daily.

HERD GAIN IN LIVE WEIGHT.

Character of Ration.	*Pounds.*
Malt sprouts	42
Gluten feed	68

A slight gain in weight is noted in both periods, the difference being of little consequence.

HERD YIELD OF MILK AND MILK INGREDIENTS.

(*Pounds*).

Character of Ration.	Total milk.	Daily per cow.	Total milk solids.	Total milk fat.	Butter equivalent. (85%.)
Malt sprouts	1522.83	18.1	216.9	74.46	87.6
Gluten feed	1530.52	18.2	218.4	76.53	90.0

The results are practically identical.

AVERAGE COMPOSITION OF THE HERD MILK.

Character of Ration.	Total solids.	Milk fat.
	%	%
Malt sprouts	14.25	4.88
Gluten feed	14.23	5.00

DRY AND DIGESTIBLE MATTER REQUIRED TO PRODUCE MILK AND BUTTER. (*Pounds*).

Character of Ration.	Dry matter required to produce:			Digestible organic matter required to produce:		
	100 pounds milk.	1 pound milk solids.	1 pound milk fat.	100 pounds milk.	1 pound milk solids.	1 pound milk fat.
Malt sprouts........	133.2	9.4	14.2	81.6	5.7	16.7
Gluten feed.........	126.8	8.9	13.7	79.3	5.6	15.8

A little more dry and digestible matter was required to produce milk with the malt sprouts than with the gluten feed ration.*

(e) Method of Feeding the Sprouts.

It is hardly possible to feed more than 2 or perhaps 3 pounds of malt sprouts daily to average sized cows. In the first half of the experiment just described, the 2 pounds of sprouts were fed dry, mixed with the other grains. In the second half, one of the cows refused to eat the dry product, consequently it was necessary to moisten. The animals had a supply of water constantly before them. The feed is quite sponge like, and will absorb a large quantity of water, and should over two pounds be fed daily, it would certainly be preferable, in order to avoid digestive disturbances, to moisten thoroughly before feeding. Animals do not particularly care for malt sprouts, therefore it is generally necessary to mix with other grains. A few combinations are suggested.

*The cost of producing milk and butter with each of the two rations was about the same and the amount of fertilizer ingredients they contained was also nearly equal. It is hardly necessary to present the detailed results. Of course, the experiment would have been more satisfactory had a larger number of cows in an earlier stage of lactation been employed.

1.	2
75 lbs. malt sprouts.	75 lbs. malt sprouts.
100 " bran or mixed feed.	125 " corn meal.
150 " gluten feed.	150 " gluten feed.
Mix and feed 7 lbs. (9 qts.) daily.	Mix and feed 7 lbs. (7 qts.) daily.

3	4
2 lbs. (3½ qts.) malt sprouts.	2 lbs. (3½ qts.) malt sprouts.
2 " (3 qts.) distillers' grains.	3 " (4qts.) distillers' grains.
3 " (2½ qts.) flour middlings.	2 " (1½ qts.) corn meal.
Total 7 lbs. (9 qts.) daily.	Total 7 lbs. (9 qts.) daily.

The above mixtures are intended for average sized cows giving 10 quarts of milk daily. The quantity can be increased or diminished proportionally, depending upon the size of the animal and the quantity and richness of the milk yield. It is believed that the first two rations can be fed dry without causing any digestive disturbances. In the case of the last two rations it may be well to moisten the sprouts before feeding, unless the animals have frequent access to water.

Conclusions.

1. Malt sprouts should contain 25 per cent of crude protein and may be classed among those feeds having a fairly high digestibility.

2. Sprouts may constitute one-third of the daily grain ration, and, at the price usually asked, may be regarded as an economical concentrate. Sprouts absorb a large quantity of water and should be quite thoroughly moistened if over two pounds are fed daily.

3. Malt sprouts are bulky and serve as a satisfactory medium for feeding the heavier concentrates. The fact that animals do not relish this feed renders it rather unpopular with the majority of feeders.

4. Sprouts are chiefly valuable as a food for dairy animals.

RELATIVE VALUE OF THE SEVERAL BY-PRODUCTS.

After taking into consideration the digestible nutrients contained in the several by-products, the mechanical condition and palatability, together with the results of different trials with dairy animals, the following general statements may be made with regard to the relative value of the several feed stuffs.

1. Distillers' dried grains with 32 per cent or more protein are fully equal if not rather superior to gluten feed in feeding value.

2. Distillers' grains and gluten feed are worth fully one-half as much again as wheat bran.

3. Brewers' dried grains and malt sprouts do not vary greatly in feeding value ; the former will generally be given the preference.

4. Brewers' grains and malt sprouts are rather superior in feeding value to wheat bran, probably ten per cent.

It must be understood that in order to get the best results from any feed, it should be fed under the most favorable conditions. A protein feed should not be fed when carbohydrates are needed, neither should feeds not particularly relished by animals be fed singly. Heavy concentrates should be mixed with those possessing considerable bulk.

HATCH EXPERIMENT STATION

OF THE

MASSACHUSETTS

AGRICULTURAL COLLEGE.

BULLETIN NO. 95.

I. ANALYSES OF MANURIAL SUBSTANCES FORWARDED FOR EXAMINATION.

II. INSTRUCTIONS REGARDING THE SAMPLING OF MATERIALS TO RE FORWARDED FOR ANALYSES.

III. NOTES ON BARNYARD MANURE.

IV. DISCUSSION OF TRADE VALUES OF FERTILIZING INGREDIENTS FOR 1904.

MARCH, 1904.

The regular Bulletins of this Station will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same. Technical Bulletins are sent only to those persons interested in the subject treated of in each case.

AMHERST, MASS.:
PRESS OF CARPENTER & MOREHOUSE
1904.

HATCH EXPERIMENT STATION

OF THE

Massachusetts Agricultural College,

AMHERST, MASS.

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The co-operation and assistance of farmers, fruit-growers, horticulturists, and all interested, directly or indirectly, in agriculture, are earnestly requested. The Bulletins will be sent free to all newspapers in the State and to such individuals interested in farming as may request the same. General bulletins, fertilizer analyses, analyses of feed-stuffs, and annual reports are published. Kindly indicate in application which of these are desired. Communications may be addressed to the

Hatch Experiment Station, Amherst, Mass.

DIVISION OF CHEMISTRY.

C. A. GOESSMANN.

ANALYSES OF FERTILIZING SUBSTANCES SENT ON FOR FREE EXAMINATION.

WOOD ASHES.

1368-1372. I. Received from Amherst, Mass.
II, III and IV. Received from Concord, Mass.
V. Received from North Hadley, Mass.

	Per Cent.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	20.01	17.37	11.85	3.99	1.88
Potassium oxide,	4.98	4.76	5.82	3.87	6.12
Phosphoric acid,	1.28	1.51	1.38	1.40	1.34
Calcium oxide,	31.10	31.10	32.42	35.99	31.99
Insoluble matter,	9.38	*	12.20	12.20	11.16

1373-1376. I. Received from Hatfield, Mass.
II. Received from Boston, Mass.
III. Received from South Deerfield. Mass.
IV. Received from Hatfield, Mass.

	Per Cent.			
	I.	II.	III.	IV.
Moisture at 100° C.,	1.17	5.65	none	.08
Potassium oxide,	4.56	1.84	6.12	6.48
Phosphoric acid,	1.57	.87	1.89	6.07
Calcium oxide,	23.09	39.75	34.68	41.11
Insoluble matter,	20.45	15.36	11.29	12.08

* Not determined.

COTTON HULL ASHES.

1377-1378. I and II. Received from Southwick, Mass.

	Per Cent. I.	Per Cent. II.
Moisture at 100° C.,	10.25	5.67
Potassium oxide,	21.02	23.28
Water Soluble Potassium oxide,	17.64	19.56
Phosphoric acid,	15.53	11.08
Calcium oxide,	3.30	3.05
Insoluble matter,	17.51	19.11

LIME KILN ASHES.

1379-1383. I. Received from Boston, Mass.
II. Received from Sunderland, Mass.
III. Received from South Deerfield, Mass.
IV and V. Received from Hatfield, Mass.

	Per Cent. I.	II.	III.	IV.	V.
Moisture at 100° C.,	26.61	1.64	none	.79	4.42
Potassium oxide,	.06	1.76	1.60	1.52	1.50
Phosphoric acid,	trace	.59	.52	.92	.56
Calcium oxide,	43.91	21.92	49.43	55.24	43.29
Insoluble matter,	*	*	7.57	3.19	20.64

SULPHATE OF AMMONIA AND NITRATE OF SODA.

1384-1386. I. Sulphate of Ammonia, received from Amherst, Mass.
II. Nitrate of Soda, received from Seekonk, Mass.
III. Nitrate of Soda, received from East Whately, Mass.

	Per Cent. I.	II.	III.
Moisture at 100° C.,	.67	.03	.48
Nitrogen,	20.11	15.37	15.57

* Not determined.

COTTON SEED MEAL.

1387-1391. I. Received from Sunderland, Mass.
II. Received from Southwick, Mass.
III, IV and V. Received from Hatfield, Mass.

	Per Cent. I.	II.	III.	IV.	V.
Moisture at 100° C.,	8.01	7.24	6.67	6.51	5.39
Nitrogen,	6.96	6.55	6.55	7.60	7.36

MURIATE OF POTASH AND HIGH GRADE SULPHATE OF POTASH.

1392-1395. I. Muriate of Potash, received from Amherst, Mass.
II. Muriate of Potash, received from Great Barrington, Mass.
III. Muriate of Potash, received from Amherst, Mass.
IV. High Grade Sulphate of Potash, received from Amherst, Mass.

	Per Cent. I.	II.	III.	IV.
Moisture at 100° C.,	.56	.24	.78	1.22
Potassium oxide,	51.12	50.28	50.80	49.08

PHOSPHATES,

1396-1400. I. Acid Phosphate, received from Amherst, Mass.
II. Acid Phosphate, received from South Amherst, Mass.
III. Dissolved Bone Black, received from Amherst, Mass.
IV. Phosphatic Slag, received from Amherst, Mass.
V. Belgian Phosphate, received from Concord, Mass.

	Per Cent. I.	II.	III.	IV.	V.
Moisture at 100° C.,	10.82	8.47	11.43	.07	.21
Total Phosphoric acid,	14.94	18.68	17.38	14.71	9.54
Soluble " "	11.26	12.13	12.38	—	—
Reverted " "	2.86	6.27	3.52	6.67	*
Insoluble " "	.82	.28	1.48	8.04	*
Calcium oxide,	*	*	*	*	41.27

*Not determined.

TANKAGE AND STEAMED BONE.

1401-1403. I. Tankage, received from Amherst, Mass.
II. Tankage, received from New Bedford, Mass.
III. Steamed Bone, received from Amherst, Mass.

	Per Cent. I.	II.	III.
Moisture at 100° C.,	6.04	8.35	11.68
Total phosphoric acid,	12.25	2.48	20.24
Available " "	5.77	1.66	8.26
Insoluble " "	6.48	.82	11.98
Nitrogen,	5.45	2.06	2.69
Potassium oxide,	*	.65	*

GROUND BONES.

1404-1406. I and II. Received from East Whately, Mass.
III. Received from Leominster, Mass.

	Per Cent. I.	II.	III.
Moisture at 100° C.,	4.55	3.90	10.55
Total phosphoric acid,	23.55	28.53	27.61
Available " "	5.75	11.85	13.72
Insoluble " "	17.80	16.68	13.89
Nitrogen,	2.82	2.64	2.48

DRY GROUND FISH.

1407-1410. I. Received from Amherst, Mass.
II. Received from Sunderland, Mass.
III. Received from North Hadley, Mass.
IV. Received from Amherst, Mass.

	Per Cent. I.	II.	III.	IV.
Moisture at 100° C.,	5.78	7.56	11.02	10.57
Total phosphoric acid,	9.57	6.84	7.66	9.16
Available " "	5.60	3.70	4.76	6.78
Insoluble " "	3.97	3.14	2.90	2.38
Nitrogen,	8.57	8.19	8.71	7.89

* Not determined.

MISCELLANEOUS MATERIAL.

1411-1415. I. Mill refuse, received from Lawrence, Mass
II. Wool dust, received from Rowley, Mass.
III. Cotton seed droppings, received from Springfield, Mass.
IV. Cotton seed dust, received from Springfield, Mass.
V. Cocoa shells, received from Mansfield, Mass.

	Per Cent.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	3.10	10.00	4.08	4.38	3.88
Total phosphoric acid,	.29	.33	.20	.54	.36
Available " "	.24	*	*	*	*
Insoluble " "	.05	*	*	*	*
Total potassium oxide,	*	.44	1.85	1.48	2.48
Water soluble potassium oxide,	11.78	*	*	*	*
Nitrogen,	1.16	8.30	.96	1.22	2.33
Sulphuric acid,	6.73	*	*	*	*
Water soluble sulphuric acid,	5.38	*	*	*	*
Calcium oxide,	*	*	.66	1.48	.76

1416-1417. I. Lime refuse from tannery, received from Lowell, Mass.
II. Waste lime, received from Stockbridge, Mass.

	Per Cent.	
	I.	II.
Moisture at 100° C.,	.66	none
Calcium oxide,	56.18	52.15
Nitrogen,	.59	—
Insoluble matter,	3.31	23.28

1418. I. Dried dandelion root, received from Marblehead, Mass.

	Per Cent.
Moisture at 100° C.,	7.63
Phosphoric acid,	.34
Potassium oxide,	2.28

* Not determined.

Nitrogen,	.73
Calcium oxide,	.09
Magnesium oxide,	.49
Sodium oxide,	2.01
Insoluble matter,	2.02

COMPOUND FERTILIZERS.

1419-1423. I. Received from Hatfield, Mass.
II. Received from North Hadley, Mass.
III. Received from Marblehead, Mass.
IV and V. Received from Concord, Mass.

	Per Cent.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	4.65	4.50	4.88	2.07	2.91
Total phosphoric acid,	10.30	6.37	11.68	9.21	11.19
Soluble " "	2.48	—	2.62	—	—
Reverted " "	5.13	4.54	6.92	3.85	7.61
Insoluble " "	2.69	1.83	2.14	5.36	3.58
Potassium oxide,	14.08	4.67	4.80	16.88	28.56
Nitrogen,	3.30	3.20	3.03	4.62	1.99

1424-1428. I. Received from Seekonk, Mass.
II. Received from Sunderland, Mass.
III. Received from East Whately, Mass.
IV. Received from Great Barrington, Mass.
V. Received from Ashley Falls, Mass.

	Per Cent.				
	I.	II.	III	IV.	V.
Moisture at 100° C.,	8.27	3.87	4.88	3.55	6.52
Total phosphoric acid,	12.82	11.20	14.86	21.44	10.18
Soluble " "	8.32	5.99	8.10	.17	4.73
Reverted " "	3.48	3.63	2.64	7.99	3.61
Insoluble " "	1.02	1.58	4.12	13.28	1.84
Potassium oxide,	6.20	5.72	4.84	.24	5.97
Nitrogen,	3.33	3.46	2.96	4.30	3.64

1429-1433. I. Received from South Amherst, Mass.
II. Received from Hadley, Mass.
III and IV. Received from Holyoke, Mass.
V. Received from Sunderland, Mass.

	Per Cent.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	6.02	5.34	8.99	7.87	2.96
Total phosphoric acid,	11.31	9.08	10.32	9.86	10.35
Soluble " "	4.67	3.13	6.63	6.12	1.01
Reverted " "	4.50	3.65	2.54	2.54	6.37
Insoluble " "	2.14	2.30	1.15	1.20	2.97
Potassium oxide,	8.00	10.08	3.44	10.76	16.74
Nitrogen,	3.04	5.62	1.45	3.09	3.56

PEAT, MUCK, ETC.

1434-1436. I. Peat, received from Boston, Mass.
II and III. Peat, received from Paxton, Mass.

	Per Cent.		
	I.	II.	III.
Moisture at 100° C.,	22.09	65.38	55.85
Nitrogen,	1.62	.34	.38
Phosphoric acid,	*	.11	.14
Calcium oxide,	*	.21	.15
Organic and volatile matter,	*	75.47	67.32
Ash,	*	24.53	32.68
Insoluble matter,	*	21.32	24.27

1437-1440. I. Muck, received from Boston, Mass.
II and III. Meadow mud, received from North Andover, Mass.
IV. Silt deposit, received from Milford, Mass.

	Per Cent.			
	I.	II.	III.	IV.
Moisture at 100° C.,	45.62	82.64	68.27	7.15
Nitrogen,	.61	.29	.12	1.14
Phosphoric acid,	.18	.03	.03	.25
Potassium oxide,	.05	.01	.05	.39
Calcium oxide,	.65	.43	.32	.70

* Not determined.

SOILS.

1441-1445. I. Received from Orange, Mass.
II. Received from Norton, Mass.
III and IV. Received from Bernardston, Mass.
V. Received from Beverly, Mass,

	Per Cent.				
	I.	II.	III.	IV.	V.
Moisture at 100° C.,	10.73	9.58	2.37	1.35	66.51
Nitrogen,	.18	.16	.12	.08	.34
Potassium oxide,	.25	.08	.20	.11	.16
Phosphoric acid,	.10	.04	.24	.15	.08
Calcium oxide,	.34	.68	.93	.15	.17

1446-1449. I and II. Received from Beverly, Mass.
III. Received from Holliston, Mass.
IV. Water solution of soil, received from Amherst, Mass.

	Per Cent.			
	I.	II.	III.	IV.
Moisture at 100° C.,	37.33	17.91	2.57	*
Nitrogen,	.23	.02	.19	—
Potassium oxide,	.35	.46	.24	1.45
Phosphoric acid,	.19	.18	.21	.48
Calcium oxide,	.35	.17	.97	—
Acidity,	*	*	*	.016

* Not determined.

II.

INSTRUCTIONS REGARDING THE SAMPLING OF MATERIALS TO BE SENT ON FOR EXAMINATION WITH STATEMENTS OF CONDITIONS TO SECURE ANALYSES FREE OF CHARGE.

It is of the utmost importance that parties forwarding fertilizing substances for examination should take particular pains in sampling, packing and forwarding such materials, in order that the analyses obtained may represent the average composition of the goods sampled, that no addition or loss of moisture in transportation may happen, and that the package be addressed to the proper department.

All samples are received and entered in the order of their arrival at this office. Each sample is assigned a number and is taken up for investigation in the order in which it has been received.

All samples should be addressed to Dr. C. A. Goessmann, Chemical Department of the Hatch Experiment Station, Amherst, Mass., to prevent confusion and possible delay. Express charges must always be prepaid. **The name of the sender should be enclosed in an envelope and placed inside the receptacle**, together with a statement of the nature of the material forwarded for analysis; whether it is an agricultural chemical, mixed fertilizer, a wood ash or the by-product of some manufacturing industry.

The receipt of all samples will be acknowledged by return mail and the results of analysis will be forwarded free of charge to all farmers as soon as completed.

The results of all analyses of samples made at the Station, free of charge, are considered at the disposal of the managers for publication if deemed advisable.

SAMPLING OF MATERIAL IN BULK.

In sampling such material as wood ashes, cotton hull ashes and in fact any material in bulk, portions should be taken from various parts of the heap and placed on a thick, smooth piece of paper and thoroughly mixed; from this mixture should be drawn a sample of about one pound, which should be placed in a clean bottle, jar or tin can tightly stoppered and sealed in order to retain the moisture of the material unchanged.

SAMPLING OF MATERIAL IN BAGS.

In sampling material which is shipped in bags, portions should be drawn from at least ten per cent of the number of bags present. A fair sample may be obtained by emptying about ten per cent of the bags present on a clean floor or other smooth surface and thoroughly mixing; small amounts are then taken from different parts of the heap and an average sample drawn as has been previously described.

SAMPLING OF SOILS.

The correct taking of representative soil samples, when such are desired for chemical investigation, is of the first importance, as without a properly taken sample, the results, which a careful chemical analysis will show, become of little value. The sample should be taken from different portions of the field and to a depth not exceeding the downward limit of the surface soil. After selecting a place where a sample is to be taken, pull up all growing vegetation and remove all surface matter which is not a part of the soil. Dig a hole in the soil about two feet square, making the sides smooth and clean by means of a sharp pointed shovel or other instrument; now place a sharp bladed shovel at the point of separation of the surface soil from the subsoil and by means of another flat bladed instrument shave off a portion (about two inches) from all four sides of the aperture, letting the soil fall into a shovel which is held in a proper position to receive the same. Place the soil in a suitable receptacle and proceed to take other samples in a like manner from several different parts of the field. The large bulk of soil which has thus been taken is now placed on a clean floor or on a large piece of thick paper and thoroughly broken up and mixed, after which an average sample is drawn and placed in a glass jar or bottle. The bottle is then securely stoppered and sealed, properly labelled and forwarded for the subsequent chemical examination

A description of the soil should accompany the sample or be sent in a sealed letter, setting forth the locality, depth at which the sample was taken, nature of subsoil and depth, the method of fertilization and crop rotation which has been in practice, general fitness of land for cultivation and all other information that would be of interest or assistance to the chemist in formulating his report.

Care should be exercised in sampling when the weather conditions are normal and no time should be lost between the drawing of the sample and the forwarding of same to the laboratory. This point applies with equal force to all materials forwarded for investigation.

STATEMENT OF CONDITIONS TO SECURE ANALYSES FREE OF CHARGE.

APPLICATION FOR FREE ANALYSIS OF FERTILIZERS AND FERTILIZING MATERIAL.

Name of Material,--

Name of manufacturer or dealer, ------------------------------------

Address of manufacturer or dealer,---------------------------------

Date of purchase,---

Price paid per ton,---

Whether bought for own use or for sale,-----------------------------

Signature of Applicant,---

Post Office Address,-------------------------------------

A printed copy of the above stated questions will be sent hereafter from this office *to every applicant for an analysis free of charge*, to be answered by him according to his best information, before his request can be considered.

The object of this course is to impart a more general interest in the results of this work of the Station and to assist in an efficient management of the official inspection of commercial fertilizers and fertilizing materials by making known the names of licensed as well as unlicensed dealers in our State.

The call for free analysis has gradually reached such proportions that the expenses necessarily incurred in the work have become a serious feature in the management of the financial resources at our disposal.

Only samples that have been properly taken, according to directions given above, will be accepted for analysis.

III.

NOTES ON BARN-YARD MANURE.

The general character and composition of the samples of barn-yard manure sent on to the Station for an examination have frequently been found to differ so materially, as may be noticed from the subsequent statement, that it calls for a special discussion on this occasion.

COMPOSITION OF BARN-YARD MANURE. (Lbs. per 100 lbs. Manure). (Results of many years observation).

	HIGHEST.	LOWEST.	AVERAGE.
Moisture,	75.00	60.00	67.00
Phosphoric acid,	.75	.13	.24
Potassium oxide,	.80	.13	.40
Nitrogen,	.67	.26	.41

It is a well known fact that the general character and the chemical composition of the barn-yard manure, which controls the agricultural and commercial value of the article, depends materially on the following points:

1. On the kind, age and function of the animals which serve in its production.

2. On the kind of feed consumed and a rational system of feeding.

3. On the character and amount of the material used in the absorption and preservation of the animal excrements, both liquid and solid, produced by the animals on trial.

4. On the age of the material obtained and the special care taken to secure, in a fair degree, its preservation previous to its incorporation into the soil.

Without any attempt to discuss here again in detail the particular importance of each of the points previously mentioned, it has occurred to the writer that it might be of interest to call the attention of our farmers to a practice in Germany, which has, no doubt, proved very useful in stimulating a special interest in studying the various modes of saving and preserving the barn-yard manure for the purpose of securing its full benefit in the interest of an economical and rational system of farm management.

The recognition of the importance of barn-yard manure as an economical and most valuable resource of plant food, as well as an efficient material for the improvement of important physical properties of the soil, is so generally recognized that even in sections of the world where chemical commercial fertilizers are most extensively used, either for supplementing home resources of plant food or as substitutes for home resources of manure, the question has received the most serious attention.

The practice above referred to, which came under my personal observation on a late visit to Germany, consists in offering premiums in money on the part of local Agricultural Societies to practical farmers who propose to take part in the competition. The following abstract of an official advertisement of the general rules which served, in the case under discussion, as the basis of adjustment, may illustrate the mode of proceeding:

"In consideration of the great loss frequently resulting from a careless treatment of the barn-yard manure, it has been decided to stimulate inquiries into the current modes of securing and handling barn-yard manure to secure the most satisfactory results. A competent committee appointed by the society shall serve as judges in the matter. The decision shall be made by the committee assigned on the various points adopted as a basis for adjustment by the society. The whole scale amounts to one hundred and fifty points; one hundred and ten points assigned to any party shall be the lowest figure to entitle to a premium; the three highest numbers assigned shall only entitle to a premium. The committee charged with the valuation shall for that purpose personally visit the farms of each of the competing parties."

The following system for assigning numbers shall serve as a basis:

a. Location of stalls,	10	points.
b. Location of dwelling house and well,	5	"
c. Location of cistern for liquid manure,	5	"
d. General condition for collection of liquid manure,	10	"
e. General condition of place for keeping manure,	5	"
f. Provisions to prevent access of rain water and surface overflow,	25	"
g. Character of the bottom of the manure pit,	20	"
h. Fall to the liquid manure cistern,	15	"

i.	Provisions to facilitate the removing of the manure,	10 points.
j.	General protection of the manure place,	5 "
k.	Size of manure place with reference to the amount of live stock kept,	10 "
l.	Treatment of manure,	30 "
		150 points.

Whatever our opinion may be regarding some of the details of the above system of rating the different points, it will be conceded that the whole idea cannot fail to show that hygienic, as well as economical interests of the farmer, are to be protected.

IV.

DISCUSSION OF TRADE VALUES OF FERTILIZING INGREDIENTS IN RAW MATERIALS AND CHEMICALS FOR 1903 AND 1904.

	1903.	1904.
	Cents per pound.	
Nitrogen in ammonia salts,	17.5	17.5
Nitrogen in nitrates,	15.0	16.0
Organic nitrogen in dry and fine ground fish, meat, blood, and in high grade mixed fertilizers,	17.0	17.5
Organic nitrogen in fine bone and tankage,	16.5	17.0
Organic nitrogen in coarse bone and tankage,	12.0	12.5
Phosphoric acid soluble in water,	4.5	4.5
Phosphoric acid soluble in ammonium citrate,	4.0	4.0
Phosphoric acid in fine ground fish, bone and tankage,	4.0	4.0
Phosphoric acid in cotton seed meal, castor pomace and wood ashes,	4.0	4.0
Phosphoric acid in coarse fish, bone and tankage,	3.0	3.0
Phosphoric acid insoluble (in water and in neutral citrate of ammonia) in mixed fertilizers,	2.0	2.0
Potash as sulphate, free from chlorides,	5.0	5.0
Potash as muriate (chloride),	4.25	4.25

The above schedule of trade values was adopted by representatives of the Massachusetts, Connecticut, Rhode Island, Maine, Vermont and New Jersey Experiment Stations at a conference held during the month of March, 1904, and is based upon the condition of the fertilizer market in centers of distribution in New England, New York and New Jersey during the six months preceding March, 1904, and refers to the current market prices, in ton lots, of the leading standard raw materials, which furnish nitrogen, phosphoric acid and potash, and which enter largely into the manufacture of our commercial fertilizers. The following is a list of such materials : —

Sulphate of ammonia,	Dissolved bone,
Nitrate of soda,	Ground phosphate rock,
Azotine,	Acid phosphate,
Dried blood,	Refuse bone black,
Cotton seed meal,	High grade sulphate of potash,
Castor pomace,	Muriate of potash,
Linseed meal,	Sulphate of potash-magnesia,
Dry ground fish,	Kainite,
Bone and tankage,	Sylvinite,
	Crude saltpetre.

A comparison of the market cost of the different essential ingredients of plant food for 1904, with the previous year, shows the following variation : Nitrogen in form of nitrates is a cent higher per pound. The higher grades of organic nitrogen, including nitrogen classed in high grade mixed fertilizers, are a half cent higher in cost than for the year 1903. The cost of the different forms of phosphoric acid and potassium oxide remains the same as in the previous year.

Valuation. The approximate value of a compound fertilizer or any material used for fertilizing purposes is obtained by calculating the value of each of the three essential elements of plant food (nitrogen, phosphoric acid and potassium oxide, including the different forms of each wherever different forms are recognized in the table) in one hundred pounds of the fertilizer, and multiplying each product by twenty to change it to a ton basis. The sum of these values will give the total approximate value of the fertilizer per ton at the principal places of distribution.

In figuring the commercial value of a compound fertilizer, a suitable amount should be added to cover the expenses incurred in the manufacture and sale of the goods.

The trade value of a fertilizer does not necessarily indicate its exact agricultural value. The trade value of a given fertilizer simply shows its cost in our general markets. The agricultural value of a fertilizer shows its capacity in producing certain agricultural crops, and depends not only upon the condition of the fertility of the soil upon which the fertilizer is used, but also upon the physical condition of the soil, the mode of cultivation, the season and the crop to be raised. Experience alone can determine the general fitness and approximate agricultural value of compound commercial fertilizers and fertilizing materials.

The Following Bulletins are Available for Distribution to Those Who May Desire Them.

No. 27. Tuberculosis in college herd; tuberculin in diagnosis; bovine rabies; poisoning by nitrate of soda.
No. 33. Glossary of fodder terms.
No. 35. Agricultural value of bone meal.
No. 41. On the use of tuberculin (translated from Dr. Bang).
No. 54. Fertilizer analyses.
No. 57. Fertilizer analyses.
No. 64. Analyses of concentrated feed stuffs.
No. 67. Grass thrips; treatment for thrips in greenhouses.
No. 68. Fertilizer analyses.
No. 70. Fertilizer analyses.
No. 72. Summer forage crops.
No. 75. Fertilizer analyses.
No. 76. The imported elm-leaf beetle.
No. 77. Fertilizer analyses.
No. 78. Concentrated feed stuffs.
No. 79. Growing China asters.
No. 81. Analyses of fertilizers and manurial substances, instructions to manufacturers, agents, etc.: discussion of trade values; treatment of barnyard manure with absorbents.
No. 82. Orchard management: cover crops in orchards; pruning orchards; report on fruits.
No. 83. Fertilizer analyses.
No. 84. Fertilizer analyses.
No. 85. Concentrated feeds.
No. 86. Orchard treatment for the San José scale. One year's experiments in Massachusetts.
No. 87. Cucumbers under glass.
No. 89. Fertilizer analyses.
No. 90. Fertilizer analyses.
No. 91. Injuries to shade trees from electricity.
No. 92. Fertilizer analyses.
No. 93. Concentrated feeds.
No. 94. Distillery and brewery by-products.
No. 95. Fertilizer analyses; notes on barnyard manure; trade values.
Technical, No. 1. Greenhouse aleyrodes; strawberry aleyrodes.
Special bulletin,—The brown-tail moth.
Special bulletin,—The coccid genera Chionaspis and Hemichionaspis.
Index, 1888-95.
Annual Reports,—1898, 1899, 1900, 1901, 1902, 1903.

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