UNIVERSITY OF MISSOURI.

COLLEGE OF AGRICULTURE AND MECHANIC ARTS,

Agricultural Experiment Station

BULLETIN NO. 63.

COMMERCIAL FERTILIZERS.

COLUMBIA, MISSOURI.

February, 1904.

Press of E. W. Stephens, Columbia, Missouri.

University of the State of Missouri.

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Agricultural Experiment Station.

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BULLETIN NO. 63

REPORT OF THE DIRECTOR.

I have the honor to submit the following report on the work of the Missouri Agricultural Experiment Station in connection with the registration and inspection of Commercial Fertilizers in Missouri for the year ending December 31, 1903:

The 42d General Assembly enacted a new law governing the sale and inspection of Commercial Fertilizers in Missouri. This law was approved March 14, 1903. Acting under this law I have registered all brands of fertilizers offered for sale in the State and have collected samples for analysis from dealers, farmers and other consumers. The samples collected have been carefully analyzed, and the results appear on a later page. The present law is efficient and satisfactory to both the manufacturer and the farmer. The thorough inspection of fertilizers wherever found is a protection both to the farmer and to the manufacturer who sells honest goods.

This report includes:

1. A copy of the law now in force governing the inspection and sale of commercial fertilizers in Missouri. (Page 5.)

2. A list of the brands of fertilizers and their guaranteed chemical composition which have been registered in this office by the manufacturers. (Page 9.)

3. The results of the chemist's analyses of brands actually sold in the State. (Page 13.)

4. Advice to farmers on the application of fertilizers. (Page 16.)

5. Directions for sending samples for analysis. (Page 21.)

6. A financial statement of the receipts and disbursements for the year ending December 31, 1903. (Page 22.)

F. B. MUMFORD,
Acting Director.

Columbia, Missouri, February 1, 1904.

MISSOURI FERTILIZER LAW.

Section 1. Any commercial fertilizer or material to be used as a fertilizer the selling price of which exceeds five dollars per ton, shall have stamped or affixed to each package of such fertilizer in a conspicuous place on the outside thereof, by the manufacturer, importer, corporation, company or person who sells or causes the same to to be sold, offered or exposed for sale, a plainly printed statement which shall certify as follows:

(1) The name, brand or trade mark under which the fertilizer is sold.

(2) The name or address of the manufacturer of the fertilizer.

(3) The guaranteed chemical composition of the fertilizer expressed in the following terms: (a) Percentum of nitrogen; percentum of available phosphoric acid, and in the case of an undissolved animal bone, the percentum of insoluble phosphoric acid; (c) percentum of potash soluble in distilled water. In case the composition is expressed in equivalent to ammonia, etc., in addition to the above, it shall be clearly and unequivocally shown that such terms are used merely as equivalents and not used to represent additional plant food.

Sec. 2. Before any commercial fertilizer or material to be used as a fertilizer, the selling price of which exceeds five dollars per ton, is sold, offered or exposed for sale in this state, the manufacturer, importer, corporation, company or person who sells or causes the same to be sold, offered or exposed for sale, shall file annually for registry with the Missouri Agricultural Experiment Station at Columbia, a statement which shall certify as follows: (1) The name, brand, or trade mark under

which the fertilizer is sold; (2) the name and address of the manufacturer of the fertilizer; (3) the guaranteed chemical composition of the fertilizer, expressed in the following terms: (a) percentum of nitrogen; (b) percentum of available phosphoric acid, and in the case of an undissolved bone, the percentum of insoluble phosphoric acid; (c) percentum of potash soluble in distilled water.

Sec. 3. It shall be the duty of the director of said experiment station to register or cause to be registered the statements of every brand of fertilizer offered for registry as aforesaid, and to furnish to every manufacturer, importer or person complying with the provisions of this act, a certificate setting forth the fact of registry, and shall furnish to the manufacturer, importer or person complying with the provisions of this act, the labels or tags required in section 4 of this act, showing that the brand of fertilizer has been duly registered at the experiment station for that year.

Sec. 4. That every person, corporation or company who shall sell, offer or expose for sale in this state any commercial fertilizer, the selling price of which exceeds five dollars per ton, shall stamp or affix to each package of such fertilizer in a conspicuous place on the outside thereof a plainly printed statement which shall recite and certify in effect and from the matters and things required to be set forth in the registered statement described in section 2 of this act. If any such fertilizer is sold, offered, or exposed for sale in bulk, such printed statement shall accompany every lot and parcel sold, offered or exposed for sale. Every person, corporation or company selling or exposing for sale such fertilizer shall in addition to said printed statement attach to every package or quantity of such fertilizer sold or exposed for sale, in a conspicuous place on the outside of said package, a label or tag furnished by said experiment station showing that such brand or commercial

fertilizer has been registered at said experiment station for that year.

Sec. 5. Every manufacturer, importer or person shall pay to said experiment station for the labels or tags required by them under section 4 of this act, the sum of one and one-half cents each for tags to be attached to packages weighing one hundred pounds or less, and three cents each for the tags or labels to be attached to bags or packages weighing more than one hundred pounds. The moneys so paid shall be used for defraying the expenses of said experiment station in registering and keeping a registry of the statements required under the second section of this act, for collecting samples in the open market, for making or causing to be made the analysis of samples, for supplying the labels or tags, for practical and scientific experiments in the value and proper use of commercial fertilizers, and for publishing the results of same and for such other work, investigations and publications as may be of practical use to the farmers of the state.

Sec. 6. It shall be the duty of the experiment station to collect or cause to be collected from the open market each year one or more samples of each and every brand of fertilizer sold in this state during that year, and make or cause to be made a chemical analysis of the same; to publish each year a full and detailed report giving the names and addresses of all the manufacturers of fertilizers selling or offering for sale commercial fertilizers in this state, a list of the brands thereof; the guaranteed composition of the same and the composition as found by the chemical analysis herein required; also an itemized statement of the receipts and expenditures under this act.

Sec. 7. The director of the experiment station is hereby authorized in person or by deputy to take samples of not more than one pound each for analysis, from any lot or package of any commercial fertilizer which

may be in the possession of any manufacturer or dealer in this state upon tender of the value of the same; and to obtain said samples said director and his deputies are hereby authorized to enter upon the premises of said manufacturer or dealer or his agents or where said fertilizer is stored. And said director is hereby authorized to prescribe and enforce such rules and regulations as may be deemed necessary to carry fully into effect the true intent and meaning of this act.

Sec. 8. No person shall sell, offer or expose for sale in this state any untreated, partially decomposed leather, horn, hair, hoof or other inert nitrogenous matter as a fertilizer or as an ingredient of any fertilizer, unless a plainly printed and explicit statement of such fact shall be conspicuously affixed to every package of such fertilizer, and such printed statement shall accompany every parcel, package or lot of the same.

Sec. 9. Every person violating or evading any of the provisions of this act shall be deemed guilty of a misdemeanor, and upon conviction thereof in any court of competent jurisdiction shall be punished with a fine of one hundred dollars for the first offense, and two hundred dollars for each subsequent violation or evasion of this act; which fines shall accrue to the benefit of and be paid into the general revenue fund of the county or municipality where such conviction is made.

Sec. 10. There being no adequate law in this state to prevent fraud in the manufacture and sale of commercial fertilizers, creates an emergency within the meaning of the constitution; therefore, this act shall take effect and be in force from and after its passage.

Name of Manufacturer.	Name or Brand of Fertilizer.	Chemical Composition Guaranteed by the Manufacturer.				
		Nitrogen.		Phosphoric Acid, (P^2O^5.)		Potash, K^2O.
		Nitrogen per cent.	Equivalent to Ammonia per cent.	Available per cent.	Insoluble from Bone, per cent.	Soluble in Distilled Water. per cent.
Armour Packing Company, Kansas City, Missouri.	Pure Raw Bone Meal	3.95	4.80	7.10	16.90	
	Pure Fine Ground Beef Bone	2.25	2.73	10.40	17.90	
	Ammoniated Dissolved Bone and Potash	1.73	2.10	10.50	1.40	2.10
	Armour's Blood and Bone Fertilizer	5.35	6.50	6.00	8.50	
	Fertilizer No. 271	1.73	2.10	7.50	1.30	1.10
	Fertilizer No. 282	1.73	2.13	8.52	1.84	2.11
	Fertilizer No. 386	2.60	3.16	8.35	2.10	6.10
	Armour's Odorless Lawn and Garden Fertilizer	3.37	4.10	9.44	2.46	3.10
Arkansas Phosphate Company, Phosphate, Ark.	Ammoniated Bone Superphosphate	1.64	2 00	10.00	2.00	2.00
	20-Century Fertilizer	1.64	2.00	10.00	2.00	1.00
	Economy Fertilizer	1.00	1.21	10.00	1.00	1.00
	Kali-Superphosphate			12.00		2.50
	Acid Phosphate			12.00		
Continental Fertilizer Company, Nashville, Tenn.	Bear Wheat and Corn Grower	.42		10.50		1.00
Cudahy Packing Company, South Omaha, Neb.	Cudahy's Regular Blood and Bone	5.25 to 5.50	6.375 to 6.675	7. to 7.25	8. to 8.25	
Globe Fertilizer Company, Louisville, Kentucky.	Braden Formula	0.82	1.00	11.00		3.00
	Globe Bone Dust	0.82	1.00	9.00		1.00
	Eagle Corn and Wheat Grower	1.65	2.00	8.00		2.00
	Bone and Potash	0.41	.50	11.00		1.00
	Acorn Bone Meal		3.00		22.00	
	Raw Bone Meal		4.00		22.00	
	Globe Grain Grower	0.41	.50	9.00		1.50

Name of Manufacturer.	Name or Brand of Fertilizer.	Chemical Composition Guaranteed by the Manufacturer.				
		Nitrogen.		Phosphoric Acid, (P_2O_5.)		Potash, K_2O.
		Nitrogen, per cent.	Equivalent to Ammonia per cent.	Available per cent.	Insoluble from Bone, per cent.	Soluble in Distilled Water, per cent.
Mayer Fertilizer and Junk Company, St. Louis, Mo.	Anchor Brands.					
	Corn and Wheat Grower	2.50	3.03	6.50	2.50	3.00
	Complete Fertilizer	2.00	2.43	8.00	2.00	1.50
	Bone and Potash	2.00	2.43	7.00	1.00	1.00
	Pure Raw Bone Meal	3.70	4.50	7.00	13.00	
	St. Louis Bone Meal	3.30	4.00	6.00	12.00	
	Acid Phosphate			14.90		
P. B. Mathiason Manufacturing Company, St. Louis, Missouri	Increscent Brands.					
	Raw Bone Meal	3.50	4.25	7.00	16.00	
	Pure Bone Meal	2.68	3.25	8.00	15.00	
	Fine Ground Bone Meal	2.06	2.50	9.00	13.00	
	Alkaline Bone			10.00		3.00
	Acidulated Bone Meal	2.47	3.00	10.00	4.00	
	Acidulated Bone and Potash	2.47	3.00	9.00	2.00	2.00
	St. Louis Fertilizer	1.65	2.00	8.00	1.50	1.50
	Potato and Tobacco Grower	1.65	2.00	7.00	1.50	4.50
	Basing Mixture	2.88	3.50	6.00	13.00	7.00
	Dissolved Bone	3.09	3.75	9.00	1.50	4.00
	Bearing Tree Fertilizer	2.00	2.43	10.00	2.00	7.00
	Lawn Fertilizer	3.91	4.75	9.00		2.00
	Atlas Special	.83	1.00	8.00	1.00	1.00
	Increscent Brand Grain Grower	1.65	2.00	8.00	1.50	1.50
	Increscent Brand Acid Phosphate			16.00		
Northwestern Fertilizing Company, Chicago, Ill.	Horseshoe Brands.					
	National Bone Dust	2.06	2.50	8.00	2.00	1.50
	Acidulated Bone and Potash	0.82	1.00	10.00	2.00	1.00

Northwestern Fertilizing Company, Chicago, Ill..	Bone and Potash			10.00	2.00	
	Quick Acting Phosphate	3.29	4.00	22.00	(total)	
	Raw Bone	2.47	3.00	20.00	(total)	
	Pure Ground Bone	1.23	1.50	25.00	(total)	
	Special Bone Meal					
Packers' Fertilizer Association, Chicago, Illinois..	Boar's Head Brands.	2.06	2.50	8.00	2.00	1.50
	World of Good Superphosphate	0.82	1.00	10.00	2.00	1.00
	Ammoniated Bone and Potash			10.00	2.00	4.00
	Potash Phosphate	3.29	4.00	22.00	(total)	
	Fine Raw Bone	2.47	3.00	20.00	(total)	
	Chicago Bone Meal	1.23	1.50	25.00	(total)	
	Special Bone Meal			14.00	1.00	
	Gilt Edge Phosphate	0.82	1.00	10.00	2.00	
	Sure Growth Phosphate			10.00	1.00	
	Soluble Phosphate			10.00	2.00	2.00
Swift & Company, Chicago, East St. Louis and Kansas City	Swift's Pure Raw Bone Meal	3.75	4.50		23.00	
	Swift's Pure Ammoniated Bone	5.00	6.00		17.00	2.00
	Swift's Pure Superphosphate	1.64	2.00	8.00	4.00	1.00
	Swift's Pure Complete Fertilizer	1.00	1.25	8.00	3.00	
	Swift's Pure Bone Meal	2.50	3.00		25.00	3.00
	Swift's Pure Ammoniated Bone and Potash	4.75	5.75		16.00	
	Swift's Pure Garden City Phosphate			14.00		2.00
	Swift's Pure Champion Wheat and Corn Grower	1.64	2.00	12.00	1.00	2.00
	Swift's Pure Special Phosphate and Potash			10.00		4.00
	Swift's Pure Champion Vegetable Grower	3.25	4.00	10.00	1.00	
	Swift's Pure Special Bone Meal	.8235	1.00		27.50	
	Swift's Pure Bone Meal and Blood	3.75	4.50		23.00	
						2.00
Tennessee Chemical Company, Nashville, Tenn...	Ox Alkaline Bone			12.00		2.00
	Ox Ammoniated Bone	1.65		10.00		1.00
	Ox Alkaline Bone with Ammonia	.42		10.50		
Tuscarora Fertilizer Company, Chicago, Ill.	Animal Bone	2.47	3.00		24.00	
	Raw Bone	3.70	4.50		22.00	2.00
	Tuscarora Standard	1.65	2.00	8.00		2.00
	Bone and Potash			10.00		
	Acid Phosphate			14.00		
Virginia-Carolina Chemical Company, Memphis, Tennessee	Scott's Gossypium Phospho	1.65	2.00	10.00	2.00	2.00

Name of Manufacturer.	Name or Brand of Fertilizer.	Chemical Composition Guaranteed by the Manufacturer.				
		Nitrogen.		Phosphoric Acid P_2O_5.		Potash K_2O.
		Nitrogen. per cent	Equivalent to Ammonia per cent	Available per cent	Insoluble from Bone per cent	Soluble in Distilled Water per cent.
Virginia-Carolina Chemical Company, Memphis, Tennessee	Royal High Grade Guano	1.65	2.00	10.00	2.00	2.00
	Beef Blood and Bone Fertilizer	1.65	2.00	8.00	2.00	2.00
	Scott's State Standard Guano	1.65	2.00	8.00	2.00	2.00
	Royal Cotton Boll Guano	1.65	2.00	8 00	2.00	2.00
	Scott's Ammoniated Bone	1.65	2.00	9.00	2.00	1.00
	Royal Animal Bone Guano	1.65	2.00	9.90	2.00	1.00
	Royal Blood, Bone and Potash	.83	1.00	10.00	2.00	1.00
	Champion Corn and Wheat Grower	.83	1.00	8.00	2.00	2.00
	Royal Fruit Grower	2.48	3.00	8.00	2.00	5.00
	V. C. C. Co.'s Truck Grower	2.06	2.50	8.00	2.00	6.00
	Royal Potash Compound			10.00	2.00	4.00
	Royal Grain Grower			10.06	2.00	4.00
	Royal Compound			10.00	2.00	2.00
	Scott's Potasso Phospho			12.00	2.00	2.00
	Scott's High Grade Acid Phosphate			14.00	2.00	
	Royal Dissolved Bone			14.00	2.00	
	Royal Acid Phosphate			12.00	2.00	
	I. X. L. Acid Phosphate			12.00	2.00	
	German Kainit (Imported)					12.00
	Pure Raw Animal Bone	3.30	4.00	6.00	14.00	
	Royal Vegetable Fertilizer	2.47	3.00	8.00	2.00	4.00
	V. C. Garden Truck Special	4.94	6.00	6.00	2.00	4.00
	V. 3-C. Fruit and Truck Special	3.30	4.00	6.00	2.00	8.00
	Fruit Tree Special	1.23	1.50	10.00	2 00	8.00
	V. C. C. Ammoniated Fertilizer	.82	1.00	10.00	2.00	3.00
	Scott's Meal Formula	.82	1.00	10 00	2.00	1.00
	Capital Bone and Potash Compound			10.00	2.00	2.00
Whitelaw Brothers, St. Louis, Missouri	In Clover	2.45	3.00	8 to 9	1 to 3	2 to 3
	Frubacto	3.29	4.00	6 to 8	2 to 4	4 to 5
	English Park	2.50 to 3.00	3.50 to 4.50	6 to 8	2 to 4	3 to 4

Date Collected.	Lab'y No.	Name or Brand of Fertilizer.	Manufacturer.	Collected from	Nitrogen.		Phosphoric Acid, P_2O_5.						Potash, K_2O.		No.
							Available.		Insoluble.		Total.				
					Found	Gua't'd	Found	Gua't'd	Found	Gua't'd	Found	Gua't'd	Found	Gua't'd	
Aug. 27	1	Ammoniated Dissolved Bone and Potash	Armour P'k'g Co., Kansas City, Mo.	Factory at Kansas City.	2.11	1.72	12.32	10.50	1.00	1.40	13.32	11.90	1.86	2.10	1
Aug. 27	3	No. 271	"	"	2.17	1.60	9.68	7.00	1.43	1.50	11.11	8.50	1.06	1.00	3
Aug. 27	4	No. 282	"	"	2.27	1.55	10.41	8.00	0.76	..	11.17	....	1.86	2.00	4
Aug. 27	15	Pure Fine Ground Beef Bone..... ...	"	"	2.37	2.24	13.34	10.40	14.46	17.90	27.80	28.30	....	....	18
Aug. 27	16	Pure Raw Bone Meal	"	"	3.96	3.94	7.89	7.10	14.76	16.90	22.65	24.00	....	....	16
Sept. 18	28	"White Diamond" Ammoniated Bone Superphosphate....	Arkansas Phos. Co. Phosphate, Ark.	Jno. C. Mitchell DeLassus, Mo.	1.58	1.64	9.25	10.00	4.58	2.00	13.83	12.00	1.85	2.00	28
Sept. 18	29	"White Diamond" Acid Phosphate....	"	"	....	....	9.47	14.to 16.	7.35	. ..	16.82	....	....	...	29
Sept. 18	26	.....	"	"	0.94	1.22	8.96	10.00	6.54	1.00	15.50	....	0.96	1.00	26
Sept. 28	30	Blood and Bone.....	Cudahy Pack'g Co. So. Omaha, Neb.	Coleman & Davis, Aurora, Mo.	5.92	6.36	8.64	6.88	7.53	4.90	16.17	11.78	....	...	30
Sept. 26	19	Pure Raw Bone.....	S. T. Hazeltine, Dorchester, Mo.	S. T. Hazeltine, Dorchester, Mo.	3.51	....	9.07	....	11.08	....	20.15	....	....	....	19
Sept. 26	27	Blood and Bone.....	T. J. Jenkins, Springfield, Mo.	T. J. Jenkins, Springfield, Mo.	2.21	....	3.13	....	4.95	...	8.08	....	....	....	27
Aug. 31	2	"Anchor Brand" Corn&Wheat Grower	Mayer Fert. & Junk Co., St. Louis, Mo.	St. Louis Factory.	1.58	2.50	7.20	6.50	6 45	*2.50	13.65	9.00	0.54	3.00	2
Aug. 31	8	"Anchor Brand" Complete Fertilizer	"	"	1.52	2.20	6.86	8.00	6.38	2.00	13.24	10.00	0.54	1.50	8
Aug. 31	5	"Anchor Brand" Bone and Potash...	"	"	1.29	2.00	9.60	7.00	10.64	*1.00	17.24	8.00	0.34	1.00	5
Sept. 3	10	Pure Raw Bone Meal	"	W. F. Strehlmann, Leslie.	3.36	3.70	8.86	7.00	12.17	13.00	21.03	20.00	....	....	10
Aug. 31	18	St. Louis Bone Meal.	"	St.Louis Fact'y	3.30	3.30	6.89	6.00	12.34	12.00	19.23	18.00	....	....	18
Aug. 31	12	"Increscent" Pure Bone Meal.....	P. B. Mathiason Mfg. Co., St. Louis	St. Louis Factory.	2.79	2 63	13.41	7.00	10.19	16.00	23.60	23.00	....	....	12

*From Bone.

ANALYSES OF FERTILIZERS.

Date Collected.	Lab'y No.	Name or Brand of Fertilizer.	Manufacturer.	Collected from	Nitrogen		Phosphoric Acid, P_2O_5.						Potash, K_2O.		No.
							Available.		Insoluble.		Total.				
					Found	Gua't'd	Found	Gua't'd	Found	Gua't'd	Found	Gua't'd	Found	Gua't'd	
Aug. 30	14	"Increscent" Extra Fine Ground Bone Meal.....	P. B. Mathiason Mfg. Co., St. Louis	St. Louis Factory.	2.37	2.05	12.18	9.00	10.46	13.00	22.64	22.00	. .	....	14
Aug. 30	17	"Increscent" Raw Bone Meal.....	"	"	3.61	3.50	9.22	7.00	13.42	16.00	22.64	23.00	...	...	17
Sept. 28	31	"Boar's Head Brand"	Packers' Frt. Asso., Chicago, Ill.	J. F. Whitmore Aurora, Mo.	2.43	2.09 to 2.87	8.56	....	4.76	....	13.32	10.to 13.	1.82	1.5 to 2.	31
Aug. 28	13	Pure Raw Bone Meal	Swift & Co., Kansas City, Kas.	Kansas City Factory.	4.04	3.75 to 4.50	10.74	....	13.58	....	24.32	23.00 to 27.50	. .	....	13
Sept. 21	22	Ammoniated Bone and Potash.....	"	"	4.32	4.to 5.	8.53	5.to 7.	8.42	....	16.95	....	3.36	3.to 4.	22
Sept. 30	24	Champion Corn Grower.....	"	Thos. Eggar, Lamar, Mo.	1.92	1.64	15.03	12.00	0.83	....	15.86	....	1.79	2.00	24
Sept. 21	25	"Ox" Alkaline Bone.	Tenn. Chem. Co.	Jno. Vincent, Fredericktown.	0.20	..	12.17	12.00	5.72	..	17.89	....	2.27	3.00	25
Sept. 17	32	Scott's State Standard Guano.....	Va.-Carolina Chem. Co., Memphis, Tenn	Hermann & Herbst, Farmington, Mo.	0.96	1.65 to 2.50	8.90	8.00 to 10.00	1.03	2.to 3.	9.93	....	3.45	2.to 3.	32
Aug. 31	7	"In Clover"	Whitelaw Bros., St. Louis, Mo.	St. Louis warehouse.	2.08	2.82	7.65	5.73	5.81	....	13.46	...	1.50	1.78	7
	9	"Frubactoe"			1.65	3.12	8.56	6.30	3.92	....	12.48	....	2.37	4.82	9

1903																
Aug. 30	6	"Increscent" Acidulated Bone &Potash	Mathiason Mfg.Co. St. Louis, Mo.	St. Louis Factory....	2.11	2.47	..	....	....	..	14.45	12.00	2.08	2.00	6
Sept. 21	20	Raw Bone Meal.....	Swift & Co., Kansas City, Kas.	Farmers M.Co. Fredericktown.	4.07	3.00 to 4.50	9.54	....	14.89	....	24.43	23.00 to 27.00	....	...	20
Sept. 29	21	Pure Raw Bone.....	"	Paqua & Perkins, Neosho..	3.47	3.75 to 4.50	13.95	....	12.43	....	25.48	23.00 to 27.00	...	....	21
Sept. 28	23	Raw Bone Meal.. ...	"	J. F. Whitmore Aurora, Mo,	3.92	3.50 to 4.50	12.82	....	12.60	....	25.42	23.00 to 27.00	....	....	23
Sept. 29	33	Fine Ground Beef Bone.....	Armour & Co., Kansas City, Mo.	Wood Moore, Neosho, Mo.	2.18	2.50	16.23	9.00	12.36	16.00	28.59	25.00	....	....	33
Sept. 17	34	Fine Ground Beef Bone.....	"	Kansas City Factory... ..	2.43	2.73	17.82	10.40	10.21	17.90	28.03	28.30	....	....	34
Sept. 30	35	Pure Raw Bone Meal	"	J. A. Cozatt, Jasper, Mo...	4.58	3.93	9.50	7.10	13.21	16.98	22.71	24.08	....	....	35
Sept. 28	36	No. 282.....	"	Jno. Tiede&Co. Billings, Mo.	2.45	1.74	13.17	8.50	1 04	1.84	13.21	10.34	1.82	2.11	36
Sept. 24	37	No. 282....	"	W. F. Neukirk, Mountain G'ye.	2.12	1.55	9.60	8.00	1.10	....	10.70	....	2.00	2.00	37
Sept. 28	38	Pure Fine Ground Beef Bone.....	"	Jno. Tiede&Co. Billings	2.70	3.06	13.11	10.00	13.97	17.90	27.08	27.90	....	....	38
Sept. 28	39	Ammoniated Bone and Potash.....	"	Coleman & Davis, Aurora..	2.30	1.72	12.55	10.50	1.36	1.40	13.91	11.90	1.74	2.10	39
Sept. 30	40	"White Diamond" Ammo. Bone Superphosphate,.....	Arkansas Phos. Co., Phosphate, Ark.	Adams Hdw. Co., Lamar..	1.18	1.64	11.81	10.00	2.18	2.00	13.99	12.00	1.60	2.00	40
Sept. 28	41	"Increscent" Pure Raw Bone Meal....	Mathiason Mfg.Co. St. Louis, Mo.	ABrockschmidt Peirce City..	3.48	3.50 to 4.00	9.11	....	13.39	....	22.50	23.00 to 25.00	....	....	41
Sept. 28	42	"Increscent" Raw Bone Meal.....	"	J. W. Sanders Co., Peirce City	3.88	3.48 to 4.31	9.31	....	13.55	....	22.86	23.00 to 27.00	....	...	42
Sept. 26	43	"Increscent" Extra Fine Bone..... ...	"	SpringfieldSeed Co., Peirce City	2.43	2.46 to 6.56	12.50	....	8.21	. ..	20.71	18.00 to 20.00	.	....	43
Sept. 26	44	"Increscent" Extra Fine Bone.....	Mathiason Mfg. Co. St. Louis, Mo.	SpringfieldSeed Co., Springfield J. W. Katz, Seymour.	2.82	2.05	12.76	....	10.15	....	22 91	22.00	....	....	44
Sept. 29	45	"Increscent" Fine Bone Meal.....	"	ABrockschmidt Peirce City.	3.09	to 2.80 2.05	12.99	9.00	10.20	13.00	23.19	to 25.00	....	....	45
Sept. 26	46	"Increscent" Acidulated Bone & Potash	"	SpringfieldSeed Co., Springfield	2.45	2.50	10.23	9.00	4.13	3.00	14.36	....	2.05	...	46
Aug. 31	47	"Anchor" Pure Raw Bone Meal...	Mayer Fert. & Junk Co., St. Louis.	St. Louis Factory.....	3.61	to 3.00 3.70	8.82 11.04	to 10.00 7.00	12.63	to 4.00 13.00	21.45	20.00	....	....	47
Sept. 21	48	St. Louis Bone Meal.	"	Phil Cohen, Fredericktown	3.11	3.30	12.09	6.00	9.44	12.00	20.48	18.00	..	....	48
Sept. 21	49	Pure Raw Bone Meal	"	"	3.37	3.70		7.00	7.61	13.00	19.70	20.00	....	....	49

ADVICE TO FARMERS.

Dr. Paul Schweitzer.

It is well to bear in mind that in the purchase of a fertilizer, no matter by what name or under what guarantee it is sold, the only things of value are the available phosphoric acid, potash and nitrogen; not *all* the phosphoric acid, potash and nitrogen which the fertilizer may contain, but only those portions of the three substances mentioned which are available to the plants; and that means the portions which are either directly soluble in water or in such physical condition as to be easily absorbed by the roots that come in contact with them. If, therefore, a fertilizer is bought under the claim of containing 12 1-2 per cent of available phosphoric acid, then a hundred pounds of it contains 12 1-2 pounds of value, the rest 87 1-2 pounds, being so much dross or useless incumbrance; and if sold under the claim of containing 3 1-2 per cent of available nitrogen, 1 1-2 per cent of water soluble potash and 8 per cent of available phosphoric acid, then thirteen pounds in the hundred-pound sack are of value and the rest incumbrance.

Now it is plain that to rely implicitly on the claim made for any article of commerce by its manufacturer would be very unwise; for though responsible houses can as a rule be trusted, the lack of supervision would beget carelessness, and this works without exception to the detriment of the buyer. It is for this reason that the State by its Fertilizer Inspection Law endeavors to

protect the farmer; this law places the responsibility of seeing that the fertilizers sold in this State are true to the claims made for them, upon the director of the experiment station or his agents. They collect twice a year, in the fall and in the spring, samples of all fertilizers bought by farmers so far as they can be reached, and subject them to a careful chemical analysis, the results of which, along with the claims for them, are published in a bulletin for general distribution. Every buyer of fertilizer should receive or call for a copy of this bulletin and compare the analytical statement with the claim made for the article he bought, so as to have a guide in future purchases.

No regulation of the prices at which fertilizers are sold can, of course, be attempted. Healthy competition will as a rule result in fair charges; yet it is desirable for every farmer to ascertain for himself whether he actually receives his money's worth; it may be done with a tolerable degree of accuracy by pricing the pound of available nitrogen at 16 cents, the pound of available phosphoric acid at 4 cents, and the pound of water-soluble potash at 4 1-2 cents; these prices are subject to fluctuation and have to be revised every year; but they are thought at the present time to be fair to producer and to consumer.

The two fertilizers previously spoken of will, consequently, have the following value; the first with 12 1-2 per cent of available phosphoric acid or 12 1-2 pounds of it in the 100-pound sack, will be worth four times 12 1-2 cents or 50 cents per 100 pounds, or $10 per ton, and the second 95 cents per 100 pounds or $19 per ton; the calculation is readily made and will serve a good purpose. A number of brands of bone meal are, for example, in the market, and selection has to be made of the number; this is the most difficult case since, in addition to the value of the ingredients mentioned, the phosphoric acid, listed as insoluble in bone goods should receive a

valuation of 2 1-2 cents per pound; but by calculating and adding the value to the rest, a comparison of the different brands can be readily made with the prices at which they are offered, and the proper choice made intelligently.

Potash, phosphoric acid and nitrates in certain amounts are necessary to insure satisfactory crops. These substances are taken up by the plants largely during the early stages of their growth, which fact has a most important bearing upon the whole question of manuring; for it is plain that, if the absorption of the largest part of the ash constituents takes place during the early growth and before the full development of the root system, a much larger part, especially of the very essential food constituents of the plant, must be present in the soil than merely suffices for a single crop. The roots have not penetrated yet and spread through the whole mass of cultivated soil, and so the food must, so to speak, seek the roots rather than the roots the food and, to do so effectively, it must be present in available form on every particle of soil. To stint the plants at this early stage of growth is fatal to their fullest and best development and a certain way to an inferior and short crop.

NITROGEN.

The term "available" so often used in regard to plant food, implies solubility in water, since the roots of plants can absorb nothing but what is soluble. Whatever is insoluble, including the vast amount of elementary nitrogen in our atmosphere, is wholly unavailable excepting in the case of leguminous plants; likewise does the available nitrogen in our soil suffer gradual but continual loss through surface washing or underdrainage, by which this most desirable and costliest of all plant foods demands more careful and more intelligent attention than the rest.

We know there are virtually but two classes of nitrogenous compounds which, on account of their solubility and experimental proof furnished therefor, can be taken up and assimilated by the plants; these are ammonia salts, and salts of nitric acid; we also know by practical trials with our cultivated crops that the latter is more effective than the former. There is no doubt that the nitrates are preferable and cheaper than other nitrogen salts and are, in reality, the rational source of nitrogen for farm crops unless, indeed, we supply, as we ought to do, the necessary nitrogen by a rotation in which a leguminous plant like clover or alfalfa takes a prominent part.

Besides those mentioned, the markets supply two other nitrogenous manures; animal like ground fish, bone, blood, scraps and various refuse of our slaughter and packing houses, and vegetable like cottonseed meal and others, whose nitrogen is always speedily available to plants but must first pass through a series of changes. These changes precede in every instance the assimilation of nitrogen and since animal substances containing it decompose more readily than vegetable ones, the former are more valuable to the farmer for manurial purposes, especially where quick responses are expected and demanded; from this statement, however, horn shavings and hide and leather scraps are excluded, as they have scarcely any effect whatever unless previously submitted to a chemical treatment.

POTASH.

The accessible Potash supply for this State consists of wood ashes and the products of the potash industry at Stassfurth, Germany.

The former are limited in amount and available only in certain places, and it is difficult to assign to them, on account of the differences in their composition, any certain value; where used, as in the southern part of

the State, ten per cent of potash in unleached ashes is probably the average. Unlimited supply reaches us, however, from Germany under the names of kainit, sulphate and muriate; the first of these contains 12 1-2 per cent of potash, and the others about 50 per cent, a guarantee being given in every case, by the original seller, which can be accepted as reliable.

PHOSPHORIC ACID.

The sources of this acid are four in number, *first*: bones either fresh or steamed or in some form resulting by the operations of the packing house industry; *second*: phosphatic deposits like those of South Carolina or the Keys of the Caribbean Sea; *third*: accumulations at certain places of fossil, chiefly excrementitious character; *fourth*: Thomas slag or slag, a by product of the smelting of iron ores, of late years brought into the markets of this country. In neither of these substances is phosphoric acid readily available; each has to be ground more or less finely, or, better yet, treated with acid in manufacturing plants to make the phosphoric acid soluble. The percentage of this acid in the numerous brands of phosphatic fertilizers varies between wide limits and can not even be approximately given.

The claim or guarantee on every sack or package, required to be put on it by law, with steady supervision on the part of the experiment station, offers means of protecting the farmer against imposition; yet the decision in regard to the necessity of buying fertilizer at all, as also the intelligent selection of kind and amount, rests with the farmer, and no fixed rules can be given for either crop or soil, here or elsewhere. Actual tests of the value of a fertilizer on the farmer's own soil is the surest and safest guide.

Directions to Purchasers of Fertilizers for Taking Sample for Analysis:

1. If possible let the agent or dealer from whom the fertilizer is bought, or his representative, be present when taking the sample.

2. Select of the lot bought at least three sacks not previously opened and in good condition. Empty them upon a clean floor and mix their contents thoroughly by shoveling. Spread the whole out evenly and take from different parts, side, middle and bottom, equal quantities, which must be mixed again and from which the sample is to be taken, amounting to no less than one pound.

3. Place sample in a clean tin can or bottle. Put on top of it one of the manufacturer's labels taken from sack, close, wrap around the certificate below, properly filled out, and send to this office by express, charges prepaid.

PURCHASER'S CERTIFICATE.

(P. O. and Date).....

I hereby certify that the sample of fertilizer sent to-day was taken in accordance with the directions printed and was taken from a lot of..... sacks, purchased by me for my own use and not for sale, from .... under the name ..... and I further certify that the fertilizer, while in my possession, had not been exposed to the acts of rain or weather.

Name .....

Witness .....

DETAILED STATEMENT OF RECEIPTS AND DISBURSEMENTS ON THE FERTILIZER CONTROL ACCOUNT FOR THE YEAR ENDING DECEMBER 31, 1903.

To Balance	$1,512	51	
To Sale of tags..	77	00	
To Sale of tags..	134	25	
To Sale of tags..	1,296	32	
To Sale of tags..	670	00	
To Sale of tags..	1,111	00	
To Sale of tags..	23	19	
	$4,824	27	

By H. J. Waters, salary.....	$ 127	62
By Paul Schweitzer, salary.....	91	67
By R. M. Bird, salary and supplies.	28	15
By Chas. Matthews, laboratory repairs	14	80
By Paul Schweitzer, salary.....	91	67
By R. M. Bird, salary.....	25	00
By Estelle Hickok, salary.....	25	00
By Crane Company, laboratory supplies	5	70
By Paul Schweitzer, salary	91	66
By R. M. Bird, salary.....	25	00
By Estelle Hickok, salary	25	00
By Victor Jones, salary.....	17	35
By E. W. Stephens, printing.....	67	87
By H. J. Waters, salary and traveling expenses	135	87
By Paul Schweitzer, salary.....	91	67
By R. M. Bird, salary.....	25	00
By Estelle Hickok, salary.....	25	00
By Lemcke & Beuchner, laboratory material	7	86
By Eimer & Amend, laboratory supplies	3	54
By Paul Schweitzer, salary.....	91	67
By R. M. Bird, salary and laboratory supplies	27	75
By Eimer & Amend, laboratory supplies	29	26
By Victor Jones, labor	12	60
By Chas. Matthews, supplies	2	65
By F. B. Mumford, salary.....	110	41
By P. Schweitzer, salary	91	66
By R. M. Bird, salary.....	25	00
By Estelle Hickok, salary.....	25	00
By F. A. Zumsteg, labor.....	11	57
By Swift & Company, tags returned	33	47
By Terrell-Crouch Lumber Co., lumber	11	00
By Paul Schweitzer, salary.....	91	67
By R. M. Bird, salary and supplies.	30	55
By S. N. Fine, salary.....	17	71
By F. O. Sawyer Paper Co., tags...	90	56
By E. W. Stephens, printing.....	18	76
By Paul Schweitzer, salary.....	91	67
By R. M. Bird, salary and traveling expenses	77	75
By S. N. Fine, salary.....	17	71
By Whitall Tatum & Co., glassware	30	26
By The Fred Macey Co., filing case.	23	24
By American Express Co., express..	10	87
By R. M. Bird, salary and traveling expenses	132	10
By P. Schweitzer, salary	91	66
By G. M. Tucker, salary.....	50	00
By F. B. Mumford, traveling expenses	17	15
By S. N. Fine, salary.....	12	85
By P. C. Murphy Trunk Co., fertilizer case	16	40
By F. O. Sawyer Paper Co., stationery	4	02
By J. W. Carlisle, fertilizer sampler	2	25
By F. B. Mumford, salary.....	110	42
By Paul Schweitzer, salary.....	91	67
By G. M. Tucker, salary and supplies	53	00
By R. M. Bird, salary.....	50	00
By Estelle Hickok, salary.....	25	00
By Clarence Farris, labor.....	14	00
By J. M. Doughty, salary.....	25	10
By F. B. Mumford, salary.....	110	42
By Paul Schweitzer, salary.....	91	67
By R. M. Bird, salary.....	50	00
By Ethyl M. Fine, salary.....	25	00
By Estelle Hickok, salary.....	25	00
By Clarence Farris, salary.....	14	00
By P. Schweitzer, salary and supplies.	95	46
By R. M. Bird, salary.....	50	00
By Clarence Farris, salary.....	14	00
By Balance	1,754	88
	$4,824	27